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## **KNOWING HOW TO KNOW**

A Case Study on the Role of Knowledge Transfer Practices in Product Innovation

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## **Abstract**

**Title:** Knowing How to Know – A Case Study on the Role of Knowledge Transfer Practices in Product Innovation

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**Keywords:** *cross-functional collaboration; explicit knowledge; incremental innovation; knowledge transfer; market knowledge; knowledge management; knowledge transfer practices; radical innovation; tacit knowledge*

**Thesis purpose:** To identify differences in knowledge transfer practices with regard to market knowledge between development of radical and incremental product innovations. The thesis aims to contribute to the current body of literature by addressing a current academic uncertainty regarding how market knowledge is transferred internally in relation to degrees of innovation. From a practical perspective it should help organizations identify knowledge transfer practices relevant to their innovation goals, be they radical or incremental.

**Methodology:** The study takes place in a Swedish high technology company. It is inductive with a qualitative approach and has a comparative multiple case study design. It is a revelatory study which utilizes representative cases to disclose patterns across and between cases. The cases were chosen through a key informant approach whereas the individual interviewees were identified via purposive snowball sampling. 18 Semi-structured interviews were used to gather the empirical material. The analysis undertaken fits the inductive approach of the study in how a within- and cross-case analysis model was used together with a two-level approach.

**Theoretical perspectives:** The study positions itself in the research area of knowledge management viewing knowledge as a key resource where it focuses on knowledge transfer in particular. By applying the concept of cross-functional collaboration, the exchange of market knowledge through different knowledge transfer practices is observed in relation to the grade of innovation of developed products.

**Conclusions:** The study contributes to existing literature on knowledge transfer by enriching the description and discussion about how market knowledge is acquired and spread internally during the development of radical and incremental product innovations. Three knowledge transfer practices were identified which are applied in different ways, depending on whether the developed product innovation is radical or incremental. These findings have practical implications as they can offer managers advice on how to use these practices, depending on whether they want to focus on the development of radical or incremental innovations.

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Axel and Julia

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# 1. INTRODUCTION

## 1.1 Background

It is no novelty that companies compete on their unique resources, nor is it nowadays doubted that knowledge is one of those resources. It is commonly argued that knowledge is the primary resource crucial for companies' competitive strength and continued existence (Nonaka, 1991; Wiig, 1997; Teece et al., 1997 in Ding, et al., 2013; Spender and Grant, 1996 in Ding, et al., 2013; Tsai, 2001 in Beck, et al., 2014). What is further stressed as an important aspect is companies' abilities to effectively manage and ensure the spread of knowledge – the transfer of knowledge (Kogut & Zander, 1992). Knowledge transfer is argued to increase productivity, contribute to companies' longevity and to further the capacity of global organizations to benefit from different expertise and market access (Argote et al., 1990; Baum & Ingram, 1998; Darr et al., 1995 in Kane et al., 2005). This could be argued to be especially applicable for companies experiencing rapid growth – a growing number of employees and the units in which they are divided naturally alters the flow of information and how knowledge is transferred from one unit to another. Higher demands on cross-functional collaboration potentially increase the need for effective knowledge transfer – the more separate units in an organization, the higher the complexity in managing the knowledge within the organization becomes. Another reason for promoting knowledge transfer is that it is described as crucial for innovation (Tidd & Bessant, 2014). Knowledge transfer is argued to be crucial for generating new knowledge and creating synergies that will allow organizations to understand technology and market changes (Tidd & Bessant, 2014). It is further argued that “[...] a company's knowledge base represents its most unique resource for radical innovation development” (Zheng Zhou & Bingxi Li, 2012, p. 1090).

The practical problems companies may face when disregarding how knowledge is transferred between the units in their organization is that they may not be utilizing their organizational knowledge to the fullest. Due to their size some organizations may not be aware of the knowledge residing in the company, which could mean that prospective synergies are overlooked (Tidd & Bessant, 2014). Furthermore it is often claimed that especially Business to Business (B2B) companies seem to struggle with acquiring knowledge that is relevant to product innovation. This stems from an under-valuation of the marketing function in comparison to other departments, like development or finance, limiting the influence of a department that gathers customer knowledge and needs (Griffin, et al., 2013). One could

therefore argue that not knowing where one of the most valuable resources is kept, produced, utilized, nor how it is created and transferred in an organization, is limiting the possibilities to make the most out of it. Being in need of innovation combined with not paying attention to how knowledge is transferred may therefore damage companies' competitiveness.

## **1.2 Problem Discussion**

Knowledge transfer as a general topic has been researched quite extensively, both quantitatively and qualitatively. When focusing particularly on knowledge transfer in relation to innovation, different views emerge. It is argued by several scholars that knowledge transfer can further radical innovation, in particular, by connecting Research and Development (R&D) departments and more market oriented units as it enables R&D to better understand customer preferences (Gupta, et al., 1986; Brettel, et al., 2011). The concept of lead users has since its introduction in the 1980s advocated inclusion of customers and users in the innovation process: “[R]esearch has consistently shown that new products and services must accurately respond to user needs if they are to succeed in the marketplace.” (Von Hippel & Katz, 2002, p. 821). It is further commonly argued that the importance of user inclusion differs with different degrees of innovation – user inclusion is argued to be more important for radical innovation than for incremental innovation (Hurley and Hult, 1998; Han et al., 1998 in Arnold, et al., 2011, p. 246).

However, it is also widely acknowledged that “[...] companies face severe challenges when involving users in the radical innovation process” (Lettl, 2007, p. 54). Adding to the complexity of earlier findings, it has more recently been shown that being customer oriented may not further radical innovations at all (Voss & Voss, 2000 in Arnold, et al., 2011). It has also been argued that being customer oriented may actually have a negative effect on product novelty (Im & Workman, 2004 in Arnold, et al., 2011). These challenges are argued to stem from cognitive hindrances for providing useful input – the customers may not know how to contribute. It may also stem from a reluctance to contribute to projects – the customers may not want to contribute (Lettl, 2007). Because of these challenges the process for achieving radical innovation often follows a certain form: “Users [are] primarily involved at the prototype stage to gain market oriented evaluations and to assess the market potential of the prospective new products“ (Lettl, 2007, p. 54).

The advancements in the field present a research puzzle in how knowledge transfer with the focus on market knowledge is in some cases assumed to be furthering radical innovation while, in other instances, the opposite is argued. Certain scholars explain the existence of this puzzle by changing the focus: the difference in degree of innovation might not be explained by investigating *if* market knowledge was acquired, but by focusing on which customers were communicated with (Arnold, et al., 2011). Involving users in the development process for achieving radical innovation is not enough – involving the *right* users is key. The right users are characterized by “[...] having high motivation toward new solutions, [being] open to new technologies, possess[ing] diverse competencies, and [being] embedded into a very supportive environment.” (Lettl, 2007, p. 53). In addition to this, it is also advocated to focus on *processes* for understanding *how* market knowledge is acquired (Arnold, et al., 2011). Finally, it is encouraged to research knowledge transfer in business-to-business context. (Arnold, et al., 2011). It remains to be investigated through which practices market knowledge is acquired and how it is spread out internally across different functions once it has entered the organization. By assuming that different market knowledge sources lead to different degrees of innovation, it can be said that market knowledge appears to be beneficial for innovation in general – but perhaps different knowledge transfer practices suit different degrees of innovation better? This study seeks to increase the academic understanding of different knowledge transfer practices and their potential connection to different degrees of innovation. It does so from a cross-functional approach, meant to showcase knowledge transfer between market knowledge generating functions and research oriented functions. The following research question guides this study:

***RQ: How do cross-functional knowledge transfer practices, with regard to market knowledge, differ between the development of incremental and radical product innovations?***

### **1.3 Purpose**

The purpose of this study is to identify differences in knowledge transfer practice between the product development of incremental and radical innovations. By focusing on transfer of market knowledge this study can address the current uncertainty regarding the role of market knowledge in relation to innovation and contribute to the existing body of literature on knowledge transfer. The purpose of the study practically contributes by helping organizations

identify knowledge transfer practices relevant to their innovation goals, be they radical or incremental.

## **1.4 Delimitations**

A number of delimitations provide the scope for this study, which may impact the generalizability of the findings. The study takes place in Sweden, in a high-tech company with B2B operations. The cases studied within the case company shall not be interpreted as reflecting the innovation output of the case company. Rather, they were chosen to enable an investigation of development of both radical and incremental product innovation. It should be noted that this study does not seek to establish causality. The effects any of the identified knowledge transfer practices might have are therefore not part of this research. The design simply allows for investigation of potential connections. It should also be noted that the study focuses on the development process from initial idea up until commercialization. Any knowledge transfer taking place after commercialization has not been taken into account.

## **1.5 Key Concepts**

This section presents this study's theoretical perspective and point of departure for addressing the research question and purpose. A number of key concepts are presented which together form the theoretical foundations of the study. An overview of the concepts is presented in Table 1.

### **1.5.1 Knowledge**

The concept of knowledge is often described as challenging to define (Romer, 1993; Grant, 1996). Regardless, this study cannot refrain from defining knowledge and utilizes the general definition provided by Oxford Dictionaries. Knowledge is seen as: "Facts, information, and skills acquired by a person through experience or education; the theoretical or practical understanding of a subject" (Oxford Dictionaries, 2015, online).

### **1.5.2 Knowledge Transfer**

Argote & Ingram (2000) provide a definition of knowledge transfer. They detail it as "[...] in organizations [...] the process through which one unit (e.g., group, department, or division) is affected by the experience of another." (Argote & Ingram, 2000, p. 151).

### **1.5.3 Radical and Incremental Innovation**

The difference between incremental and radical innovation plays a key role in this study in how it guides selection of the units of analysis. While it is often organizationally dependent how certain products or services are attributed with a certain grade of innovation there are basic definitions for the grades of innovations in the literature. (Dewar & Dutton, 1986; Garcia & Calantone, 2002) This study employs the gradual view on the terminology of innovation, which was developed in an extensive literature review by Garcia & Calantone (2002). These authors present three types of innovations: radical (breakthrough), really new and incremental. Radical innovations, according to the authors, both create a new market and use new technology in the industry – meaning that the market and the technology are affected on a macro level. Radical innovations have an automatic effect on the micro level once they are disrupting the macro level. If only one of the two macro-factors is disrupted, either the market or the technology, the innovation is instead named really new. Lastly, when no effect can be seen on the macro-side and only the marketing and/or technology within the company are affected, Garcia & Cantalone define this as incremental innovation. This framework is used in this study to distinguish between past innovations of the case company that are of interest for the research. According to this definition, no truly radical innovations have emerged in the company and the framework is instead used to distinguish between incremental and really new innovations. However, for the sake of conceptual clarity, the really new innovations chosen as subjects of study are hereafter referred to as ‘radical innovations’.

### **1.5.4 Cross-functional Collaboration**

Cross-functional collaboration is in this study regarded as the cooperation between organizational entities with different functions, such as R&D, market knowledge generating departments like marketing and sales and other functional units that are relevant during the development of a new product (Kahn 1996; Li and Calantone 1998; Song, Montoya-Weiss, and Schmidt 1997 in De Luca & Atuahene-Gima, 2007).

### **1.5.5 Market Knowledge**

Market knowledge is a concept crucial for this study as it represents organizations’ knowledge about customers and/or competitors (Li & Calantone, 1998; Day 1994; Kohli & Jaworski 1990; Narver & Slater, 1990 in De Luca & Atuahene-Gima, 2007), specifically customers’

current and potential needs for products, as well as knowledge about competitors' products or strategies. Market knowledge is gathered via market knowledge competencies (Li & Calantone, 1998).

### **1.5.6 Knowledge Transfer Practices**

Kostova & Roth define the concept of an organizational practice: "[...] as an organization's routine use of knowledge for conducting a particular function that has evolved over time under the influence of the organization's history, people, interests, and actions" (2002, p. 216). A knowledge transfer practice is then regarded in this study to be an organization's routine use of transferring that knowledge. This activity of transferring knowledge can be both conscious and subconscious.

TABLE 1: KEY CONCEPTS

Concept	Description	Source
Knowledge	"Facts, information, and skills acquired by a person through experience or education"	Oxford Dictionaries, 2015
Knowledge transfer	Process through which one organizational unit is affected by the experience of others.	Argote & Ingram, 2000
Incremental innovation	A new product that employs a technology and/or means of marketing, which is new within the company.	Garcia & Calantone, 2002
Radical innovation	A new product that employs a technology, which is new within the industry and/or which creates a new market around itself.	Garcia & Calantone, 2002
Cross-functionality	Cooperation between functional units that are relevant to the development process of a product.	De Luca & Atuahene-Gima, 2007
Market knowledge	Knowledge about customers' current and potential needs and about competitors' products or strategies.	De Luca & Atuahene-Gima, 2007; Li & Calantone, 1998
Knowledge transfer practices	An organization's routine use of transferring knowledge. This can be conscious or subconscious.	Kostova & Roth, 2002

## 2. LITERATURE REVIEW

In order to explore the identified practical and academic gaps forming the research problem of this study, its focus must first be put in relation to previous literature in the field of knowledge transfer. The first section of this chapter details the advancements in research on knowledge as a resource and on how to manage it. It also covers how knowledge transfer has been researched in relation to cross-departmental collaboration and innovation. The second and final section concludes the chapter by a summary of the literature reviewed and the assumptions associated to it.<sup>1</sup>

### 2.1 Previous Literature

#### 2.1.1 Knowledge as a Key Resource

The academic discussion and empirical studies covering knowledge as a base for competitive advantage is rooted in theories on organizational learning and technology management (e.g., Kay, 1979; Levitt and March, 1988; Boisot, 1995 in Grant, 1996). The explicit shift from a resource based view (RBV) to a knowledge based view (KBV) started to emerge in the mid-1990s. On a macro-economic level, Romer (1993) introduced the concept of ‘idea gaps’, which were described as a lack of knowledge necessary to create value in the contemporary economies. The central argument was “[...] that idea gaps are central to the process of economic development“ (Romer, 1993, p. 548). On the same note, Grant (1996) presented the ‘knowledge-based theory of the firm’, which argued that knowledge resides within individuals and organizations must seek to facilitate application of the knowledge rather than creating knowledge. In this theory the role of the organization is to incorporate individual knowledge into products and services. The role of management is to provide coordination needed for this incorporation of knowledge (Grant, 1996). Grant focuses solely on knowledge *application* while knowledge *creation* is suggested to be accounted for in a more comprehensive model.

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<sup>1</sup> The literature search was conducted using the Google Scholar platform as well as the online library functions of Lund University. By using different keywords in isolation, in combination with each other or combined with other related terms, main contributions to the field were identified. Among others, the following keywords were covered: *knowledge transfer*, *cross functional collaboration*, *knowledge management*, *boundary spanning agents*, *barriers to knowledge transfer*. Sources that were cited the most were prioritized to ensure a credible foundation for this paper.

Simultaneously as the KBV gained grounds, knowledge management was established as a research topic. Wiig et al. contributed to this topic by providing a descriptive framework of methods and techniques focusing on knowledge management (Wiig, et al., 1997). The authors express that knowledge as a resource is particularly difficult to manage. They detail classic tasks in managing a resource, namely ensuring that the resource is: “[...] delivered at the right time; available at the right place; present in the right shape; satisfying the quality requirements; obtained at the lowest possible cost” (Wiig, et al., 1997, p. 16). Knowledge as a resource is then argued to carry additional challenges and unique properties as it is immaterial, tricky to measure, unstable and materialized in individual agents (Wiig, et al., 1997). The paper seeks to address these unique properties by looking at a knowledge management cycle and the activities involved therein.

### **2.1.2 Knowledge Transfer**

As a sub-field of organizational learning and knowledge management the transfer of knowledge has emerged as a topic of interest. One of the earlier contributions to this particular focus is to be found in work by Nonaka (1991). Although having named it *knowledge-creation*, Nonaka introduced the concept of different knowledge types and focused on the transfer from one type to another. In using multiple Japanese cases to exemplify the different types of knowledge and how those are communicated, Nonaka argued that a shared common language is crucial for allowing this transfer to take place. This work contributes to this study primarily by introducing knowledge types<sup>2</sup> and a common language as an important aspect of knowledge transfer.

In a similar vein, albeit with a different focus, Szulanski (2000) views knowledge transfer as a process consisting of four stages: initiation, implementation, ramp up and integration. This quantitative study with a cross-sectional design sampled a number of companies, allegedly best-practice examples of knowledge transfer, and essentially argues that more detailed studies of the knowledge transfer process are needed. Nonetheless Szulanski introduces the importance of motivation for effective knowledge transfer.

Providing yet another perspective on knowledge transfer, Argote & Ingram (2000) offer an initial suggestion as for how to measure knowledge transfer: “[K]nowledge transfer can be measured by measuring changes in knowledge or changes in performance.” (Argote &

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<sup>2</sup> The types of knowledge are introduced in detail further down in this section.

Ingram, 2000, p. 151). Their paper introduces a framework of knowledge-storage entities used to explain the difficulties of transferring people, tools, tasks and the networks that these units create. The paper utilized previous literature on the topic and is not based on empirical findings. It is however concluded that the creation and transfer of knowledge in organizations provide a basis for competitive advantage, but in order for it to be successful, networks that are moved from one context to the other must fit the new context. The paper contributes to this study in how it supports viewing knowledge transfer as a process while it offers an alternative approach to how to conceptualize the different types of knowledge in a company by focusing on networks

### **2.1.3 Knowledge transfer dimensions**

There are different dimensions proposed to understand knowledge transfer more specifically. This study takes two knowledge transfer dimensions into account: knowledge media richness and the type of knowledge transferred.

Media richness, as adopted from Koskinen & Vanharanta (2002) is a measurement of different mediums of communication. The concept has two underlying dimensions: the variety of cues that is potentially conveyed by the medium and the quickness of the feedback it can provide. The dimensions influence the ability to resolve ambiguity. The scale of media richness, starting from the richest, looks as follows: (1) face-to-face, (2) telephone, (3) written personal communication, (4) written formal communication, and (5) numeric formal communication (Daft and Weick, 1984 in Koskinen & Vanharanta, 2002). More specifically Trevino, et al., (1987) explain that different media will be used for different reasons and in different situations: “[...] face-to-face [is] used to show teamwork, trust, goodwill, and informality, whereas written media symbolizes authority, legitimacy, compliance with protocol, and lack of urgency.” (1987, p. 569). Managers can therefore establish a culture of those characteristics, depending on whether face-to-face or written communication is promoted.

The type of knowledge transferred can be divided into tacit and explicit knowledge, as introduced by Nonaka (1991). Goffin et al. (2011) define explicit knowledge as clearly explained and documented whereas tacit knowledge is not easily expressed. Tacit knowledge is usually difficult to communicate (Jimes and Lucardi, 2003; Leonard and Sensiper, 1998 in Goffin, et al., 2011). It is commonly transferred through storytelling or direct interaction

(Hernandez-Serrano, Spiro, Lamartine, and Zoumas, 2002; Mascitelli, 2000 in Goffin, et al., 2011). Experiences that are otherwise difficult to express can be transferred via metaphors and stories (Lakoff and Johnson, 1980; Srivastva and Barrett, 1988 in Goffin, et al., 2011). The usage of metaphors and stories are therefore an indicator for the existence and generation of tacit knowledge (Wong and Radcliffe, 2000 in Goffin, et al., 2011). It is argued by Grant (1996) that explicit knowledge becomes visible when it is communicated, whereas tacit knowledge is argued to be exposed only when it is applied. Based on this it is assumed that transfer of tacit knowledge is “[...] slow, costly, and uncertain.” (Kogut and Zander, 1992, in Grant, 1996, p. 111). Based on the distinction between tacit and explicit knowledge Nonaka (1991) presents four types of knowledge transfer: tacit to tacit – a kind of socialization in which knowledge is transferred between individuals but never made explicit; explicit to explicit – the systematized and codified knowledge as seen in reports and explicit communication; tacit to explicit – the articulation of the informal, highly personal tacit knowledge; and explicit to tacit – the internalization of the explicit knowledge.

#### **2.1.4 Cross-functional Collaboration as Knowledge Transfer**

An aspect of knowledge transfer within companies is cross-functional collaboration (CFC). One way to investigate collaboration between different organizational units is by relating it to innovation. In the publication "Knowledge Transfer in Intraorganizational Networks: Effects of Network Position and Absorptive Capacity On Business Unit Innovation and Performance" Tsai (2001) outlines dependencies between network centrality of organizational units and the unit's absorptive capacity with resulting effects on the unit's innovation. Claiming that knowledge is unevenly distributed among a company's unit-network, it is assumed that a central network position (one that has access to the most knowledge by other units) increases a unit's innovation. Based on a quantitative survey within two multinational corporations it is concluded that a central network position contributes to a unit's innovative output, but not to the business performance. This research contributes to this study by offering a possible explanation for different practices of knowledge transfer: a unit's centrality within its network.

Hansen (2002) takes the concept of knowledge networks one step further and introduces the concept of inter-unit networks. Inter-unit networks are combinations of units that possess related sets of knowledge. By looking at the number of connections, in a quantitative cross-sectional research, it was shown that both product development time and amount of knowledge transfer are affected by the number of units in a network. In differentiating

between indirect relations (i.e. connections through intermediaries) and direct relations it was found that a high number of intermediaries between provider and recipient of knowledge may lead to distorted information and also longer project completion times. It was found that having direct relations to other units facilitated transfer of tacit knowledge but maintaining them also led to longer project completion time. For explicit knowledge the more direct relations led to longer times of completion.

In a more recent contribution to CFC Reinholt et al. (2011) elaborate on the importance of network position in relation to autonomous motivation and knowledge sharing capabilities within networks. Via a cross-sectional quantitative survey research the authors confirm their assumptions that a central network position increases knowledge acquisition and provision, and that this is strengthened by the employees' autonomous motivation to share knowledge, as well as their individual capabilities to share knowledge. This research indicates that more than just a strong network position needs to be present to facilitate high knowledge transfer and mentions the responsibility of management to provide the right motivation and capabilities.

Knowledge flowing between different functions – be them internal or external – can also be facilitated by individuals. Tushman and Scanlan (1981) refer to the persons who bridge these different networks or functions across boundaries as boundary spanning individuals. They are described to communicate across departments or functions, which have developed their own languages and codes, and thereby act as a sort of translator between units. By conducting a quantitative study within the R&D department of an American high technology company they found that true boundary spanning individuals can only be those employees who are very well connected internally as well as externally – regardless of their actual role or title. Therefore, in addition to being well connected, boundary spanning individuals need to be respected and trusted and are perceived to have a big competence by their peers.

### **2.1.5 Relating Transfer of Market Knowledge to Innovation**

A more recent turn in the field has begun to occupy itself with knowledge transfer of a certain type, namely integration of market knowledge. The main findings in this more narrow research area links it to innovation with varying implications for this study.

An early contribution to this particular focus does not mention knowledge transfer per se, but presents the marketing function as an important source for customer knowledge needed in the research and development functions of companies. Griffin & Hauser reviewed literature in

this area and presented that "a need for managing flows [of knowledge] across marketing and R&D boundaries was recognized as important in the 1970's. Managing the interface became critical in the 1980's and has continued to be important to firm success since then" (Griffin & Hauser, 1995, p. 2). The paper argues that language and cultural barriers prevent communication between marketing and R&D, which hampers successful product development.

How market knowledge may bring competitive advantages has also been covered by focusing on new product development in particular. Li & Calantone (1998) highlighted the effects market knowledge competence has on new product advantage and how this in turn affects market performance. The authors conclude that R&D strength is important for new product advantage and that the R&D-marketing interface is the strongest influence on new product advantage, leading to a tighter gap between what the market expects and what the company aims to offer. A relevant finding for this study is that conflicts could arise between marketing and R&D and that customers could help to mediate these conflicts with their knowledge, according to the authors.

Even more recent contributions also present how market knowledge may relate to degrees of innovation. In a quantitative study conducted on 225 strategic business units in two industries in a B2C context Arnold et al., (2011) investigated links between market orientation – in terms of customer acquisition or retention – and degree of innovation (radical and incremental). The authors employ the concepts of depth and diversity of customer knowledge, as well as resource exploitation and exploration, as control variables. It was found that a business unit's customer orientation – materialized in their structure, leadership, culture, strategy and control – influences innovation performance. It was argued that focusing on acquiring customers, as opposed to retaining existing customers, furthers customer knowledge diversity as well as resource exploration. This was in turn found to be positively related to increased radical innovation performance. Additionally, it was found that diverse customer knowledge is negatively related to incremental innovation and that focusing more on customer acquisition hampers incremental innovation performance. The authors further demonstrate that an increased focus on customer retention instead enhances incremental innovation by three mechanisms: enhanced depth of customer knowledge, less diversity of knowledge, and increased exploitation of resources decisions. However, an increased focus on

customer retention actually hinders radical innovation performance because of the lessened customer knowledge diversity and prioritized resource exploitation (Arnold, et al., 2011).

Lastly, the concept of knowledge transfer and its links to innovation emerged more clearly in the focus of the article “How knowledge affects radical innovation: Knowledge base, market knowledge acquisition, and internal knowledge sharing” (Zheng Zhou & Bingxi Li, 2012). This quantitative study sampled and surveyed high tech companies in China and concluded that different types of knowledge bases require different types of knowledge inflows. The purpose of this study was to address disagreements in the current literature on the Knowledge based view (KBV). It was concluded that companies with a broad and diverse knowledge base are more likely to accomplish radical innovation with the use of internal knowledge sharing, rather than acquiring knowledge from the market. Companies with a deep and specific knowledge base are more likely to achieve radical innovation by turning to the market rather than sharing internally. Linking this conclusion to previous conclusion by Arnold, et al (2011) one may argue that, in general, the more diverse the knowledge held within a business unit, the more easily can radical innovation be achieved.

## **2.2 Summary and Synthesis of Previous Literature**

The reviewed literature provides this study with general assumptions on the reviewed concepts of knowledge in general, knowledge transfer, cross-functional collaboration, and on the topic of knowledge transfer between marketing and research functions. These assumptions, together with previously defined key concepts, form the theoretical springboard of this study and guide the interpretation and analysis of the generated findings. This section concludes by presenting these assumptions visually (see Table 2).

First, based on the covered literature on knowledge in general, it can be assumed that knowledge is a key resource for maintaining competitive advantage and it can and should be managed in order to be utilized in an optimal way. It can further be assumed that managing knowledge carries additional challenges – it is intangible, unpredictable, fickle and materialized by individual actors with free will. Lastly, it can be assumed that knowledge can be defined as what is known by an organization and it can be either explicit (codified, objective, facts and theories) or tacit (revealed through application defined as knowing how to do something). The crucial difference between the types is in how they are being transferred between different agents.

The literature on knowledge transfer indicates two basic assumptions. First, the transfer of knowledge can be seen as a process in which knowledge is transferred from one unit to another. Second, it can be expressed in one out of four types: tacit to tacit; explicit to explicit; tacit to explicit; and, explicit to tacit. It can furthermore be measured by investigating change in knowledge or performance.

Moving on to the advancements of cross-functional collaboration research, it can be assumed that for one, as knowledge is unevenly distributed among companies' units, it can be assumed that knowledge must be transferred between different units with different functions. It can also be assumed that cross-functional collaboration can facilitate knowledge transfer by network effects.

Lastly, covering what has been established on knowledge transfer between the cross-functional collaboration of marketing and research functions, four primary assumptions can be made. First, it can be said that communication between marketing and R&D is needed for successful product development and cross-functional project-development teams lead to higher market-place success. Second, there are different market knowledge orientations: Companies may focus on acquiring new customers or on keeping the old. These orientations are assumed to influence the degree of innovation performed. Focusing on acquiring customers furthers customer knowledge diversity and resource exploration which is good for radical innovation performance. Focusing on customer retention enhances incremental innovation by deepening customer knowledge, while making it less diverse. Simultaneously radical innovation is hampered. The final assumption is that different types of knowledge bases require different types of knowledge inflows – if a company rather has a deep knowledge base they are more likely to be able to achieve radical innovation by turning to the market rather than sharing internally.

TABLE 2: ASSUMPTIONS FROM PREVIOUS LITERATURE

Topic	Assumptions	References
Knowledge as a resource	<p>1. Knowledge is a key resource for maintaining competitive advantage; it can and should be managed.</p> <p>2. Managing knowledge carries unique challenges as it is materialized in individuals.</p> <p>3. Knowledge can be either explicit or tacit.</p>	Romer, 1993; Grant, 1996; Wiig, 1997; Wiig et al., 1997.
Knowledge transfer	<p>4. Knowledge transfer is a process in which knowledge is transferred from one unit to another.</p> <p>5. Knowledge transfer can be expressed in one out of four types: tacit to tacit; explicit to explicit; tacit to explicit; and, explicit to tacit</p>	Trevino, et al., 1987; Kogut and Zander, 1992; Nonaka, 1991; Grant, 1996; Szulanski, 2000; Argote & Ingram, 2000; Koskinen & Vanharanta, 2002; Goffin et al., 2011.
Cross-functional Collaboration	<p>6. Knowledge must be transferred within companies as it is unevenly distributed among different functional units.</p> <p>7. Cross-functional collaboration can facilitate knowledge transfer by network effects.</p>	Tushman and Scanlan, 1981; Tsai, 2001; Hansen, 2002; Reinholt, et al., 2011.
Cross-functional collaboration between marketing and R&D	<p>8. Communication between marketing and R&amp;D is needed for successful product development.</p> <p>9. There are different market knowledge orientations that influence the degree of innovation performed. Companies may focus on acquiring new customers or on keeping the old.</p> <p>10. Focusing on acquiring customers furthers radical innovation performance and hampers incremental innovation. Focusing on customer retention enhances incremental innovation, but hampers radical innovation.</p> <p>11. Different types of knowledge base s require different types of knowledge inflows – companies with deep knowledge bases are more likely to be able to achieve radical innovation by turning to the market rather than sharing internally.</p>	Griffin and Hauser, 1995; Li & Calantone, 1998; Arnold et al., 2011; Zheng Zhou & Bingxi Li, 2012.

### **3. METHODOLOGY**

This chapter presents and evaluates the methodological choices made in relation to the purpose of this study: to identify differences in knowledge transfer practices between the development of radical and incremental product innovations. The chapter is initiated by presenting the research approach and overall process before the comparative design of this study, an inductively driven multiple case study, is explained. It further details the data collection covering the underlying motivation for the case selection and sampling as well as the qualitative research method of semi-structured interviews employed for gathering empirical material. The final section presents the method used for data analysis – a cross-sectional analysis conducted in two levels. A summary and evaluation of the choices made conclude this chapter.

#### **3.1 Research Approach, Overall Process and Design**

The research approach of this study is much aligned with common aspects of qualitative studies as suggested by Bryman & Bell (2011): it is inductive in how it aspires to permit the material collected to contribute to and generate theory, rather than confirming existing theory; it acknowledges that it can only claim to review the topic of interest by interpreting accounts of the participants in the study rather than claiming to depict an absolute truth; and lastly, it also acknowledges that the reality of the units studied is ever-changing as it is a result of the participants social interactions that continuously reconstruct it. It should however be noted that there are deductive features incorporated in the design as the research question was articulated in dialogue with previous literature. Also, certain concepts and dimensions of the topic guiding the data collection were deduced from previous literature to ensure contribution to existing theory.

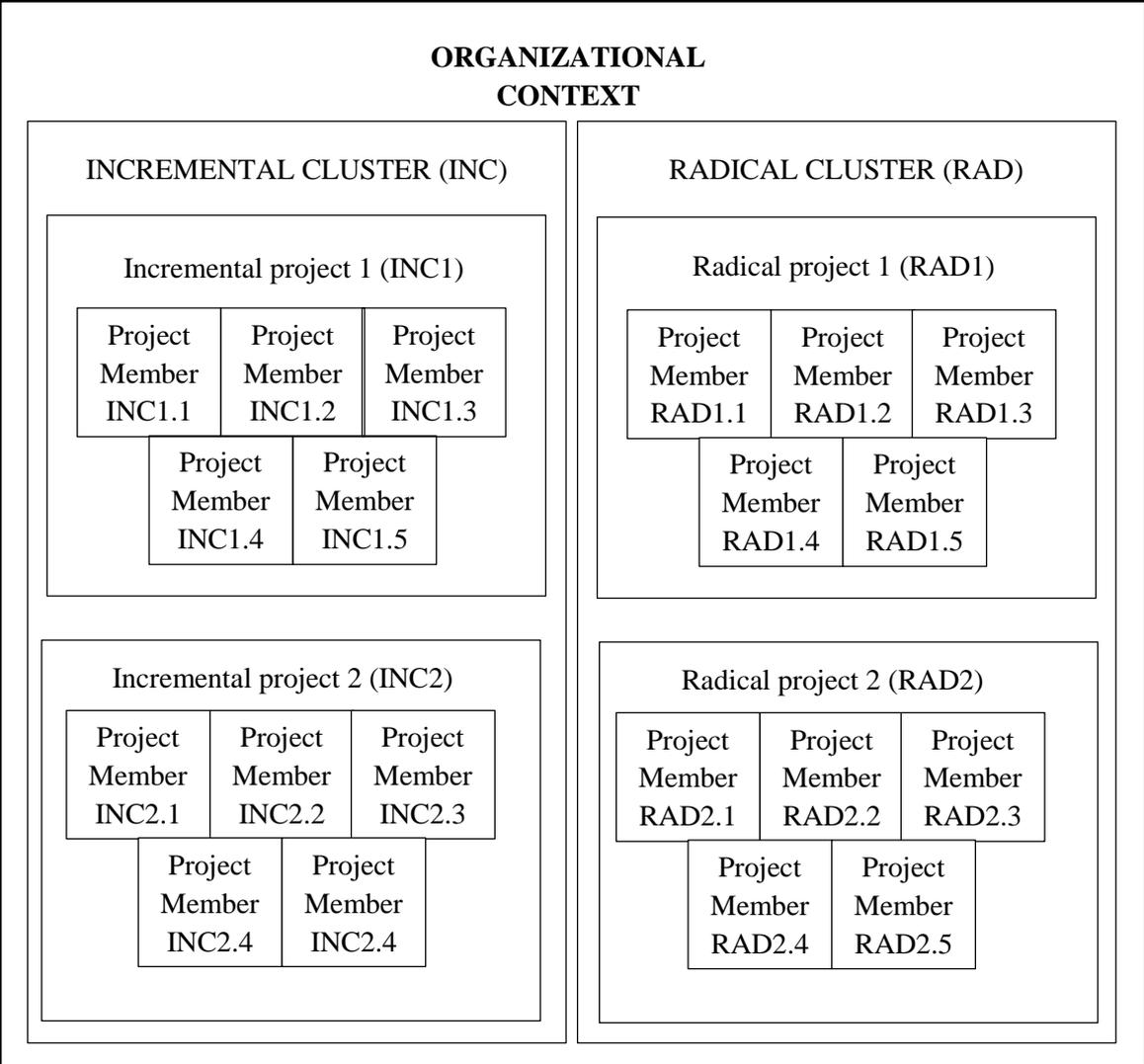
The overall process of this study is closely related to the suggested main steps for qualitative research as presented by Bryman & Bell (2011). The process was initiated by establishing a common understanding of issues the case organization is facing. The case company provided the research opportunity via an internship arrangement and was thus consulted closely for the general focus of the study. Then, based on these discussions a number of general research questions was formulated which led to the following steps: selecting suitable subjects to study and collecting appropriate data, which was processed early on to allow for iterated revisions both of data collection and of a the research focus.

In terms of the chosen design, and in accordance with a typology provided by Yin (2003, in Bryman & Bell, 2011) this study is considered to be a revelatory study, as it provides an opportunity to closely study knowledge transfer in relation to innovation. As stated by Bryman & Bell (2011) a revelatory case does not need to cover a strictly unique topic. What characterizes this case as revelatory is the inductive approach to previous literature and theory on the topic. The design, a multiple case study design with embedded units of analysis, is according to Yin (2003) argued to permit for appropriate examination of current and past events when the research subjects, in this case the development projects, cannot be changed. It entails a comparative element in how the study takes place within one company but looks into two different groups of development projects, hereon referred to as clusters. Each cluster is made up from two cases: two radical innovation development projects (radical cluster) and two incremental innovation development projects (incremental cluster). It should be stressed that the four projects, i.e. the cases that are compared, should be regarded as representative cases of development projects for incremental as well as radical innovation within this particular case company. The cases are the embedded units of analysis within which individual project participants constitute the main source of data. Figure 1 visualizes the design of this study.

Bryman & Bell (2011) argue that multiple-case studies improve theory building as the comparison between cases may suggest new concepts of interest, which thus responds to the inductive aspirations of this study. Yin (2003) also adds to the strength of this design by arguing that the ability to use replication strengthens the quality of findings. This is achieved by studying each case, in this study – each project, with the same method to identify potential similarities and differences within and across the projects. There are however certain limitations involved with the case study design as such, as well as with comparative multiple-case studies in particular. The case study is often criticized for lacking generalizability (Bryman & Bell, 2011). This study recognizes the limited generalizability and instead places its locus of attention on furthering thorough and refined insights into knowledge transfer practices as opposed to argue broad generalities about it. A weakness associated with the multiple-case study design is that, according to Yin (2003), it is resource-consuming. This is seen in this study in the number of cases investigated needed to enable comparison: four cases, two in each cluster, combined with four to five individual interviewees for each case led to a total of 18 formal semi-structured interviews. The design itself may therefore limit the possible depth of investigation in terms of the individual cases.

In spite of the relatively large volume of material it could still be doubted whether two projects with only four to five interviews per project can be treated as separate cases representing examples of radical versus incremental innovation development projects. It is also argued that multiple-case studies are prone to force connections within and across cases on the expense of contextual insight (Dyer & Wilkins, 1991 in Bryman & Bell, 2011). In addition, the comparative design and the different levels of analysis may have amplified the strength in the detected patterns. The cases are however seen as representative for this particular context, and the amplifying of patterns could be seen as an inherent part of cross-case comparison with embedded units of analysis – it is *general* patterns for this particular context that are identified.

FIGURE 1: RESEARCH DESIGN



## **3.2 Data Collection**

This section presents data collection undertaken in terms of case selection as well as selection of interviewees. The section also presents the more practical aspects involved with the research method of semi-structured interviews. It aspires to present a transparent and clear overview of the steps undertaken in this research to ensure the research criteria of replicability, as explained by Bryman & Bell (2011) is achieved to the greatest extent possible.

### **3.2.1 Case Selection and Sampling**

The case company in which this study was carried out was provided via an internship program and it was not explicitly chosen for this undertaking. However, the case company proved to be particularly suitable for studying knowledge transfer practices in relation to innovation, as it is a rapidly growing multi-unit organization with B2B operations. The case company also expressed an interest in investigating their current knowledge transfer practices. Through initial observation it was recognized that the case company has many different functional units involved in development and in addition, the case company has a track record of both incremental and radical innovation. Based on these aspects the case is considered to be a suitable point of exploration for this topic.

The cases within the case company, the different projects, were carefully selected to aid the comparative design. Projects of different degrees of innovation were targeted, as picking these opposites was believed to highlight possible differences in knowledge transfer practices and to distinguish patterns more easily (Eisenhardt & Graebner, 2007). Based on discussions with key stakeholders within the case company an initial list of 13 different projects was compiled. These different projects were further evaluated during informal meetings and talks with different employees in the case company before a final selection of four projects was made. The chosen projects were deemed suitable for the research purpose for three reasons. First, they fit the chosen definition of incremental and radical innovation. Second, they are recently released, which was believed to facilitate the collection of credible data. Third, they are products and not simply technologies. The incremental projects are denoted INC1 and INC2, whereas the radical projects are denoted RAD1 and RAD2. It should be noted that the case selection constituted a critical point for this study, as the evaluation of which projects are considered to be incremental or radical carries great implications for the findings generated. The process of the case selection was therefore thoroughly executed. The final selection of

projects harmonizes with the general understanding within the case company of what constitutes radical innovation. With that being said, a limitation with the case selection can be identified: a different definition of radical innovation is likely to have yielded different findings. However, given that most organizations could be argued to have an internal spectrum of what is radical in their particular context, the case selection is believed to highlight intra-organizational differences that can be translated to most other multi-unit organizations.

As a sampling method for identifying suitable interviewees a key informant approach, as described by Bryman & Bell (2011), was employed. The mentor at the case company recommended to target certain key individuals who he deemed to have an insight in the chosen projects. These individuals then became key informants for each project and provided guidance on who to interview. In addition to employing the key informant approach, purposive sampling, as explained by Bryman & Bell (2011), was used. This non-probability form of sampling was used in how interviewees with different functions were selected to cover multiple areas of expertise and provide insight in terms of cross-functional knowledge transfer. The purposive sampling could further be described as snowball sampling, as also described by Bryman & Bell (2011), as the key informants provided access to the final selection of interviewees. The key informants were only asked to provide a variety of names and functions of individuals highly involved in the development of the chosen projects and had no further influence over the final decision. In total 18 individuals were interviewed, four to five for each project, as depicted in Table 3. In two cases the same individuals were used to give accounts on two different projects (in Table 3 the interviewees INC1.5 and INC2.5 are the same person, as well as INC2.4 and RAD1.4.). This overlap was accounted for by asking the individual to keep the projects separate during the interviews. The chosen interviewees were selected based on their different functions. For sake of clarity, two similar titles, ‘product manager’ and ‘project manager’, must be clearly distinguished. Product managers order the product to be developed after having identified a gap in the market and give the project manager a business case and a list of requirements. In terms of reporting, product managers are positioned one level above project managers, who are officially responsible for coordinating the project team. To avoid confusion, the ‘product manager’ is from here on referred to as the ‘product owner’.

There may be some limitations with the selection of interviewees. First, given this study’s interest in market knowledge, one could argue that the selection could have included external stakeholders as well. However, as the main focus is on intra-organizational transfer practices, the locus of attention remains within the case company. Second, the sampling method of purposive and snowball sampling could be argued to carry some limitations, as the use of key informants and purposive sampling removes any statistical generalizability. Although statistical generalizability is not an aspiration of this case study it is worth mentioning. A third issue may be found in how the key informants may carry unintentional bias in their selection of interviewees. This issue was addressed by keeping informants separate from the final decision on who to interview. Also, the selected interviewees, although granted anonymity, may feel pressured to withhold or state certain information knowing that they were chosen by their colleagues. This was addressed by offering a casual and relaxed atmosphere combined with the guarantee of anonymity.

TABLE 3: FINAL SELECTION OF INTERVIEWEES

<b>Function</b>	<b>INCREMENTAL CLUSTER</b>		<b>RADICAL CLUSTER</b>	
	<b>INC1</b>	<b>INC2</b>	<b>RAD1</b>	<b>RAD2</b>
<i>Product Owner/ Manager</i>	INC1.1	INC2.1	RAD1.1	RAD2.1
<i>Project Manager</i>	INC1.2	INC2.2	RAD1.2	RAD2.2
<i>Tech/R&amp;D</i>	INC1.3	INC2.3	RAD1.3	RAD2.3
<i>Marketing</i>	INC1.4	INC2.4	RAD1.4	RAD2.4
<i>Sales</i>	INC1.5	INC2.5	RAD1.5	RAD2.5

### 3.2.2 Research Method

The primary data of this research was collected through the qualitative method of semi-structured interviews. This method was chosen as it is commonly used for generating rich material useful for the deep understanding of topics from the perspective of the interviewees (Bryman & Bell, 2011). The interviews concentrated on the interviewees’ experiences of working with the projects and were conducted both in person with two interviewers present – one leading the interview and one taking notes and filling in, as proposed by Bryman & Bell (2011). The interviews were held primarily in English, both in face-to-face meetings at the

premises of the case company and by telephone, depending on the interviewees' preferences. All interviews were recorded with the consent of the interviewees. An interview guide was developed (see appendix A) with the intention of providing a backbone to the interviews without controlling the sessions too much. The guide was primarily used as an aid to ensure that particularly important questions were asked. As suggested by Bryman & Bell (2011) the guide ensured that similar phrasing was used in formulating questions, yet it allowed for a flexible interview process focusing on the interviewees' expressions.

Two pilot studies were conducted which allowed for valuable feedback to be gathered, and assisted the revision and refinement of the interview guide. The interview guide was revisited and revised throughout the process to allow emerging findings to be further looked into if deemed of interest. This follows recommendations by Bryman & Bell (2011), which strongly advocate flexibility during the interviews but also in adapting the guide. The questions were centered around a general product development timeline (see Appendix A). The timeline was developed together with employees of the case company who were not included in the study and displayed the formalized development process of the case company in a simplified structure. The use of a timeline had the purpose of providing common points of reference to the past, assisting the recollection of the interviewees memories, as well as to encourage answers specific to these projects. This addresses the challenge in gathering retrospective accounts. As an additional measure to remain focused on the particular projects and to ease recollection, the interviewees were asked to draw a mind map detailing the names and functions of all the people that they deemed important, influential or that they had the most contact with during the project. In addition to facilitating remembrance, this activity also gave a visual overview of how the interviewees viewed knowledge and information flows during the project. These visualizations were used to better understand the accounts of the interviewees.

Besides being useful for generating rich individual accounts of the projects, there are disadvantages with the qualitative method. Qualitative methods are commonly argued to be excessively subjective, complicated to replicate and generalize, and in lack of transparency (Bryman & Bell, 2011). These limitations were accounted for primarily by aspiring to achieve a high degree of transparency in terms of which concepts were chosen to be investigated and how the data collection was conducted. The low generalizability is recognized and was previously addressed as a known issue with the methodology. In terms of evaluating the

research method more specifically, semi-structured interviews were deemed appropriate, as this study is interested in past events – observation or any other method more distant from the individuals would be difficult to argue for. One can however argue for including additional data sources to complement the interviews. A disadvantage of this method of interviews is the risk of bias: given that the interviewees knew that other project members also were being interviewed they may have felt pressured to answer in accordance with what they assumed others would answer. However, in this study the questions did not aim to touch upon personal or sensitive topics, it is therefore assumed that this bias is of a tolerable level. Another limitation with the chosen method, as expressed by Gioia, et al. (2013), is the risk of going native – that is, by remaining committed to the words and expressions of the interviewees the interpretive edge may be limited. In order to address this weakness an iterative approach in terms of involvement of the material was employed in how the collected material was analyzed throughout the process, meaning that the level of focus was shifted back and forth between being deep in the material and getting a general overview. An additional measure to lessen this bias is found in the aforementioned assurance of anonymity, which can be claimed to safeguard two ethical criteria proposed by Diener and Crandall (1978, in Bryman & Bell, 2011). There should be no harm to the interviewees and their privacy shall not be intruded upon. It was further ensured that the interviewees were kept well informed, another ethical criteria stressed by Diener and Crandall (1978, in Bryman & Bell, 2011). The interviewees were given general information about the purpose of the study.

### **3.3 Method for Data Analysis**

The material collected was analyzed using a within- and cross-case analysis model as proposed by Eisenhardt (1989). The analytical process was initiated by revisiting all recordings of the interviews. Each interview was listened to carefully several times and a large number of segments of interest for the research topic was extracted and written down in data sheets. The interviews were not transcribed in their entirety. Although it is commonly recommended to transcribe entire interviews alternative measures can be employed for processing large amounts of qualitative data (Bryman & Bell, 2011). This study employed the approach of transcribing portions of the interviews that either centered around the topics of interest or stood out strongly in the material. All quotes presented in the findings are thus actual quotes from transcribed portions of text and they have been approved for publishing by the case company.

In the first part of the analysis and case by case, the segments of interest for the research question were labeled into categories. The next step, still within the cases, was then to try to find patterns in the data in terms of similarities and differences. The similarities in each case were then cross-checked within the cluster so as to generate a number of categories characterizing each cluster. The two clusters were then compared, which resulted in a number of higher order themes in which similarities and differences of the clusters could be evaluated. Then, bringing the analysis further into the 2<sup>nd</sup> order, theoretical handling of the data linked it to previous literature. As suggested by Gioia, et al. (2013) our primary focus fell upon concepts that either clearly support earlier findings in the academic body or concepts not previously seen as emerging in these kinds of queries. When the analytical step was concluded, three general themes had been identified which then could be analyzed further and translated into actual knowledge transfer practices.

On a more general level, the data analysis followed the recommendations of Gioia, et al. (2013) which provide a number of guidelines meant to increase the scientific thoroughness of the qualitative analysis commonly criticized for not being systematic and transparent enough. In line with the proposed strategies of Gioia, et al. (2013) the first step of analysis was conducted in separation from the previous literature in the field. While accounting for the difficulty in reviewing emerging concepts completely in isolation, the analysis undertaken strived to observe the data collected free from preconceived ideas of what would be discovered. The analysis further rested on three basic assumptions provided by Gioia et al. (2013), which have implications for the analysis and interpretation of the data. First it is assumed that the organizational world is socially constructed, that is, it is created and re-created simultaneously by agents actively interacting in the context in which they reside. This is argued to be a crucial recognition for studying social phenomenon (Gioia et al., 2013). It is secondly assumed that the agents in this particular context are aware of their own behaviors and deliberate actions, their accounts should thus be accepted at face value as providing actual insights. The analysis in this study merely combines their accounts into higher order themes, which together make up an additional layer of the social reality. This relates to the third assumption in how we as researchers assumed that we are insightful enough to distinguish patterns in the data and relationships elusive to the interviewees. On a final note, the merits of the analytical process could both be questioned and strengthened by the fact that the study was undertaken as part of an internship program. Being in close connection with the research subjects may risk neutrality and objectivity in assessing the findings. The close connection

and physical presence at the case company are however also likely to warrant a deep and rich understanding of the organizational context, refining the drawn conclusions. Given that this study seeks deeper understanding of knowledge transfer practices the close connection to the case company is seen as a beneficial aspect of this study.

### **3.4 Summary and Evaluation of Methodology**

In summarizing the methodology it can be stated that this study takes on a qualitative approach with a comparative multiple case study design, aimed to disclose patterns across and between the studied cases. The interviewees were identified via purposive snowball sampling. Semi-structured interviews were used to gather the empirical material. The analysis undertaken fits the inductive approach of the study in how a within- and cross-case analysis model was used together with a two-level analysis.

As argued by Lincoln & Guba (1985 in Bryman & Bell, 2011) qualitative research can best be evaluated by employing the concept of trustworthiness, rather than the traditional criteria of reliability and validity that are better equipped for quantitative studies. The trustworthiness of this study was observed with four measures. First, credibility was addressed by including several interviewees for each case to generate multiple accounts of the past events and respondent validation was also employed by allowing the interviewees to give their opinion about the presented timeline. Second, the transferability was addressed by attempting to be as transparent as possible with case and interviewee selection, it could however have been improved by providing even richer descriptions of the context in which the study took place. Third, no measures have been taken to improve the dependability of the study as no explicit peer auditors have been employed. However, being in close cooperation with the case company mentor, who gained full insight into the research undertaken provides a certain level of dependability. Fourth, the actions taken for confirmability aimed to lessen subjectivity of the study and included conscious questioning of theoretical and individual preconceptions by moving back and forth between the materials and the literature as well as consulting the case company mentor.

## 4. PRESENTATION OF EMPIRICAL DATA

This section displays the findings of this study presented cluster by cluster. Each cluster's findings are condensed into three main themes, which are made up by more detailed sub-categories. After the clusters are individually presented, a cross-cluster observation takes place, which showcases, in writing and visually, similarities and differences in the extracted data. The categories, and the themes they constitute, are displayed in Appendix B and C respectively.

### 4.1 Incremental Cluster

The incremental cluster) is made up from two projects defined as incremental innovations in how they only provide newness within the company (technology and/or marketing related) and no newness to the market. The products released are both described as strategic developments, made primarily with the intention of filling gaps in the product portfolio. For this cluster 14 categories were identified and these were sorted into three overarching themes. An overview of the findings generated for this cluster is presented in Appendix B.

#### 4.1.1 Theme: Cross-boundary Activities

The first theme concerns the nature of information exchange across different types of boundaries. In the incremental cluster this was expressed in three categories: cross-departmental exchange, cross-project exchange and feedback and request from sales.

The first category of cross-departmental exchange and support can be found in the high regard of a specialized research and development department, which supplied the project teams with ideas and input:

*"The basic idea started before I worked here, it was [external R&D department] that came up with a prototype, so that's how we started the project." INC2.3*

The second category displays how experienced individuals from other areas of the case company were also asked actively for feedback and demonstrated cross-project exchange:

*"I often ask [person X], he has a long experience within the company and he is good at pointing out issues." INC1.1*

The third boundary-transcending exchange happens when the sales department expresses a desire for features:

*"I get so much feedback out from the field. I get emails from sales people. I get feedback when we lose a deal because we didn't have a certain feature. [...] they complain and say which features that are important and say, 'ok but remember, next time, you need to have this feature'." INC2.1*

#### **4.1.2 Theme: Individual Focus**

This theme reflects an orientation towards viewing individuals as key for the projects. It is made up from five categories. The first three categories concern how individuals act as intermediaries the last two categories from which this theme emerges are: people carry knowledge and experience as a resource.

First and foremost the product owner is described as an intermediary in terms of filtering outside knowledge into the project, acting as the main interface:

*"[T]he Product Owner is also a filter, he will get a lot of responses from the outside world [...] then it is up to him to decide if he would like to do a change to the project." INC2.2*

Second, another key individual is the project manager who is seen as the interface between the team and the product owner:

*"In the same way I [as a Project Manager] am a filter for the project team." INC2.2*

Third, certain individuals with a market oriented function are seen as an interface connecting the different sales regions to product management in general:

*"The main intention of this role is to be the interface between the sales regions and product management." INC2.5*

Fourth, in terms of the individual's role of carrying knowledge, it is expressed that direct interaction with key individuals is promoted to spread it:

*"You need to be careful keeping the persons who are key personnel, trying to share...that they share their knowledge so you're not dependent on one specific person. [...] I got one key person, I try to get someone to work together with that person to get knowledge spread." INC1.3*

The fifth category, experience as a resource, demonstrates that individuals place value in their previous experience:

*"In this project I didn't have to go and find that [customer information], I just needed to validate my initial questions. This is the point: I knew what questions to ask. [...] If you already know what questions to ask, you already have the answers, you just need to validate basically. And in my case I had that background from both retail and banking." INC1.4*

#### **4.1.3 Theme: Communication**

The theme of communication is made up from six categories: Selective distribution of information, different ways of talking and communicating, full picture is needed, forgetting is common, informal communication and internal request for documentation. It includes all findings that regard the way individuals communicate.

The first category is selective distribution of information. It is seen by management that certain knowledge has to be withheld from certain departments or individuals to facilitate a better project development and to avoid complications and complexity:

*"[In the future] I would try to limit the options for the team members, because engineers with one thousand options, that gets too complicated. We must restrict the number of alternatives." INC2.3*

*"When it comes to requirements, like technical requirements, it's a challenge if [the team and the customers] speak. Because the project members, they might talk to one customer and think: this is the absolute truth. And they want to fulfill that customer's request. And then I know about [...] the other customers and they have a different view." INC1.1*

The second category shows that many interviewees mentioned that there are different ways of talking and communication. The importance to have the same language internally was expressed, but also the current existence of differences:

*"The problem that we are facing today is that sales is not always good at describing things in a way that management can understand [...]"*  
INC1.5/INC2.5

*"The project team starts talking in code [...] they have a concept and [...] there is a whole thesis behind what it is and what it does and everybody in the project knows exactly what it is [...] And then you go: 'What?' Because you don't get it." INC1.4*

The third category on communication shows that having the project team have a full picture of the project is regarded by many to be a necessity for a successful development:

*"I think the most important thing is to keep them [the team] with energy, and enthusiastic, and by involving them in as many steps as possible, without causing extra stress, I think it's one way to keep them enthusiastic." INC2.2*

The fourth category refers to the aspect of forgetting, which is seen as the background of the need for a full picture, to avoid that engineers do not know what final product they are working for:

*"Everybody forgot what they were doing. What happens in R&D: they get that initial [task] and then they start dissecting it. [...] And one part is taken to, I don't know, mechanics, and they dissect it even more. So everyone has like bits and pieces of the puzzle. And then if you ask these guys, okay: why are you making [this specific screw] they will say: I don't know." INC1.4*

The fifth category of informal communication expressed the way in which most interaction occurs within the case company and all interviewees expressed this:

*"I was doing some customer meetings together with [the product owner and the project manager [...]] and when you do these things, spend two days with people, then you're getting more close to them so that it's way more easy to get information [...]" INC2.5*

Finally, in terms of preferred means of communication, it was found that written and formalized communication is requested by internal parties:

*"Normally if I turn to the project manager and ask for a change, they always get back to me and say: you have to write a change request." INCI.1*

## **4.2 Radical Cluster**

The radical cluster is made up of two projects defined as radical innovations in how they provide at least a new technical advancement to the industry, create a new market, or both. Both products in this case provided previously unused technologies to the industry and were released recently. For this cluster 14 clear categories were identified and these were sorted into the three overarching themes also employed in the incremental cluster. An overview of the finding is presented in Appendix C.

### **4.2.1 Theme: Cross-boundary Activities**

In the radical cluster this theme consists of four categories: cross-departmental exchange, input from internal customer, customer input and external input.

The first category of this theme displays the internal movement of information and knowledge of cross-departmental nature. Input from a separate department who suggested a new technology to be integrated also falls under this category:

*"After a while, an [additional feature] came [...] [The product owner] is the orderer, but the idea came from [person from a separate R&D department]." RAD2.2*

Second, the category of internal customers was found. Contact with the sales-department was key in this area, sales was viewed as an "internal customer" by product owners:

*"Sales are my customer. Everything I do is for sales. If they don't like it, then I should not do it. If I cannot sell it to them, then they cannot sell it to their customers either." RAD2.1*

Subsidiaries of the case company were given a similar label:

*"Just to get some feedback, we had earlier versions of the hardware sent to our office in [the USA] to get installed, just to get some internal, but still customer feedback. We did get some feedback from that, they found bugs for instance."*  
RAD1.2

The third and fourth category show that there was knowledge and information transferred from external actors that are not part of the case company. This happened mainly through feedback from customers. Both the initial idea but also ongoing development was guided by customer input:

*"We had a guy at [customer X] who was highly involved, and also at [customer Y], we tried the concept with them, and then also [customer Z], we had them with us, and also [another customer]. And then at a later stage, global sales personnel that were highly involved."* RAD1.1

This includes the first hand customer "experience", which, according to the interviewees, meant going to the end-user and experiencing the conditions under which the product is going to be used:

*"All the sales areas are sending in reports every month, so I know that [the need] had been there before, but it's when you are there and meeting the customers, you understand how big it is. [...] You have to be there and to hear [the customers] and question them."* RAD2.1

Other external input came from partners and collaborators from outside the case company, which makes up the fourth category:

*"We went on a road tour, in the beginning of 2013[...] we went out and started talking to some of our national integrators that we targeted to become companies that we wanted to evaluate the product, look at it, bench test it, play with it, evaluate it and then eventually beta test it[...]"* RAD1.5

#### **4.2.2 Theme: Individual Focus**

The individual focus emerges in five categories in the radical innovation projects: individual as an intermediary (product owner), product owner as a filter, involved product owner, and people carry knowledge.

The first category shows reliance on individuals in the emphasis placed on the function of the product owner. The product owner was described as an intermediary mostly for gaining outside input:

*"From what I remember it was [the product owner] who had the idea. [...] [The product owner] is out on a lot of business trips to meet our suppliers and distributors around the world and he gets a lot of input from them. And there he picked up that [problem]." RAD2.3*

Second, the product owner is also described as having a filtering function in terms of market input:

*"No, in my role we don't often actually meet the end-customer. It's all filtered through the [product owner] who has the contact with the sales group." RAD2.4*

The third category shows that a certain level of involvement of the product owner is desired:

*"It helps a lot if [the product owner] is actually involved in the project, coming down to the project and asking: how is it going, what's the problem you have today? Also very much, when it comes to the project room, we can take questions directly and he can make decisions based on that. [...] Otherwise engineers would go to project managers, project managers would go to me, I talk to... [the information ends up different] up here at the end." RAD2.3*

*"The [product owner] is also used as a project member here. In general we work in areas that are very new, and their knowledge is not as deep in these [new areas]. So, since they keep learning, you want them very close to the team, and I want them to talk directly to the developers. All the information doesn't have to flow through me – the decisions have to go through me." RAD1.2*

The fourth category shows the use of people as knowledge carriers, evident in how keeping the same persons throughout the project was described as important:

*"Me and the project manager [were key individuals] and we were the same all through the project." RAD2.1*

This category also demonstrates that people are used as knowledge sources both for educating new staff and in how information and ideas are stored:

*“You get a new face into the team, have around table and say who does what. You try to get them together and say ‘ok, you should talk to this person, they know what you need to know in this case’. I can explain the general idea but the details are in this person, or this person and you two, you talk together, you have your own meeting.” RAD2.2*

*“Probably, the idea just stay with the person, we don’t really have a great process for that [...] I’d like to think we can capture all these ideas but to my knowledge we don’t have a structured way of capturing them, I can’t say that for certain. It’s the backlog that product owners have of course. [...] I think the [product owners] have much more working title lists, if you like, that I don’t normally read, where they keep ideas like that, but from a project perspective, as it always have a start and end, as soon as we hand over to the line, to R&D or whatever,, we just close the project over and all other ideas need to be handed over to somewhere else” RAD1.2*

#### **4.2.3 Theme: Communication**

This theme is made up from six categories: different ways of talking and communicating; educating the organization is needed; informal communication; meetings preferred; physical location matters; visualization employed.

First, it was found that individuals within different departments use different terminologies and languages to communicate. Different audiences require different languages to address them, people at different levels and in different departments communicate differently. Especially engineers were mentioned to have their own technical language:

*"I think everyone here is so used to advanced technology that we don't think too much about [the language], it's more about when it hits the market – it's a very conservative market [...] so if you see our products, it can seem very advanced, but for [the project team] this is the way it should be. [...] So it's not as easy to explain to friends how amazing this product is, it depends on the audience really." RAD1.2*

Second, in connection to this, the interviewees expressed a need to educate the organization, especially when introducing a novel product. Misconceptions are said to be prevalent and are dealt with on a spontaneous level. The reason why the case company needed this new product was not clear to everyone:

*"Yeah of course you do [have to explain the product], a lot to operations of course. [They ask:] Why should we do this, it costs a lot of money." RAD2.2*

*"[My role and function] has been a lot of selling internally, sell the idea, sell the concept internally. There has been a lot of time and effort put into that, to get people to understand that this is something the organization should do and that has taken a lot of energy and power" RAD1.1*

Third, informal communication was mentioned as the preferred way of exchange and it is actively used to get input or to sell an idea internally, be it on business trips or during a coffee break:

*"[Would I schedule a meeting?] No, I would definitely just walk over. [...] Doors are always open [...] It's a responsibility for everyone not to run down your door all the time, but we try to schedule as little as possible." RAD1.2*

This includes informal decision making, which then later is formalized in official meetings.

*"Decisions are mostly taken in formal meetings, but the substances, the informal decision is taken outside. [...] We formalize it in project meetings, but very many decisions come from outside, from internal meetings at the desk or in the cafeteria." RAD2.3*

Fourth, it was communicated that face-to-face interactions were preferred over emails as it was described as more personal and deemed to be more effective. Direct feedback and a lower risk of misunderstanding were mentioned as advantages by many of the interviewees:

*"Face-to-face meetings are often the most effective, I think. Depending on what you want to do – it's a lot easier to come to an understanding, rather than forwarding mail." RAD1.3*

*"We try as much as possible [to meet] face-to-face, because it is really hard to write everything down a 100% clear, you can't get the feedback directly. When you write, there are a lot of things between the lines. And if you start to write all this stuff between the lines, you have a long mail and then the people who read it forget what was at the beginning." RAD2.3*

*"I learn a lot [from meeting a lot of people in person], so I understand how the product should be built." RAD2.2*

Fifth, in the category of physical location matters, it was expressed that the physical location seems to be of importance to the development of a product. It was stressed that working in just one room was better for communication, as emails and therefore miscommunication can be avoided:

*"I mean, we, the core of the project, we sat together very close. It is not like now when you are spread out over an entire floor. We sat in corridors opposite of each other, so you didn't have to get up or write an email. It was more of, just go in there and ask, and just be there when you were available [...] it is a big difference compared to now, just having to pass two doors is an obstacle in that sense." RAD1.1*

According to the sources it makes changing the direction easier as well:

*"In a really small team, you are more flexible. The larger the team becomes, the less flexible you are and [...] then it is important to aim for the same goal. In a small team it was easier to change direction, because just in the room we can say it and everybody knows about it." RAD2.3*

Lastly, the use of rich media emerged in the category of visualization for communicating across functions: Visualization was named as an essential tool in explaining ideas and concepts, namely using drawings to explain them to others. This happened within the team:

*"We basically had our stand-ups and our meetings where we had a whiteboard and we drew a lot." RAD1.3*

...and between departments:

*"We went through CAD drawings. The mechanical engineer developed for me [the marketing person] a cross section." RAD2.4*

### **4.3 Cross-cluster Findings**

This section combines the clusters' unique findings, which were detailed in the previous section. It compares the different accounts on the different themes as to more easily provide an overview of where the two clusters harmonize and where they diverge. An overview of the cross-cluster analysis is presented in Table 4, at the end of this section.

#### **4.3.1 Theme: Cross-boundary Activities**

Information flows between different boundaries can be found in all of the researched projects. Especially communication between different departments, further called cross-departmental communication, is a dominant theme. Both incremental and radical innovation projects had in common that a third party, an R&D department of the case company which is specialized in new concepts, supported the managers and teams, either by their own initiative or because they were asked for advice. Apart from that exchange, a lot of cross-departmental communication can be traced back to the case company's own sales organization, which in both radical and incremental innovation development expresses explicit needs for features and products, and also was consulted by managers and regarded as "internal customers" to get more insight.

A striking difference between the development cycles of radical and incremental innovations can be found in the contact to outside sources, specifically customers, partners, suppliers, installers and managers of installers. This happened almost exclusively on the radical side of development and only marginally on the incremental side.

#### **4.3.2 Theme: Individual Focus**

Both clusters display a reliance on certain key individuals in the project but differ in how different official functions are described. Both clusters do however describe individuals as carriers of vital knowledge.

First, in terms of individual functions, both clusters emphasize individual influence over the projects but there are differences in terms of who of these individuals play a more central role. Product owners have an evident role in both clusters but the magnitude of this role is more

clearly pronounced in the radical innovation projects. In the radical cluster, the product owner is seen as the key interface for the project in terms of gaining external input but also for filtering that input. In the incremental cluster several individuals were described as interfaces transferring knowledge within the case company. An additional difference was how involvement of the product owner, in terms of being involved in the team's work in the project, was more clearly seen as something valuable in the radical innovation projects as opposed to in the incrementally innovative projects.

Second, both clusters express that individuals also fulfill the function of carrying knowledge. The individual stores and transfers knowledge, both for idea recycling purposes as well as education of new staff. In both clusters the knowledge transfer capabilities are discussed in reference to experience and history within the case company. The clusters are similar in the way knowledge is described as residing within individuals.

#### **4.3.3 Theme: Communication**

Both clusters were rich in displaying facets of communication, which allowed for a more in-depth comparison. The interviewees expressed what was communicated and also which means of communication were used and preferred.

In terms of what was communicated during the development, both members of the radical and the incremental innovation projects acknowledged a need for individually adjusting which information is communicated to whom. This, according to the radical cluster, depends on the audience receiving it. Educating the organization was a key point here that was not present in the incremental cluster. The incremental cluster takes the concept of conscious distribution of information one step further, expressing the need for a complete understanding, a bigger picture or vision that should be present in the project team. Certain details on the other hand might be withheld and more selectively and strategically communicated.

When discussing how the information is distributed, both clusters were strong in expressing an existence of and a desire for informal communication. This is achieved by avoiding scheduling and going to colleagues unannounced or by coincidentally running into each other. The radical cluster more clearly express a preference for employing richer media. Face-to-face communication is preferred as it allows for direct feedback and decreases the risk of misunderstandings. Visualizations, frequent meetings and importance of sitting close to each other indicate a clear orientation to rich media usage.



TABLE 4: CROSS-CLUSTER COMPARISON OF THEMES

<b>Theme</b>		<b>Description</b>
<b>Cross-boundary activities</b>	Similarities	Cross departmental communication, both between R&D functions and between managers and sales.
	Differences	In the radical cluster more outside input from customers.
<b>Individual Focus</b>	Similarities	Relying on key individuals.  Regard individuals as carriers of knowledge.
	Differences	In the incremental cluster several individuals function as intermediaries.  In the radical cluster one main individual functions as an intermediary.
<b>Communication</b>	Similarities	Informal communication is preferred
	Differences	In the incremental cluster some information is selectively distributed.  In the radical cluster the rest of the company needs to be educated, communication takes place mainly through rich media and physical closeness and visualization is more important.

## **5. ANALYSIS**

This section relates the findings to the research question guiding this study focusing on how knowledge transfer practices differ between the developments of incremental and radically innovations. With the help of the assumptions concluding the literature review (presented in Table 2) the differences and similarities found in each theme are interpreted. Based on that interpretation three knowledge transfer practices are identified. The practices are explained and specified in terms of possible advantages and disadvantages. This section is concluded with a summary and visual overview of these practices (see Table 5).

### **5.1 Cross-boundary Activities and the Practice of Positioning the Network**

The findings indicate that activities spanning across organizational boundaries, be it in the form of projects, departments or the external environment, exist in both clusters. The key difference is that in the radical cluster more expressions of using input external to the case company are identified. As this finding is directly related to the primary focus of this study, the mechanisms at play in this difference must be fully grasped and understood.

One way of understanding this difference is by looking at the project teams as units in a network that either seeks input externally or internally. A unit's network position, in terms of centrality, is argued to be of great importance for how well that unit can benefit from knowledge residing in other parts of the network (Tsai, 2001). In order to apply this understanding to this finding it is crucial to distinguish between what a network versus a network unit refers to in this particular study. One can see the network as constituted of the different units that are active during development, as reported by the interviewees themselves. If so, the product owner, project manager and project team makes up the one network unit of interest for this finding. As it has been argued that centrality guides how well information from other units can be absorbed, one may assume that central network units of the radical innovation projects have occupied a more central position in relation to the market than the incremental ones. The incremental cluster did not describe actors outside of their immediate organization as part of the network guiding the development, something that the radical cluster did. This difference can further be analyzed in the light of characteristics of the knowledge base of the case company as a whole. It has been proven that companies with a deep, specific knowledge base may need to consult the market to achieve radical innovation. For companies with a diverse knowledge base a conscious in-house cross-boundary activity

may be enough for achieving more groundbreaking innovations (Zheng Zhou & Bingxi Li, 2012). Based on this, the finding that the projects of the radical cluster also are more externally oriented is not surprising but rather expected by the literature.

In order to further make sense of this difference in use of external input, one can investigate the actual connections linking the networks to the other units. Networks differ in how well they obtain knowledge from other units and it has been argued to be linked to whether the connections between the units are direct or indirect. Having direct connections, in the form of direct access to different units, is described as helpful for transferring tacit knowledge, but more of a hindrance in transferring explicit knowledge, as the direct links are not needed in this case (Hansen, 2002). This could explain why the radical cluster seems more externally oriented -meeting with customers directly may be useful for understanding needs that are difficult to express, such as the actual use of new features. On the same note it may be more costly than necessary when the customer needs are easily articulated as in the case of incremental improvements. This could thus explain why the radical cluster engages more in direct customer contact.

If one investigates this difference with the help of literature on the interface between marketing functions and R&D functions, certain characteristics can be pointed out. First, cross-functional collaboration between more market oriented units and more research oriented units, as is the case for the teams in this project, is challenging as there are differences in language and culture between different business units (Griffin & Hauser, 1995). This was found in this research as well. The exchange between those different functions is however crucial for new product advantage (Li & Calantone, 1998). As a way to balance the different languages, cultures and needs of the functions, customers or customer knowledge can be brought in closer to the development process as mediating factor (Li & Calantone, 1998). The findings of this research could indicate that this strategy is being employed by projects in the radical cluster, as they seem to have a closer contact to customers, acquiring knowledge through customer input. This then implies that the marketing-R&D interface is being used and strengthened more vigorously in the radical cluster.

### **5.1.1 Practice Identified: Positioning the Network**

By looking at the theme on how the network is used, a knowledge transfer practice can be identified: positioning of the network. A benefit of this practice could be argued to be that the

more direct customer contact provides access to tacit customer knowledge, which, as argued by Nonaka (1991) is difficult to express. Considering previously unexpressed customer needs related to more radical innovation, access to tacit knowledge may be of crucial importance. Direct contact with sources of information can also be argued to grant less distortion of information, as less intermediaries are used (Hansen, 2002). An additional benefit with positioning the network close to the market relates to the assumption that companies with a deep, specific knowledge base need to consult the market to achieve radical innovation (Zheng Zhou & Bingxi Li, 2012). As a deep knowledge base can be assumed to be a characteristic of the case company the practice seems to already be in use as a way to ensure successful radical innovation. It should however be noted that a central network is by some argued not to be enough, the individuals within the network need to be motivated and capable of sharing the knowledge within the network, (Reinholt, et al., 2011). One could also argue that the benefit of positioning the network close to the market can be limited depending on which customer is communicated with. Arnold, et al. (2011) would argue that if the radical cluster, similarly to the incremental one, primarily turn to their existing customer base – employing the customer retention strategy – the market oriented input generated from those connections are not likely to be generating radical innovation but rather foster incremental innovation capabilities. An additional problem with this positioning is that it has also been put forth that keeping direct connections is costly so if the needs of the customers are clearly understood, then perhaps it is not necessary. One can thus see that there are benefits with the incremental approach, of keeping the central core further away from the market, especially in how it is less costly and complex to maintain. (Hansen, 2002). This benefit must however be balanced with the potential loss of understanding customer needs.

In conclusion it can be argued that the practice of positioning the project network closer to the market and being in contact with customers seems to help acquiring market knowledge, specifically in terms of knowledge about customer needs, and enables flows of tacit knowledge, which is argued by many to be crucial when engaging in radical innovation development. Even in the incremental cluster, the quality of the product could be improved by approaching customers in a more structured way. It should thus be kept in mind that customer contact requires time, investment, it may add complexity, and it is crucial to address the *right* customer.

## **5.2 Individual Focus and the Practice of Utilization of Individuals for Knowledge Transfer across Boundaries**

Not surprisingly, like assumed by the knowledge based theory (Grant, 1996; Wiig, 1997) both clusters expressed that individuals function as carriers of experience and knowledge. This is not only acknowledged, but also utilized within both clusters by promoting direct interaction between individuals to spread knowledge. This then is a clear indicator of tacit-to-tacit knowledge transfer as expressed by Nonaka (1991).

It is furthermore of high interest to look into the roles of knowledge carrying individuals. Like mentioned above, the interface between the market and the R&D function is essential for new product advantage. In the case company certain individuals fulfill this task. In general it can be said that these individuals possess a high degree of responsibility and power, but also of esteem and reputation. What both clusters have in common is the individual influence the product owner exerts by funneling knowledge and information between the outside and the inside, even though the details differ. A product owner connects the sales and customer sides with the R&D functions for the radical cluster, strengthening the marketing-R&D interface (Li & Calantone, 1998). In the incremental cluster the tasks of closing knowledge gaps between the project team, the market and each other is split among several individuals.

Individuals who are connecting departments and areas that communicate differently can be understood by employing the concept of boundary-spanning individuals (Tushman & Scanlan, 1981) – they are well connected both internally and externally and their perceived competence is more important than their formal position. The main difference between the clusters is the extent to which these boundary spanners are existent: in the incremental cluster, several individuals were mentioned equally often to be of importance when it comes to translating between functions. In the radical cluster, the focus was more directed towards one individual. There might be two possible reasons for this difference: possibly, there is one boundary spanning individual on the radical side, while there exists no equally dominant boundary spanning individual on the incremental side. This might be due to a lack of people who are internally and externally connected, well respected or trusted in the incremental cluster. Thus, several people are named and the focus is not only on one individual. The other possible explanation is that the incremental cluster actually *requires* more boundary spanning individuals because it lacks the aforementioned market access of the radical cluster. This

might then mean that the incrementally innovative projects balance the lack of market knowledge acquisition by having more internal boundary spanning, strengthening their innovative capabilities in different ways.

### **5.2.1 Practice Identified: Utilization of Individuals for Knowledge Transfer across Boundaries**

Based on the theme on individual focus it can be argued that the two clusters differ in the way they seek to bridge cultural and linguistic gaps between different functions within the development team. Both clusters address this by using the practice of utilization of individuals for knowledge transfer across boundaries. They tackle the difference in language and knowledge between functions by utilizing boundary spanning individuals, who act as translators (Tushman & Scanlan, 1981). The benefit with keeping this function in one individual position, as present in the radical cluster, is a clear division of responsibility and most likely individual ownership of the project, which for radical innovation may facilitate keeping one clear vision. The problem with placing this emphasis on one individual acting as an intermediary, rather than having more individuals partaking in the direct connection, is the risk of relying on just one individual – loss and misinterpretation of information are examples of possible consequences (Hansen, 2002). The benefits of having this function divided in several positions, as seen in the incremental cluster, are that there is a lower risk of losing knowledge thanks to the shared responsibility. On the other hand, it is also argued that too many intermediaries may distort information even further (Hansen, 2002).

In conclusion, the practice of utilizing individuals for knowledge transfer can on one hand, if relying on one central individual, be helpful for keeping individual ownership. The downside is that there are risks with relying too much on one individual. This could be reduced by incorporating additional individuals to act as interfaces with the awareness that this might lead to additional distortion of information.

### **5.3 Communication and the Practice Usage of Rich Media**

The finding of similar and differing ways of communicating market knowledge, but also knowledge in general, displays that especially face-to-face communication seems to be of greater importance in the radical cluster. Both clusters were found to adjust distribution of information for strategic reasons in combination with informal communication. Small yet noteworthy differences were found regarding the richness of media used.

The reasons why the radically innovative projects employ more direct face-to-face communication, while also stressing the need for physical closeness and visualization, might stem from the added complexity of a radical innovation: avoiding misunderstandings becomes more difficult, especially if no prior knowledge about the product exists. This ties into the finding that the radically innovative projects felt a need to educate the organization – more complexity and radical thinking asks for more in depth and rich communication which is argued to be more beneficial for avoiding misunderstandings (Koskinen & Vanharanta, 2002).

When looking at the finding that the incremental cluster expressed the need to have a shared vision or “bigger picture” in the project team, one might now assume that a weaker face-to-face communication is a reason for this, as less rich media may lead to less feedback and common understanding (Koskinen & Vanharanta, 2002). Were it for a richer communication, perhaps a shared vision would not be just as necessary – and the other way around: a project would possibly not be so dependent on rich communication if it had a more commonly shared vision.

### **5.3.1 Practice Identified: Usage of Rich Media**

In reviewing the theme on communication it was found that the radical cluster is utilizing more rich media, namely face-to-face communication, to transfer internal and market knowledge. This practice has both benefits and disadvantages. A benefit is that it enables access to more tacit knowledge, as previously demonstrated in the practice of positioning the network closer to the market. This could be argued to be important when engaging in radically innovative product development, which seeks to address new customer needs. The incremental cluster engages less in rich media communication which could indicate that the information in that cluster was more of a routine nature for which less rich media can be deemed suitable (Trevino, et al., 1987). The problem is evident when considering the time aspect: to rely mainly on face-to-face communication – even for routine messages – would probably increase time spent. In the incremental cluster this time is perhaps saved, especially as they are seeking to address more explicitly communicated customer needs. However, the incremental cluster expresses a greater wish for having a common vision – something that may be a consequence of not engaging in rich media communication.

It could be concluded that the practice of using richer media may lessen the need for a big picture perspective as well as providing more tacit knowledge transfer. It must of course be put in relation to the time consumed for those activities.

#### **5.4 Summary of Analysis: Answering the Research Question**

This paragraph synthesizes the above practices and provides an answer to the research question of this study.

Three major practices were found that answer the research question of how cross-functional knowledge transfer practices, with regard to market knowledge, differ between the development of incremental and radical product innovations: (1) the positioning of the development unit in terms of a central network position is more market oriented in the radical cluster, supplying these units with more tacit customer and market knowledge at the cost of resources and time. It was further found that (2) the incremental cluster tended to rely on several boundary spanning individuals to transfer market knowledge internally while the radical cluster showed the existence of one strong single individual who assumes product ownership at the cost of potential knowledge loss and distortion. Lastly (3) the use of rich media, in particular face-to-face communication, was much more present in the radical cluster, probably due to a bigger complexity and therefore bigger need for actively avoiding misunderstandings. The incrementally innovative projects expressed a need for a common vision in the team, which might be a direct result from this lack of media richness.

TABLE 5: IDENTIFIED KNOWLEDGE TRANSFER PRACTICES

<b>Practice</b>	<b>Related Theme</b>	<b>Description (Incremental)</b>	<b>Description (Radical)</b>
1. Positioning of the network	Cross-boundary activities	Network is positioned more distant from the market.	Network is positioned closer to the market e.g. customers and partners.
2. Utilization of Individuals for Knowledge Transfer across Boundaries	Individual Focus	Utilizing several individuals to transfer market knowledge within the case company	Utilizing one central individual to transfer market knowledge within the case company
3. Usage Rich Media	Communication	Less use of rich media.	More use of rich media.

## 6. CONCLUSIONS AND IMPLICATIONS

### 6.1 Conclusions and Limitations

The purpose of this study was to identify differences in knowledge transfer practices between development of radical and incremental product innovations and thereby contribute to knowledge transfer literature regarding how market knowledge is transferred internally in relation to innovation. This was achieved by constructing a multiple case study research design within a multi-unit company with a track record of both incremental and radical innovation. By conducting 18 semi-structured interviews the development of four cases (two radical product innovations and two incremental product innovations) was investigated. It was found that, with regard to market knowledge, there are differences between the cross-functional knowledge transfer practices of radical and incremental innovations within the case company. This was identified by constructing three knowledge transfer practices which highlighted that the radical projects had been more oriented towards the market, focused on one dominant individual intermediary between functions and used more rich media.

It can thus be concluded that the study contributes to existing literature on knowledge transfer by enriching the description and discussion about *how* market knowledge is acquired and how it is spread internally during the development and whether that differs between radical and incremental product innovations. It can still be maintained that inclusion of market knowledge is crucial for innovation, as argued by other scholars, but this study emphasizes that in acquiring that knowledge, different practices may serve certain objectives better. It also presents a new focus for future studies by introducing knowledge transfer practices as a focal point for investigation.

The conclusions of this study should be seen in the light of a number of limitations. First of all, the chosen definition of radical and incremental innovation excludes breakthrough innovations and limits the generalizability of the study. Any questions regarding the cross-functional knowledge transfer practices in relation to extremely new innovations can therefore not be answered. A second limitation could be found in the use of only one source of empirical data. If the study had incorporated additional data sources, the descriptions would have been even richer.

A third and final limitation, which indicates what future research may engage in, concern what the chosen design does *not* include. This paper only looks into potential connections

between knowledge transfer dimensions and the grades of innovation. Rival explanations for the patterns identified in the different degrees innovation may exist. It should be acknowledged that the chosen research design is not able to illuminate all of those. Examples of these explanations could be the composition of teams in terms of size, personality and diversity. All these factors provide possible avenues for future research. The chosen design could however be argued to rule out a few other contextual explanations concerning company specific factors, such as age and size of the case company as well as industry specific factors and country specific factors. These factors are controlled for, as this research only takes place within one company and one industry within one country.

## **6.2 Implications for Future Research**

The conclusions and the limitations of this study allow formulation of implications for future research as well as for practitioners. To further the understanding of cross-functional knowledge transfer practices and their effects on innovation regarding internal and external knowledge transfer, future research could focus on several facets. In relation to the limitations of this study, a longitudinal and experimental study would be worthwhile to establish causality and distinguish, which potential effects the identified knowledge transfer practices have on the grade of innovation. Repeating this study might be challenging as the exact replication of a qualitative research is hardly possible, but a similar research design with a bigger scope in terms of data sources and/or cases might nonetheless be valuable to strengthen or question the findings and conclusions. Increasing the number of companies, projects or interviewees might guide the future research in this area. Conducting a comparable study at a cross-sectional level, including other industries than high technology could furthermore enrich the existing literature on knowledge transfer and give more specific practical implications to different industries. Also, as this study did not focus on breakthrough innovations, further research that showcases knowledge transfer practices in the case of this degree of innovation would be a valuable addition to the stock of knowledge transfer literature.

## **6.3 Practical Implications**

A number of managerial implications can be extracted from the findings of this study. Mainly it offers managers assistance in knowing what to focus on once the grade of product innovation has been established.

For incremental innovations this means a focus on positioning the unit further away from the market, accepting that less market knowledge reaches the team. The risk of losing out on valuable knowledge has to be assessed by the manager and a clear understanding of the needs should exist if one wishes to bypass information from customers or the market in general. The perks of this are a more effective use of resources, which is essential for incremental innovations that are often faced with intense time pressure. In terms of effectiveness, the conscious use of more than one knowledgeable boundary spanner seems to facilitate incrementally innovative product development. More individuals can spread more information and might speed up processes at the potential cost of knowledge distortion. The reduced application of rich media falls into the same category: face-to-face communication can, to a certain extent, be consciously disregarded in incremental product innovation project to save time, as long as the understanding for the products needs and requirements are clear to the development team – the need for a common vision becomes apparent here.

Should the product development at hand be of a more radical nature, other implications can be extracted. The team of a radical innovation development should rather be positioned closer to the market to facilitate market knowledge and tacit customer input through direct contact. That way the customer knowledge can bridge the otherwise challenging bridge between R&D and marketing. This is especially worthwhile if the company has a rather deep knowledge base and cannot get valuable new knowledge from inside the organization. The risk of distorted market information decreases as well. It should be mentioned that talking to the right customers is key here. This task was fulfilled by one single key individual/boundary spanner in this study's research, but there are no indications that a single person has to facilitate this connection. It should be noted though that a one single boundary spanner as an owner and guiding persona might facilitate a successful development of radical innovations. The obvious risk here is a loss of knowledge, as only one person keeps track of everything market knowledge related. Including additional boundary spanners might mitigate this risk, depending on how radical or risky the venture is supposed to be. Finally, the richness of media is of high importance for radical innovations: direct face-to-face communication, visualization and physical closeness help to tap into tacit knowledge pools and to bypass misunderstandings that result from the newness of the product.

A final, more abstract, but equally important managerial implication of this study is the increased awareness for the topic at hand. Acknowledging knowledge transfer and knowledge

transfer practices as vital concepts for innovation is an essential step towards a more structured and successful approach to innovating sustainably. Even if none of the other managerial implications about 'knowing how to know' are followed, an increased awareness about the importance of knowledge transfer can be regarded as a net benefit to knowledge dependent companies.

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## APPENDIX A: INTERVIEW GUIDE

Disclaimer: Please give us your personal opinion. Please answer very precisely when asked about events. No right or wrong. Open questions. If unclear, just ask us to repeat.

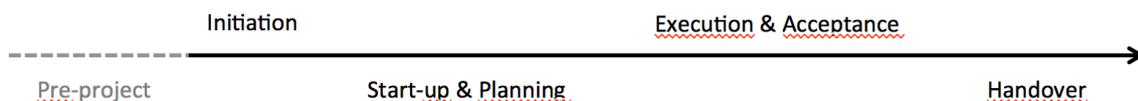
This will be anonymous.

### General questions

1. What is your position? How long have you worked for [the case company]? Always in the same position/department?
2. Tell us about your department, what do you do? Size, place in the organization? (network position)
3. How big was the team? Was that good/bad? Perfect team size?
4. Were new people joining and old people leaving during the development?
5. This product – who had the idea?
6. This product – what are the main features?
7. Who came up with the features?
8. How/why, did features change?
9. Do you remember the product proposal? How did you treat it?
10. Did you have a prototype? How did it help you?

### Show a general timeline to agree on phases

11. Would you agree that these are the general stages of the development timeline? If not, how would you label the stages?
12. Which phase were you most active in?



**Create Influence map focusing on the stage stated by them, asking them to make the influence map**

Looking at the phase and the map:

13. As a PM/PrM what is your purpose/role/function?
14. Who did you turn to when you had problems? How?
15. What means of communication did you prefer then? –
16. How were you seated in the office?
17. Do you recall any informal/spontaneous talks about this product?
18. Did you document anything at this stage? How do you do it personally?
19. What happened to ideas that weren't realized?
20. Did the different teams/departments communicate the same way? (language)
21. New info coming in – how is it communicated/distributed?
22. Should everyone know the same/everything about the development?
23. Does this change over time?
24. Which other departments had an interest in this product? (internal customers)
25. Did they have an influence in some way? How did you use them?
26. Did the organization have to be educated about this product?
27. Did everybody understand the product?
28. Do you remember the press release?
29. Anything you learned in this event that has helped you in other projects/instances?
30. Were there any misunderstandings?

## APPENDIX B: FINDINGS INCREMENTAL CLUSTER

Theme	Categories	Description
Exchange across boundaries	1. Cross-departmental exchange	Explicitly using input and idea from other departments.
	2. Cross-project exchange	Using individuals with similar functions but from other projects to get information and input.
	3. Feedback and request from sales	Sales requesting particular features that are incorporated.
Individual Focus	4. individuals as intermediary (product owner)	Product owner is main interface between the project and the case company.
	5. individuals as intermediary (project manager)	Project manager is main interface between the product owner and the team.
	6. individuals as intermediary (individual with a market oriented function)	This individual is the main interface between the market and product management.
	7. People carry knowledge	Knowledge resides within individuals who must share it in order for it to be transferred.
	8. Experience as a resource	Previous experiences further the projects and provide tacit knowledge.
Communication	9. Selective distribution of information	Certain knowledge has to be withheld to facilitate project development and to avoid complexity.
	10. Different ways of talking and communicating	Different organizational units use different terminology and words.
	11. Full picture is needed	Complete vision of a project is a necessity for a successful and swift development.

	12. Forgetting is common	Keeping track and overview is difficult when tasks are dissected.
	13. Informal communication	Informal and casual meetings are common.
	14. Internal request for documentation	Written documentation is requested.

### APPENDIX C: FINDINGS RADICAL CLUSTER

Theme	Categories	Description
Exchange across boundaries	1. Cross-departmental exchange	Explicitly using input and idea from other departments.
	2. Input from internal customer	Other organizational unit are considered to be internal customers.
	3. Customer input	Customers are explicitly used to gain insight.
	4. External input	Partners and other collaborative partners provide sources for input.
Individual Focus	5. Individuals as Intermediary (product owner)	Product owner is main interface between market and the team.
	6. Product owner as a filter	Product owner is expected to filter information to the team.
	7. Involved product owner	An involved product owner is encouraged and seen as beneficial.
	8. People carry knowledge	Knowledge resides within individuals who carry it over time and between projects.
Communication	9. Different ways of talking and communicating	Terminologies and language differ between departments and individuals.

	10. Educating organization is needed	Expressed need to educate organization, when introducing a novel product.
	11. Informal communication	Associations during business trips, lunch and coffee breaks serve an important forum for communication and decision-making.
	12. Meetings preferred	Richer face-to-face interactions preferred over emails – more personal and effective.
	13. Physical location matters	Physical location is of importance to the development of a product – less miscommunication.
	15. Visualization employed	Visualization is an essential tool for explaining ideas and concepts within the team and across boundaries.