Aalto University
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Balancing between Freedom and Control - Leadership Roles of a New Product Development Project Leader at Different Phases of Innovation Process

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Master's thesis

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ABSTRACT
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Research Objectives

In the success of innovation, leadership plays an important role. Project leader is usually responsible in managing the innovation process as well as the people in the team. The innovation process consists of phases that are very different by nature and hence, leadership practices applicable for the development phase may not be applicable for the front end phase. Thus, leaders of an innovative team need to balance between different kinds of roles and functions during the innovation process. Although the importance of leadership to innovation success has been discussed, the importance of different leadership functions and roles of a project leader at certain phases of innovation process have received only little attention. The aim of this study is to recognize and describe the leadership functions and roles of a project leader during the front end and development phase.

Methodology

This study was conducted as a qualitative research and data was gathered through semi-structured interviews. A total of seven interviews were conducted for the study. Interviews consisted of upper management and project leaders of three Finnish companies. The companies were a manufacturer of office furniture, a manufacturer of elevators and escalators, and a manufacturer of heavy duty cargo transportation platforms. The study analysis was done by thematic analysis.

Research Results

The results of the study support the existing discussion of the importance of a project leader in the context of new product development. Furthermore, the results support earlier studies about the necessity of conducting various leadership functions and leadership roles along the innovation process. According to the findings of the study, team builder leadership role is the most important role of the project leader during the front end of innovation. In the development phase, on the other hand, in addition to the team builder role, also communicator and planner leadership roles were seen as essential for the success of the project.

Key Words

Innovation, innovation process, leadership, leadership function, leadership role

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Tutkimusongelma

Johtamisella on tärkeä rooli innovaatioiden onnistumisen kannalta. Projektipäällikkö on yleensä vastuussa niin innovaatioprosessin kuin tiimin jäsentenkin johtamisesta. Innovaatioprosessi koostuu vaiheista, jotka ovat luonteeltaan hyvin erilaisia. Näin ollen, johtamiskäytännöt jotka ovat soveltuvia prosessin kehitysvaiheessa (development phase), eivät välttämättä ole soveltuvia prosessin alkupäässä (front end of innovation). Täten, innovatiivisen tiimin projektipäällikön täytyy tasapainoilla eri johtamiskäytäntöjen ja -roolien välillä innovaatioprosessin aikana. Vaikka johtamisen tärkeydestä innovaation onnistumisen kannalta on keskusteltu, projektipäällikön eri johtamiskäytännöt ja –roolit sekä niiden tärkeys tietyissä vaiheissa innovaatioprosessia on saanut vain vähän huomiota. Tämän tutkimuksen tarkoitus on tunnistaa ja kuvata projektipäällikön johtamiskäytäntöjä ja –rooleja innovaatioprosessin alkupäässä sekä kehitysvaiheessa.

Tutkimusmenetelmät

Tämä tutkimus suoritettiin kvalitaatiivisena tutkimuksena ja aineistonkeruumenetelmänä käytettiin semistrukturoitua haastattelua. Tutkimusta varten suoritettiin yhteensä seitsemän haastattelua. Haastateltavat koostuivat kolmen suomalaisen yrityksen ylemmästä johdosta sekä projektipäälliköistä. Yritykset olivat toimistohuonekaluvalmistaja, hissi ja liukuporras valmistaja sekä erikoiskuljetuskalustojen valmistaja. Tutkimuksen analyysi tehtiin teemoittelun avulla.

Tutkimustulokset

Tutkimustulokset tukevat olemassaolevaa keskustelua projektipäällikön tärkeydestä uuden tuotteen kehityksen kontekstissa. Lisäksi, tulokset tukevat aikaisempia tutkimuksia eri johtamiskäytäntöjen ja –roolien harjoittamisen tarpeellisuudesta innovaatioprosessin aikana. Tutkimustulosten mukaan tiimin rakentaja (team builder) on tärkein johtamisrooli innovaatioprosessin alkupään aikana. Kehitysvaiheen aikana toisaalta tiimin rakentaja roolin lisäksi myös kommunikaattorin (communicator) ja suunnittelijan (planner) roolit nähtiin oleellisiksi projektin onnistumisen kannalta.

Avainsanat

Innovaatio, innovaatioprosessi, johtaminen, johtamiskäytäntö, johtamisrooli

Definitions and Abbreviations

In this thesis, the following definitions of the key concepts are used:

Innovation
Innovation is about coming up with something new, implementing it, and successfully introducing it into the marketplace (Buijs, 2007).

Innovation Process
Innovation process means all the activities that have to be undertaken in order to turn an invention into a commercial product or service (Smith, 2006). Innovation process can be divided into three phases; front end phase, development phase and commercialization phase (Koen et al., 2001). In this thesis this division by Koen et al. is used as a basis for the study.

Product Innovation
Product innovation encompasses the development of a new or improved product (Trott, 2008).

Front End of Innovation (FEI)
Front end of innovation is the first stage of innovation process and can be defined as the phase from idea generation to its approval for further development or termination (Murphy & Kumar, 1997).

Development phase
Development phase follows FEI phase and focuses on developing selected, new product concepts into final products as efficiently and effectively as possible (Koen et al., 2001).

Leadership (vs. Management)
Leadership is about dealing with change in where the key elements are developing a vision, aligning people, and motivating. On the contrary the key elements of management are planning, organizing, and controlling (Kotter, 2001).

List of abbreviations used in this thesis:

NPD	New product development
R&D	Research and Development
PKII	Pienen ja keskisuuren teollisuuden ideat innovaatioiksi / SME from ideas to innovation
SME	Small and medium sized enterprise
Tekes	Finnish Funding Agency for Technology and Innovation

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1. Introduction

Year ago I was taking part on the one academic year long product and design innovation course. The teams consisted of Stanford students and students of global partner universities, one being School of Science and Technology. The course aims at tackling real world design challenges brought forth by real companies. During the course, students apply the Stanford Design Innovation Process by observing and interviewing users, by benchmarking existing technologies and products, by brainstorming, and by iteratively prototyping to quickly test the ideas. Hence, the course gives pretty realistic picture of the path the innovation process can follow.

Many times during the course I remember myself thinking that what if the development teams would have a team leader, would the leader be able to help and support us in our innovation journey? How could the project leader make the circumstances such that we would be most likely to succeed in our attempts? During the course I became more and more interested about the leadership perspective of innovation process. Luckily, short after the course was finished I got the chance to do my master's thesis regarding the leadership during the innovation process.

This thesis is part of a larger research project called "SME ideas to innovation" (Pienen ja keskisuuren teollisuuden ideat innovaatioksi, PKII). The PKII research project focuses on the product development operations of small to medium sized enterprises (SMEs) pursuing to produce new knowledge and theory of product development operations along with concrete procedures and tools for the case companies. The project is a part of the "Liito Innovative Business Competence and Management" programme run by the Finnish Funding Agency for Technology and Innovation (Tekes). In total there are 13 companies participating the project. These companies represent very different industries including both producers of tangible products and providers of knowledge-intensive services, and the areas of business vary from architectural and furniture design and manufacturing to woodworking machinery and cargo transportation platforms. However all the companies have a common denominator in the operations; product design and product / service development. For this thesis three Finnish companies of different sizes that represent different fields of business were studied. Two of the companies interviewed were also part of the PKII project.

Furthermore, this thesis is part of the Retail and Channel Management Master's Degree Program. The subject of the thesis is also very central when considering the

industry of commerce, in where continuous regeneration and development is needed. As in many other lines of business, also in the field of commerce, success lies in increasing competitiveness through introduction of successful innovations.

1.1. Background

Today, innovation is a fundamental condition for the survival of companies of all sizes. Companies are faced with the realities of shortening product-life cycles (Ailin & Lindgren 2008, Griffin 1997, Cooper 2000), rising consumer expectations (Smith, 2006), rapidly changing market environment and increased level of competition (Griffin, 1997). They can no longer depend on short-term tactics, such as implementing minor differentiation or incremental improvements of products or services (Ailin & Lindgren, 2008). Hence, continuous development and market introduction of new products is an important determinant of sustained company performance and a dominant driver of competition (Schilling & Hill 1998, Ernst 2002). Successful innovation allows companies to stay ahead of the competition in terms of cost, performance and development time to market of products. All these advantages can translate into value to customers and stakeholders of the companies. (Ailin & Lindgren, 2008)

Organizations capability to produce innovations depends on how innovation activities have been organized and how effective the applied process is (Poskela, 2009). Innovation process consists of phases that are very different by nature, including different types of tasks and different amount of task uncertainty (Koen et al. 2001, Kim & Wilemon 2002a). Difference is usually made between the front end phase and development phase (Koen et al. 2001). Where front end phase consists of identifying the opportunities, creating ideas and further developing them into concepts, development phase focuses on developing these concepts into final products. It is widely accepted that leadership plays an important role in the success of innovation (see e.g. Waldman & Bass 1991, Brown & Eisenhardt 1995, McDonough III 2000, Kim & Wilemon 2002a, Hohn 2004, Buijs 2007). Moreover, the responsibility for managing the innovation process and the people in the team is usually in charge of the project leader (Elkins & Keller, 2003). Hence the role of a project leader is essential in the context of innovations and because of that the focus of this research. Successful innovation is unlikely without leaders, who guide the team developing new products through the often iterative and chaotic process (Barckzak & Wilemon, 1989). Because of the different nature of the phases of innovation process, different leadership approaches are required; many of the management practices and activities applicable for the development phase may not be applicable for the front end phase (Buckler

1997, Koen et al., 2001). Thus, leaders of an innovative team need to balance between different kinds of roles and functions during the innovation process (see e.g. McDonough III & Barckzak 1991, Kim et al. 1999, Hohn 2004, Buijs 2007). As Buijs (2007, 203) colourfully expresses it, leaders of innovation projects need to be "controlled schizophrenics" having multiple personalities simultaneously.

Although the importance of leadership to innovation success has been discussed (see e.g. Waldman & Bass 1991, Barckzak & Wilemon 1989, Kim & Wilemon 2002a, Buijs 2007), and the impact of leadership functions and roles to the performance of the development team has been studied (see e.g. Kim et al., 1999, Somech 2006) the importance of different leadership functions and roles at certain phases of the innovation process have received only little attention. This research looks into the different leadership functions and roles presented by project leaders of new product development teams. The aim of this study is to find out what kind of functions and roles of a project leader are necessary at different phases of innovation process, more precisely at the front end of and development phase of innovation.

1.2. Research Problem and Research Gap

Previous literature has emphasized the importance of leadership in new product development (NPD) efforts (Barckzak & Wilemon 1989, Waldman & Bass 1991, Barckzak & Wilemon 2001, Kim & Wilemon 2002a, Hohn 2004). Some literature has examined team building in the context of new product development and suggested practices for team leaders in order to improve team performance (McDonough III 2000, Barckzak & Wilemon, 2001). Others have explored the effects of leadership style on the performance of cross functional teams (Somech, 2006) and on the speed of NPD (McDonough & Barckzak, 1991). Waldman and Bass (1991) studied the importance of transformational leadership at different phases of innovation process. Their study suggests that nurturing leadership is necessary at the early phases of innovation process whereas in the latter phases persistence of leadership is of importance.

There has also been some exploration about the role of leadership within NPD projects. The study of Barckzak and Wilemon (1989) explored the functions and roles of a team leader between an operating team and an innovating team, the former being less innovative. The results suggest that operating leaders utilize a narrow range of familiar techniques in fulfilling their functions and roles whereas innovative leaders use a wide variety of familiar and unfamiliar steps in accomplishing their objectives. Furthermore, they identified four roles performed by team leaders of new product

development team: communicator, climate-setter, planner and interfacer. The study of Kim et al. (1999) examined the relationship between the role of the Research and Development (R&D) project leaders and their team performance. The results show that different leadership functions and roles are important depending on the nature of the project. In addition, in their study they found out that roles of technical expert, team builder, gatekeeper, and strategic planner were related to team performance.

However, the studies discussed above do not consider at which phase of the innovation process the different leadership functions and roles are necessary. Thus, the leadership roles during the front end and development phases have not been studied enough and there is still a need for further research about the role and functions of an immediate manager, that is, project leader, during the innovation process.

1.3. Research Objectives and Research Questions

The purpose of this thesis is to recognize and describe the various leadership functions and roles of a project leader of NPD team at the front end and development phase of product innovation process. In this study, project leader refers to a person who is responsible of the overall daily work and the progress of the project as well of leading the project team.

Furthermore, this thesis focuses on analyzing the front end and development phases of innovation process, excluding the last phase of innovation process, commercialization phase. This is due to the fact, that front end and development phases are very different from their characteristics offering interesting baselines to the study of leadership roles and functions. Consequently, the researcher did not see that including commercialization phase would have brought any added value to this study.

The main research question derived from the research problem is:

What are the different leadership roles of a product development project leader at front end and development phase of product innovation process?

To find an answer to the main question, the following research sub-questions are posed:

RQ 1: What are the characteristics of the front end and development phases?
RQ 2: What are the leadership functions of a project leader during the front end?
RQ 3: What are the leadership functions of a project leader during the development phase?

1.4. Structure of Thesis

This thesis is divided into five main sections: introduction, theoretical background, research methods, empirical findings, and discussion and conclusion, as Figure 1 depicts. The chapter 1, introduction, presents the background for the study as well as the research gap and research objectives. The theoretical background consists of existing knowledge of innovation and its different forms, innovation process, leadership during the innovation process, and the leadership roles and functions of a project leader of NPD team. After the theoretical background, in chapter 3, research methods and their reasoning are described. Chapter 4 presents the central findings of the study conducted and finally, Chapter 5 discusses the results, their trustworthiness, suggestions for future research and managerial implications.

Figure 1 Structure of the Thesis

1. INTRODUCTION Background of the Study Research Problem and Research Questions
2. THEORETICAL PART Innovation Innovation Process Leadership during the Innovation Process Leadership Functions and Roles of a NPD project leader
3. RESEARCH METHODS Data Collection and Analysis
4. EMPIRICAL FINDINGS
5. DISCUSSION OF RESULTS AND CONCLUSION Limitation of the Study Managerial Implications Suggestion for Future Research

2. Theoretical Background

This chapter reviews existing literature and studies on innovation, innovation processes, the leadership during the process as well as the different leadership functions and roles performed by the project leaders. The ultimate objective of this chapter is to present the theoretical background to support the research done. The chapter is divided into five main sections. The first one focuses on explaining the definition of innovation and its different aspects such as classification, types and models of innovation. The second section introduces innovation process models, different phases of the process as well as the characteristics and activities of these phases. The third section discusses about the leadership during the innovation process whereas the fourth section presents the different functions and roles performed by project leader of innovative projects. Finally, the last section will introduce the theoretical framework for the study.

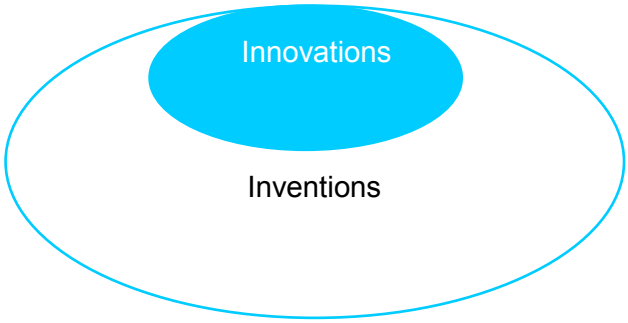
2.1. Innovation

The term “innovation” comes from the Latin word “innovare” which means to make something new. Innovation is a very broad concept and is defined and understood in a variety of ways. Schumpeter (1983) was one of the first studying innovations and he defined innovation as the commercialization of new elements or a combination of old elements in industrial organizations. As Amabile et al. (1996) note, innovation is about acting on creative ideas. Afuah (1998, 13) describes innovation as *“a use of new knowledge to offer a new product or service that customers want”.* According to Tidd et al. (2005), innovation is a process of turning opportunity into new ideas and further, putting these into widely used practise. On the other hand Hislop (2005) states innovation to be the deliberate modification or transformation of an organization, of an organizations product, services, processes or structures. In their definition, Luecke and Katz (2003) emphasize the successful introduction of a new thing or method. Smith (2006) describes innovations as new things applied in business of producing, distributing, and consuming products or services. Trott (2008) argues that innovation is the sum of theoretical conception, technical invention and commercial exploitation. To sum up “i*nnovation is about coming up with something new, implementing it and successfully introducing it into the marketplace”,* as Buijs (2007, 204) has expressed it.

Often innovations and inventions are being confused with each other for which reason it is important to bring forth the difference of these two concepts. *Inventions became*

innovations when they have proven their feasibility (Smith, 2006). Or as Garcia and Calantone (2002) express it, invention does not become innovation until it has passed through production and marketing and diffused to the market. Not nearly all inventions develop to innovations as Figure 2 depicts.

Figure 2 Inventions and Innovations

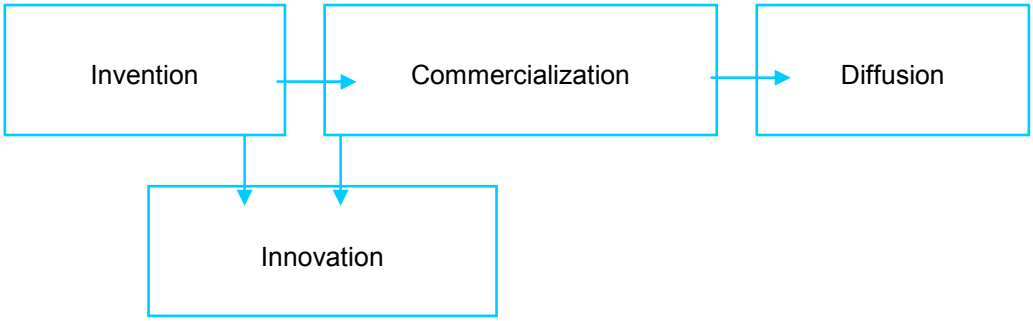


Source: Smith (2006)

Invention forms a part of innovation involving new ideas, new discoveries and new breakthroughs. A key feature of inventions is the "newness" – they incorporate some "inventive step". However inventions are not normally ready for market at this stage. In addition to invention, innovation includes also activities such as design, manufacturing, marketing, distribution and product support. (Smith, 2006)

As Figure 3 demonstrates, innovation involves both invention and commercialization phases.

Figure 3 Invention, Innovation and Diffusion

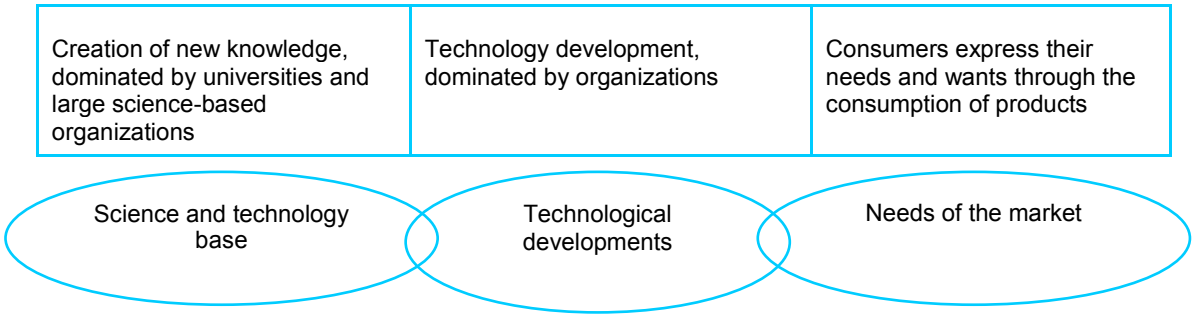


Source: Smith (2006)

Furthermore, commercialization is not the end of the story but innovation is followed by diffusion. It is a stage where innovation becomes widely used and in time spreads to other fields. (Smith, 2006)

The conceptual framework of innovation by Trott (2008) consists of three factors, as can be noted from Figure 4.

Figure 4 Conceptual Framework of Innovation



Source: Trott (2008)

According to Trott innovation can be said to occur through the interaction of the science and technology base (dominated by universities and industry), the technological development (dominated by industry) and the needs of the market.

2.1.1. Classification of Innovation

Innovations can also be differentiated in terms of the degree of novelty associated with them. There are several different classifications of innovation but the most common classification is the division into radical and incremental innovations (see e.g. Ettlie et al. 1984, Dewar & Dutton 1986, Koberg et al. 2003). Radical and incremental innovations classify the distinction between big-change and small-change innovations, as Smith (2006) has expressed it. According to Smith (2006), radical innovation is much more than improvements to existing designs; it calls for a whole new design, ideally using new components configured in a new way. Radical innovations are comparatively rare and often associated with the introduction of a new technology. Leifer et al. (2001) describe radical innovation as a product, process, or service with either unprecedented performance features or familiar features that offer significant improvements in performance or cost that transform existing markets or create new ones. Radical innovations transform the relationship between customers and suppliers, restructure marketplace economics, displace current products, and create entirely new product categories (Leifer et al., 2001). Garcia and Calantone (2002) propose that radical innovations are innovations that cause marketing and technology discontinuities

in macro (world, industry, market) and micro (company, consumer) level. Incremental innovations occur only at micro level causing either technological or marketing discontinuity but never both (Garcia & Calantone, 2002). In addition to radical and incremental innovations, Garcia and Calantone (2002) present a third classification of innovations, namely “really new innovations”. According to them, really new innovations are situated between radical and incremental innovations.

Incremental innovation is the most common type of innovation. According to Smith (2006) incremental innovations are based on existing business concepts and processes and the components are not radically altered. It improves an existing design through improvements in the components. Furthermore, it is not necessary for a company to change its methods along with incremental innovation. Smith argues that improvements in knowledge and materials usually lead to products and services being enhanced over time.

Although the distinction between radical and incremental innovation has produced important insights, Henderson and Clark (1990) claim that it is still fundamentally in-complete. They present a typology of innovations that involves two more categories of innovation: the modular innovation and architectural innovation. According to Henderson and Clark (1990) modular innovation is an innovation that changes only the core design concepts of a technology, such as the replacement of analogical telephone with digital telephones, but does not involve a whole new design. Smith (2006) emphasizes that the key feature of modular innovation is the use of new or different components. In the case where the new components embrace a new technology, it can transform the way in which one or more components within overall system operate but do not change the system and its configuration (Smith, 2006). Henderson and Clark (1990) argue that architectural innovation changes the relationships between the core design concepts. Furthermore, it is an innovation that changes the architecture of the product but leaves the components and the core design concepts that they embody unchanged (Henderson & Clark, 1990). The components will continue to function as they have but within a new redesigned and reconfigured system (Smith, 2006).

The degree of novelty in innovations can also be seen as a continuum one end consisting of minor, incremental changes and the other end of major, radical changes (Katz & Shapiro 1987, Green et al. 1995) Katz and Shapiro (1987) define minor innovation as something that incrementally adds to the existing technology and major innovation as something that replaces the existing technology. Also “evolutionary” and “revolutionary” (see e.g. Walsh et al. 2002, Patrakosol & Olson 2006) or “continuous”

and “discontinuous” (see e.g. Lynn et al 1996, Walsh et al. 2002) innovation definitions have been presented. According to Patrakosol and Olson (2006) evolutionary improvement occurs when the process changes are incremental and revolutionary improvements occur when the process changes are rapid and radical. Bower and Christensen (1995) talk about sustaining and disruptive technologies. According to them, sustaining technology maintains a rate of improvement whereas disruptive technologies provide a very different solution from the previous ones.

One of the often cited classifications of innovation is the one from Wheelwright and Clark (1992). They make the distinction between derivative, platform and breakthrough projects in the context of product innovations. Derivative projects are about improving, upgrading or extending existing products pursuing to short-term benefits whereas in breakthrough projects the new core product and the process are developed in order to build long-term competitive advantage. Platform projects are in between derivative and breakthrough projects in their newness. (Wheelwright & Clark, 1992)

Table 1 illustrates the different classifications of innovation and the related literature.

Table 1 Classifications of Innovation

Classification of Innovation	Authors
Radical / Incremental	e.g. Ettlie et al. 1984 Dewar and Dutton 1986 Leifer et al. 2001 Koberg et al. 2003 Smith 2006
Radical / Really new / Incremental	e.g. Garcia and Calantone 2002
Incremental / Modular / Architectural / Radical	e.g. Henderson & Clark 1990
Discontinuous / Continuous	e.g. Lynn et al. 1996 Walsh et al. 2002
Disruptive / Sustaining	e.g. Bower and Christensen 1995
Major / Minor	e.g. Katz and Shapiro 1987 Green et al. 1995
Revolutionary / Evolutionary	e.g. Patrakosol and Olson 2006 Utterback 1994

While the classification of innovations enables comparison between organizations at least to some extent, Downs and Mohr (1976) argue that the same innovation may be classified differently in different organizations. For example, an innovation may be seen as incremental or minor by one organization but radical or major by others. Hence, innovation is rarely the same thing to two organizations

Although many of the classifications can be considered as (physical) product or technology-driven, innovation can take many forms as can be noted during the following section.

2.1.2. Types of Innovation

Types of innovation categorize innovations by the idea of application or by the fields where innovations are used. A distinction is normally made between product and process innovation, the former involving the incorporation of new technology into new or existing products or services, whereas the latter involves adopting new technology in the actual production of new product or service (McLoughlin & Harris, 1997).

Often product innovations may be associated with service components, as Gattiker (1990) argues. Furthermore, Gattiker (1990) argues that the distinction between product and process innovation has proven to be increasingly difficult to draw. According to the author, it makes more sense to regard product and process innovations as opposite ends of a continuum rather than as mutually exclusive categories of innovation. According to Smith (2006) innovation can take the form of new products, services and processes. To these Ailin and Lindgren (2008) add new business models. Trott (2008), on the other hand, states innovation to relate to physical product, service process, production process, management approach or organizational or marketing activity. Typology of innovations and examples of the different types of innovations by Trott (2008) can be seen in Table 2.

Table 2 Typology of Innovations

Type of Innovation	Example
Product Innovation	The development of a new or improved product
Process Innovation	The development of a new manufacturing process
Organizational Innovation	A new venture division; a new internal communication system
Management Innovation	TQM (Total Quality Management Systems)
Production Innovation	Quality circles just-in-time (JIT), manufacturing systems; new production planning software
Commercial / Marketing Innovation	New financing approaches; new sales approach, e.g. direct marketing
Service Innovation	Internet-based financial services

Source: Trott (2008)

This thesis focuses on analyzing product innovation processes and the leadership functions during them. Product innovations, especially consumer products, are probably the most known innovations since they appear to consumers in a very concrete way. Product innovations can also be industrial products such as machinery and equipment. (Smith, 2006)

A widely accepted and used classification and definition of product newness in product development research is the one by Booz, Allen and Hamilton (1982). They classify new products in the following six categories:

- *New-to-the-world*; the first of their kind creating a totally new market
- *New product lines*; not new to the market place but quite new to the firm
- *Additions to existing product lines*; new to the firm, fitting within the existing product line
- *Improvements and revisions to existing products*; replacements of existing products in a firm's product line
- *Repositions;* new applications for existing products involving retargeting an old product to a new segment or for a different application
- *Cost reduction*; least "new" of all categories, new products designed to replace existing product in line, yielding similar benefits and performance at lower cost

Cooper (2000) argues that when successful, new-to-the-world products are the most profitable, making 50% of the sales. Hence, companies should put much effort on properly managing the innovation process from the very beginning until the launch of the new product.

2.1.3. Different Generation Innovation Models

Various types of models have been introduced in the literature for innovation processes. Innovation process has traditionally been viewed as a sequence of separable stages of activities (Trott, 2008). The first generation model, technology push model, emphasizes technological discoveries and developments in science as the main source of innovation (Trott, 2008). This model is very much the traditional perspective on the innovation model (Rothwell 1994, Trott 2008). The weaknesses of the model are that it ignores marketplace portraying it as passive and assumes that more technology will lead to more innovation (Smith, 2006). According to this model R&D has only little or no interaction with the rest of the company or overall strategy (Nobelius, 2004). While the technology push model can be applied to few cases, it is not generally applicable.

It was not before the 1970s that it was suggested the role of the marketplace to be influential in the innovation model (von Hippel, 1978). Market pull model considers customers as the most important origin of new, innovative ideas (Trott, 2008). The weakness of this model is that by meeting the apparent needs of the customers with modest improvements, new technologies can be left ignored and hence lead to firms losing their capacity to innovate (Smith, 2006). Both, the process of technology push and market pull models are linear and sequential, each step following on from the completion of the previous one (Trott, 2008).

The third generation innovation model, called the interactive coupling model, combines new opportunities in markets and new technological inventions utilizing them both as a basis for development (Rothwell, 1994). In interactive coupling model, both the technology and the market are influential (Smith, 2006). This model suggests that it is the result of simultaneous coupling of knowledge within the research and development, manufacturing and marketing that will foster innovation (Trott, 2008).

The fourth generation innovation model, interactive model, emphasizes the concentration of core business, and core technologies as well as the formation of strategic alliances (Rothwell, 1994). According to Rothwell (1994) the importance of

speed in the development of new innovations for the market led to tighter integration of internal functions and parallel development activities. In this model, R&D was seen as an integrative activity, moving away from product focus to concept focus where activities are conducted in parallel with cross-functional teams (Nobelius, 2004). According to this model, innovations occur as the result of the interaction between the marketplace, the science base and organization's capabilities (Smith, 2006).

Finally, the prevailing model today, the fifth generation model (also termed as the network model) emphasizes more intensive organizational and systems integration, more flexible and flatter organizational structures, and exploitation of modern information technology in innovation management (Rothwell, 1994). It focuses on collaboration involving e.g. competitors, suppliers and distributors (Nobelius, 2004). This model reflects the way in which organizations increasingly rely on external resources through alliances, agreements and contracts with third-party organizations (Smith, 2006). According to Smith (2006) network model is not universally practiced but rather only in certain industry sectors such as aerospace, pharmaceuticals and computing.

2.1.4. User Innovation

Studies of user innovation show that many of the most important commercialized products and processes were developed by users. Rosenberg (1976) found out that important and basic machines like milling machines were first developed and built by users that had a strong need for them. Freeman (1968) reported that the most widely licensed chemical production processes were developed by user firms. The studies of von Hippel (1976, 1977) showed that users were the developers of about 80 percent of the most important scientific instrument innovations. Also Shah (2000) found out that the most commercially important equipment innovations in four sporting fields tended to be developed by users. Thus, users, firms or individual consumers, of new products are seen as an important source of innovation (von Hippel, 1988). As Rogers (1995) has pointed out, in many cases improvements to products are realized during the diffusion phase with the help of user feedback and re-inventions by users. According to Franke et al. (2006) product modifications and development by users are relatively common among many fields. Baldwin et al. (2006) argue that users develop products to serve their own needs. Some of these products are also adopted by manufacturers and sold as commercial products (Baldwin et al., 2006). Furthermore, Baldwin et al. (2006) argue that user innovation can greatly influence the rate and direction of innovations in some industries. According to the theory developed by Baldwin et al.

(2006), user innovations begin when one or more users of a product recognize a new set of design possibilities and begin to explore that.

The lead user method, developed by Eric von Hippel (1986), is widely known method of user innovation. Lead users are users whose present strong needs will become general in the market after months or years (von Hippel, 2005). According to von Hippel and Katz (2004) the lead users can serve as a need-forecasting laboratory for marketing research since they are familiar with the future conditions. The remarkable finding of von Hippel's (1986) twelve-year study was that users were often the actual developers of prototype solutions that led to successful commercial products. Von Hippel's research evidence shows that often innovative users have valuable new product information to offer. Lead user method differs from the traditional market research in the way that it tries to collect information about both needs and solutions from the leading edge of the target markets whereas the traditional market research concentrates on learning what a typical customers might need (von Hippel & Katz, 2004). According to von Hippel and Katz (2004) the underlying assumption is that lead users have already come up with innovations and R&D should see if they can adapt these ideas and innovations to the needs of their own market.

2.1.5. Open Innovation

There is currently a broad awareness of open innovation and its relevance to firm's R&D processes. According to Chesbrough (2003a) there is a fundamental shift in the way companies generate ideas and bring them to market. He further argues that the boundaries between the firm and its surrounding environment have become more permeable. In closed innovation, that has held to be the right way to bring new ideas to market, company generates, develops and commercializes its own ideas (Chesbrough, 2003b). Chesbrough (2003a) notes that the logic that supports an internally oriented approach to R&D has become obsolete in many industries. According to Chesbrough (2003b) several factors have led to the creation of the new model of open innovation. First of all, Chesbrough (2003a) state that the rise in the mobility of knowledge workers made it difficult for companies to control their ideas and expertise. Secondly, the growing availability of private venture capital, which has helped to finance and support new firms in their efforts to commercialize ideas was an important factor in the creation of open innovation (Chesbrough, 2003a). Baldwin and von Hippel (2009) suggest that the practices in open software development were important in bringing the phenomenon of free revealing to general awareness.

In open innovation firms commercialize external as well as internal ideas utilizing outside and in-house pathways to market. The basic idea is that because the knowledge is widely distributed, companies can not afford to rely only on their research but should instead profit from other companies e.g. by buying or licensing processes or inventions. On the other hand internal inventions that are not being used in company's business should be given outside for other organizations to utilize e.g. through licensing or joint ventures. (Chesbrough, 2003a)

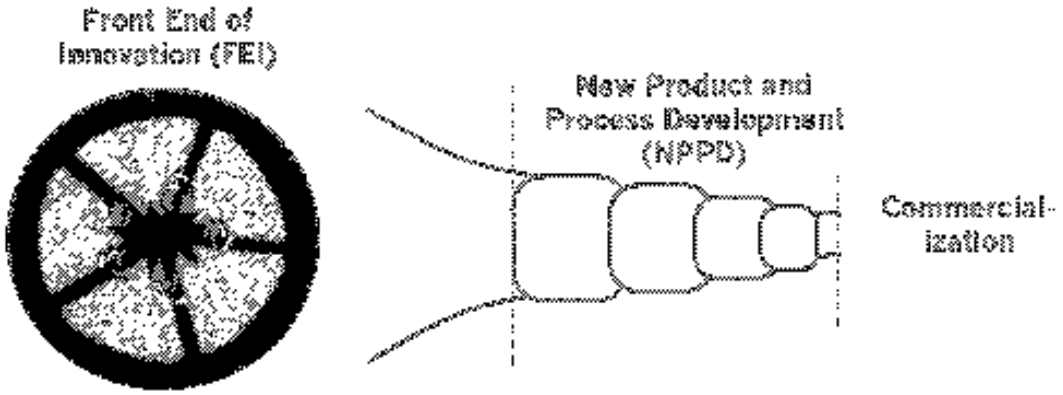
According to Baldwin and von Hippel (2009) there are two reasons for innovators to freely reveal their ideas and innovations: first, it is pretty difficult to effectively protect most innovations and second, innovators often benefit significantly from freely revealing their innovations. Baldwin and Hippel (2009) emphasize that a transition from innovation by producers to open single user innovation and open collaborative innovation is also desirable in terms of social welfare.

2.2. Innovation Process

The innovation process is a process of all the activities that have to be undertaken in order to turn an invention into a commercial product or service (Smith, 2006). It takes a number of steps to get an idea to a product, and the product to the markets for consumers to buy. How many steps it takes and how they are linked together depends on the nature of the product or service. It is commonly agreed that the processes are not meant to be strict specifications but guidelines that need to be flexibly adapted to specific situations and projects. According to Hislop (2005) in the process of innovation organizations strive to implement changes to their existing products, services, structures or processes. Buijs (2007, 204) proposes that "*innovation process is a set of different, parallel, competing and conflicting processes which all occur at the same time*." He emphasizes that a shared understanding, the level of comfort with ambiguity and the degree of trust between team members play important roles during the innovation journey.

The innovation process can be understood to consist of three phases: front-end phase, development phase and commercialization phase (see e.g. Buckler 1997, Koen et al. 2001) as depicted in Figure 5. The front end of innovation is the first phase of the innovation process and refers to activities that take place before the actual development phase (Koen et al. 2001, Nobelius & Trygg 2002). Ideation and the processing and development of concepts occur at this phase of the innovation process (Nobelius & Trygg, 2002). Front end phase is followed by the development phase, or new product and process development phase as Koen et al. (2001) names it, which focuses on developing the selected components into final products effectively and efficiently (Buckler 1997, Koen et al. 2001). The last phase, commercialization phase, brings new products onto the market, thus enables organizations to benefit from previous development activities (Koen et al., 2001). Koen et al. (2001) argue that the entire innovation process needs to be aligned with the business strategy to ensure uninterrupted flow of new products, processes and services that bring value to the corporation.

Figure 5 Innovation Process According to Koen et al.



Source: Koen et al. (2001)

This thesis concentrates on analyzing the front end and development phases, their differences and attributes as well as the different leadership functions and roles used in these phases. The last phase of innovation process, commercialization phase, will be left out. As was mentioned in the introduction chapter, the front end and development phases already offer interesting baselines to the study of leadership roles and functions and thus the commercialization phase was not seen to bring any added value to the study.

Front end and development phases of innovation process differ a lot by nature and because of that require very different leadership practices as well. Front end phase is experimental, difficult to plan and often very chaotic whereas the development phase is formal, well structured and speed and timing play important roles (Koen et al. 2001, Kim & Wilemon 2002b, Hohn 2004). Development phase is usually described as a series of stages through which an idea is processed and evaluated (Koen, 2001). Next the process models, activities and characteristics of these two phases will be discussed.

2.2.1. Front End of Innovation

The front end of innovation (FEI) is considered the first stage of the innovation process and it can roughly be described as the period from the idea generation to its approval for development or termination. (Murphy & Kummar, 1997). Kim and Wilemon (1999; see Kim & Wilemon 2002b) argue that FEI is the period between the first consideration of opportunity and the judgment for further development. Khurana and Rosenthal (1998) talk about front end completeness, where the front end is complete when a

business unit either commits to the funding and launch the project or decides not to do so. According to Verworn et al. (2008) the front end of innovation determines which projects will be executed.

It is commonly agreed that the FEI is the most challenging part of the innovation process. Because the uncertainty is highest at the front end and there is very little information, this phase is often called “the fuzzy front end” (FFE), a term made popular by Smith and Reinertsen (1991; see Verworn et al. 2008). According to Zhang and Doll (2001) this “fuzziness” derives from unclear customer requirements, unproven and changing technologies as well as from unpredictable business environment.

As Buijs (2008) expresses it, FEI is the breeding ground for all new products or services. During the front end the direction for the whole innovation process is set (Reid & de Brentani, 2004). Buijs (2003) argues that the front end of innovation is the strategic part of product innovation. Many important decisions related to target market, potential of the opportunity, and strategic alignment are made (Kim & Wilemon, 2002b). According to Buijs (2008) front end includes everything necessary to come up with a strategically sound design brief for future products and services for a company. Cooper (1997) has found out that insistent work at the front end remarkably drives up the success of NPD. Also Monaert (1995) states, that the quality of planning activities is a critical factor when it comes to successful development projects. In his review of empirical work about NPD success factors Ernst (2002) found out that the quality of planning before beginning of the actual development phase is crucial for the success of NPD process.

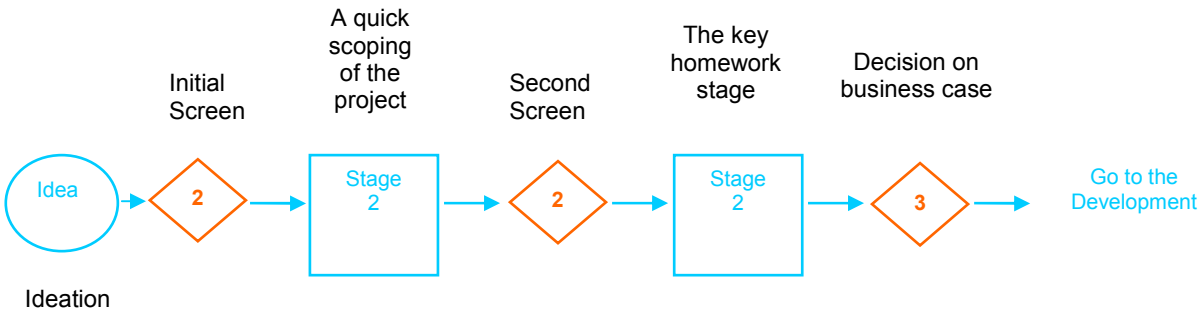
Process Models of Front End

There are several models in the literature that aim at describing and organizing the front end phase of the innovation process (see e.g. Cooper 1997, Khurana & Rosenthal 1998, Koen et al. 2001, Nobelius & Trygg, 2001). One of the most referred models of the front end is the linear Stage-Gate model by Cooper (1993). The Stage-Gate front end model includes three phases and three decision gates as depicted in Figure 6. The different phases are ideation, a quick scoping of the project, and the homework stage. The outcome of the ideation phase is a conceptualized idea. At the first decision gate the ideas are screened against a set of criteria of what must and should be met. The purpose of the stages is to solve problems and generate information that will facilitate decision making about the new product. In the quick

scoping stage market and technical information is gathered to know about the feasibility of the project. If the idea passes the second decision gate it is investigated in more detail in the key homework stage. In this last phase investigation e.g. about user's needs, the competitive situation, markets, technical feasibility, financial issues, and testing the concept are made. (Cooper, 1993) Cooper (1988) argues that the final phase, is the most difficult and expensive phase of the fuzzy front end. The aim is to build a business case which includes product definition, project justification as well as an action plan through the launch. The objective is to make the final decision about continuing or interrupting the project prior the development. (Cooper, 1988) The *business case* is built based on the up-front investigation. It should include a defined product, a business justification and a detailed action plan. (Cooper 1993) Furthermore, Cooper (2000) emphasizes the importance of "up-front homework" 2000, 4) that is, investigation related to the project between front end and the start of the development phases. He argues that solid up-front homework drives up new product success rates significantly.

The Stage-Gate model is one of the most linear and formal process models of the front end giving a systematic way to manage the process (Poskela, 2009). Hislop (2005), like many others, argues that linear models are oversimplifying as interactive learning and combining different knowledge come to characterize innovation processes.

Figure 6 Front End Activities According to Cooper

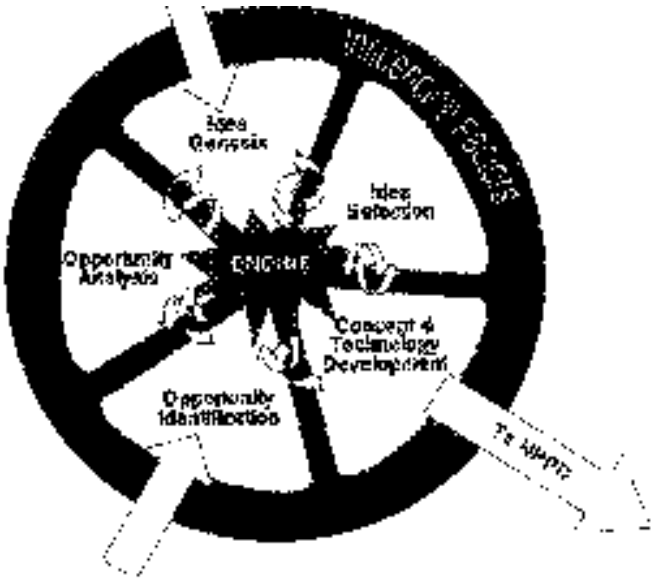


Source: Cooper (1997)

Koen et al. (2001) present the new concept development model, which describes the definition of the key components of the front end of innovation (see Figure 7). The five key elements of the front end of innovation are opportunity identification, opportunity analysis, idea genesis, idea selection and concept and technology development. These five front end elements are fuelled by the leadership and culture of the organization. Previous studies, including the study of Koen et al. (2001) have shown the engine

(leadership and culture of organization) to be a critical part of FEI. The circular shape of the front end phase suggests the flow, circulation and iteration of ideas between and among all the five elements. Koen et al. (2001) state that this differs considerably from the sequential NPD project processes which redo activities associate with significant delays and added costs. The new concept development model tries to describe the actual front end practices, which are the iterative and non-linear nature of the phase. The factors influencing the front end of innovation as well as the whole innovation process consists of organizational capabilities, business strategy, the outside world including distribution channels, customers and competitors and finally the enabling science. (Koen et al., 2001)

Figure 7 New Concept Development Model



Source: Koen et al. (2001)

Between the two extremes of linear and non-linear models there are several other process models for managing the front end phase. The Delft innovation model by Buijs and Valkenburg (2005; see Buijs 2007) is also an iterative process model consisting of five phases: strategy formulation, design brief formulation, development, market introduction and product use. Of those five product use, strategy formulation and design brief formulation comprise the front end phase. Product use phase involves checking the product against technical specifications as well as checking the brand promise. At this phase the organization should find out the possible need to innovate and if the current product is still up to date. Strategy formulation phase involves several analyses that should result in the company knowing e.g. the competitive and substituting products/services, its core competencies, opportunities in the market as well as threats and opportunities in the business environment. Design brief formulation,

on the other hand, concentrates on the strategic idea about the future. At this phase, it is important to look at the needs of potential users. Also the priorities and conflicting interests as well as the limitations of the company should be recognized. In design brief formulation phase resource planning is necessary and special knowledge and skills are needed to realize the planned. (Buijs, 2008)

Another cyclic innovation process is presented by Desouza et al. (2009). The front end phase consists, according to the authors, of generation and mobilization of ideas, advocacy and screening and experimentation. They emphasize the importance of mobilizing ideas from the environment where they are well-known to environment where they are new and fresh. This can give objectiveness and inspire idea generation by revealing assumptions in practices, processes, or products. Desouza et al. emphasize that advocating for ideas, the second step in the front end phase, is a risky and time-consuming process. According to the authors, if the idea is truly innovative, there might not be enough qualified individuals within the organization who can evaluate it. The last phase, experimentation phase, tests the suitability of the idea for a particular organization at a particular time. Important outputs of this stage are libraries of ideas for the future, identification of suitable ideas for commercialization and work-in-progress prototypes.

Khurana and Rosenthal (1998) suggest that the greatest success comes to organization when applying a holistic approach to the front end. This approach links business strategy, product strategy, and product-specific decisions. The elements of holistic approach require company-wide support and senior management involvement. Furthermore, the authors suggest that the front end approach must be compatible with the firm's product, market, and organizational contexts. Khurana and Rosenthal divide the front end phase into three phases that are pre-phase zero, phase zero and phase one. Pre-phase zero includes the product strategy formulation and communication, opportunity identification, and assessment and idea generation, phase zero product concept definition, and finally, phase one is about feasibility and project planning as well as executive reviews. The authors stress that achieving a balance between creativity and discipline is the key in developing a competence in the front end.

Reid and de Brentani (2004), criticize that researchers tend to apply the same front end models and activities regardless of the level of innovation (incremental or radical). They argue that radical innovations move to organizations in a different way than incremental innovations. According to the authors, in the case of radical innovations, individuals act as boundary spanners. They argue that the essence of "fuzzy front end"

is the process of identifying, understanding, and acting on emerging patterns in the environment.

Furthermore the current front end models have been criticized for adopting one single front end model without regarding the contextual differences (see e.g. Reinertsen 1994, Nobelius & Trygg 2002, Reid & de Brentani 2004). Nobelius and Trygg (2002) emphasize the importance of alternative processes or routes and managerial freedom in the front end phase for different types of projects. They state that a greater flexibility among the front end models is needed. In their study they analyzed three development projects and the results showed differentiated front end processes with respect to activities performed and task sequences as well as relative time duration and perceived importance of individual tasks. Nobelius and Trygg (2002) present a front end model that includes mission statement, concept generation, concept screening, concept definition, business analysis and project planning. These activities occur after strategic planning and opportunity identification.

Reinertsen's (1994) two-track front end model takes into account the contextual factors of the organization and considers front end as a process that must be optimized. The model is differentiated due to the different time focus the projects have. The two front end models differ depending on whether the activities are conducted in parallel or in sequence. Reinertsen argues that time-focused projects should be conducted in parallel. He argues that processes should respect the unique economics of different situations. In his latter article Reinertsen (1999) argues that process flow rates, the size of process queues, and the batch size of the process among others are to be optimized in the front end context. Furthermore, the number, layout and sequence of gates in the process are issues that affect the effectiveness and efficiency of process execution.

Smith et al. (1999) state that in order the front end of innovation to be successful, a clear and widely-accepted process definition, effective and fast-moving process leadership, clear and simple process-linked metrics and most critically, the active support by high-level management is needed. In their study of Japanese new product development projects, Verworn et al. (2008) found out that an early reduction of market and technical uncertainty as well as an initial planning before development phase, have a positive impact on NPD project success.

Koen et al. (2001) emphasize that sustained successful innovation can occur only when the front end activities can be accomplished with the organizational capabilities of the company. In addition, it is critical to understand establishing sciences and

technologies. Furthermore, a supportive climate is essential for a productive FEI. (Koen et al., 2001)

Activities of Front End

Activities during the front end aim at reducing uncertainty (Monaert et al. 1994, Kim & Wilemon 2002a, Koen et al. 2001). According to Monaert et al. (1994) uncertainty is best reduced by encouraging closer communications between R&D and marketing, having a decentralized project structure, and requiring formal deadlines and controls even during the front end phases. In their study, Monaert et al. (1994) found out that successful projects reduced on average the same amount of uncertainty during planning in the front end that the unsuccessful projects during the whole innovation process.

Front end models in the literature include certain activities that are considered to be critical in order to effectively carry out the front end phase. These activities have been discussed by several authors (see e.g. Cooper, 1997, Khurana and Rosenthal, 1998, Koen et al. 2001, Nobelius & Trygg, 2002, Tidd et al. 2005, Desouza et al. 2009). Based on the different models of front end and the discussion by authors, Poskela (2009) have summarized the front end activities to include eight activities. The front end activities according to Poskela (2009) are opportunity identification, idea generation, idea screening and selection, concept development, concept testing, customer need assessment, technology verification, and business analysis. Next each of these activities will be shortly discussed.

Opportunity identification is the phase where the organization identifies the opportunities it wants to pursue (Koen et al., 2001). This phase launches front end of innovation (Nobelius & Trygg, 2002). According to Tidd et al. (2002) this phase focuses on detecting signals in the environment about potential for change. Potential for change can occur e.g. from new technological opportunities, legislative pressure, shifts in the political environment, competitor behaviour or new social trends. Koen et al. (2001) emphasize that these opportunities may emerge through formal identification process or informal interaction in ad hoc situations. They underline that this identification of opportunities is typically driven by the company's strategies and goals.

During the *idea generation*, new ideas are created, whether through redefinition of concepts, changes in the processes, creation of new components of service, or

development of new services (Koen et al., 2001). According to Montoya-Weiss and O'Driscoll (2000) the idea development involves transforming raw ideas into a robust concept through careful definition of the underlying technologies, identification of expected customer benefits, and assessment of the market opportunity. This phase represents the evolutionary process of the idea; the birth, development and maturation into a concrete idea (Koen et al., 2001). As Von Krogh et al. (2000) expresses it, the idea usually goes through many iterations and changes as it is examined, studied, discussed and developed. Sutton (2002) argues that innovation requires increasing the diversity of ideas in a company. According to him, promising ideas can come from what appear to be varied sort of junk. Koen and Kohli (1998) suggest that most profitable ideas come from the interaction with the customer. Desouza et al. (2009) state, that one crucial concern for idea generation is for employees to recognize when they have done something innovative. They argue that sometimes employees will be too modest or too unfamiliar with standard business processes to identify their own behaviour as innovative. Smith (2006) argues that since innovation generally is less structured, idea generation is more likely to take a form of a sudden insight. He further argues that insight is the starting point that leads to invention and thence to innovation.

Idea screening and selection aims at identifying the ideas that have most potential for further development (Poskela, 2009). This phase evaluates the potential opportunities for ideas within a particular organization's context. (Desouza et al., 2009). Also, immediate feedback is provided to inventors at this phase (Poskela, 2009). Cooper (1997) emphasizes the importance of idea screening as a formal step. According to him it can be seen as a tentative decision to commit initial resources to the project. Furthermore, he argues that during the screening phase "loser projects" will be weed out. Koen et al. (2001) argue that the selection of ideas is often the critical activity in organizations because of the several product/service/process ideas. Idea selection is challenging due to the limited information and understanding at this point. Tidd et al. (2005) emphasize that selection phase includes selecting of the various market and technology opportunities the ones that fit with the overall business strategy of the firm. They propose that at this phase the company should think about what it is realistically capable of doing and what it chooses to do and what to leave out.

Once the identified new opportunity has been translated into alternative ideas it is then developed into refined and solid concepts (Poskela, 2009). *Concept development* is a critical phase of front end where selected ideas are concretized (Khurana & Rosenthal 1998, Nobelius & Trygg 2002). Different methods, such as sketches, 3D models or prototypes can be used to help to concretize the product (Khurana & Rosenthal 1998,

Cooper 1997). After all, the purpose of this phase is to develop the idea into so concrete form which will help in allocating the needed resources for further development (Tidd et al., 2005). Cooper (2000) emphasizes that in *concept testing* the viability of the concept can be tested before the actual development phase (Poskela, 2009). Poskela (2009) argues that this phase is sometimes neglected because of time constrains or because the development group is too eager to launch the development project. Tidd et al. (2005) emphasize that concept testing will help to avoid problems in later development phases.

In order for a company to succeed in development projects, customer needs have to be satisfied. Information about customer requirements is a critical activity of front end phase (Montoya-Weiss & Calantone, 1994). Desouza et al. (2009) state that it would be important to keep in mind such questions as who is most likely to benefit from the product, and who will be using it? *Customer need assessment* has been recognized as a crucial factor when regarding the success of front end and new product development (Cooper 1993, Smith et al. 1999, Zhang & Doll 2001). The relative increase in benefits of the new product for the customer in comparison with competitor's product must be clearly defined (Ernst, 2002).

According to Cooper (1998) *technology verification* is about translating customer needs into technically and economically feasible solutions. Furthermore, it involves assessing the functionality of solutions, technical costs, risks and legal requirements (Cooper, 1998). This part of the front end is a crucial part in order to avoid technical failures which are one of the main reasons of new product failures when new technologies are applied. Koen et al. (2001) note, that at least part of the technology verification activities may be conducted as a separate technology development process.

New concepts are not viable unless they create competitive advantage for companies. *Business analysis* phase ensures that the new concept is being analyzed also from business point of view. According to Koen et al. (2001) business case is developed based on estimates of market potential, customer needs, investment requirements, competitor assessments, technology unknowns and overall project risk. The level of formality of the business case depends on the nature of opportunity, amount of resources, organizational requirements as well as the business culture (Koen et al. 2001).

2.2.2. Development Phase

After front end phase follows the development phase. This phase focuses on developing selected, new product concepts into final products as efficiently and effectively as possible (Koen et al., 2001). During the development phase a full development team is working around the concept, and the outcome of this phase is a complete product and (Kim & Wilemon, 2002b). Development phase of product innovation process is often described as a process of new product development (NPD), a term used often also in this thesis.

New product development is a critical process for companies and a familiar subject in the literature (see e.g. Schoonhoven et al. 1990, Brown & Eisenhardt 1995, Pina e Cunha and Gomez 2003). As Brown and Eisenhardt (1995) have expressed it, NPD is among the essential processes for success, survival, and renewal of organizations. Schoonhoven et al. (1990) note that product development is critical for organizations to diversify, adapt, and reinvent in order to keep up with evolving market and technical conditions. Firms developing exciting new products that appeal to consumers are likely to be the winners in the market, thus product development is a source of competitive advantage (Cooper, 2000). Next the process models most commonly related with tangible products are presented.

Process Models of Development Phase

Product development processes have been discussed extensively in the literature and several various development processes by different authors have been presented. The overall order of different activities in development processes is often somewhat the same regardless of the author. Development processes are often presented as a limited number of sequential and identifiable stages. Usually product development process models proceed from the more abstract into more detailed level. It has been discussed that new product success is closely related to the activities carried out in the process as well as the ability to execute these activities (see e.g. Wind & Mahajan 1988, Cooper & Kleinschmidt 1986). As Otto and Wood (2001, 14) express it, “a product development process can be thought as a sequence of parallel and serial activities or steps to be completed”. Process models represent the ideal path from the formation of an idea to the manufacturing of a finished product. In real life, the steps themselves will not always be as clearly differentiated nor come in the presented sequence as shown in the model (Tidd et al., 2005) rather they are somewhat iterative

and overlapping. According to Pina e Cunha and Gomez (2003) sequential, step-by-step models are tools to guide project managers along the product innovation process. Furthermore the authors argue that these models are expected to reduce uncertainty by presenting a number of steps to be conducted in sequence. Ernst (2002) concludes that the presence of a formal or informal NPD process in a firm establishes the basis for success of new products.

Most organizations use NPD processes consisting of several activities and review points. Activities gather as well as produce information about the viability of successfully completing the project. Between different activities are review points in where the information available are reviewed and the decision about moving to the next stage of the project, stopping the project, or holding the project until more information is gathered is made. (Schmidt et al., 2009)

Every company has a different development process which is influenced and shaped by the sophistication of the product, the competitive environment, the rate of change of technology as well as the rate of change of the system within which the product is used, among others (Otto & Wood, 2001). Organizations may adjust the step-by-step model to the products they are developing (Pina e Cunha & Gomez, 2003). For example, when considering service development the technical development phase may not be critical at all whereas in the case of (physical) product development this phase is usually very time-consuming.

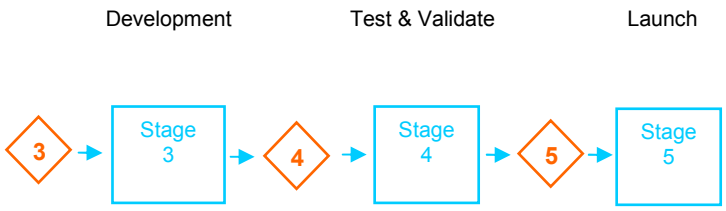
The Stage-Gate front end model was presented earlier as one of the most well known sequential front end processes. The same applies to the Stage-Gate NPD model, which is one of the best known NPD models. Stage-Gate model was originally developed from research that modelled how the successful organizations do their new product development (Cooper, 2002a). The fundamentals of Stage-Gate model were only described very briefly in the front end chapter, and because of that they are now discussed in more depth.

The idea in Stage-Gate model is that it consists of multiple stages of activities and decision gates. In each of the stages, a variety of activities such as marketing, technical and financial, are undertaken concurrently. Activities solve problems and gather and produce information about the viability of successfully completing the project. The entrance to each stage is gate that controls the process and serves as the quality control and checkpoints. (Cooper, 1993) It is important to keep in mind that gates are the quality control check-points that ensure that only the right projects are

moving forward (Cooper, 2008). In order to make it to the point of product launch, each gate must be passed through (Otto & Wood, 2001). According to Otto and Wood early gates ensure that there is a market for the product whereas the later gates ensure more detailed factors, e.g. that the software is working with the mechanical hardware. Schmidt et al. (2009) note that gates are how and where organizations eliminate relatively weaker development projects so that effort and resources can be dedicated to the most deserving ones. At each gate, the decision about whether to proceed with the development ("go"), whether to stop the project ("kill"), or whether to wait with the decision ("hold") until more information is available, has to be made. In their study Schmidt et al. found out that more review points / gates are used for radical NPD projects than incremental ones. In addition, their findings also showed that the number of criteria used to evaluate NPD projects increases as NPD projects progress and that the number of review team members grows over stages, too. According to Cooper (1994) normally, a new product development project consists of four to six stages and gates. Furthermore, none of the stages is "owned" by any one function such as marketing or manufacturing. In contrast, at each stage, players from all functions are active players on the project team. Cooper (1999) argues, that having tough Go / Kill gates is strongly correlated with the profitabilities of businesses product efforts. Otto and Wood (2001) argue that in practice gates operate differently. Instead of "killing the project" other possibilities are usually considered: specifications are revised and budget allocations expanded. However, according to them, once a project begins, there is usually very little chance that it ever gets killed.

Cooper's Stage-Gate NPD model consists of five stages, as can be seen in Figure 8. The stages that follow the front end phase, discussed already in the section 2.3.1, are development phase, testing and validation and launching. The *development* phase follows the business case building. It includes the actual design and development of the new product. The manufacturing process is mapped out in this phase, and additionally the marketing launch and operating plans are developed. *Testing and validate* includes the verification and validation of the new product, its marketing and production. Finally, the last phase, *launch* is about commercialization of the new product. (Cooper, 2000)

Figure 8 Stage-Gate Process after FEI

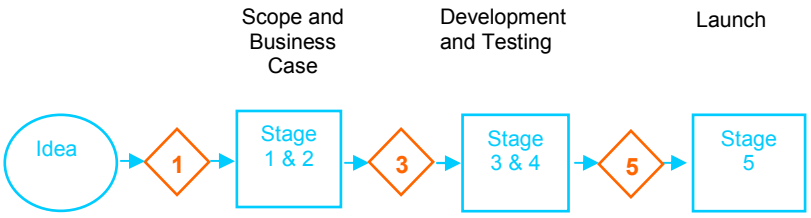


Source: Cooper (1994)

Cooper (2008) argues that even though the Stage-Gate model has a linear visual appearance, it is not a linear system. He emphasizes that there is much looping, iterations, and back-and-forth play. Furthermore, Cooper argues that some activities are undertaken sequentially, some in parallel and some overlapping.

In the literature it has been discussed that innovation models should take into account the contextual factors such as the level of innovation (Reid & de Brentani, 2004), time-focus of the project (Reinertsen, 1994) and other contextual differences (Nobelius & Trygg, 2002). Pina e Cunha and Gomez (2003) state traditional, sequential models to be presumed to suit every case in any context. To take the different circumstances of different development projects into account, Cooper (2008) presents a scalable Stage-Gate Xpress process. This process is meant to be a framework for moderate risk projects, such as modifications and improvements to existing products (Cooper, 2008). Instead of five stages that exist in the basic Stage-Gate model, the Stage-Gate Xpress model has three stages with overlapped activities as Figure 9 depicts.

Figure 9 Xpress Stage-Gate



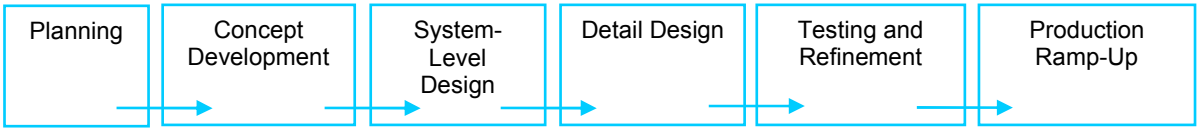
Source: Cooper (2008)

Beyond stage-gate model there is so-called spiral model of product development. According to Otto and Wood (2001) this model is common in time-compressed industries, such as software industry. The idea in spiral models is that it repeats the stage-gate process several times before the product is totally finished. This way at the end of any stage-gate process, there is a partial product that works at some level. The

strategy in spiral model is to seek user feedback early, before “major gates” are passed and parts of the design become frozen. (Otto & Wood, 2001, Ulrich & Eppinger 2003)

One of the widely accepted models of NPD is the more detailed generic process model by Ulrich and Eppinger (2003) which can also be categorized as an engineering design process. Their model is divided into six different phases: planning, concept development, system level design, detail design, testing and refinement and production ramp-up (Figure 10).

Figure 10 Product Development Process



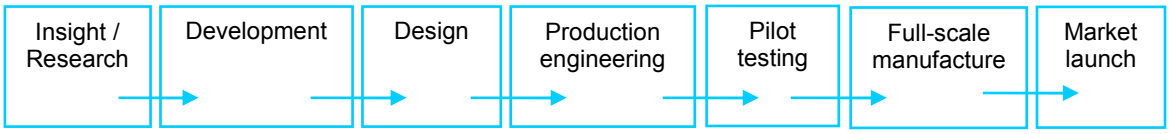
Source: Ulrich & Eppinger (2003)

The first phase, planning phase, of the process is also called as “phase zero”, since it precedes the project approval and launch of the actual development phase. This phase includes assessment of technology developments and market objectives as well as definition of the target market and business goals. In the *concept development* phase the needs of the target market are identified, alternative concepts are generated and evaluated and one or more concepts are selected for further development and testing. The first two phases, planning and concept development can be regarded as front end activities according to the definition of Poskela (2009) and this thesis. Concept development phase is followed by *system-level design*. This phase includes the definition of the product architecture and decomposition of the product into subsystems and components whereas the *detail design phase* focuses on the complete specification of the geometry, materials, and tolerances of all the unique parts in the product. The *testing and refinement* phase involves the construction, and evaluation of multiple prototype versions of the product. Prototypes are built to determine whether the product will work as designed as well as whether it satisfies the key customer needs. In the last phase, *production ramp-up* phase, the product is made using the intended production system. The purpose of this phase is to train work force and to solve any problems in the production processes. (Ulrich & Eppinger, 2003)

The product innovation process of Smith (2006) is somewhat similar to the NPD model of Ulrich and Eppinger (2003). The process starts with *insight/research* which can be defined to be a front end activity. Smith (2006) argues that technological innovations are typically resulting of a big investment in research whereas others are more the

result of individual human ingenuity. The following phases prior to the commercialization phase, market launch, are development, design, production engineering, pilot testing, and full-scale manufacture (see Figure 11).

Figure 11 Innovation Process according to Smith



Source: Smith 2006

The innovation process of Smith (2006) does not separate concept development as it's own stage as the one from Ulrich and Eppinger (2003). The actual development phase begins with turning ideas and technologies into products in the development stage. The product that results from the development stage will have many of the operational characteristics of the final product even though it is not near to be ready to sell to customers. Central to this stage is also the construction of models and prototypes. (Smith, 2006) The development stage of Smith's innovation process is somewhat similar to the system-level design phase in the process of Ulrich and Eppinger (2003). Also the activities in *design* stage goes mainly hand in hand with the *detail design* stage of Ulrich and Eppinger (2003), where the designer has to give the attributes and features to the prototype required by the consumers. This stage is likely to involve specifying the precise shape of the product, the tolerances to which it will be manufactured, the materials to be used in manufacture and the process by which the product will be manufactured (Smith, 2006). Smith puts emphasis on making the physical product in substantial quantities in *production engineering* stage. Here the initial decision about manufacturing the product in-house or outsourcing it to subcontractors is made. Where Ulrich and Eppinger (2003) talk about constructing multiple prototype versions in the testing and refinement stage, Smith (2006) emphasizes the customer interaction in the *pilot* t*esting* stage. Pilot testing has mainly to do with ensuring that the product is safe to use in the hands of consumers and much of the testing will involve interaction with consumers. In the *full-scale manufacture* phase it is ensured that the individual items of the manufacturing system are interacting effectively. According to Smith (2006) the product is manufactured using the intended production system, as is also the case in the production ramp-up stage of product development process by Ulrich and Eppinger (2003).

Another widely known engineering design process in addition to the one from Ulrich and Eppinger (2003) is the one from Pahl and Beitz (1984). The main phases of their process are *planning* and *task clarification*, *conceptual design*, *embodiment design* and *detail design*. The purpose of the first phase is to collect information about the requirements and needs that have to be fulfilled, to recognize the existing constraints and their importance and to result in a specification of information that focuses on the interests of the design process. The second phase focuses on determining a principle solution. This phase includes the creation of solution variants and elaborating and evaluating them. Furthermore, a concept that will be the basis for further development is selected. The third phase, embodiment design, includes elaborating the concept to possibly various overall layout variants of the system. The layouts are assessed, combined and improved to form the best possible layout, which then is evaluated in terms of fulfilment of requirements and financial viability. Finally, the detail design phase is about finalizing the solution and the individual parts in terms of technical details. This phase results in the specification of information in the form of production documentation. (Pahl et al., 2007) The process model of Pahl and Beitz (1984) does not include manufacturing or launching phases as most of the processes described earlier.

Sequential product development processes have been criticized for the simplistic and linear description of the process as the actual process is seldom linear rather the phases can blend into one another. According to Pina e Cunha and Gomez (2003) the definition of tight steps to follow inhibits the development of innovations that include unexpected movements, such as radical innovations. Pina e Cunha and Gomes (2003) state sequential models to rely heavily on planning, anticipation, and control. Furthermore, Pina e Cunha and Gomez (2003) argue that sequential models are more appropriate in managing routine and incremental innovations rather than in discovering radical innovations. Louis and Sutton (1991) propose that one of the risks in these kinds of models is that they create automatic ways of dealing with problems that might require flexibility. Cooper (1990) emphasizes that sequential models should be considered as tools to manage, direct, and control the efforts of product innovations rather than strict specifications. Furthermore, according to Cooper (2008) sequential, step-by-step models act as instruments for developing systemized and standardized product innovation practices.

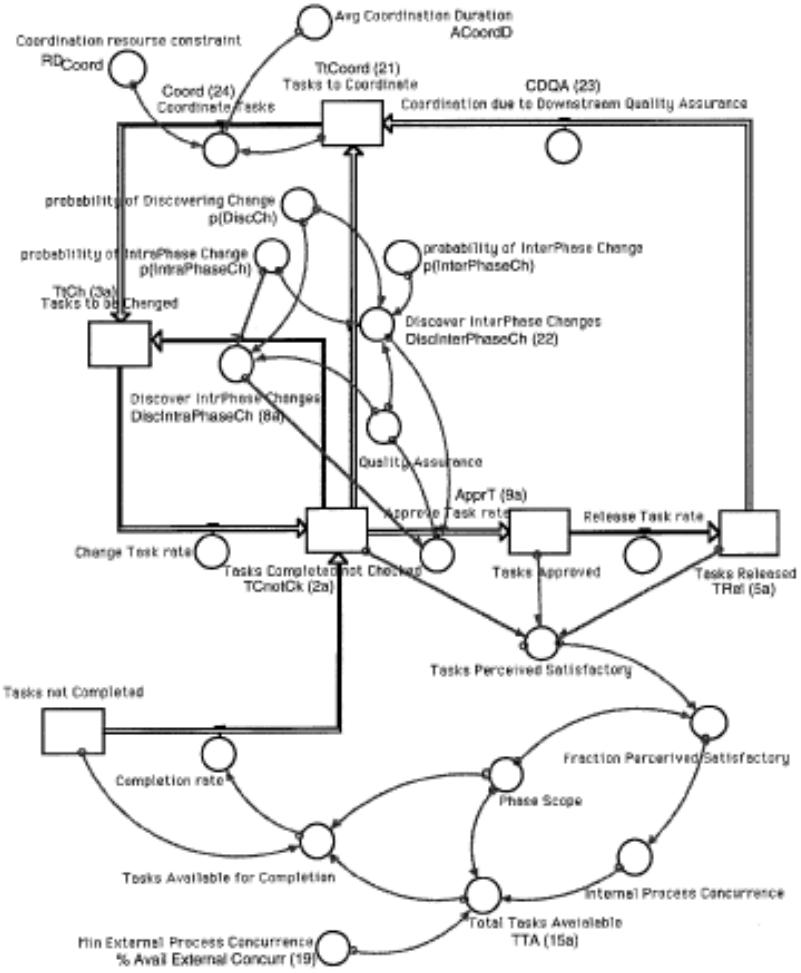
Browning and Eppinger (2002) emphasize that iteration is a fundamental, but often unaddressed feature of product development processes. As the previous product development processes show, most process modelling literature is oriented toward production or business processes, where the process consists of sequential steps

without iterative loops. However, important characteristics of product development processes are, unlike most business and production processes, that they are often described as creative, innovative and iterative. New trends such as distributed product development, cross-functional teams and concurrent product development are affecting product development (Lin et al., 2008). Hence, the product development practices and processes created for relatively stable market and long product life-cycle are no longer capable of producing low cost and high quality products at a rapid pace (Clark & Fujimoto, 1991; see Lin et al. 2008). Some models have been developed to study the iterative nature of product development processes. Smith and Eppinger (1997) developed a sequential iteration model, which was used to describe rework probabilities and task duration. Previous studies have also shown that overlapping activities can reduce project life cycle time (Krishnan, 1997). Overlapping refers to NPD processes where the downstream activities start before the upstream activities are completed. The model of Krishnan et al. (1997) developed a framework for two overlapped sequential activities in order to determine the optimal timing of information transfer. In their study, Browning and Eppinger (2002) integrated several important characteristics of product development processes into a single model which consists of networks of activities exchanging deliverables. The model is used to explore the effects of varying the process architecture, providing support in project planning and re-planning.

Ford and Sterman (1998) argue that to improve project performance managers need to understand the dynamic concurrence relationships that constrain the sequencing of tasks in product development. They present a dynamic model of product development process which models process, resources, scope and targets. It uses three features to describe the development process in a single phase; circular iteration, multiple development, and dynamic concurrence. In their model, tasks flow among five states: Tasks not Completed (TnC), Tasks Completed by not Checked (TCnotCk), Tasks to be Changed (TtCh), Tasks Approved (TAppr) and Tasks Released (TRel).

Figure 12 depicts the development process model phases and flows as well as feedback loops of a single phase of the model by Ford and Sterman (1998).

Figure 12 Dynamic Model of Product Development Process

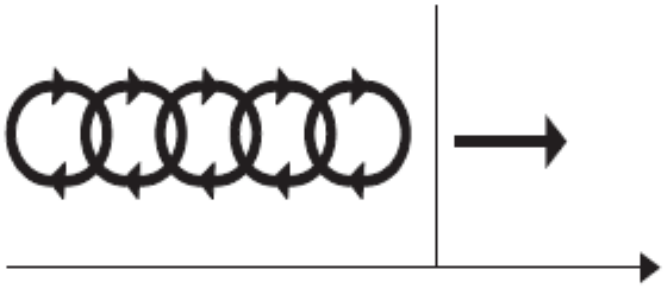


Source: Ford & Sterman (1998)

Pina e Cunha and Gomez (2003) argue that the product innovation management is moving “from planned and mechanistic, towards emergent and organic” (2003, 174). In addition to sequential, step-by-step model, they present four other NPD models that are compression model, flexible model, integrative model and improvisational model. They suggest that these models fall into a continuum ranging from more planned to more emergent models. Where sequential and compression models try to build increasingly efficient and reliable routines, flexible, integrative and improvisational models emphasize increment of resilience and agility. The authors propose that new NPD models understand the novelty of innovation processes as an opportunity for learning and discovery rather than an uncertainty to be removed.

To give a better picture from the discussion of Pina e Cunha and Gomez (2003), the simplistic picture of an integrative NPD model is presented in Figure 13. As can be realized from the figure, this model is integrative and iterative acknowledging that NPD is a complex activity that requires the capability to obtain, transform and interpret large amounts of different kind of internal and external information. The integrative model also reinforces the shift from functions to knowledge; it thinks in terms of the pool of knowledge required to deliver a new product rather than in terms of distinct departments of different functions.

Figure 13 Integrative Model



Source: Pina e Cunha & Gomez (2003)

As can be seen from the figures above, the iterative and concurrent development models look very different from the Stage-Gate or engineering development models. Even though the iterative models would describe more truthfully the flow of work in different phases of product development process, it could be imagined that the sequential models are better tools for managing the process. Griffin (1997) argues that firms cannot allow their NPD practices to stagnate since they could be left behind the competitively. It is clear that since companies operate in a dynamic environment where market environments are rapidly changing, product life cycles become shorter and the level of competition increases, also NPD practices need to change over time.

2.2.3. Comparison between Front End and Development Phases

Previous chapters pointed out the differences between the tasks and illustrated flow of work of front end and development phases. Furthermore, these two phases of innovation process differ a lot in their characteristics and atmospheres.

It is commonly agreed that the front end of the innovation process is the most challenging part of the innovation process. Because the uncertainty is highest at the front end of the innovation and there is very little information at this phase it is often

called “the fuzzy front end” (FFE), a term made popular by Smith and Reinertsen (1991; see Verworn et al. 2008). According to Zhang and Doll (2001) this “fuzziness” derives from unclear customer requirements, unproven and changing technologies as well as from unpredictable business environment. Koen et al (2001) note that compared to the front end phase, development phase is more structured and linear and the nature of working is disciplined and goal-oriented. Where front end is uncertain and unpredictable, development phase is clear and defined. Furthermore, speed and timing issues play an important role on this phase.

As opposite to the development phase, the front end is dynamic and unstructured by nature (Murphy & Kumar 1997, Kim & Wilemon 2002b) and requires out-of-box thinking (Buijs, 2007). Buckler (1997) characterizes the front end phase as experimental, requiring high tolerance for uncertainty and ambiguity, and the willingness to consider the unreasonable. In addition to experimental, Koen et al. (2001) characterize the front end as often chaotic and difficult to plan. Uncertainty and unpredictability are seen as central characteristics (Zien & Buckler 1997, Koen et al., 2001). The nature of working in the front end, on the other hand, is based on “trial-and-error” where high failure rate is typical (Kim & Wilemon, 2002b). Where the development phase is considered to be linear, the front end phase is non-linear and iterative, including “looping back”, “redirecting”, and “redoing” (Koen et al., 2001). Kim and Wilemon (2002b) argue that since there are still lots of things unknown, front end is characterized by seeking knowledge and learning while being creative. They further argue that one must learn to accept approximate solutions since the information available for decision making during the front end is typically qualitative, informal and approximate. Montoya-Weiss and O’Driscoll (2000) state that the early stages of innovation process typically involve ad-hoc decisions and ill-defined processes. Smith et al. (1999) emphasize the importance of “fast failure” or “rapid risk reduction” during the front end by rapidly shifting from many ideas to find those most likely to succeed. Furthermore, management methods are unstructured, experimental and creativity is needed (Kim & Wilemon, 2002b).

The differences between the characteristics of the front end of innovation and development phase are presented in Table 3.

Table 3 Comparison between the Front end and Development phase

Factors	General Characteristics of Front End Phase	General Characteristics of Development Phase
State of and idea	Probable, fuzzy, easy to change	Determined to develop, clear, specific, difficult to change
Features of information for decision making	Qualitative, informal, approximate	Quantitative, formal and precise
Outcome	A blueprint	A product
Action	Diminishing ambiguity to decide whether to make it happen	Making it happen
Nature of work	Experimental, often chaotic, difficult to plan, eureka moments	Structured, disciplined and goal-oriented with project plan
Width and depth of focus	Broad and thin	Narrow but detailed
Ease of rejecting an idea	Easy	More difficult
Degree of formalization	Low	High
Personnel involvement	Individual or small project team	A full development team
Budget	Small / none	Large designated
Revenue expectations	Often uncertain, sometimes done with a great deal of speculation	Believable and with increasing certainty, analysis and documentation as the product release date gets closer
Commercialization date	Unpredictable	Definable
Management Methods	Unstructured, experimental, creativity needed	Structured, systematic
Visible damage if abandoned	Usually small	Substantial
Commitment of the CEO	None or small	Usually high

Source: Adapted from Koen et al. 2001 and Kim & Wilemon 2002b.

As the table depicts, development phase is characterized by high-levels of formality and routine working as opposite to front end which is characterized by low levels of formalisation and non-routine working (Kim and Wilemon, 2002b). The state of an idea in development phase is determined, clear and specific, and it is difficult to change. Also the information available at this phase is usually quantitative and precise. Smith et al. (1991) note avoidance of failure to be critical in the development project. Furthermore, management methods are structured and systematic (Kim & Wilemon, 2002b). Also funding is accurately budgeted and revenue expectations are increasingly accurate as opposite to the front end, where funding in this phase is variable, often small or even non-existent (Koen et al., 2001). In comparison, revenue expectations at the front end are uncertain and often done with speculations (Koen et al. 2001). Furthermore, Smith and Reinertsen (1991, see Nobelius & Trygg, 2000) argue that the early stages of innovation process are often neglected with regard to resources, attention and top management support due to the indefinite objectives and lack of traditional project management focus.

As can be noted from the table above, the different characteristics of FEI and development phase require different methods for managing the processes. While management methods in front end are unstructured, experimental and lot of creativity is needed, management in development phase requires more structured and systematic approach. The differences in the management approaches during the front end and development phase are discussed in the following chapters.

2.3. Leadership during the Innovation Process

Leading an innovative team is a special kind of leadership (see e.g. Kim et al. 1999, Kim & Wilemon 2002a, Buijs 2007). It is about finding a path through an unknown field and dealing with unfamiliar circumstances (Hohn, 2004). “Leading an innovative team is a paradoxical challenge for a leader”, as Hohn (2004) expresses it. She argues that the team needs time to create and destroy, freedom to take risks, and freedom to break out from procedures and rules without being punished. On the other hand a team must work efficiently toward a goal within the organizations’ constrains. Unlike a leader of routine job, innovation leader must have a clear vision to cope with uncertain goals, creativity and persistence throughout the innovation process, and an ability to cooperate and integrate team members with diverse backgrounds (Kim et al., 1999). In addition, conventional leadership behaviour has usually been defined to deal with internal activities such as task structuring activities and human relationships with team members and within the team (Ancona & Caldwell 1988; see Kim et al. 1999) whereas innovation leadership requires dealing with information and resources also from outside the development team (Kim et al., 1999). Innovation leadership must be balanced, people-focused and it must include a high tolerance for ambiguity and paradoxes (Buijs, 2007).

As the previous chapters described, the activities between the front end and development phases of innovation process are very different by nature, including very different degrees of task uncertainty. This means that leadership practices applicable in the front end may not be applicable in the development phase Buijs, 2007; Kim & Wilemon, 2002a; Hohn, 2004; Waldman & Bass, 1991). Thus different leadership approaches are needed in the front end and development phase.

Hohn (2004) proposes that a leader of an innovative team must balance between generative and focusing modes of leadership. The generative mode fosters exploration and originality that leads to new ideas whereas the focusing mode is the leadership behaviour that directs the process leading to performing the task within the given constrains. In the generative modes good group dynamics in terms of openness and good communication play an important role. In this the leader encourages playing and uses creativity techniques to stimulate the group to generate new perspectives. The pace of this phase is adjusted to the creative process of the group meaning that the outcome is not precisely defined. Challenge and risk taking belong to the generative mode. To maintain intrinsic motivation, the leader gives autonomy to the team and challenges them to use and develop their expertise. The leader is satisfied when the

team has created new and original ideas. It is also important that the leader minimizes the pressure from environment, so that the group could work freely. On the other hand, in the focusing mode the goal is clear and the pace is determined by plans. The team works efficiently within the given constrains of budgets and resources and clear communication is of importance. Furthermore, the focus is business oriented and directed towards performance. The leader presses the team to reach targets and boosts their motivation with material and immaterial rewards. The leader is satisfied if the team has solved the problem. (Hohn, 2004)

The characteristics of these modes can also be seen in Table 4

Table 4 Generative and Focusing Modes of Leadership

Generative mode (Front End)	Focusing mode (Development Phase)
Vision development	Goal management
Play/fun metaphors	Fight/power metaphors
Development oriented	Business oriented
Have we created new ideas?	Have we solved the problem?
Pace given by the creative process	Pace given by planning and monitoring
Challenge and risk taking	Defining action
Exploring of conflicts	Crisis and conflict management
Finding freedom	Acting with constrains
Chaotic	Ordered
Intrinsic motivation	Extrinsic motivation
Autonomy and challenging conditions	Material and immaterial rewards

Source: Hohn (2004)

Although, according to Hohn (2004), the leader of innovative team must constantly alternate between these different modes, taking into account the nature of front end and development phases the generative mode can be considered to be more applicable during the front whereas the focusing mode can be considered to be more applicable during the development phase.

Furthermore, transformational leadership has been used as a basis for understanding the role of leadership behaviour during the innovation process (see e.g. Howell & Higgins 1990, Waldman & Bass, 1991, Keller 1992, Elkins & Keller 2003). In their article Waldman and Bass (1991) showed the linkages between transformational

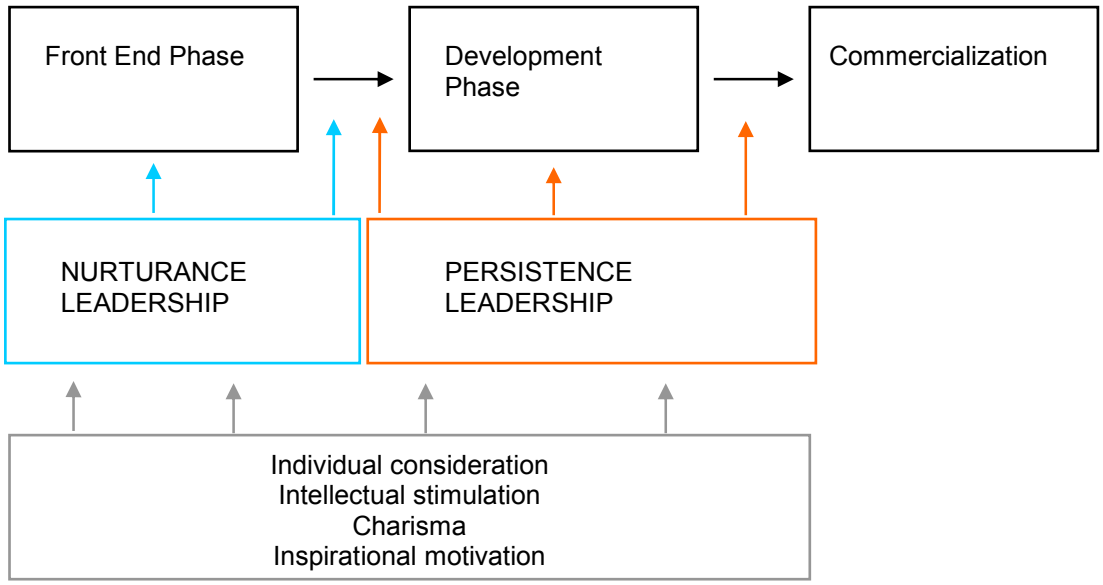
leadership and various phases of innovation process. They argue that leadership which is nurturing and persistent is central to understanding the innovation process (Waldman & Bass, 1991). The leader role of nurturing behaviour is oriented toward the development and support of new ideas, toward the front end phase. Kanter (1988; see Waldman & Bass 1991) argues that nurturance leadership is especially needed in the idea generation phase. Leaders may stimulate people to think about and pay attention to new ideas. In that way, the leader is acting as a catalyst by getting people to consider problems in new ways (Waldman & Bass, 1991). It is important that the team wont become too isolated from its environment since it might be harmful during the early idea generation phases (Keller, 1992). That is why detecting information from the environment and bringing it back to the organization is an important activity at this point of the innovation process. This helps to bring useful information and new ideas into a group of potential innovators. (Waldman & Bass, 1991) Another important element of nurturing leader role is the display of high expectations and confidence by leaders towards employees. This kind of leadership is also especially relevant during idea generation phase when followers lack confidence and need inspiration (Keller, 1992).

In the later phases of innovation process, the role of leader is somewhat different. Waldman and Bass (1991) argue that in the development phase it is the persistence of leadership that counts. According to them, if leadership persistence succeeds, it maintains the energy and enthusiasm associated with idea generation through to the realization of an innovation in the form of tangible products and processes. Furthermore, Waldman and Bass suggest that leadership persistence has two social focuses: internal group relations and external group relations. Related to internal group relations, lack of progress or threats from outside the group such as withdrawal of resources can put off the original energy level and cause disloyalty and instability or in the worst case the possible disbanding of an innovation effort. Conger and Kanungo (1987) emphasize that leadership persistence is essential to generate strong commitment and emotional ties, even in the face of possible setbacks and uncertainty. Such commitment can be accomplished by reminding group members of the vision, continually emphasizing the underlying values and promoting group loyalty and teamwork. Waldman and Bass (1991) note that optimism and encouragement need to be provided to the group to persist in their efforts even when they may be experiencing difficulties in creating a feasible prototype. Furthermore, Bass (1988) emphasizes that followers need to remain committed toward difficult goals even when setbacks and disappointments occur. Leadership persistence is especially necessary to mobilize support and build a coalition of individuals across group boundaries (Keller, 1992). According to Waldman and Bass (1991), a unique aspect of innovation leadership is

related to factors that are external to the group: the uncertainty of innovation success and the necessary involvement of multiple functional areas. They argue that since innovation by its nature cannot be carefully time scheduled, the team may need leadership to protect it from outside pressures.

Bass and Avolio (1990) propose that transformational leadership consists of four components: individual consideration, intellectual stimulation, charisma and inspirational leadership. According to them, transformational leader provide support and encouragement (individual consideration), encourage followers to view problems from new perspectives (intellectual stimulation), communicate a vision (inspirational motivation) and engender emotion and identification (charisma). More precisely, individual consideration is about the leader treating followers as individuals, showing concern for their unique problems and approaches to work and providing developmental opportunities according to individuals' needs and desires (Waldman & Bass, 1991). Intellectual stimulation on the other hand is about helping employees to conceptualize old or repeating problems in new ways Keller (1992). According to Keller (1992) intellectual stimulation involves behaviour which gets employees to think about and pay attention to new ideas, needs and opportunities (Keller, 1992). Furthermore Elkins and Keller (2003) note that the use of intellectual stimulation, that encourages team members from various disciplines to view problems from new vantage points, can enhance innovation. Waldman and Bass (1991) note intellectual stimulation to be more rational dimension of transformational leadership whereas charisma is a highly emotional aspect of leadership. According to Waldman and Bass charisma includes emotional attachment which employees often have for leaders, and the extent to which the employees identify with leader's ideas and values. Inspirational leadership on the other hand involves getting followers to remain optimistic and persevere toward difficult goals even when setbacks and disappointments occur (Bass, 1988). Furthermore, Bass (1988) argues that inspirational leaders display a set of mission to continually provide a vision of where the group is heading. The various factors affecting the innovation process can be detected in Figure 14.

Figure 14 Nurturance and Persistence Leadership



Source: Waldman & Bass (1991)

According to Keller (1992) the team tasks and context influence on the required transformational leadership performance. For example in incremental development projects, the leader may be engaged in task allocation and coordination behaviours whereas in radical innovation projects transformational leadership may be effective in the inspiration and intellectual stimulation of team members.

2.4. Leadership Roles of a NPD Project Leader

Usually, the responsibility for managing the innovation process and the people in the team is in charge of the project leader (Elkins & Keller, 2001). Although the technical expertise is a much emphasized characteristic of a project leader (see e.g. Barckzak & Wilemon 1989, Kim et al. 1999, Clark & Wheelwright 1992), leading creative and innovative individuals requires also many other skills (Mumford et al., 2002). Valle and Avella (2003) note the responsibilities of a NPD leader to be diverse. First of all the NPD leader is responsible for acting as a bridge between the team and upper management. Secondly, he needs to facilitate the NPD process, and obtain resources. Moreover, he needs to manage the entire NPD process from the very beginning to the end, integrating the different segments of business into a strategically calculated whole as Murphy and Gorchels (1996) have expressed it. Hence, the role of a project leader is essential in NPD projects and has also been the focus in studying leadership in R&D context.

It is widely discussed in the literature that leaders of an innovative team need to balance between different kinds of roles and functions during the innovation process (see e.g. McDonough III & Barckzak 1991, Kim et al. 1999, Hohn 2004, Buijs 2007). As Buijs (2007) colourfully expresses it, leaders of innovation projects should be "controlled schizophrenics" having multiple personalities; leaders are required to behave and act in different and conflicting roles simultaneously. In addition, this has to be done without losing contact or trust with innovation team members since the team expect their leader to be in control. Furthermore Buijs (2007) emphasizes that leader of innovation project must have an attitude of being certain about uncertainties and offering comfort in the present moment as well as taking future steps into consideration. For example, while the leader is already thinking about the next uncertain step, the team has to be encouraged to execute the present step comfortably. This attitude needs a high level of tolerance for dealing with different states of minds and different personal feelings. According to Buijs (2007), this means having multiple personalities at the same time.

Kim and Wilemon (2002a) argue that appropriate leadership roles and functions depend on the nature of the idea, the experiences of team members, the organizational structure as well as the priorities. According to them, leaders must be aware of different function requirements of different situations.

Numbers of roles have been suggested to be essential for innovation in R&D context. Roberts and Fusfeld (1981) suggest project leader of an innovative project to play the following roles: idea generating, project leading, sponsoring/coaching, gatekeeping, and entrepreneuring/championing. The idea-generating role consists of developing and testing new ideas as well as creative problem solving. Project leading is about motivating team members, organizing projects, and coordinating team members whereas sponsoring/coaching focuses on providing guidance and developing team members' abilities. In addition to these internal leadership functions with project group members, project leaders play important roles in external leadership activities. The roles including external leadership activities proposed by Roberts and Fusfeld are gatekeeping and entrepreneuring/championing. The first includes activities both inside and outside of the project team, such as information dissemination, personnel coordination, and obtaining knowledge regarding professional development outside of the organization. Entrepreneuring/championing role, on the other hand, focuses merely on obtaining resources and selling ideas outside of the project group.

The empirical study of leadership functions of NPD team leaders by Barckzak and Wilemon (1989) suggest that team leaders of a successful team to perform the following roles: communicator, climate-setter, planner, and interfacer. Communicator role refers to the leader's communication with the team members as well as the methods used to foster communication within the team. Climate-setter role refers to creating an environment which helps members to feel comfortable with their work and team members, as well as to selecting the right individuals to be part of the team, and resolving internal conflicts. Planner role includes developing a plan and vision to guide and direct the team. Finally, interfacer role consists of communication and coordination between the team and other groups such as customers, senior management and other functional areas. This role helps to increase the awareness of the project and to gain needed support.

The study of Kim et al. (1999) offers a comprehensive summary of the different functions of leaders of NPD process discussed in the literature. Based on previous studies, Kim et al. (1999) suggest five leadership roles to be commonly accepted to be roles that project leader must fulfil in order to successfully complete the project. Those roles are strategic planner, team builder, technical expert, champion and gatekeeper. Strategic planner equals with the planner role by Barckzak and Wilemon (1989), and with the project leading role by Roberts and Fusfeld (1981). Team builder role, on the other hand, equals with the climate setter role by Barckzak and Wilemon (1989) and with the sponsoring/coaching role by Roberts and Fusfeld (1981). The role of

gatekeeper by Roberts and Fusfeld (1981) and Kim et al. (1999) includes internal and external communication activities, matching somewhat with the communicator role by Barckzak and Wilemon. In addition, gatekeeper role involves identifying valuable sources of information, screening relevant information and distributing the information to the team. The role of champion defined by Kim et al. (1999) is similar to the one by Roberts and Fusfeld (1981) including actively promoting innovation, building support, getting required resources and overcoming resistance in the organization. This role of champion includes similar functions than the interfacer role of Barckzak and Wilemon (1989). Finally, technical expert role defined by Kim et al. (1999) refers to leaders' ability to provide professional support to the team as well as technical stimulation, and generate feasible ideas. The idea generating role by Roberts and Fusfeld (1981) involves similar kind of activities where professional support and technical expertise of the project leader is needed.

Hence, the roles relevant for this research are planner, team builder, communicator, technical expert and champion. It is defined in this research that the role of a champion includes also the functions of the interfacer role by Barckzak and Wilemon (1989) because of the similarities of these activities. The names for the roles between the three studies were chosen based on the researcher's liking. Table 5 clarifies the usage and equality between the terms of leadership roles by different authors.

Table 5 Terms of Leadership Roles by Different Authors

Terms of leadership roles used in this research	Leadership roles by Roberts and Fusfeld (1981)	Leadership roles by Barckzak and Wilemon (1989)	Leadership roles by Kim et al. (1999)
Planner	Project leading	Planner	Strategic Planner
Team Builder	Sponsoring / Coaching	Climate Setter	Team Builder
Communicator	Gatekeeping	Communicator	Gatekeeper
Technical Expert	Idea generating		Technical Expert
Champion	Entrepreneuring / Championing	Interfacer	Champion

The first column shows the terms for leadership roles used in this research and the following columns show how similar roles have been termed by other authors. Next each of the roles mentioned above and the functions they include will be discussed in more depth.

2.4.1. Planner

The conventional role of a project leader is to set the long- and short-range goals for the project and formulate plans to guide the project such as time schedule and resource allocation (Roberts and Fusfeld 1981, Friedman et al. 1992, Kim et al. 1999, Barckzak & Wilemon 2001). Taking into account the nature of innovation process, these plans need to be flexible anyhow. However the overall vision and strategy need to usually be stable, while the processes achieving them may often vary (Barckzak & Wilemon, 1989). According to Brown and Eisenhardt (1995), for drawing the vision, the project leader must have the ability to mesh together firm competencies and strategies with the needs of the market in order to create an effective product concept. The functions of "planner" role, has been discussed to be critical for the success of innovation efforts (Kim et al. 1999, Friedman et al. 1992). However, innovation project leaders face difficulties in setting clear goals and planning the methods to achieve these goals, since innovation projects attempt to conquer the unknown (Kim et al., 1999).

The study of McDonough III (2000) suggests that developing appropriate project goals and empowering the team with needed decision-making power are strongly associated with team success. Furthermore, Keller (1992) proposes that effective leaders of innovation projects inspire a sense of mission and purpose about the importance of one's work. According to Kotter (2001) developing a vision or setting a direction of the future is one of the most important functions of a leader. Leaders should create a picture of the future, with which people can identify and which generates excitement (Kotter, 2001). According to Nadler and Tushman (1990) the vision should be challenging, meaningful and worth aiming but it also need to be credible. People need to believe that it is possible to succeed in reaching the vision otherwise it may harm the motivation of people (Nadler & Tushman, 1990). Moreover, different authors have emphasized that leaders need to continually remind about the vision, that is, about where the team is heading to during the innovation process (McDonough III & Barczak 1991, Bass 1988).

2.4.2. Team Builder

One critical function of a project leader of innovative task is to act as a "team builder", as Kim et al. (1999) name it. Leaders need to establish a climate which supports innovative pursuits (Barckzak & Wilemon, 1989). In her study Hohn (2004) found out that that during the early phases of innovation process, leaders play with both the

content of the innovation and the bureaucratic rules of the organization. “Organizational cheating”, as she calls it, is helpful for achieving and creating the mental space that the team needs to perform their innovative task. Furthermore, Hohn (2004) suggests, that in case the new ideas are turned away, leaders of innovation teams should not react to this response rather they should simply continue and find ways to circumvent organizations decline.

Developing team membership, fostering an environment where mutual trust exist and team members are willing to share different ideas, information, experiences and perspectives is of importance (Kim et al. 1999, Barckzak & Wilemon 2001). Barczak and Wilemon (2001) emphasize that team spirit is a necessary condition for teams to succeed. Especially in cross-functional effort, which is one of the corner stones regarding teams with innovative tasks, team building is considered to be one of the most critical leadership activities (Kim et al. 1999, McDonough III 2000, Barckzak & Wilemon 2001). The study of McDonough III (2000) shows, that cooperation, commitment to the project and respect and trust among team members contribute to team success (McDonough III, 2000).

Various things are influencing the team climate such as the kind of team members selected and the way interpersonal conflicts and disagreements are handled in the team (Barckzak & Wilemon, 2001). Barckzak and Wilemon (1989) have described an effective climate to be a climate where members of the team feel comfortable with their work and their interpersonal environment. Buijs (2007) emphasizes that the innovation leader should explore the feelings of the team. He argues that in a situation where the team is feeling down, the leader should be optimistic whereas if the team is being overly enthusiastic, then the leader should be cool. If the team has fallen in love with an extremely funny idea, the leader should point out which were the original objectives of the innovative task. Finally, if the team rejects all of the ideas and focuses too much on feasibility, the leader should provoke them to dream and to let at least some of the wild ideas to be considered.

The studies have showed that leading by example is an important method for leaders’ of innovation projects (Amabile 1986, Barckzak & Wilemon 2001). This means that leaders consciously monitor their own behaviour to ensure they are sending the right message. Furthermore, innovating leaders actively encourage team members to decide on their own how to accomplish specific tasks (Amabile 1986, Barckzak & Wilemon 2001). The study of Barckzak and Wilemon (1989) suggest that leaders of an

innovative team encourage independent decision making by purposefully refusing to help if a member comes to them with a task-related problem and that way.

Since project groups are typically composed of individuals with different backgrounds, perspectives, problems and needs, individual consideration is needed. This means treating followers as individuals, showing concern for their unique problems and approaches to work and providing developmental opportunities according to individuals' needs and desires. (Bass 1985; see Bass 1988, Keller 1992)

Providing ways to motivate team members is one way to set the team climate (Barckzak & Wilemon 1989). Motivating leaders are able to communicate in a way that inspires people to sacrifice in terms of hard work (Amabile & Khaire, 2008, Kotter 2001). The biggest motivator of creative work has discussed to be the work itself (see e.g. Amabile 1996, James 2002). Amabile et al. (1996) emphasize that intrinsic factors such as the work environment, quality of co-workers, and the ability to pursue personal interests are of high importance when it comes to creative work. Furthermore, according to Amabile and Khaire (2008), creative people appreciate independence and intellectual challenge and leaders should find ways to provide them. The study conducted by Barckzak and Wilemon (2001) showed that cross-functional team members are frustrated by the lack of knowledge and understanding about the evaluation and reward systems for NPD work. Thus, the criteria and the specifics of the rewards for a good performance need to be clearly communicated to the team members.

One of the most important functions of an innovation leader is to get and encourage employees to pay attention to new ideas, needs, and opportunities (see e.g. Bass 1985; see Bass 1988, Waldman & Bass 1991, Kim et al. 1999, Hohn 2004; Amabile & Khaire 2008). Leaders need to stimulate team members to consider and conceptualize problems in new ways (Farris 1988; see Kim et al. 1999, Waldman & Bass 1991, Hohn 2004) and encourage team members to do more than what might normally be expected (Keller, 1992).

According to Amabile et al. (1996) creativity by individuals and teams is a starting point for innovation since all innovation begins with creative ideas. Furthermore they note that creativity is fostered when individuals and teams have relatively high autonomy in the day-to-day conduct of the work and a sense of ownership over their own ideas and own work. Furthermore, research has shown individuals to be more creative if they have the feeling to have a choice in how to go about accomplishing the tasks that they

are given (Amabile & Gitomer 1984; see Amabile 1998). The research of Amabile et al. (2002) shows, that creativity suffers from time pressure. Furthermore, the study showed that time pressure on a certain day meant less creative thinking in addition to that day on the next two days. Hence, protecting creative work from time pressure is essential. However, in cases where avoiding time pressure is unavoidable, the effect can be minimized by sharing a sense that the work is vital and protect the creative work from distractions and interruptions.

Finally, project leaders of innovative teams need to challenge the professional involvement of team members by emphasizing new challenges and innovative ways of doing things as well as encouraging risk taking behaviour (Keller, 1992). Leaders should decrease the fear of failure and rather encourage constant experiment and that way enable early failures (Amabile & Khaire, 2008). Amabile and Khaire (2008) emphasize that above all, leaders should create an environment of psychological safety and convince people that they will not be humiliated or punished if they make mistakes or speak up with ideas and concerns. Farson and Keyes (2002) talk about failure-tolerant leaders who help people to overcome their fear of failure e.g. by admitting their own mistakes. Furthermore, according to Farson and Keyes, failure-tolerant leaders examine and build upon mistakes. They give employees the opportunity to explore in terms of learning and experience instead of success or failure. After all, failure implies some sort of output and inaction is far worse than failure in terms of innovative effort (Johansson, 2004).

2.4.3. Communicator

Team leaders regard communicating the focus of the project, project changes and development and individual member responsibilities as one of their most important tasks (Barckzak and Wilemon, 1989). Furthermore, their study suggests that this kind of communication keeps the team directed and builds the team climate. Barckzak and Wilemon (1989) name these functions to be part of the “communicator” role of a leader. In their other study about factors influencing cross-functional team member’s satisfaction Barckzak and Wilemon (2001) found out that team members, who have a shared understanding of a common goal, are aligned in their efforts to achieve that common goal as well as more satisfied. Clear roles and responsibilities help to keep each member focused on his or her specific task. In addition the authors found out that clear project goals that are well understood by team members will result in greater focus and satisfaction whereas lack of clear project goals makes it difficult for the team to know how to proceed.

An important function in this communicator role of the leader is to foster communication within the team (Barckzak & Wilemon 1989, Kim et al. 1999, Clark & Wheelwright 1992). For this, leaders use variety methods, both formal and informal (Barckzak & Wilemon, 1989). One of the formal methods is scheduling and conducting team meetings whereas informal methods for communicating are such as setting up informal gatherings, setting up coffee areas and putting team members in close physical proximity.

The leaders of development projects play an important role also in external communication (Barckzak & Wilemon 1989, Kim et al. 1999). Leaders need to collect and channel the information about important changes in the internal and external environments (Roberts & Fusfeld, 1981). In addition to identifying valuable sources of information it is important for a team leader to screen the relevant information in order to achieve effective communication (Kim et al. 1999). These functions help to bring useful information and new ideas into a group of potential innovators (Kim et al., 1999). The studies have shown that effective project leaders link their teams with outside information sources, actively monitor and receive important information, and share this information to the team (Barckzak & Wilemon 1989, Kim et al. 1999, Clark & Wheelwright 1992).

2.4.4. Technical Expert

The role of “technical expert” of the project leader is seen of importance in development projects (Howell & Higgins 1990, Clark & Wheelwright 1992). Many authors emphasize leaders of NPD team to need strong technical skills (Barckzak & Wilemon 1989, Kim et al. 1999, Clark & Wheelwright 1992). This has also been noted to be important because professionals tend to accept authority based on expertise better than authority based on hierarchy (Kim et al. 1999).

The technical expert role includes generating and recognizing good ideas, finding and defining significant problems, and providing technical stimulation to gather various ideas and solutions into a framework that can be used as a basis for further development (Kim et al., 1999). In addition to encouraging creative thinking, the leaders themselves should also come up with original ideas and that way show example to the team (Kim et al. 1999, Howell & Higgins 1990). Kim et al. (1999) emphasize that especially in a case of radical development projects, it is important that leaders suggest new ideas and alternative technological solutions themselves and this

way provide technical stimulation. However, Valle and Avella (2003) emphasize that the project leader should not go too deep into the role of technical expert since they might forget their fundamental role as a guide and promoter of the correct operation of the team.

2.4.5. Champion

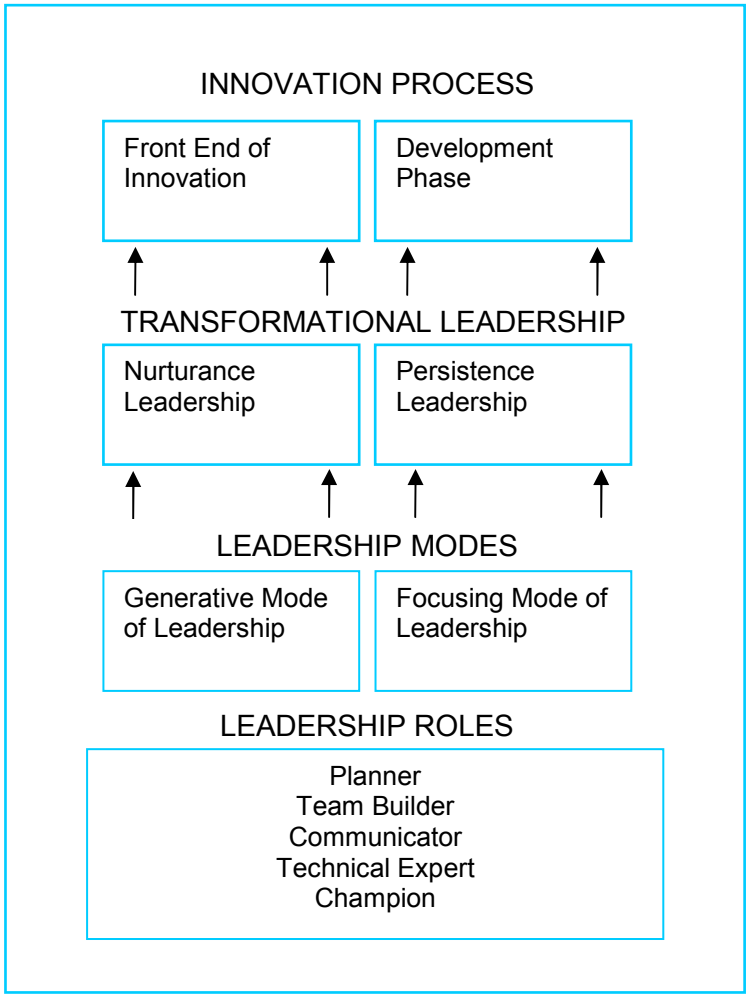
The role of a champion is in this research defined to include both the champion role (see e.g. Howell & Higgins 1990, Kim et al. 1989) and the interfacer role by Barckzak and Wilemon (1989). In the existing literature the role of a “champion” behaviour has been emphasized by many studies (Markham et al. 1991, Howell & Higgins 1990, Roberts & Fusfeld, 1981). Champion has been defined as an individual who informally emerges in an organization and actively promotes innovation, builds support, gets required resources, overcomes resistance from organizational members, and ensures the implementation of innovation (see e.g. Howell & Higgins 1990, Markham et al. 1991, Kim et al. 1999). Markham et al. (1991) suggest that since the exact organizational positions which take on the champion role have remained unclear, project leaders and other executives may have significant roles in the champion process (Markham et al., 1991). The study of Howell and Higgins (1990) suggest that champions are informal transformational leaders. According to the study of Markham et al. (1991) champions are more common for projects related to the champions’ home-function interests. Furthermore, Markham et al. (1991) emphasize the importance of promoting innovation since there always will be many different kinds of organizational resistance to change or innovation.

Furthermore, the task of innovation involves lot of interactions with external agencies and other functional groups in order to supply new information and other required resources (Farris 1988; see Kim et al. 1999, Howell & Higgins 1990). Barckzak and Wilemon (1989) identify it to be important for a leader to act as a link between the team and other groups. This involves creating meaningful interfaces with other functional units in the firm as well as customers. By creating effective interfaces with senior management the awareness of the project can be increased.

2.5. Theoretical Framework

After reviewing the relevant existing literature for the purposes of this study, this chapter presents the theoretical framework for the study. The theoretical framework is built combining the information from the literature about innovation processes, leadership during the innovation processes and leadership roles of a NPD project leader. Figure 15 depicts the framework of this research.

Figure 15 Theoretical Framework



As can be noted, the framework consists of four components. First component is the innovation process by Koen et al. (2001) consisting of three phases: the front end of innovation, development phase and commercialization phase. As mentioned earlier in this thesis, this research focuses on the first two phases of the innovation process, the front end and development phases, excluding the last phase, commercialization phase. Second component of the theoretical framework is transformational leadership during the front end and development phases. As discussed in section 2.6 the leadership

during the front end should be nurturance leadership whereas leadership during the development phase should be persistence leadership. Furthermore, it was noted in the section 2.6 that leadership mode that is generative is needed during the front end phase whereas focusing leadership mode is applicable during the development phase. Finally, the leadership roles of a NPD project leader form the last component of the theoretical framework. The leadership roles discussed earlier in the literature review were planner, team builder, communicator, technical expert, and champion.

Table 6 shows the key functions of the leadership roles discussed during the previous sections. The purpose of the empirical study of this thesis is to fill in the last column by indicating which of these roles are most necessary in the front end phase and which in the development phase.

Table 6 Summary of Leadership Roles

ROLES	FUNCTIONS	FRONT END / DEVELOPMENT PHASE
Planner (internal role)	Setting goals and developing the vision of the project, planning the time schedule, and resource allocation, controlling and evaluating the whole process	
Team builder (internal role)	Developing team membership, establishing climate that supports innovative pursuits, selecting the right individuals to the team, providing ways to motivate, resolving conflicts among members, fostering an environment with mutual trust, making it easy to share different ideas, encouraging creativity information, experiences and perspectives.	
Communicator (internal & external role)	Identifying valuable sources for information, screening relevant information, interpreting the implications of information, linking the team with outside information sources, fostering communication within the team	
Technical Expert (internal role)	Generating and recognizing good ideas, finding and defining significant problems, providing technical stimulation, coming up with original ideas	
Champion (external role)	Promoting innovation, building support, getting required resources, overcoming resistance from organizational members and ensuring the implementation of innovation, acting as a link between the team and other groups	

As discussed in section 2.6, leadership plays an important role in the success of innovation process. Furthermore, since the first two phases of the innovation process are very different by nature, different kind of leadership approached are required. Hence, the leader of a NPD team must balance between the different leadership roles depending on the nature of the process phase. With the help of theoretical framework (see Figure 15), this study aims to find out what are the different leadership roles used at the front end phase and what are the different leadership roles used at the development phase, and thus answers the research questions posed in section 1.3.

3. Methods

This chapter explains the research methods used in the empirical part of the study, meaning the way the data was collected and analyzed. Furthermore, the trustworthiness of the study is discussed. The chapter begins by presenting the research frame of the study after which the data collection and data analysis of this research are described. Finally, strategies enhancing the trustworthiness of the study are presented.

3.1. Research Frame

The aim of this study was to describe the various leadership functions and roles performed by a project leader of product development projects. The main research question was:

What are the different leadership roles of a project leader at front end and development phase of product innovation process?

Furthermore, the three research sub-questions posed were:

RQ 1: What are the characteristics of the front end and development phases?
RQ 2: What are the leadership functions of a project leader during the front end?
RQ 3: What are the leadership functions of a project leader during the development phase?

The research method used in this thesis is qualitative. As Denzin and Lincoln (2000) have described, qualitative research is about studying things in their natural settings, attempting to make sense of, or to interpret, phenomena in terms of the meanings people bring to them. Qualitative research is a valid research method in cases where in-depth information and understanding is needed (Eriksson & Kovalainen, 2008). Unlike quantitative research, qualitative research is not based on measurement and numerical data, rather it attempts to describe something and answer questions such as how and why (Koskinen et al., 2005). In order to find an answer for the main research question of this study, the interviewees needed to describe their leadership behaviour at different situations. Hence, this study needed in-depth information that would have not been possible to gain through quantitative research methods.

This study was conducted as a part of a research project called “SME ideas to innovation” (Pienen ja keskisuuren teollisuuden ideat innovaatioksi, PKII). As mentioned in the introduction of this research, the PKII research project focuses on the product development operations of small to medium sized enterprises (SMEs) and is a part of the “Liito Innovative Business Competence and Management” programme run by the Finnish Funding Agency for Technology and Innovation (Tekes). Two of the companies interviewed were part of the PKII research project. These companies were chosen in the basis of their size and business field. Other company represents a small company and is a manufacturer of heavy duty cargo transportation platforms while the other company represents a large company and is a manufacturer of office furniture. Hence, these two companies represent very different targets and can offer interesting and different point of views to the study. The third company was chosen because of its strong emphasis on innovative product development, and also because of the existing contacts to the company.

3.2. Data Collection

During the data collection phase, that is, during the interviews, the purpose is to record the perspective of a particular interviewee fully and fairly (Quinn, 2002). The data collection method chosen for this study was a semi-structured interview. In a semi-structured interview, an interview guide with specific open-ended questions organized by topics is used but the order in which the questions are presented may vary between the interviews (Bailey, 2007). A benefit of this data collection method is the conversational setting, allowing comprehensive and in-depth discussion about the topic (Hirsijärvi & Hurme, 2001). The interactive nature of the semi-structured interview format allows the researcher to react on knowledge gained during the interview and ask for additional information (Silverman, 2006). In the present study, the questions were same for all interviewees but the order of them varied depending of the flow of the interview. By using qualitative approach and semi-structured questions the interviewees’ own views were better understood and thus, valuable insights gained. According to Morse and Richards (2002), the use of semi-structured interviews is appropriate in a case where the researcher has enough knowledge about the study topic to frame the needed discussion in advance.

Data was gathered in seven personal semi-structured interviews conducted in two large, international Finnish companies and one small company operating only in Finland. Furthermore, these companies operate in different fields of businesses, one being a small manufacturer of heavy duty cargo transportation platforms, another, a

large furniture manufacturer and the third, a large elevator and escalator manufacturer and service provider. Thus the studied innovation activities cover tangible products with different drivers; design and technology. Table 7 summarizes the information of the companies interviewed for this study.

Table 7 Company Information

	Company A	Company B	Company C
Business field	Office furniture manufacturer	Elevator and escalator manufacturer	Manufacturer of heavy duty cargo transportation platforms
Size	Large firm	Large firm	Small firm
Internationality	Operates internationally	Operates globally	Operates in Finland
Interviewees (Title / Sex / Experience from current work / Date of Interview)	1) Product development and research manager / Male / Five years / 3.11.2009 (interview 1) 2) Project leader / Male / Four years / 24.11.2009 (interview 2)	1) Development program manager / Male / ca. 8 months (earlier in charge of the front end phase) / 27.11.2009 (interview 5) 2) Product development manager / Male / Three years / 1.12.2009 (interview 6) 3) Project leader / Male / Five years / 10.12.2009 (interview 7)	1) Managing director / Male / Two years 26.11.2009 (interview 3) 2) Project leader / Male, 15 years 26.11.2009 (interview 4)

In total, seven interviews were conducted in this study. Key personnel regarding innovation activity and new product development within the companies were interviewed to form an in-depth understanding on the leadership functions and roles within the front end and development phase of the innovation process. From the interviewees, three were project leaders of a product development team, two were product development managers, one was a functional manager of new concept development who was earlier in charge of the front end activities of the innovation

process, and finally one of the interviewees was a managing director. The interviewees were chosen on the basis of their position in the company and their willingness to participate in the study. Product development managers, development program manager, and the managing director are referred to as upper managers in the discussion of the results of this study. Since two upper managers were interviewed from Company B, the development program manager is referred to as upper manager 1, and the product development manager is referred to as upper manager 2. Upper level managers were interviewed in order to get a broader and more objective view on the roles and function of the immediate manager, project leader, of a product development team. As noted earlier, in this study project leader refers to a person who is responsible of the overall daily work and the progress of the project as well of leading the project team.

It is necessary to note that the involvement of project leader in product development projects varied between the companies. In large Company A, project leader was named after the project had been accepted in executive group, meaning that some front end activities has already been conducted, such as outlines of the product concept. Nevertheless, the first development phase following the approval of the project includes activities characteristic to front end (see section 2.3.2). As the project leader of Company A noted, depending on the project, the brief given by a product manager can be pretty detailed or more abstract. Hence, the interviewees from firm A provided important views also to the discussion about the front end phase. Large Company B, on the other hand, had a project leader in charge already during the concept development phase. However, depending on the project it might be that the project leader changes when proceeding to the actual development phase. In the small Company C, the project leader is in charge of the project from the very beginning until the completion of the project.

The interviewees were contacted by phone after which email was sent to tell a bit more about the study and to make an appointment. It was relatively easy to get interviewees involved in the study. The fact that two of the companies contacted, were part of the larger PKII –research project had probably influence on the positive attitude of the companies. The interviews were conducted in November-December 2009, and held in each of the interviewee's work place.

Before starting the actual interview, the backgrounds and objectives of the study were told. Mainly, the interview proceeded along the pre-defined structure however the emphasis of different subjects varied between the interviews. The interview structure

consisted of 1) innovation process, 2) it's characteristics and differences between different phases and; 3) leadership functions, roles and priorities during the different phases of innovation process. The structure of the interview can be seen in Appendix 1.

The interviews were conducted in Finnish which was the mother tongue of the participants, thus all the examples presented in this research have been translated. The interviews lasted from 70 to 47 minutes, averaging at 59 minutes. All the interviews were tape recorded and transcribed. In addition, notes were taken during the interview. Most of the interviews were transcribed shortly after the interview except in few cases (interview 6 and 7), in which there was few weeks break in between conducting the interview and transcribing it. This was due to the busyness in researcher's personal life. However, notes written during the interviews were read after every interview and additional notes were made to clarify and to remember the central findings. It was also noted during few interviews that respondents liked to continue discussing after the tape recorder was stopped. Actually, the discussion after the record was stopped was always very valuable considering the research.

3.3. Data Analysis

Data analysis involves making sense of what people have said, looking for patterns, putting together what is said in one place with what is said in another, and integrating the different things people have said (Quinn, 2002). In this research thematic analysis was used. After all the interviews were transcribed, the data was combined and divided under different themes mainly respect to the research sub-questions. According to Braun and Clarke (2006, 79), thematic analysis means "identifying, analysing, and reporting patterns (themes) within data." Minimally it organises and describes data set in detail but frequently goes further interpreting various aspects of research topic (Braun & Clarke, 2006).

According to Eskola and Suoranta (2000), thematic analysis is a recommendable way of data analysis in solving some practical problems. They argue that in these cases, essential data regarding the practical research problem can be picked up. For example, as the researcher was trying to find out the leadership functions used during the front end phase, themes such as "creating an open atmosphere" or "developing a vision" were sought. Inessential data was left out and only essential information was analyzed and answers to research questions were sought. In addition, the essential data was further categorized under more specific themes such as leadership functions

of a certain leadership role e.g. “motivating team members” or “encouraging creativity”. Finally, the data from different companies under each theme was compared with each other. In order to make it easier to detect the answers from different companies of the large data file consisting of almost from 100 single spaced pages of data, the answers of each company’s representative were given a certain colour. The researcher found out that a large range of different leadership functions were named by the interviewees, some of them only by one or two of them. This made it challenging to find common themes in analyzing the data and coming up with a clear way of organizing the data felt difficult.

On occasions, gaps or ambiguities found during analysis cry out for more data collection and interviewees may need to be contacted to clarify or deepen responses (Quinn, 2002). Also during this research process few of the interviewees were contacted after the interviews to ensure that the researcher had a correct understanding of the subjects in question.

3.4. Trustworthiness of the Study

Trustworthiness refers to conducting and presenting the research in such a way that the reader can trust the results and be convinced that the research is worthy of his or her attention (Lincoln & Guba, 1985). Moreover, according to Bailey (2007) reader should see how the researcher arrived at the conclusion he or she made. Trustworthiness possesses a set of closely related and interdependent set of evaluative criteria that are: credibility, transferability, dependability, and confirmability (Lincoln & Guba, 1985). Credibility refers to an evaluation of whether or not the research findings represent a credible interpretation of the data drawn from the original data. That is, whether the results of the research are credible or believable from the perspective of participants. Transferability, on the other hand, means the degree to which the findings of the particular research can be applied or transferred beyond the research. Researcher can enhance transferability by thoroughly describing the research context and assumptions central to the research. However, Eskola and Suoranta (2000) note that usually the transferability is not good in qualitative research because of the multiform nature of research. Dependability, on the other hand, is the evaluation of the quality of data collection, data analysis, and theory generation. Dependability emphasizes the need for describing the changes that occur in the research setting and how these affected the way the study was approached. Finally, confirmability refers to the degree to which the results could be confirmed by others. (Lincoln & Guba, 1985)

According to Eskola and Suoranta (2000), the main credibility criterion in the qualitative research is the researcher itself. Hence, when evaluating credibility of the study the whole research process needs to be evaluated. Trustworthiness of this study was enhanced along the research process by various strategies. First of all, during the research process, the researcher frequently discussed about the proceeding and results of the study with researchers from the PKII -research project of which this study is part of, and gained valuable observations and suggestions. The researchers of the PKII –project have experience in conducting empirical research as well as good knowledge about the current scientific discussion related to innovation literature and can be regarded as experts in their field. These frequent discussions with a trusted expert in the research topic is called “peer debriefing” (Bailey 2007, 188), and it is one good strategy for enhancing the trustworthiness of the study. Expert reviews, on the other hand, involve seeking input from someone familiar with the research topic, perhaps even someone who has published on the subject. According to Bailey (2007) expert reviews occur in the later stages of research. In this study, also expert reviews were used to enhance the trustworthiness: the researcher discussed with two professors of the research topic and gained valuable insights to the research problem. Notes were taken during both of these discussions in order to remember what was discussed and suggested.

Furthermore, before conducting any interviews, the interview outline was reviewed by the advisor as well as researchers from the project. Because the interviews were conducted as semi-structured interviews including free discussion, the length and thoroughness of answers differed between the interviewees. According to Hirsijärvi and Remes (2004), trustworthiness of an interview may be diminished by the fact that participants have a tendency to give socially acceptable answers. Although the interviews conducted for this study did not include for example moral questions or questions regarding social obligations, it may be that interviewees in managerial positions may want to give a better picture of the truth and describe how things should be rather than how they are. However, as the interviews were conducted as anonymous without giving out either the name of respondents or the organization itself, it can be assumed that the answers were honest and reliable. Nevertheless, when conducting interviews it must be noted that people may understand questions differently which will effect on the given answer. This was tried to avoid by forming the questions in such a way that the danger of misunderstanding is minimized as well as assessing the functionality of the questions after first interviews. During the interviews additional questions were presented to make sure the researcher had understood interviewee correctly. Hirsijärvi and Hurme (2001) argue that once the interviews do not

give any new information to the interviewer, the number of interviewees is sufficient. During the interviews it was noted that the same answers were beginning to repeat and thus, it can be considered that seven interviews was sufficient for the purposes of this study. All the interviews were recorded and transcribed. Finally, the results were sent to the interviewees to make sure the data have been interpreted correctly. Since the purpose of qualitative research is to describe or understand certain phenomena of interest from the participant's eyes, they are the only ones who can judge the credibility of the results. Hence, the credibility of this research was enhanced by giving the participants (interviewees) a possibility to comment the interpretations of the researcher. Since no additional comments on the results were given by the interviewees, it can be noted that the researcher had interpreted the data correctly.

4. Empirical Findings

In this chapter the main findings of the research are presented. The results are organized under the following three main sections: innovation process, leadership functions during the front end and leadership functions during the development phase. Hence, the findings are categorized so that each of them relates to one the three research sub-question:

RQ 1: What are the characteristics of front end and development phase?
RQ 2: What are the leadership functions of a project leader during the front end?
RQ 3: What are the leadership functions of a project leader during the development phase?

Few areas characteristic for the nature of innovation and often spoken in the literature were emphasized also during the interviews of this study. These areas were encouraging creativity (see e.g. Hohn 2004, Buijs 2007, Amabile & Khaire 2008), facing setbacks (see e.g. Cooper 1999, Koen et al. 2001, Kim & Wilemon 2002b), and maintaining the excitement (see e.g. Waldman & Bass 1991, Amabile & Khaire, 2008). All of these subjects are discussed as larger own sections under the main sections. Furthermore, during the interviews a wide range of different leadership functions were pointed out. Some of them were mentioned only by one or two interviewees. To make it clearer and easier for the reader, several sub-headlines are used in presenting the findings.

4.1. Innovation Process

The interview started by discussing about the innovation processes of the companies. It seems to be more typical for Finnish companies to talk about product development processes instead of innovation processes. Furthermore, as has been noted earlier, all the companies interviewed are manufacturers of tangible products which might be one reason for using the term “product development process”, instead of “innovation process”. Nevertheless, one of the interviewees corrected the researcher who was talking about product development process that the more correct term for their process would be innovation process. Hence, innovation process is also a known and used term in companies.

At the beginning of the interview, all the interviewees were asked to describe in their own words of which kind of phases does their firms' innovation process consist of. As was discussed in the theoretical background -part, according to different authors, well-defined innovation processes correlate with successful new development projects (see e.g. Edgett 1994, Cooper 1998). Many of the interviewees showed the product development process figures of their company and used them as a backup to explain the progress of the process. Both of the large companies had pretty detailed, and linear process models for product development consisting of several stages, milestones and checkpoints. Both of them had separate predevelopment (front end) phases which were followed by development phases and commercialization activities. The process models of large companies had similarities although they consisted of different amounts of stages. As Otto and Wood (2001) note, every company has a different development process which is influenced by the sophistication of the product and the competitive environment, among others. The process and different phases were well known by both the project leaders as well as the upper managers. The small firm C didn't have a defined innovation process since, according to interviewees, the small size of the organization made it possible to manage the process without one. It has been noted in earlier studies that as the company size gets smaller, the activities get more informal. Hoffman et al. (1998) argue product development activities to be organized more formally within larger SMEs (Small and Medium Enterprises) than in smaller SMEs in where the activities tend to be more ad-hoc or project driven. As the upper manager of small Company C noted:

"Our job is merely the kind of that you need to control the chaos rather than categorize it and make it systematic."

Nevertheless, when interviewing the managing director and project leader of the small firm, both of them were well aware of the different phases that the process usually includes. Furthermore, the product development process of the small Company C usually starts with negotiating with the customer, which gives more defined starting point to the process than is the case with both large firms. In other words the products in small Company C are mainly developed for the need of a certain customer. In addition, the upper manager of small Company C emphasized it to be important that their activity would not be or become too hierarchical or inflexible. He further noted that *"everyone can and must participate in all kinds of activity."*

There were also differences between the consistencies of the development teams during the process. In large Company A, the people working during the front end were

working also during the development phase whereas in large Company B, this was not the case; people working on the front end activities wouldn't usually work in the development phase. In addition, these functions were also separated in the organization. However, in both of the cases the size of the team grows at the development phase. In the case of the small Company C, the same people were working in the project throughout the whole process. It was noted though, that the core group is about three persons that also have a stronger role during the front end. However, the whole development team, approximately five persons, are part of the project from the very beginning.

More Organized Approach on Front End Phase

Several studies highlight the importance of front end (see e.g. Cooper 1997, Kim & Wilemon 2002b, Buijs 2008). The activities during the front end have been noted as vital elements in gaining competitive advantage (Cooper and Kleinschmidt, 1994). However, it is still the phase which requires deeper understanding (Verworn et al.). Furthermore, many authors agree front end activities to aim at reducing uncertainty (see e.g. Monaert et al. 1994, Kim & Wilemon 2002a, Koen et al. 2001). Moreover, Monaert et al. (1994) argue, that uncertainty can be reduced by requiring formal deadlines and controls even during the front end phases. Furthermore, Shapero (1985) note, that there is no conflict between deadlines and creativity. According to him, managers should assign tough deadlines even for creative work but stay out of the operating details of a project.

The more organized approach on the front end phase was also brought up during the interviews. It was noted by the upper manager of Company A, that the front end phase of the process should be more structured:

"We have been discussing that the predevelopment phases (front end phase) should get to the similar format as the development phase. --- It (development phase) is really structured activity and there are clear deadlines about what has to be done and when."

However, the results of the study by Redmond et al. (1993) show it to be important for leaders to give subordinates time to think about the problem. They argue that in a case where originality is needed, the pressure of organization may cause leaders to demand immediate solutions. Furthermore, Estrin (2008) note leaders to need to have the patience to let ideas to ripen. She argues that if impatience is sensed, employees will not take time to try something new, rather they will take the quickest path instead of the best. Also the study of Amabile et al. (2002) shows creativity to suffer from time

pressures. Thus, although it was not brought up during this research, earlier studies strongly emphasize the importance of protecting creative work from time pressure and this should also be noted by the project leaders and upper managers.

Taking the Context into Account

In the literature, it has been discussed that the innovation process should take the contextual differences into account and aloud more flexibility in their usage (see e.g. Nobelius & Trygg 2002, Reid & de Brentani 2004), and that the models should be adjusted to the products that are being developed (Pina e Cunha & Gomez, 2003). This was also pointed out during the interviews with Company B. Although the innovation process was well-defined in Company B, it was noted that the process can be modified taking the context into account:

"It is not necessary in every case to go through all points of each phase. This is the case for example in countries where the complexity of product development process is concise and the speed of the process is a big trump." (upper manager 1, company B)

As was noted earlier in this thesis, it is commonly agreed that the processes are not meant to be strict specifications but rather guidelines that can flexibly be adapted to specific situations.

Furthermore, Cooper (2008) notes that the linear visual appearance of the process model does not mean that there would not be looping and iterations during the process. Furthermore, Tidd et al. (2005) note that in real life the steps of the process will not be as clearly differentiated nor come in the presented sequence as shown in the models. Although the interviewees of large companies A and B emphasized that the process is carefully followed, it was agreed that in practice it does not go as chronologically as presented.

"It (product development) goes mainly along the process model but not as chronologically as presented… there is always those extra iterations which you just can not avoid."
(project leader, company A)

Tool for Managing the Process

According to Pina e Cunha and Gomez (2003), step-by-step models are tools to guide managers along the process and in that way reduce the amount of uncertainty. This note was supported also by the results of this study. It was noted during the interviews

that because of the disoriented nature of innovation process, it is necessary to have a tool for managing it. The project leader of Company A emphasized product development process model to be important tool for managing the project:

"The fact, that you have some kind of template where to lean and which tells you how to proceed and you can even match the timetable of the project to it…it helps a lot."

The model of innovation process was also seen as a good tool for preventing the team to become too isolated from the environment. The upper manager 1 of Company B noted that the project leader needs to know at which phase of the process the project is and what needs to be clear at that phase. Furthermore he commented that the project leader should mirror the state of the project to the process model.

Although it was agreed by interviewees that iterative models describe the true nature of the innovation process, linear models of the process were agreed to be better in managing the process. These comments support Cooper's (1990) point of view about linear NPD process models that, according to him, should be used for managing, directing, and controlling the process.

Brainstorming activities

Since coming up with new and innovating ideas is one of the key elements of the front end (see e.g. Koen & Kohli 1998, Desouza et al. 2009), interviewees were asked about the brainstorming activities of their companies. The interviews showed that brainstorming is not very organized in most of the cases. Henry and Walker (1991) note it often to be the case that ideas are not generated in any conscious or systematic way. On the other hand, Mostert (2007) note organizing a creativity session to be just one way in trying to find the innovative ideas or solutions. He emphasizes that creativity takes place in each individuals own mind that needs to make the vital link between the problem and the solution. Furthermore, the "click" might happen during ordinary things such as while having a coffee or taking a walk. Hence, it does not necessary require brainstorming session to come up with the "click".

Small Company C mentioned not to have any systematic or organized brainstorming rather ideas are shared with others when ever one comes up with an idea. It was also noted that since the company has a long experience, old solutions are being utilized and modified. Noteboom (1994) argues that as the firm size grows, it is necessary for communication and knowledge to become more explicit, structured, formal, and documented in order to deliver the needed communication across a larger amount of

people. That is, there is not necessarily need for formal and organized way of brainstorming or sharing ideas in smaller companies. Also Harrison and Watson (1998; see Subrahmanya 2009) note SMEs to be generally more flexible and adapt themselves better to develop and implement new ideas. However, the upper manager of the small Company C commented that generating new ideas was not a problem; rather the challenge is in concretising those ideas and developing them further.

Large Company A noted brainstorming to be done mostly case-by-case. The project leader of Company A pointed out that systematic brainstorming in where solutions to customer needs where sought, has been tested. However, since the activity required too much time, that was not implemented as a practice. Large Company B, on the other hand, mentioned to have organized brainstorming as a custom.

In both of the large companies, ideas were collected mainly via email into so called idea-inboxes. These were seen practical since most of the ideas are also sent via email so it is easy to forward them into the idea-inbox. Different software's for idea collection were seen to be too complicated and time-consuming to use. Furthermore, large Company A noted to organize brainstorming days twice a year, in which the idea-inbox is went through with the product development team department:

"We have good experiences about those brainstorming days where people get together and share their ideas from past six months." (upper manager, company A)

Large Company B had also an innovation tool for improvement suggestion that was mainly in use for the product development department.

In order to be able to get the ideas through, the usage of informal channels for selling the ideas were emphasized. The upper manager 1 of large Company B noted it to be important that product developers have good communication skills as well as the ability to sell ideas further:

"You need to know small talk and systematically build demand for you idea. Say, you know your boss is having a meeting that ends at 10 am. Accidently, you happen to be drinking coffee outside the meeting room at the time the meeting ends…It's not enough to only to try to sell your idea through the traditional channels, like idea inboxes and so. "

Sources of Ideas

Opportunity identification is an important part of the front end and is a phase where organization identifies the opportunities it wants to pursue (Koen et al., 2001). The study of Koen and Kohli (1998) showed R&D engineers and scientists to be one of the best sources of ideas. All of the three firms also mentioned that most ideas and solutions to come from inside the product development department. That is because they are constantly following (new) technology development, and are good in evaluating the different opportunities, methods and solutions based on their experience.

"When talking about the technical solutions, our designers are pretty good in evaluating different solutions and possibilities." (project leader, company A)

"To be honest, most of the new ideas come inside the product development department since they are so up-to-date with the technology." (upper manager 1, company B)

Hence, product developers are a valuable source for ideas and sharing and collecting their ideas should be made easy in the organization.

As several authors have noted (see e.g. Koen et al. 2001, Tidd et al. 2005), also the interviewees mentioned development of technology, that is new technological opportunities, to spawn new ideas as well as needs, and be a potential for change. For example, in the case of office furniture manufacturer Company A, flat computer screens had a big effect on their product development.

Furthermore, Company A mentioned to receive ideas from "ordinary people" that contact the company. However, those ideas rarely develop into a new product. The upper manager of Company A noted that usually the one who has came up with the idea "gets stuck with it" and can not see the cons of it. This was mentioned to be the case with most of the ideas that come from outside the company. Furthermore, customers were not used as any systematic way in recognizing new opportunities.

The upper manager 1 of large Company B pointed out it to be important that end-users are utilized and involved in developing new products. Observing end-users were seen as of importance. However, he also noted that product development should not rely too much on what customers tell they would like to have:

"We want to challenge our customers, since often customers can't tell what they want. You have to read between the lines, follow their everyday living and ask about the challenges they are having in their everyday living. If the customer can tell us what they need, then we are already too late."

Also the interviewees of small Company C mentioned customers to be an important source for ideas. Especially, since there is a lot of interaction with the customers during their product development process, suggestions are given by both of the parties.

Users have been noted as an important source of innovation by several authors (see e.g. von Hippel 1988, Baldwin 2006). Also, the results of Koen and Kohli (1998) study suggest, that a close contact between engineers/scientists and end-users is essential for radical innovations. Von Hippel (1988) argues that especially lead user perceptions and preferences should be utilized. Furthermore, according to von Hippel and Katz (2004), users can serve as a need-forecasting laboratory since they are familiar with future conditions. Table 8 sums up the findings regarding the innovation process of companies interviewed.

Table 8 Findings about Innovation Process

	Large Company A	Large Company B	Small Company C
Innovation process model in use within the company?	Yes	Yes	No
People working during the front end are working also during the development phase?	Yes	Usually no	Yes
Number of people working during the front end phase?	officially 1 (product manager who's in charge of the phase)	ca. 2	2-3
Number of people working during the development phase?	about 10, in larger projects 15-20	Dozens	5
Functions of front end development phase separated in the organization?	No	Yes	No
Duration of the front end phase?	ca. 6 months	ca. 6 months (2-9 months)	1-3 months
Duration of the development phase?	ca. 1 year, larger projects 2-3 years	1 – 1,5 years	3-6 months
Organized brainstorming in the firm?	case-by-case	Yes	No

As the Table 8 notes, there are differences between the innovation process activities, especially between the large Companies A and B and the small Company C. The size of the development team is smaller, and the duration of the projects is usually shorter in small Company C. Furthermore, the small Company C did not have a product development process model in use nor organized brainstorming activities. According to the interviewees of Company C, as well as different authors, the smaller size of the

organization makes it possible to manage product development activities without official and formal process guides.

4.2. Front End versus Development Phase

The respondents were asked to describe the characteristics of the front end and development phases as well the nature of work during them. The answers given by the respondents supported the existing discussion in the literature about these two phases of innovation process. Also, the answers given were pretty similar between the interviewees. As is widely discussed in the literature (see e.g. Koen et al. 2001, Kim & Wilemon 2002b), it was also agreed among the respondents that the front end and development phases are very different by nature.

"The front end and development phases are like day and night." (upper manager 1, company B)

Nature of Front End

All the interviewees agreed the front end phase to be less structured and bureaucratic than the development phase. Furthermore, the nature of work in the front end was mentioned to be about nice inventing and brainstorming. These notions support the discussion in the literature about the characteristics of front end in which front end has been described as informal, iterative, unstructured and experimental (see e.g. Buckler 1997, Zien & Buckler 1997, Koen et al. 2001, Buijs 2007). The upper manager of small Company C described front end as:

"The front end is in a way also about dreaming…you could compare it to a situation where no laws or order exist."

Furthermore, the upper manager of small Company C mentioned front end to be the nicest phase of the whole process:

"Well yes, the Gyro Gearloose (Pelle Peloton) phase is the nicest phase…that is when you brainstorm and only afterwards start to fix them. It is the nicest to draw different things in the air."

The upper manager 1 of Company B, noted front end to require ability to conceptualize, to live in uncertainty, and to constantly be alert to new things and search for the best approach. Moreover, he mentioned it to be important to bare disappointments since

many of the ideas and may not be feasible. High tolerance for uncertainty and ambiguity during the front end phase has also been emphasized in the literature. Buckler (1997), among others, argues that FEI requires high tolerance for uncertainty and ambiguity, and the willingness to consider the unreasonable. However, Katz (2004) notes that usually people do not deal well with uncertainty, rather they like to know what will happen next and how they will be affected. Taken this into account, people working with innovative projects need to have characteristics different from most of the people, which needs to be taken into account when managers are recruiting employees in innovative projects.

The upper manager of large Company A argued that inventiveness and creativity is needed less and less as the process goes further:

"At the beginning there are big challenges about how to do something and those are interesting, and at the end you think that how to get the product to the customer."

However, the upper manager 2 of large Company B noted that the same creativity elements exist in the development phase as exist in the front end phase but the target is more focused. He argued that the creativity and inventiveness is present from the very start of the project until completing the project. He further argued that:

"Even though the concept phase (front end phase) tries to minimize the risks and define the concept there still remains lot of aspects of inventiveness to the development phase."

Interestingly, front end was not described to be chaotic as it has been by several authors (see e.g. Koen et al. 2001, Hohn 2004, Buijs 2007). Rather, the chaotic nature was mentioned to occur as the project goes further and more and more people and stakeholders are involved.

"At some point the project is a controlled chaos and no one knows are we on schedule or not."

(upper manager, company A)

Front end and development phases were mentioned to differ also in the sense that in the front end phase there are usually only few people working with the given task whereas in development phase the team is larger and different stakeholders are involved in the project requiring more systematic management of the project.

Nature of Development Phase

The development phase was mentioned to be much more detailed than the front end phase, consisting of several milestones. The work in the development phase was seen as more systematic and structured than the front end phase including a strict timetable. Development phase was also described as "pedantic", "bureaucratic", "goal-oriented" and "regimented". It was noted that in the development phase there are a lot of tasks that "just need to get done". The descriptions of the characteristics of development phase mentioned above go also hand-in-hand with the discussion in the literature where development phase has been described as, structured, linear and goal-oriented, among others (see e.g. Koen et al. 2001, Kim & Wilemon 2002b). Furthermore, small details were seen as of importance during the development phase:

"In the development phase it is very important to be persistent and push through even very little changes. Say, you have a cross in a wrong place in the order-form. The guy working in the front end phase couldn't care less but if it is not fixed it means that wrong products are being ordered and delivered so the guy working in the development phase has to pay attention to it."
(upper manager 1, company B)

Both upper managers of large Company B, mentioned front end and development phases to require different kind of personalities and skills. Another upper manager of the company mentioned:

"According to my own experience, we have people who are inspired by the inventiveness and out-of-box thinking but who don't like it when something should be completed. Then we have other kinds of people who like to commit to different goals and enjoy achieving them."

It is important to notice that in Company B, the front end activities and development activities were separated in the organization which might have affected to the point of views of the upper managers. However, also the respondents of Company A and C agreed these two phases to be very different by nature even though there were approximately same people working in both of the phases.

Motivation of Professionals

As various authors have noted (see e.g. Amabile 1996, James 2002) also the results of this research suggests work itself to be the most important motivator of a creative work.

In general, people working with product development were described to be curious to different things and to enjoy challenges and figuring out things.

"The people who want to work with product development are those who broke up the railroad the next day they received it because they were interested to see what's in there."
(upper manager, company A)

The biggest motivator of developers during the front end and development phase was agreed to be inventing and doing something new and starting fresh, as can be noted from the following comments:

"They (product developers) love to design new weird things that don't exist in the world yet." (upper manager, company A)

"I think creating something new is the most important motivator…at least it's not the money."
(upper manager 1, company B)

Keller (1992) note providing new challenges to be an important function of a NPD project leader. Also Katz (2004a) has emphasized the importance of providing possibilities for development in managing creative performance. According to him the work enthusiasm will suffer if employees can not redefine or expand their jobs for continued change and growth. Giving the possibility to learn and develop new skills is a big motivator of professionals (Katz 2004 b). Thus, it can be noted to be important for the project leader to provide new challenges for their team members.

In addition to the work itself, the upper manager of company B mentioned motivators during the development phase to be learning something new, achieving the set goals, and seeing the results of own work. Also, in the case of the small Company C, most of the employees are shareholders of the company which was mentioned to be a motivator for them.

However, it was also mentioned to be challenging to motivate team members at certain situations. As is usually the case especially in the large companies, there are several development projects going on at the same concurrently. Completing challenging tasks at the end of the development phase when team members can already be part of a

new and inspiring, project was seen challenging. The project leader of Company B commented:

"Especially during the end of the development phase, when team members have moved to other projects but they still have some duties to my project. Motivating them to do the tasks to the old project when their interests are already in the new one can sometimes be very difficult."

The study of Gemmill and Wilemon (1994), also pointed out that one of the biggest sources of project leader frustration is the lack of commitment among team members. Their study showed, that in these kinds of situations, project leaders feel themselves helpless and powerless. Furthermore, the project leaders interviewed by the authors seemed to blame themselves about the lack of commitment of (some) team members. Thus, the motivation of professionals is important also in that sense that it affects the working and the feelings of the project leader.

It was emphasized to be important by several interviewees that the project leader gets people to work for the project even without the actual superior title. That was said to come through project leader's example and knowledge. The project leader should have good social capabilities to get things done even without the organizational power.

However, as the development phase reaches a certain point where the amount of routine work increases, it was difficult for the interviewees to name the motivators in that phase.

"I think that there's nothing that motivates in that phase…lot of it is just 'obligatory evil' that needs to get done." (upper manager, company A)

Redmond et al. (1993) note that acknowledging employees potential and accomplishments contribute to their motivation and solution quality even during more routine work periods. Furthermore, the authors suggest that creativity can be facilitated simply by acknowledging the potential and accomplishments of an individual.

The importance of acknowledging good work done was noted also by several interviewees. This was seen important during both, the front end and development phases.

"I think that the best motivator is to thank for the good work done."
(project leader, company C)

Furthermore, promoting the team in general was mentioned to be important. This can be done by sharing the achievements of the team with the rest of the organization as a project manager from large Company B does:

"Whenever the team achieves something worthwhile, I send an email to the team and copy it to our managers."

Using material rewards, such as taking the team for a dinner or organizing other common happenings, shared opinions between the interviewees. The small Company C did not see any usage of using material rewards. They mentioned having tested using them but the benefit, according to the interviewees, was only very short termed. The large Company A mentioned to time to time use material rewards such as taking the team for a dinner or organizing other common happenings. Also, although rarely, financial rewards were given as recognition for work done especially well. However, also these were mentioned often to be addressed to the whole team. Furthermore, financial rewards were seen challenging since both the quality and amount of the work should be taken into account. The study by Griffin (1997) showed project-completion dinner to be the most frequently used reward in NPD settings. Furthermore, the findings suggest that financial rewards were used only rarely in NPD. Barckzak and Wilemon (2001) discuss that the frustration of cross-functional team members which occurs from the lack of knowledge and understanding about the evaluation and reward systems for new product development work. This was not pointed out during the interviews. In deed, this might be due to a fact that only employees in managerial positions were interviewed and not the people actually conducting the tasks. Table 9 summarizes the central findings regarding the front end and development phases.

Table 9 Findings about Differences between FEI and Development Phases

	Front End	Development Phase
Characteristics of front end	Free, unstructured, not so timetable driven	Structured, regimented, bureaucratic
Nature of Work	Inventing, discovering, experimenting	Systematic, detailed, goal-oriented
What motivates people?	Work, doing something new, getting recognition of work well done	Work, doing something new, learning something new, achieving set goals, seeing the results of ones work, getting recognition of work well done
How are the people like working in this phase?	Alert to new things, bare uncertainty, like out-of-box thinking and developing something that does not exist in the world yet	Goal oriented, enjoy systematic working

To sum up, the front end phase was characterized as unstructured, free and not so timetable driven as the development phase. Moreover the nature of work was characterized to include inventing, experimenting and discovering. The development phase, on the other hand, was described to be systematic, structured, regimented, and more bureaucratic than the front end phase. Biggest motivator in both of the phases was noted to be the work itself and to do something new. Furthermore, the other motivators during the development phase were learning something new, achieving the set goals, and seeing the results of ones work. According to the interviews people working in the front end need to be alert to new things, bare uncertainty well, and get excited about developing something that does not exist in the world yet, whereas people working in the development phase are goal oriented and prefer structured and more systematic working. However, as has been mentioned earlier, only in the case of large Company B, the front end and development functions were separated in the organization, and usually people working in the front end would not be working in the development phase. In the two other companies, small Company C and large Company A, usually the people working in the front end would also be working during the development phase. However, according to the interviews, team members need to emphasize different skills and state of minds during the first two phases of innovation process.

4.3. Leadership Functions during the Front End

The interviewees that had experience in working with the front end activities were asked about the most important functions of a project leader during the front end phase, before the actual development phase. All in all, four of the respondents had experiences from the front end of innovation. However, the researcher noticed it to be challenging to gain answers to the question about leadership functions during the front end. As has been noted earlier, front end is known as a phase of the innovation process that is not as well understood as the development phase (see e.g. Koen et al. 2001, Zhang & Doll 2001, Nobelius & Trygg 2001). Furthermore, Khurana and Rosenthal (1998, 66) argue that "front end does not easily lend itself to direct leadership." The results of their study showed that often leadership began in the development phase, after the front end was complete and the so called formal project development could begin. This might also be the reason why it was more difficult for interviewees to name leadership functions during the front end phase: leadership during the front end is not considered much in the companies.

For example, the small Company C did not see that the role of the project leader would be any different during the front end or development phases. Rather, the project leader of Company C argued that the wires need to be kept in hands the same way during the whole process. Furthermore, he emphasized that one of his most important functions is to give support to the thoughts and doubts of the team members.

In addition, as mentioned earlier, Company A named the project leader only after the project had been approved for development. Thus, according this study it can be noted that leadership during the front end is not yet very well understood in companies.

However, large Company B, had obviously been considering the leadership during the front end and was able to name different leadership functions necessary at the front end phase.

Having a Vision

The importance of project leader having a vision has been emphasized in earlier studies (see e.g. Barckzak & Wilemon 1989, Brown & Eisenhardt 1995, Valle & Avella, 2003). Valle and Avella (2003) note, that the vision of project leader clarifies the meaning of the product for the firm. The importance of developing a vision was brought up also during the interviews. The upper manager 1 of Company B noted one of the

most important leadership functions during the front end to be to draw the goal and develop the vision of the project:

"I would say, that to draw the goal and link it with the firm's strategy is most important."
(upper manager 1, company B)

Furthermore, he emphasized that common goals are fundamental elements for the success of the project. He mentioned that under a great pressure, the team has to have a common understanding about where they are aiming at and what are the biggest challenges. The importance of setting common goals has also been recognized in earlier studies (see e.g. Barckzak & Wilemon 1989, McDonough 2000). For example, the study of McDonough III (2000) suggests that developing appropriate project goals are associated with the success of the team. Furthermore, Kim et al. (1999) argue it to be difficult for a project leader of an innovative project to set the goals for the team because of the uncertain nature of the project. However, setting the goals for the team was not mentioned to be a problem during the interviews. It might of course be that the projects of which respondents were discussing about were merely incremental or otherwise more defined by nature, which made it easier to draw the goal.

Empowering the Team

Moreover, it was noted by several interviewees that the leaders shouldn't tell the project team what to do but rather "throw the ball in the air" and be directional in their leading. In addition, the leader should give support to the team as well as give feedback about the direction they are going to. Many previous studies underline the importance of empowering the team of innovative projects (see e.g. Barckzak & Wilemon 1989, Amabile and Gitomer 1984; see Amabile 1996, Hohn 2004). Hohn (2004) argues that giving autonomy to the team helps in maintaining the intrinsic motivation whereas, according to Amabile and Gitomer (1984; see Amabile 1996) the feeling of freedom in accomplishing the tasks increases the creativity of an individual. Furthermore, the study of Barckzak and Wilemon (1989) showed innovative leaders to emphasize the importance to leave issues open enough so that the team members can expand on those by themselves. In addition, McDonough (2000), suggest empowering the team with needed decision-making power to be strongly associated with team success. According to the comments above, it can be stated that giving freedom to the development team during the front end is of great importance.

However, the project leader of Company B noted that giving freedom to the team members depends on how well the leader knows the team members in before hand.

He mentioned it to be easier to give freedom to people, with whom you have been working before:

"If you know the people, you know that everything will get done."

The study of Kirjavainen et al. (2010) note also that high level of autonomy is perceived to be an important motivator, and enabler of effectiveness. However, the results of the study show that giving freedom may create a feeling of weak management. Hence, balancing between freedom and control is a challenging task of a leader.

Encouraging Creativity

In the literature, the front end is described to be very unstructured by nature and requiring creativity and out-of-box thinking (see e.g. Hohn 2004, Buijs 2007). Furthermore, it has been noted that leader behaviour has an impact on subordinate creativity (Redmond et al., 1993). That is why encouraging creativity was also one of the themes discussed during the interviews. The interviewees were asked about what they see to be the preconditions for creativity and how they try to encourage it. Many of the respondents first doubted if they were encouraging creativity at all rather, they thought that people working with product development are creative individuals and not much encouragement is needed.

"I don't know how it (creativity) is being encouraged…I think that people working in my team are curious experimenters by nature." (project leader, company A)

However, once the discussion went further different leadership functions for promoting creativity could be found.

Creating an Open and Trustful Atmosphere

Open and free atmosphere was agreed to be very important for the creative work in the front end by many interviewees. The upper manager of Company A commented the idea-days organized twice a year as following:

"The two last hours are the best when people are really tired and they come up with really crazy ideas."

The previous comment addresses that creating a free and relaxed atmosphere helps in generating innovative ideas and solutions. Furthermore, the upper manager of large Company A emphasized that no one should be blamed about a “bad” or a “crazy” idea. In addition, he emphasized respect towards team members to be a precondition for a good atmosphere. For example, others ideas should not be stolen and that the one who originally came up with the idea should be given the honour. However, team members should be encouraged to build upon others ideas and suggestions. Creating a climate which supports innovative pursuits has discussed to be critical in innovative projects by many authors (Barckzak & Wilemon 1989, Barckzak & Wilemon 2001). Furthermore, Buijs (2007) emphasizes the importance of shared understanding and the degree of trust during the innovation process. The results of this study support also the earlier studies in which fostering an environment of mutual trust and where team members are willing to share ideas and information is seen of importance. At best the atmosphere was said to be open, honest and trustful and the kind of where people like to share their ideas and feelings. There should be so big trust among team members that they are not afraid to say anything or dare to ask “stupid questions.” The upper manager 1 of Company B commented a very successful project he had been part of as following:

“We had so big trust among the team that you could be a bit stupid and you didn’t have to be afraid of what you’re going to say.”

A project leader of Company B emphasized that the project leader should not try to lead by authority; rather the project leader should act as a friend to the team members to make them feel relaxed and keep the atmosphere open. Furthermore, he commented that when the atmosphere of the team is on the right level, leadership is hardly needed.

Productive informal discussion was said to occur when the atmosphere is open and trustful. The project leader described the open and relaxed atmosphere of his team in the following way:

“Many times a day we have informal meetings where the team gathers around a table to talk about a problem someone has related to the product. Then others come up with different solutions and they evaluate and talk about them.”

However, building the team atmosphere was seen challenging in cases where there are no real project teams. Especially during the development phase, the large

Company B commented it often to be the case that only few people are working full-time for the project. When the rest of the team is working for several projects concurrently, it can be difficult to get a feeling of a team. On the other hand, Katz (2004) notes many professionals contributing to a project to complain that they are not really being treated as real members of the team. Moreover, they do not feel as part of the overall effort since the only time they hear from project leaders or core project members is when something is needed from them. However, he notes work assignments to be more motivating for professionals when they are given a complete picture of the project and they feel as they are real members of the project. Thus, it would be important for a project leader to involve also "part-timers" as much as possible to the project, and keep them updated about the proceeding of the project.

In addition, Shapero (1985) argues that productivity and creativity can be enhanced by assigning more than one project to a professional. He further argues that the ability to switch to a second project and let the other incubate in the subconscious is important for creativity. Taking this into account, it can be noted to be good that at least some of the team members are working on several projects at the same time. Hence, they can get the needed distance to the projects and come up with good solutions.

Leading by Example

Many of the interviewees noted it to be important to encourage openness by own example. Project leaders said to encourage openness by being themselves open about the issues regarding the project to the team. Project leader of the Company A explained that:

"During the team meetings I very openly tell about issues related to the project and ask others opinions. I hope this encourages team members to tell their point of views and be open as well."

Furthermore, it was often spoken during the interviews that the project leader has to act as an example to the project team during the whole innovation process. Acting as an example was also noted to be a motivator for team members. Project leader of large Company B noted:

"When you do your job as well as possible, other people will try to do the same."

Earlier studies have also showed leading by example to be an important method for leaders of innovative projects (see e.g. Amabile 1986, Barckzak & Wilemon 2001). In

that leaders are consciously monitoring their own behaviour to ensure that right messages are being sent to the team (Barckzak & Wilemon, 2001)

Encouraging Risk Taking

The upper manager 1 of Company B argued that in order to provoke and encourage creativity, the fear of failure should be minimized. He himself mentioned to emphasize that he has the biggest responsibility, not the team and suggested that one way to minimize the fear of failure is to take the responsibility from the team:

"Simplified said, I tell them to do and not worry about the consequences. I will take the responsibility of what they do."

The previous studies have also noted the importance of encouraging risk taking and minimizing the fear of failure in the context of innovation (see e.g. Keller 1992, Farson & Keyes 2002, Hohn 2004). Hohn (2004) emphasizes that the team needs freedom to take risks and to break out from procedures without being punished. However Nemeth (1997) note that companies are more likely to encourage loyalty and commitment to the company than innovation or risk taking. By encouraging loyalty and commitment, productivity and high morale may be achieved, but creativity, innovation or "the ability to respond readily to change" is obstructed, as Nemeth (74, 1997) express it.

One of the most important functions of an innovation leader has stated to be to stimulate people to think about new ways of doing things (Kanter 1988, Waldman & Bass 1991). Also displaying high expectations towards employees has been mentioned to be a method of innovation leader (Waldman & Bass 1991). These were highlighted also during the interviews. Project leader of small Company C mentioned to challenge team members by demanding new solutions:

"I have taken the sceptical role and question the suggestions of the team. I expect new solutions from them."

The upper manager 1 of a large Company B mentioned to provoke creativity by challenging people to think about the problem from other people's perspectives. Furthermore he commented to "dig" from the developers that what a suggested solution would mean in practice; how would customer experience it?

Providing Alternative Ways of Working

Also the physical environment was seen as encouraging element for creativity. Upper manager of the firm B commented that it isn't necessary for the development team to work inside the firm's facilities:

"If the vision and goals are clear and the trust for the team is good, why should the work be done in the office?"

He further continued to have been thinking about different, more innovative options for the team's ways of working:

"I thought that our team could go to a summer cottage for few weeks and work 24 hours a day, okey of course we would cook and go to sauna, but then start again in the morning…to create it together."

Building the Team of Right Kind of Individuals

The results of the study are in accordance with the study of Barckzak and Wilemon (2001), who, among others, have emphasized that selecting right kind of team members to the team have a big influence on team climate. All the interviewees emphasized that having right people working for the project is essential for the atmosphere as well as for the success of the project. Furthermore, even though having right kind of skills in the project team is important, it was seen more important to have right kinds of personalities in the team that will build the right kind of atmosphere for the project. When people feel the project as their own, they will also give their very best. The upper manager 1 of the Company B commented:

"Building the team for a certain project should be more like choosing members in your football team."

Mostert (2007) also argues that for creativity more important than having diversity of people is to have "diversity of mind", that is the ability to think creatively. This means that not the diversity in educational background is necessarily important but rather the personalities are what matters. Furthermore, Redmond et al. (1993) note that if originality is wanted, leaders should seek out people who have knowledge about the problems to be worked with at hand, or leaders should provide them the educational and development possibilities. Furthermore, they argue that leaders should not force new employees to apply the new information in the same way other experts do, rather they should encourage the development of different perspectives.

Table 10 draws together the findings regarding the leadership functions during the front end of innovation. It shows which functions were mentioned to be important in each of the companies interviewed. In cases where there is no mark in the column of a certain company, it does not mean that these functions would not be seen as important in the company in question. However, it means that the functions in question were not pointed out during the interviews.

Table 10 Findings about Leadership Functions during Front End

Leadership Functions in the Front End	Large Company A	Large Company B	Small Company C
Building the team from right kind of personalities	X	X	X
Developing the vision		X	
Drawing the goal(s)		X	
Setting the direction		X	
Giving freedom to the team ("throwing the ball in the air")	X	X	X
Providing feedback about the direction of the team	X	X	X
Creating an open and trustful atmosphere (by own example)	X	X	X
Minimizing the fear of failure		X	
Providing alternative ways of working for the team		X	
Stimulating the generation of new perspectives		X	X
Showing commitment by being present	X	X	X
Giving recognition of good ideas & good work done	X	X	X

Table 10 shows that large Company B was able to name several important leadership functions during the front end. This might be due to the fact that the Company B is the largest of all the companies and because of that the innovation process activities are more organized. One example of this is that the actions of front and development phases as their own organizational functions. This way both of the phases can be invested more.

Building the team of right kind of individuals was seen as a starting point for the success of the project by each of the company. In addition, giving freedom to the team was emphasized during the interviews. However, it is of importance for the project leader to provide feedback about the direction the team is heading to. Furthermore, creating an environment where mutual trust exists and people are willing to share their ideas was seen as a condition for creative work. Finally all the companies interviewed mentioned giving recognition of good ideas and good work done to be an important reward for product developers.

4.4. Leadership Functions during the Development Phase

All the interviewees were also asked about the most important functions of a project leader during the development phase. It seemed to be easier for respondents to name different leadership functions used in the development phase than in the front end phase. This might be due to its more normal project nature, and due the fact, that there is more understanding about the development phase (see e.g. Cooper 1993, Khurana & Rosenthal 1998, Koen et al. 2001).

Unlike during the front end phase, leadership, and its importance, during the development phase was well recognized. The role of the project leader during the development phase was emphasized by several upper managers.

"The project lives or dies depending on the project leader. He is in the key position…really in the key position." (upper manager, company A)

Furthermore, the upper manager of large Company A mentioned that the project either goes forward or does not depending on the social as well as professional skills of the project leader. He argued, that the team is full of professionals that are only looking at their own work and project leader has to be able to connect these different parts of work. He further argued that the project leader needs to be assertive in managing the new product development process.

"People do not like things to swell (velloa), rather they like that somebody tells them what to do since it reduces the pain of their own thinking."

The importance of project leader of NPD team has been emphasized also in several earlier studies.

Providing Professional Support

The importance of professional skills of the project leader was underlined by many interviewees. The upper manager of large Company A mentioned one of his project leaders authority to base strongly on his professional skills in office chair related things. Since the NPD teams consist of professionals from different fields, it was seen of importance that the project leader goes into deep to the project and learns as much as possible about it. This way the project leader can also provide professional support to the team members. The upper manager 2 of Company B noted:

"Many young project leaders attain authority pretty fast once they become experts on the field and are able to help people working in the team."

In the literature, the technical skills and professional support is seen as a remarkable character of a NPD project leader (Howell & Higgins 1990, Clark & Wheelwright 1992, Valle & Avella 2003). Kim et al. (1999) noted technical skills to be important because the team consisting of professionals tend to accept authority based on expertise better than hierarchy. Furthermore, Valle and Avella (2003) argue that project leaders must maintain and develop their own technical capacity in the work field. However, the project leader should keep in mind that his most important role is to guide and promote the team to the correct activity, not to be expert in technical issues (Valle & Avella, 2003).

Furthermore, it was noted by the interviewees that because team members see themselves as experts of their own field, it is important to clearly rationalize the decisions made between different options. The project leader of Company B mentioned it to be important to be careful in advising people in their fields of expert. Furthermore, project leaders of both large companies A and B emphasized that leading a team of professionals means that the decisions you make as a project leader have to be rationalized very well. That is, the project leader should objectively evaluate different options and the pros and cons in them. However, the project leader of a large Company A noted project leader to also need to be selfish and make own decisions.

This was mentioned to be important especially when the timetable of the project is lagging.

Communicating the Purpose of the Project

At the beginning of the development phase it was seen very important for the project leader and the team to understand the scope of the project; what it is that the team is doing and what kind of concrete actions are required reaching the goal.

The project leader of large Company B mentioned that everyone should have the needed information to be able to reach the goals set. Furthermore, he commented that:

"The beginning is very much about creating understanding about the project; what is it that we are actually doing."

Furthermore, the project leader of Company A, in which project leader is named after the approval of the project, noted that at the beginning of the development phase the project leader should ensure that the brief includes all the needed details to be able to start the development. Also, the study of Barckzak and Wilemon (1989) suggested that communicating the focus of the project and responsibilities of team members are crucial tasks of the project leader of an innovative team.

Setting Goals and Committing Team Members

Setting goals for the project was seen as an important task of a project leader since the nature of the development phase is very goal-oriented. The project leader of Company B mentioned setting clear goals to the different functions working for the project to be of big importance. This was said to be essential since, in the product development projects of Company B, team members can be working for the project all over the organization. Different stakeholders from different functions need to understand what needs to be done and what is the goal of the project. He noted, that project leader should find the most important requirements and then pack them so that that they are doable.

"You need to break down the scope of the project in concrete doing."
(project leader, company B)

Furthermore, the project leader of Company B noted:

"The better the planning has been done, the better the work is already done."

Also Lynn et al. (1999) note providing clear and stable project goals, and providing the resources the team needs to reach these goals, to be important success factors of NPD. These conventional functions of a project leader are part of the “planner role” which has noted to be critical for the success of the project by many authors (see e.g. Kim et al. 1999, Friedman et al. 1999).

Furthermore, it was mentioned that the project leader have to be able to commit project team members to the common goal. The upper manager 2 of large Company B mentioned project kick-off to be as one good way in helping to commit everyone to the project. In these, the key persons of the project, including the project leader, present the plan and the goal of the project as well as what it requires from the team members. Lynn (1998) argues that reaching an agreement and understanding among the vision, and having a strong commitment are fundamental conditions for a successful NPD project.

Controlling and Monitoring the Project

The work at latter stages of development phase was described to be regimented and detailed working requiring persistence. In these an important function of the project leader was said to be to get the different functions work in a certain way, at a certain time and towards a certain goal. However, it was also noted that the project leader might lack the time to negotiate even-handedly with each party. That is why it was seen to be very important that the project leader recognizes the critical parts and phases of the project and communicates actively with the parties in question trying to keep them in timetable. Nevertheless, one project leader pointed out that the project leader should have time for small things as well:

“Something that might be small thing to the project leader might be remarkable thing to the team member.”

However, the interviewees of large firms mentioned the challenge of project leaders to be that they work as virtual superiors meaning that often the project team members aren’t their formal subordinates. This makes it more difficult for project leaders to prioritize the work regarding the project since the formal superiors of the team members might prioritize other work in front of your project. As one project leader mentioned:

“The team members can have other priorities on behalf of their superior and often the new project is not the priority one.”

It was noted that especially in the development phase, the project leaders need to work with a large amount of people in different functions and positions, and need to be able to change the standpoint depending on with whom the project leader is working with. Also, according to Kim et al. (1999) it is important that the project leader deals with information and resources from outside the development team.

Good follow-up was commented to be an essential part of development phase to help to keep up with what should still be done. Especially when the project is lagging the timetable, it should immediately be noted and acted upon. Furthermore, one project leader mentioned to use weekly follow-up as a tool to ensure that the team is going to the right direction. However, the project leader of Company A noted that:

"In the development phase the product is on so big focus that usually there's no risk that the team will go to a wrong direction in that sense…rather the risk is that solutions that don't fit in the budget are being sought."

Furthermore, the project leader of Company A mentioned taking care of and managing small details that in other case would be left without attention to be one of his most important functions. According to him, this included also not so pleasant tasks, such as, reminding and pointing out what needs still to be done and by whom. Also, he mentioned that it needs to be taken into account that different people need to be handled differently.

Also this research confirmed the fact, that leadership functions during the development phase are much about planning. These conventional functions of a project leader; setting goals, planning schedules and monitoring the project have been discussed to be critical for the success of innovation efforts (Friedman et al. 1992, Kim et al. 1999). Many of the interviewees commented that the planning at this phase is very systematic including information about when different things can and should be completed. Furthermore, the work needs to be divided and scheduled among different organizational functions.

4.4.1. Facing Setbacks

Since facing setbacks is part of the nature of new product development (see e.g. Ulrich & Eppinger 2003, Cooper, 1993), the leaders were asked how they act in these

situations. First of all, it was commonly agreed among the interviewees that the team faces several setbacks during the development phase.

"These setbacks occur…there is no one or two setbacks, there are dozens or hundreds of them…that you have to return to the previous phases to redo them.." (upper manager, firm A)

Secondly the interviewees agreed that during the setbacks, the problem solving ability of the project leader is really weighted.

Showing the Direction

It was emphasized that during difficult times, the project leader needs to stay strong. In addition, it was mentioned that the project leader need to be the one the team can trust to, meaning that even though he/she wouldn't know what to do at a certain moment, the project leader need to be able to lead the team further. This "being certain about uncertainties" is also recognized among different authors (see e.g. Hohn 2004, Buijs, 2007). The upper manager 1 of large Company B said that in the case of setbacks, the project leader needs to encourage the team and show the direction where the team should head to. The other upper manager 2 of Company B noted that even though the project leader would not know which would be the right thing to do at the moment, it should not be shown to the team.

"In challenging times, the project leader needs to act as a strong leader, whereas in other times his/her role can be more of an expert's role." (upper manager 2, company B)

The same upper manager 2 from large Company B mentioned a precautionary method for handling setbacks. He discussed about drawing scenarios; thinking in before hand about the possible threats of the project and what would be the actions to be taken.

Furthermore, the project leader has to be able to tell the bad news to the team and to the stakeholders. Nevertheless, it was mentioned during the interviews that often it might be a good idea to think solutions and plans for the setbacks faced before telling about the problems to the team. The upper manager 2 from the large Company B mentioned:

"Openness is a good thing but it doesn't mean that the problems should be delegated to the team, rather the problems should be presented with possible solutions."

Communicating the Reason for Setbacks

Usually the reasons for the projects to prolong were said to be some concrete problems, such as technical or logistic problems. That is why it was noted to be important to communicate the team that they are not the reason for the problems. Upper manager of large Company A commented that:

"Even though setbacks occur, it is not necessarily anybody's fault – it's just the nature of the game. Team members need to know they are doing the right things even though the timetable is not keeping up."

He further commented that speeding up the so called cycles of the project is one way to try to accelerate the project:

"Say, you have team meetings every other week including task deadlines. But if you change the meetings to be every week, as well as the deadlines, it will speed up the project. Most of the tasks don't require two weeks to be completed, rather some hours, but to be able to complete them you need some information from someone else or you need someone else to complete their part first. People are sometimes pretty narrow-minded in that, that they need a project leader to tell the next person that the part he/she needed to start working his/her part is ready. When you keep the meetings more often you get to change the information more often also."

Furthermore, when facing setbacks, it was seen important by several interviewees that the project leader won't start to talk the team down. Rather it should be discussed why that has happened and what can be learned from it. Also, taking distance to the problems was recommended. Project leader of small firm C noted that:

"I've said to my team that once you think you found the solution, sleep over one night and see if you still think the same way next morning."

Taking Part in Solving the Problem

The same advices mentioned above apply in cases where an individual has made a mistake. The individual should be encouraged rather than talked down. However, it was mentioned that the reason for the mistake has to be talked through also. Furthermore, it was noted that when problems occur it is important that the project leader "rolls his sleeves" and goes to the root level to take part in solving the problem. Project leader of large Company B mentioned it to be important to tell the team that they're in this together.

"You can't go to him/her (who has made the mistake) that 'oh, you blew this up', rather you should encourage him like 'this seems really interesting, I wonder how we could solve this!' "

On the other hand, setbacks were seen as the ones that reward the developers most. It was noted that the people tending to drift towards product development usually like challenges and solving different kinds of problems. Project leader of large Company B mentioned that:

"Setbacks are the reasons why some projects are remembered. Once you solve those problems, they give the best feelings!"

Project leaders agreed showing commitment to the project by being present and giving their time to team members. In addition, they show interest to the project by enquiring how team members are doing with their tasks and taking part in solving problems as was noted above. This function is not valid only during the development phase but also during the front end.

Staying Optimistic

Humour was seen a helpful element to keep the atmosphere less serious during challenging times. In addition, "announcing small victories" as the upper manager of Company A mentioned, was said to be important to show that progress is being done. Optimism has been recognized to be important during setbacks also in earlier studies. Waldman and Bass (1991) emphasize that optimism and encouragement needs to be provided to the group in order to persist in their effort even when facing difficulties.

4.4.2. Maintaining the Excitement

It has been discussed in the literature that it is important for project leaders of NPD projects to try to limit the loss of momentum and maintaining the excitement as the project goes further (Waldman & Bass 1991, Amabile & Khaire, 2008). This was brought up also during the interviews and all the respondents recognized this to be a big challenge. It was noted by many leaders that at the beginning of the innovation process, during the front end and the beginning of development phase, the developers are very excited. However, around the midway of the project the nature of the work changes "into playing with details and millimetres" as the upper manager of large Company A mentioned. It is usually then, when frustration occurs.

Especially in cases where the timetable doesn't keep and there are technical or other problems, frustration occurs…and once the team gets really frustrated, it is very difficult to get the good feeling back again. Although the project will be completed sooner or later, the work is not meaningful anymore." (upper manager, company A)

When acquiring the respondents how they see the excitement could be maintained during the process, it was noted to be very challenging. Furthermore, it was difficult for leaders to name methods for maintaining the excitement. However, all of them mentioned that how the project is received in the in the organization has a huge effect on the atmosphere of the project team. As the project leader of large Company A commented:

"If the new product doesn't have much value to the company you wouldn't say it's motivating to work with that development project."

The notions above are in accordance with the study of Katz (2004). He argues that most professionals have motivational problems when assigned tasks appear to have only little significance. Furthermore he notes that professionals are most motivated when working on projects that are considered important.

It was mentioned during the interviews that if the product has a strong "suction" in the organization and there is a feeling that the product is very important to the company, it is easier to maintain the excitement and passion during the whole process. As other interviewees of large companies, the project leader of Company B mentioned it to be easier to work in a bigger project, since they are prioritized high and it is much easier to have the resources needed.

"It is much easier to have a bigger project since everybody is interested about it and you have all the support you need." (project leader, company B)

Also in the literature, organizations support has identified to be necessary for the success product innovation process (see e.g. Cooper 1993, Kim & Wilemon 2002b). According to Cooper (1993) management should empower the NPD project teams and make the necessary resources available.

Reminding the Meaning of the Project

As noted earlier, at the beginning of the project it is important for project leader to clarify the meaning of the product for the firm to the team members (Valle & Avella,

2003). However, the upper manager 1 of Company B emphasized the importance of reminding the meaning of the work being done along the process, especially during the phases that might be frustrating. He noted:

"It is important to point out and remind about the reason the product in question is being developed. For example, it's not just a technical device they are developing but they are making the everyday of the end-user easier and more pleasurable."

Keller (1992) has also noted communicating the purpose and importance of ones work to be essential function of a leader. Also Conger and Kanungo (1987) proposed that reminding the team about the vision of the project is of great importance in face of setbacks.

Reducing Routine Works

Furthermore, the interviewees of large Company A, mentioned that reducing routine works to be done during the development phase might help to reduce the feeling of frustration. In the case of large Company A the routine work is trying to be reduced by renewing the software. An upper manager of the Company A also mentioned that it would be good if the routine work could be delegated to people who like doing that kind of work. The freedom to pursue tasks of greatest interest to the employee has been noted to be one of the most important motivators in R&D work (James, 2002).

"--- that we could reduce the routine work --- that people who are interested in routine work could it." (upper manager, company A)

Furthermore, the upper manager of Company A commented that it would be good if employees could do what they like the best. He further argued this to be important also in maintaining the interest during the end of development phase where the amount of routine work increases. The freedom to pursue tasks of greatest interest to the employee has been noted to be one of the most important motivators in R&D work also in earlier studies (see e.g. Amabile 1996).

Table 11 summarizes the findings regarding the leadership functions during the front end of innovation. As Table 10, Table 11 shows which functions were mentioned to be important in each of the companies interviewed during the development phase. Again, in cases where there is no mark in the column of a certain company, it does not necessarily mean that these functions would not be seen as important in the company

in question. However, it means that the functions in question were not pointed out during the interviews.

Table 11 Findings about Leadership Functions during Development Phase

Leadership Functions in the Development Phase	Large Company A	Large Company B	Small Company C
Creating an understanding of the scope and the goals of the project	X	X	
Breaking down the project in concrete tasks	X	X	
Setting goals to different functions	X	X	
Planning the timetable		X	
Committing team members to the common goal	X	X	
Showing direction to the team	X	X	X
Controlling the work of different functions	X	X	X
Recognizing the critical parts of the project and putting more emphasis on them		X	
Collaborating with different functions and groups	X	X	X
Monitoring the proceeding of the project (are we on budget? are we on timetable?)	X	X	X
Providing professional support		X	X
Maintaining the atmosphere relaxed an open	X	X	X

Announcing small victories	X		
Informing the achievements of the project		X	
Communicating the reasons of possible setbacks		X	
Taking part in solving the possible problems		X	X
Clearly communicating and rationalizing the decisions made	X	X	
Informing about bad news with alternative solutions		X	
Reminding the meaning of the teams work / project		X	
Giving recognition of good work done	X	X	X
Follow-up the proceeding of the project	X	X	X
Showing commitment to the project (by being present)	X	X	X

As table 11 depicts, several common leadership functions during the development phase were found between the interviewees. Unlike during the front end, during the development phase it was seen of importance that the project leader shows the direction to the team. That is, project leader takes more control during the development phase, whereas during the front end it was more important for project leader to “throw the ball in the air”. Furthermore, during the development phase it is necessary to monitor whether the project is on budget and on timetable. The results show also, that project leader have an important role in collaborating with different functions and groups. Since there usually are several setbacks during the development process, maintaining the atmosphere relaxed and open and giving recognition of good work done are essential.

5. Discussion and Conclusion

In this chapter the main findings of the study are discussed. The main research question is answered by going through the findings by using the theoretical framework presented in section 2.8. Furthermore the limitation of the study is analyzed. Also, managerial implications are considered and finally, suggestions for future research are presented.

5.1. Discussion of Results

While chapter 4 presented the findings of the study and thereby answered the three research sub-questions, this chapter concentrates on answering the main research question of the thesis. The main research question was:

What are the different leadership roles of the project leader at the front end and at the development phases of the innovation process?

The main focus of this study was on identifying the leadership functions of NPD project leader during the front end and development phases of innovation process in order to find out the different leadership roles of the project leader at these phases. The summary of the findings regarding the leadership functions during the front end and development phases are shown in Table 12.

Table 12 Summary of the Main Findings

Leadership Functions during the Front End	Leadership Functions during the Development Phase
Building the team from right kind of personalities	Creating an understanding of the scope and the goals of the project
Developing the vision	Breaking down the project in concrete tasks
Drawing the goal(s)	Setting goals to different functions
Setting the direction	Planning the timetable
Giving freedom to the team (“throwing the ball in the air”)	Committing team members to the common goal
Providing feedback about the direction of the team	Showing direction to the team
Creating an open and trustful atmosphere (by own example)	Controlling the work of different functions
Minimizing the fear of failure	Recognizing the critical parts of the project and putting more emphasis on them
Providing alternative ways of working for the team	Collaborating with different functions and groups
Stimulating the generation of new perspectives	Monitoring the proceeding of the project (are we on budget?, are we on timetable?)
Giving recognition of good ideas & good work done	Providing professional support
Showing commitment to the project (by being present)	Maintaining the atmosphere relaxed an open
	Encouraging cooperation
	Announcing small victories
	Informing the achievements of the project
	Communicating the reasons of possible setbacks
	Taking part in solving the possible problems
	Clearly communicating and rationalizing the decisions made
	Informing about bad news with alternative solutions
	Reminding the meaning of the teams work / project
	Follow-up the proceeding of the project
	Giving recognition of good work done
	Showing commitment to the project (by being present)

The results of this study mainly follow the existing discussion in the literature. For example, when comparing the results of the study with the generative and focusing modes of leadership presented by Hohn (2004), many similarities can be found. As Hohn (2004) suggests, good group dynamics and openness plays an important role in the generative mode (front end phase). However, the results of this study show open and relaxed atmosphere to be important also during the development phase, especially when facing setbacks. Furthermore Hohn (2004) emphasize clear communication to be a central element in the focusing mode of leadership. This is strongly supported by the results of this study. In addition, unlike Hohn (2004) suggests this study suggests intrinsic motivation factors to be important in front end and development phases. Thus, the work itself was seen as a big motivator also during the development phase. In addition to that learning something new and seeing the results of one's work were mentioned to be motivating for developers.

Also transformational leadership was part of the framework of this thesis. Waldman and Bass (1991) suggest that nurturance leadership is of importance during the front end whereas leadership persistence is important during the development phase. This includes stimulating the team to generate new ideas and acting as a catalyst by getting people to consider problems in a new way. The results support these leadership functions to be important during the innovation process. Furthermore, displaying high expectations towards team members, also a function of nurturance leadership, was seen of importance this research.

Leadership persistence, on the other hand, includes maintaining the energy and enthusiasm associated with idea generation. This was pointed out in many of the interviews however, many of the leaders mentioned to lack the ways to maintain the excitement. Furthermore building strong commitment during the development phase is an essential function of leadership persistence. Again, the results of this study support the view. In addition, emphasizing the underlying values, reminding about the vision and providing emphasis and encouragement, all important elements of leadership persistence, were found to be essential functions of the project leader in this research.

The results of the study, presented in Table 12 were compared with the functions of different leadership roles, discussed in section 2.7 (see also Table 6) and categorized under the five leadership roles as can be seen in Appendix 2. As Appendix 2 shows most of the leadership functions during the front end are functions of team builder leader role. Thus, the results suggest the team builder role of a project leader to be the most important and strongest of the roles during the front end phase. This is due to the

importance of creating an atmosphere that is trustful and open, and where ideas and opinions can freely be discussed by team members. Furthermore, the team need to be encouraged to independent working by minimizing the fear of failure. Earlier studies have shown individuals to be more creative if they have the feeling of freedom in the way to accomplish the tasks (e.g. Amabile & Gitomer 1984; see Amabile 1998). That is why giving freedom to the team in finding their ways to accomplish their tasks is important. Also, the project leader should stimulate team members to generate new perspectives by providing different and innovative possibilities for team to work.

Nevertheless, the leadership functions of the team builder role were also seen important during the development phase. Here, it was noted to be important to keep up the good feeling of the team even though the nature of the work might time to time be very routine-like. The project faces usually several setbacks during the development phases, such as technical problems. Therefore it is important to announce small victories and give recognition of good work done to keep team members motivated. In addition, reminding about the actual purpose of the project – the reason why the team is working so hard also for small details, was seen of importance. This means that the project leader must communicate and remind for example, that the work the team is doing will result in better office chair ergonomics and further in better working circumstances.

During the front end, also communicator's role is needed, though not in such a level as team builder role. The project leader needs to communicate the direction of the project and draw the goal in clear but inspiring way. The team needs to have a common understanding about the direction they are heading to but have the freedom to choose the methods and ways to get there. The results suggest that planner, technical expert, and champion roles to play a smaller role during the front end. However, functions of planner role are needed in controlling and providing feedback about the direction the team is heading to. Technical expert role, on the other hand, is needed in giving recognition of and recognizing the potential and feasible ideas.

In addition to the team builder role, the results show that planner and communicator roles are very important during the development phase since big amount of the important leadership functions during the development phase are functions of planner and communicator in addition to team builder leadership roles. The communicator role includes creating a common understanding about the project, its scope and roles. It is important that the project leader clearly communicates the goals of the project as well as the responsibilities of different functions. Here, the project leader needs to show and communicate the direction to the team. In addition, the project leader needs to inform

the achievements of the team to important positions of the organization in order to promote the project. Since NPD team consists of professionals of different fields it is important for the project leader to clearly rationalize the decision and choices made between different options. Also the reasons for possible setbacks and problems need to be informed. This was seen important also in that sense that the team would not feel guilty about the problems they are not in fault. Before communicating the problems the project is facing, the project leader needs to think about alternative solutions in before hand.

Planner role seems to play a remarkable role during the development phase end. One of the reasons for this is that the team at this phase is larger and there are several stakeholders important to the project. Goals need to be set to different functions. In addition, timetable for completing different tasks need to be carefully planned. The project leader needs to constantly monitor the project and control the different stakeholders and functions working for the project. It was also noted to be important for the project leader to prioritize and recognize the critical parts of the project and giving more attention to those. Furthermore, the whole project needs to be monitored in order to notice is the project keeping the timetable as well as the budget.

Finally, also the functions of technical and champion roles were noted to be needed during the development phase although not in such a level as the ones discussed previously. The project leader need to act as a technical expert in that sense that he/she provides professional support for team members for example when they are doubting between different solutions. Champion role then again in this context means collaborating with different groups and units to provide and supply new information.

As was mentioned in the section 2.8 (see Table 6), the purpose of the empirical research of this study was to fill in the columns in the Table 13, that is, to show what are the strongest leadership roles during the front end and development phase.

Table 13 Leadership Roles during FEI and Development Phase

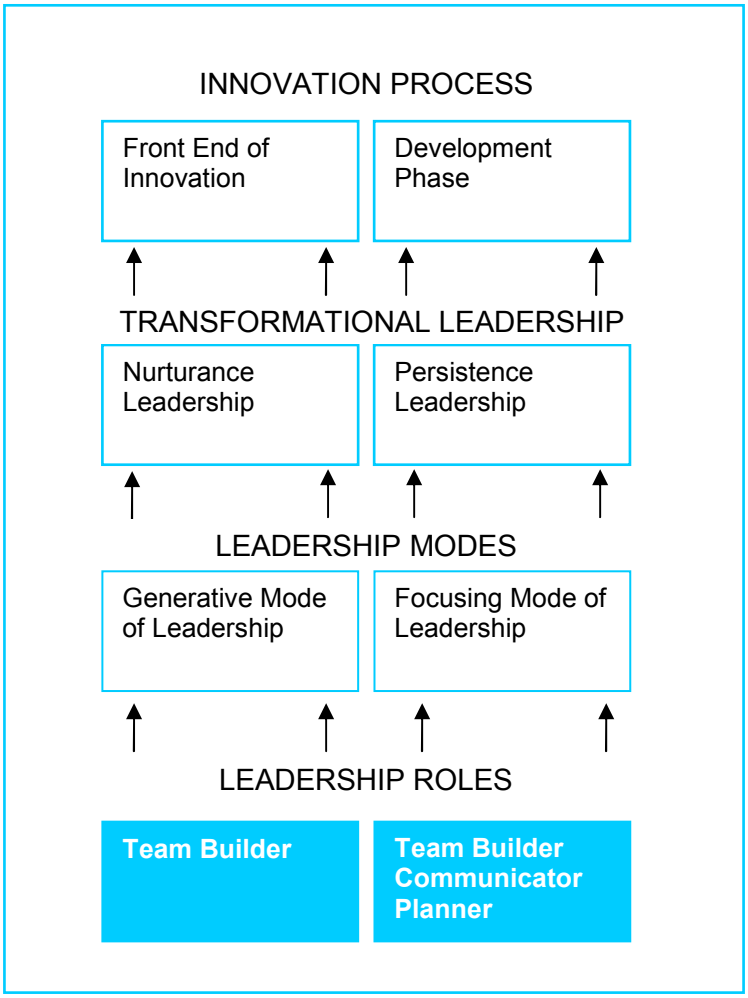
ROLES	FUNCTIONS	FRONT END / DEVELOPMENT PHASE
Planner (internal role)	Setting goals and developing the vision of the project, planning the time schedule, and resource allocation, controlling and evaluating the whole process	Development phase
Team builder (internal role)	Developing team membership, establishing climate that supports innovative pursuits, selecting the right individuals to the team, providing ways to motivate, resolving conflicts among members, fostering an environment with mutual trust, making it easy to share different ideas, encouraging creativity information, experiences and perspectives.	Front end & Development phase
Communicator (internal & external role)	Identifying valuable sources for information, screening relevant information, interpreting the implications of information, linking the team with outside information sources, fostering communication within the team	Development phase
Technical Expert (internal role)	Generating and recognizing good ideas, finding and defining significant problems, providing technical stimulation, coming up with original ideas	
Champion (external role)	Promoting innovation, building support, getting required resources, overcoming resistance from organizational members and ensuring the implementation of innovation, acting as a link between the team and other groups	

To sum up, the findings of this study suggest team builder role to be the most important and strongest role during the front end phase whereas during the development phase all, team builder, communicator and planner roles play very important roles.

In the literature it is speculated that project leaders would also play the role of a champion. However, the results of this study do not strongly support this view, rather the interviews showed champion role to be a role of an upper manager. One upper manager noted that, especially during the front end, it is important that an upper manager, for example manager of product development department, fights for the project in executive groups and budget negotiations. Furthermore, another upper manager noted it to be important to sell the project to his/her colleges and managers also from other departments in order to commit them to the project.

Figure 16 shows the accomplished framework that has been fulfilled with the findings of this study.

Figure 16 Accomplished Theoretical Framework



This research confirms the widely discussed fact that a project leader of a NPD team needs to vary between different roles during the innovation process. According this study, creating an open and trustful atmosphere (team builder), clearly communication the vision and goals of the project (communicator), and monitoring the proceeding of the project (planner) were one of the most important functions of a product development project leader.

5.2. Limitation of the Study

There are some limitations to the study conducted. First of all, the empirical part of the study is limited to observe the leadership in product innovation projects. That is, the findings may not apply for other innovation fields, such as service or process

innovations. In this study, the empirical data was collected from product development project leaders and upper managers. This means that the insights of people who actually perform in innovation processes were left out. The findings of the study could have been different if the data had been collected from employees performing such tasks. It is possible that upper managers, for example, don't have an accurate picture of how the operational activities are performed in practice. Furthermore, it can be that the respondents were willing to tell about some leadership functions as how it should be done rather than how it actually was done. Hence, adding another perspective to the study by interviewing team members of the project team would provide value to the study. On the other hand, since all the interviewees are in managerial positions, it is assumable that they have a holistic view about the processes and function.

The amount of data is also one matter that can be considered as a limitation. Seven interviews were conducted for this research and it can be argued whether it is enough or not. Although, the findings showed a broad scale of different leadership functions, some of the findings about the leadership functions were brought up only by one or two interviewees. The study is also limited to three companies and therefore the findings may not be applicable to all situations. Furthermore, the study conducted observed projects conducted mostly in Finland thus the findings may not apply other parts of the world. However, this study did not aim at geographical or otherwise broad generalization of leadership functions and roles of a project leader; rather the objective was to point out noteworthy viewpoints related to the role of a project leader.

5.3. Managerial Implications

One clear outcome of this study was that project leaders of NPD teams have a very important role during the innovation process. As the existing literature also suggest, project leaders act as a bridge between several functions; between the team and senior management, between the team and customers, between the different stakeholders as well as between different functional units. Furthermore it was emphasized by upper managers that the success of the projects depends well on how the project leader is able to carry the project further.

First of all, although the professional skills of project leader (technical expert role) were seen of importance, there were several other as important functions that were highly emphasized, such as communication skills (communicator), the ability to create a trustful and open atmosphere (team builder), as well as the ability to keep the project in schedule and in budget (planner role). Hence, when choosing a project leader for a

NPD project, the (technical) professional skills should not play the most important role, rather the other skills, competencies and experience of the individual.

Another strongly emphasized fact was the meaning of building the team of right kind of individuals, that is, of right kind of skills *and* personalities for the project in question. Hence, big emphasis should be put not only on which kinds of skills are needed to the project team but also, which types of people are needed. One upper manager were discussing about an extremely successful project, in which the atmosphere and inspiration was one of the greatest. That project differed from the usual ones in that, that he was able to choose the team members for the project. Of course being able to know the personalities of people requires knowing them quite well. This is not always possible. However, it should be noted that people with engineering background can nevertheless be very "unengineering like" and look at things from different point of view than the educational background might indicate.

Furthermore, the findings suggest that leadership during the front end is still not very well understood in the companies, since for most of the interviewees it was difficult to name leadership functions during the front end phase. However, as the existing literature shows, front end is a very important part of the innovation process in which many important decisions are made and which can drive up the success of new product development. Leadership is needed to promote the necessary kinds of information sharing and integrated thinking, as Khurana and Rosenthal (1998) have pointed out. If the leadership during the front end would be more organized, the capabilities of companies might be utilized more properly.

Finally, the fact that how the project is perceived by rest of the organization, especially by management, seemed to have a big effect on how well the "excitement" as well as motivation about the project could be maintained. This is something that the management should recognize, since paying attention also to smaller projects might increase the motivation of the team members which again might lead to more efficient performance.

5.4. Suggestions for Future Research

In future studies, it would be interesting to involve also the team members of a NPD project and hear their insights about what kind of leadership functions are necessary at different phases of the innovation process. It could well be that employees have different opinions on the necessary leadership functions than leaders themselves.

Furthermore, the present study could be extended to investigate the possible differences in leadership function between small and large firms. Since this study included only one small firm the comparison would not be very valid. Moreover, comparing the leadership functions during the innovation process in Finnish firms and foreign firms would be very interesting.

Also, since this research did not define to examine leadership functions and roles only in incremental (enhancements in existing products) or radical innovation projects (totally new products), it would be interesting to see are there differences between the leadership behaviour in these projects. It is likely that differences could be found already only because of the different amount of uncertainties these projects include.

5.5. Final Words

Working with this thesis has been interesting, although time to time also very frustrating. It was very interesting to have the chance to hear about the innovation activities of these three companies interviewed for this study. I want to thank them for their cooperation. I have also learned a lot during this research process. When I compare my knowledge about the topic of my thesis at the beginning of the research process, with the knowledge I have now, I can really tell the difference. Working intensively and for relative long time with the thesis has not diminished my interest on the topic, quite the opposite: I hope to have a chance to work related to product development and other innovation activities of companies also in the future.

In the introduction I was discussing whether a project leader would have been able to help us in our challenges and struggle during the one academic year long design and innovation course last year. Based on this study and also on my own understanding, I can rather confidently say that yes, yes a project leader would have been able to ease our innovation journey. However, balancing between freedom and control would have not been easy for him.

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INTERVIEW OUTLINE

Background Information

Name and Title
Job description / What does it include?
Professional background
When did you start at the current company?

Innovation Process

Is there an innovation process / product development process model in use in your company?

What are the different stages of the process?
- How would you outline the front end of innovation process?
- What activities does it include? Where does it end? How would you divide it into phases?
- How would you define the development phase of innovation process?
- What activities does it include? Where does it end? How would you divide it into phases?

If you consider the previous successful product development process you had:
- What made it successful?
- In where was it successful?
- What was affecting on it? what were the circumstances?

Front End of Innovation

Who are the key personnel involved in this phase?
- Who initiates the process?
- Who controls the process?
- Who makes decision?
- Who is involved?

What is the most challenging thing / phase of the front end?

How would you describe the nature of work during the front end?
- What are the characteristics?
- How is the atmosphere?

How would you describe the teamwork during the FEI phase?

Where do ideas emerge? (from which departments?)
- Does your company have guidelines to help in recognition and construction of ideas?
- Who are participating in the brainstorming?
- How are ideas further developed?

- Who makes the decision of which ideas will be further developed?
- What happens then?

- How are good ideas recognized? What is the process?
- What happens to ideas that are “ahead of their time”?
    - Do you have an idea bank?

-Who/How is the decision made about the continuation whether to continue to development phase or not?

Development Phase

Who are the key personnel involved in this phase?
- Who initiates the process?
- Who controls the process?
- Who makes decision?
- Who is involved?

How would you describe the nature of work during the front end?
-What are the characteristics?
-How is the atmosphere?

How would you describe the teamwork during the development phase?

What is the most challenging thing/phase of development phase?

Leadership during the FEI

What is the role of leadership during the front end?

What is the role of the project leader?
-What functions does the project leader have? Can you name examples?
-How does the project leader ensure the team is going to the right direction?
-How does the p. leader urge on creativity and innovative problem solving?
-How does the p. leader balance between freedom and control?
-How does p. leader act in the following situations:
- if the team is feeling down?
- if the team is overly enthusiastic?
- if the team “has fallen in love” with their idea?
- if the team rejects all of the ideas and focus too much on feasibility?

- How do leaders encourage team members to freely speak about their ideas? (How to create psychological safety?)
- How does the leader encourage collaboration among multi-disciplinary teams?
- How are employees motivated during the FEI? What motivates at this phase?
- How to get employees give their very best?
- How does the leader stimulate “out-of-box thinking”?
- How does the leader ensure that the team won’t become too isolated from the environment?
- What is the most important element of a leader during the FEI phase?
- How to generate strong commitment?
- In the face of setbacks or uncertainty, how do leaders encourage employees and create strong commitment? / how to ensure that employees remaining positive?
- How are non-potential projects eliminated?
- How should leaders show commitment?

- How does the leader come over the possible resistance to the new idea in the organization?

Leadership during the Development Phase

- What is the role of a (project) leader during the NPPD?
- What activities does the p. leader have? Give some examples.
- How does p. leader control the process?
- How does the p. leader motivate employees?
- How to get employees give their very best?
- What is the most important element of a leader during the NPPD phase?
- How do leaders create open and relaxed atmosphere?
- How does the leader encourage collaboration among multi-disciplinary teams?
- How are employees motivated during the development phase? What motivates at this phase?
- How to get employees give their very best?
- How to generate strong commitment?
- In the face of setbacks or uncertainty, how do leaders encourage employees and create strong commitment? / how to ensure that employees remaining positive?
- How should leaders show commitment?

What are the leadership challenges in leading the innovation process?
- If you think about the challenging moments you have had, (e.g. the project was lagging the timetable, interpersonal issues) how did you act in those situations?

	Planner	Team builder	Communicator	Technical Expert	Champion
Leadership functions during front end	- Providing feedback about the direction of the team	- Building the team from right kind of personalities - Creating an open and trustful atmosphere (by own example) - Minimizing the fear of failure - Providing alternative ways of working for the team - Giving freedom to the team ("throwing the ball in the air") - Stimulating the generation of new perspectives	- Drawing the goal - Setting the direction	- Giving recognition of good ideas	
Leadership functions during development phase	- Setting goals to different functions - Breaking down the project in concrete tasks - Planning the timetable - Follow-up the proceeding of the project - Controlling the work of different functions - Recognize the critical parts of the project and putting more emphasis on them - Monitoring the proceeding of the project (are we on budget? are we on timetable?)	- Give recognition of good work done - Maintaining the atmosphere relaxed an open - Showing commitment by being present - Reminding the meaning of the teams work / project - Announcing small victories	- Committing team members to the common goal - Creating an understanding of the scope and the goals of the project - Communicating the responsibilities - Showing direction to the team - Informing the achievements of the project - Communicating the reasons of possible setbacks - Informing about bad news with alternative solutions - Clearly communicating and rationalizing the decisions made	- Providing professional support - Taking part in solving the possible problems	- Collaborating with different functions and groups - Informing the achievements of the project