USER INNOVATION

A THEORETICAL MODEL AND APPLICATION AT SAFAN

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"Coming together is a beginning. Keeping together is progress. Working together is success"

– Henry Ford (1863-1947) –

GENERAL INFORMATION

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PREFACE

In October 2008, I started this research to complete my master study Business Administration at the University of Twente. This thesis metaphorically represents the last mountain I had to climb, and in this case it was also the highest. Not that I didn't like working on this assignment, on the contrary, I really enjoyed participating in this study and I am grateful to be involved in the project *Competences for Innovation*. Therefore I would sincerely like to thank Dr. Dries Faems and Safan for offering me this wonderful opportunity.

The objective of this study was to search within the field of user innovation for possibilities to lift Safan's innovative competences. The biggest challenge in writing this master thesis was the possibility to conduct scientific research in combination with the practical suitability. I think that the results are interesting for both science and practice and could be valuable in many ways.

Before you eagerly start to read I first want to thank some people for their valuable input and support during the whole process of writing this thesis. Particular thanks goes to the employees of Safan for providing me with the valuable information to make this research to a success, and in special to my internship supervisors; Dr. Ir. Klaas de Haas and Ing. Wim van Kranen. I also want to thank my supervisors at the University, Dr. Dries Faems and Prof. Dr. Ir. Olaf Fisscher for their valuable advice, guidance and critical opinions.

Finally I want to thank my family, friends and colleague students who where the Sherpa on this journey, and especially Linda, for her great support and trust during this whole process. I hope you all enjoy reading this master thesis!

Ben Leenders,

Enschede, May 2009

MANAGEMENT SUMMARY

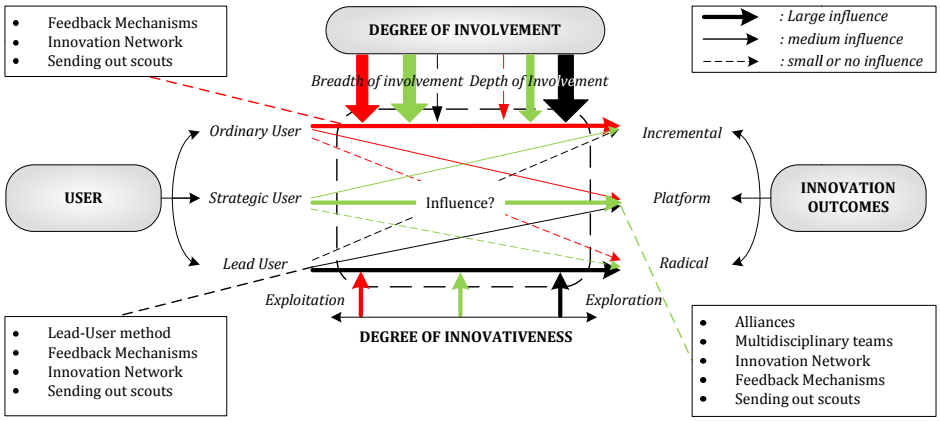
The purpose of this qualitative study is to create a better understanding on the complex topic of user innovation and apply these findings at Safan. Safan is a highly innovative producer of mechanical sheet-working solutions who engaged in the project *'Competences for Innovation'*, a project initiated by the University of Twente. The main reason to be part of the project was the feeling that Safan could enlarge their innovative capabilities by expanding their scope on innovative activities, and most of all by cooperating with its users. Therefore this thesis will focus on one particular strategy to improve the innovation performance of Safan: *the reliance on users to stimulate innovation.* To reach this goal the following research question was formulated;

> *In which way can current mechanisms for user innovation be optimized and which new mechanisms for user innovation can be introduced in Safan's innovation process?*

To answer this question I divided the central question into two sub-questions in order to cover both the theoretical part (*In what way should the user be involved in the innovation process according to literature?)* and the empirical part of this research (*What is the current situation at Safan concerning user innovation?)*

Theoretical analyses

In the theoretical analyses I focused on different dimensions as recognized in the user innovation literature. After identifying these dimensions and have integrated them in a theoretical framework, I performed an extensive literature study on these subjects in order to create a transparent view on relations, links and influences, and added them to my model. The next step was to search for mechanisms which could structure, guide and organize these processes. This resulted in my conceptual model as presented below and served as my frame of reference during the remainder of this research;



Empirical analysis

The empirical analysis served to answer the second question; *what is the current situation at Safan concerning user innovation?* To do so I performed interviews with employees from all departments involved in the innovation processes. However, during these interviews it became clear that my model only focused on *the active involvement* of the user, but did not included the *passive involvement* of the user. Therefore the analysis was divided in two parts. This resulted in the following bottlenecks.

Passive user involvement

- The ideas entering Safan are not stored in a structured way. A lot of information which could have been valuable in future NPD projects is lost.
- A lot of valuable information enters at Specials, but the contact and information sharing between R&D, Engineering and Specials is lacking structure and efficiency. Therefore a lot of this valuable information is lost or stays in the minds of the different departments.
- Safan employees receive no or hardly any feedback on their input, and do not have access to this information. At this moment there you can store this data in the change report database, but because of the major workload concerned with treating these so called proposals (e.g. there are still change proposals from 2007) a lot of these ideas are not treated anymore and will eventually disappear in the lot.
- There is no direct link between more technology related departments and the user. Market related departments are the information buffer and valuable information could be biased or even lost during the communication.

Pro-active user involvement

- Users are selected on intuition and not on well discussed and elaborated criteria. The users selected are most of the time strategic users.
- User-involvement is normally limited to traditional search mechanisms (e.g. market research or questionnaires and surveys). The I-Brake and TS did an attempt to bring the user involvement to a higher level, but the results were still not satisfying.
- Both sales and service see and feel the need to store information in a structured, more formalized way. At this moment there is no central database were all incoming information is stored or is accessible for other departments involved in the NPD process.

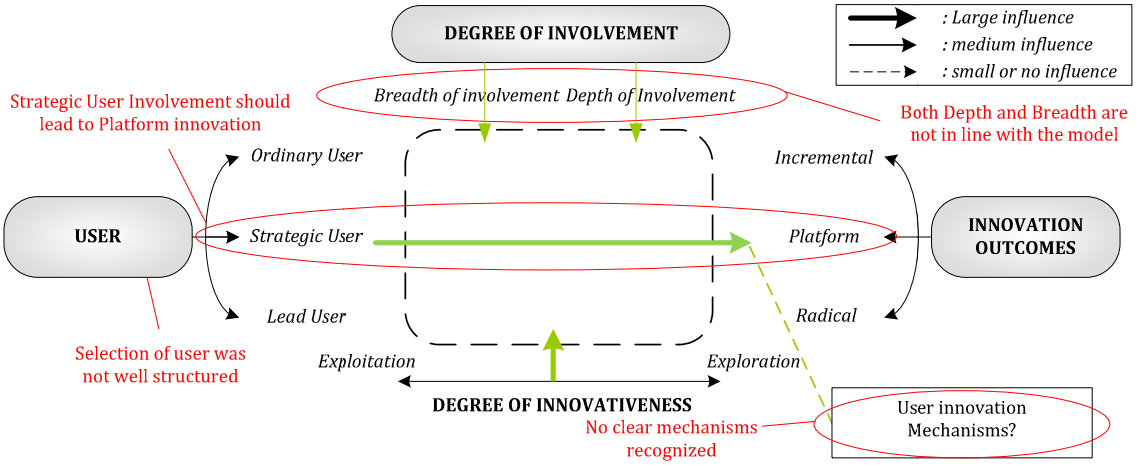
- Users are involved only in later stages of the NPD process; *concepts and ideas are already shaped at that moment*.

Discussion

In the discussion I confronted the theoretical findings and the empirical findings to search and explain the similarities, deviations and differences.

Pro-active user involvement

During the discussion I used my conceptual model as field of reference. Based on this model it can be stated that Safan did select the right user in the context of the I-Brake and TS project, but they are not aware of *'why they did it right'*. Intuition and experience is not sufficient to select the right user. Theoretically seen there was a match, but the input of the strategic users involved in the project was minimal and resulted in unsatisfying results. This was mainly caused by the lack of breadth and depth of involvement during the project. Besides that there were no well organized mechanisms present in the innovation process. There were several opportunities in this context, but Safan did not utilized the possibilities to improve mechanisms which are already present (think of the feedback mechanism in the form of log-data and the role of the user in multidisciplinary teams).



The other existing activities could be found in the role of service engineers and sales consultants as *scouts*, and the principle of *probe and learn* in the form of field tests as performed by Safan. However, just as with the mechanisms used in the I-Brake and TS project, these mechanisms' potential is not fully utilized. It showed that service engineers and sales consultants are potential sources for valuable input, but their current scope is rather limited.

Based on the conceptual model I recognized *three* major absent activities. *First* of all the range of users involved is limited to strategic users, while theory clearly show the benefits and need of involving also the ordinary user and

the lead user. *Secondly* Safan does not use several possible mechanisms to actively involve the user. Safan has strong incentives towards traditional marketing tools but this is no suited method to actively involve the user. Mechanisms such as the lead-user method or feedback mechanisms could improve the innovative Competences of Safan. The *third* point is about information management. While there is a new database concerning the complaints, there is no database or information sharing point which is accessible for every department concerned with the information generated through visits and observations at the user. Therefore potential input could be lost, which could have been prevented by a proper data sharing mechanism.

Passive user involvement

The discussion on the passive user involvement activities was facing one major problem: it didn't had the theoretical frame of reference as the active involvement had. This is why this part serves as a global discussion on possible explanations of the findings from the empirical analysis. To do so I used the concept of knowledge management. By confronting the empirical findings with knowledge management literature it became clear that Safan must improve their information management activities in order to effectively use it and communicate it through the organization. The issues as recognized at Safan cannot be seen as separate problems, but are parts of the bigger picture. For example, just a database would not solve the problems, the whole culture and strategy must stimulate these activities in order to make it work.

Conclusion

The conceptual model and the notion of passive user involvement both are valuable contributions to theory. Besides that it presents several valuable practical implications. However, to profit from these findings Safan has to focus on some points of improvement. Safan must realize the importance of selecting the right user in the right context. Selecting by the means of intuition and experience must be substituted by a well structured selection procedure. Therefore it is important to know your market and the characteristics of the different users, and it would be wise to map the current user portfolio by *ordinary, strategic* and *lead-users*. Secondly, because innovative success depends on both exploration and exploitation it is important to balance your research on these activities. Therefore it is important to involve all users and not only the strategic users. Besides that Safan must structure their knowledge infrastructure in order to use the incoming information more effectively. In order to stimulate these activities I recommend to:

- Involve the user more effectively in the multi-disciplinary project teams (both depth and breadth of involvement are important)

- Re-launch the Log-data feedback mechanism and involve all user groups
- Involve technology driven departments to support and reinforce market-driven departments in the active search for user involvement, and enlarge the scope in this search.
- Make use of the *Lead-user method* to stimulate explorative research.
- Introduce more *feedback mechanisms* in order to create a better understanding of the market and its needs (make sure that you involve ordinary, strategic and lead-users to cover the whole market).
- Create a *Central Sharing Point* to capture Innovative Ideas, in order to prevent information from getting lost, not well captured or effectively ventilated throughout the organization. This must be organized under the conditions of the recommendation on knowledge management.
- To structure and organize the incoming user information in the passive involvement context, I recommend doing a follow-up study concerned with knowledge management.

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1 INTRODUCTION

This first chapter will focus on the structure of the research. In § 1 a brief introduction to Safan and the background of the problem will be given to understand the reason for research. In § 2 the research objectives will be formulated. At first the research goal will be discussed. Then the scope of the research will be set, which in turn leads to the premises and constraints for the central question. Finally the research questions shall be formulated. In § 3 I will clarify the research method and § 4 will discuss the relevance of the research. I will conclude this chapter with the structure of this thesis.

1.1 Background

Safan is a highly innovative producer of mechanical sheet-working solutions (e.g. press-brakes, shears, integrated systems and automated product solutions like bending cells) Because Safan is not the biggest player on the market, they try to be the smartest. Safan's strategy therefore is to distinguish themselves by focusing on specific areas in the sheet metal industry and by offering highly innovative products. After their market entry with mechanical sheet working instruments in 1932, Safan's products evolved over time with as a fundamental change the introduction of its first hydraulic shear in 1965. The first breakthrough innovation came with Safan's servo-hydraulic press-brake in 1980. The introduction of robotics, ICT and servo-mechatronica in the sheet metal working industry gave rise to a new platform of innovations. After the introduction of the robot in 1988, Safan launched its innovative Touch Screen Control in 1995, the first servo-mechatronic press-brake in 1995, the first shear with hybrid drive 1999, and the first servo-electronic press brake; the first intelligent press-brake with integrated robots in 2007[1]. In order to maintain this continuous flow of innovations, Safan invests heavily in its own research and development department (R&D), growing from four to twelve employees in only two years time.

In the light of this evolving innovation process, Safan engaged in the project 'Competences for Innovation', a project which is initiated by the University of Twente[2]. The main reason to be part of the project was the feeling that Safan could enlarge their innovative capabilities by expanding their scope on generating innovation, and most of all by cooperating with its users or other knowledgeable actors in the mechanical sheet-working industry. But which users are best to involve in what situation, what sort of mechanisms can generate and stimulate this continuous flow of

[1] See appendix 1 for a visual representation of the technological platforms and innovations over time
[2] For more information about the project you can contact the author

innovations, and what mechanisms fit Safan's profile and wishes best? These kinds of questions triggered this study towards better innovative competences at Safan. In this thesis, the focus will be on one particular strategy to improve the innovation performance of Safan: *the reliance on users to stimulate innovation.*

1.2 Research objectives

According to Chesbrough, Vanhaverbeke and West (2006, p. 1663) it can be roughly said that the shift in the innovation scope at Safan can be seen as a paradigm shift from closed innovation to open innovation. They describe open innovation as "*a paradigm that assumes that firms can and should use external ideas as well as internal ideas, and internal and external paths to market, as they look to advance their technology"* (Chesbrough et al., 2006, p. 1)[3]. In the literature collaboration with users has been mentioned as one of the potential strategies to support a shift towards an open innovation model, and users are recognized as innovators in more and more cases (e.g. Von Hippel, 1988). Lettl (2007), for instance, emphasizes that it is an important capability "*to involve the 'right' users at the 'right' time in the 'right' form" (Lettl, 2007, p. 1).* Or as Schreier and Prügl (2008) states; *"Contrary to conventional wisdom, manufacturers are not exclusively responsible for generating ideas for new products. In fact, users have often been found to be the initial developers of what later became commercially important products and processes"* (Schreier & Prügl, 2008, p. 1). The next example will illustrate the power of user-driven innovation.

A study to the role of lead users at 3M company (Lilien, Morrison, Searls, Sonnack, & Von Hippel, 2003), describes the following;

> *"3M is known for its innovative capabilities – and we find that lead user process improves upon those capabilities. Annual sales of lead user project at 3M are conservatively projected to be $ 146 million after 5 years – more than eight times higher than sales for the average contemporaneously conducted "traditional" project. Each funded lead user project created a major product line for a 3M division. As a direct result, divisions funding lead user project ideas experienced their highest rate of major product line generation in the past 50 years"*

However, involvement of the user often happens in a non-systematic and barely reflected way. According to Ornetzeder (2006) it is the case that "*many firms do not make sufficient use of the available potential of user experiences and expectations for further product improvements."*(Ornetzeder, 2006, p. 140). Therefore, it is very important to organize and structure this process, in order to involve the user in an efficient way. But by what

[3] This topic will be described in more detail in chapter 2

means, tools, or mechanism could this process be structured or organized? With the topics described above in mind, a transparent and focused research goal can be defined

1.2.1 Research Goal

By confronting theory and practice, it must become clear which existing user innovation mechanisms at Safan must, or can be optimized, and which additional user innovation mechanisms could be recommended to lift the innovation process to a higher level. It must strengthen Safan's innovative competences and create an environment where the continuous flow of innovation by the user is normal, rather than exceptional. This leads to the following research goal;

> *Lift Safan's innovative competences to a higher level, and sustain a continuous flow of innovations, within the scope of user innovation*

To reach this goal, some research questions must be formulated. But first a well defined research scope must be defined.

1.2.2 Scope of the research

The term *user* must be worked out in more detail in several ways. *First* of all, Looking at the characteristics of a supply chain, an actor can be a user as well as a manufacturer or a supplier (von Hippel, 2005). For example, an aircraft manufacturer is in the case of an airline industry a manufacturer. But if you look at the metal-forming industry, this same manufacturer is a user. In this way a firm or an individual can form different functional relationships. Von Hippel (2005) sees the necessity of the clear distinction on what exactly is a user and what is a manufacturer or a supplier. Important is to place these actors in the correct context. In this study Safan is seen as the manufacturer and shall be treated as so. A *second* point to be stressed is that numerous literature studies refer to both *users* and *customers* as the same (e.g. *"If within-segment variation is low, users within the segment (…) product designed to serve all customers in their segment"* (von Hippel, 2005, p. 37)). In this case, the term user will be defined as stated by Von Hippel (2005, p. 3); *"Users are firms or individual consumers that expect to benefit from using a product or a service. In contrast, manufacturers expect to benefit from selling a product or a service".* According to the dictionary a customer can be defined as; "*a patron; one who purchases or receives a product or service from a business or merchant, or plans to. Every person who passes by is a potential customer"* [4]. This term is closely related to the term user, but to be succinct the term *user* is used throughout this study to refer to both

[4]Customer. (n.d.). *Dictionary.com Unabridged* (v 1.1). Retrieved October 28, 2008, from Dictionary.com website: http://dictionary.reference.com/browse/customer

customer and user, and so they won't be used interchangeably. A *third* point is that the term user shall consist out of existing users as well as potential users. An important constraint is that these users are all present in the current market, not in analogues markets. Figure 1 gives a visual representation of the scope of the research.

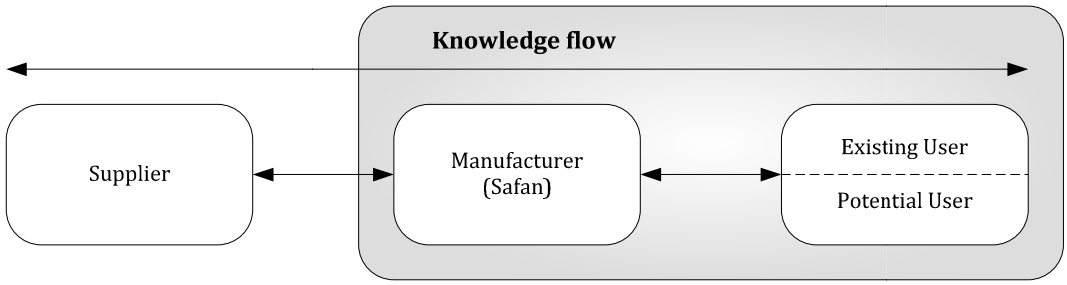

Figure 1: Research scope

1.2.3 Central question

When looking at the goal, it is important to cover all areas, but not to cross the borders created by the scope's constraints. To do so, a main question is formulated, and secondly some research questions will give structure and depth to the research.

> *In which way can current mechanisms for user innovation be optimized and which new mechanisms for user innovation can be introduced in Safan's innovation process?*

Definitions

- As mentioned in § 1.2.2 the term user is rather ambiguous and will be used in this thesis as defined by Von Hippel (2005, p. 3); *"Users are firms or individual consumers that expect to benefit from using a product or a service. In contrast, manufacturers expect to benefit from selling a product or a service".*
- Because much literature has been written about innovation, there are also many definitions. The definition used in this study is conducted from the Narayanan (2001); "*Innovation refers to both the output and the process of arriving at a technologically feasible solution to a problem triggered by a technological opportunity or customer need".*
- *User innovation* will be used as; the input and involvement of the user in the innovation process in order to generate new innovative ideas and products (von Hippel, 2005; West, 2008).
- The term *mechanism* will be used as described in the dictionary[5]; "*An instrument or a process, physical or mental, by which something is done or comes into being".*

[5]Mechanism. (n.d.). *Dictionary.com Unabridged (v 1.1)*. Retrieved November 04, 2008, from Dictionary.com website:

1.2.4 Research questions

Since the central question cannot be answered directly and consists of several subjects, it is split up in the following research questions.

- In what way should the user be involved in the innovation process according to literature?
  - *What users should be involved in what context?*
  - *What mechanisms can be recognized according to the user innovation literature?*
  - *In what context should these mechanisms be used?*
- What is the current situation at Safan concerning user innovation?
  - *What users does Safan involve and how do they do that?*
  - *Which mechanisms to actively involve users in the innovation process do/did they use/ used already?*
  - *How are these user innovation mechanisms organized?*
  - *How does Safan evaluate these existing user innovation mechanisms?*

1.3 Method

In order to pursuit the research objectives, several steps need to be executed. In this paragraph I will discuss the used research method clarify and structure these steps. I used the model as described by Verschuren & Doorewaard (2007) as a starting point.

1.3.1 Orientation

The orientation phase describes the sources that provide input for the analyses. A first step is the practical orientation which comprises interviews with some experts at Safan, and a meeting with respect to the project Competences for Innovation. The second step in the orientation phase is the search for literature based on library and internet sources. Theory will comprise the topics of open innovation and the role of the user in these innovation practices. Based on these findings the problem will become more transparent and the research goals can be formulated.

1.3.2 Analysis

The analytical phase comprises a theoretical analysis and an empirical analysis. The methodology used concerning both parts are discussed in more detail at the beginning of each chapter.

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http://dictionary.reference.com/browse/mechanism

1.3.3 Design

In order to look at possible points of improvement or similarities between practice and theory, I discussed results from both analyses; *the current situation at Safan* and *the results from the theoretical analysis*. These differences or similarities form the basis for the conclusions and recommendations. The developed conclusions will be used to formulate the recommendations which are to guide Safan towards improvements in its innovation process. Figure 2 visually maps the methodological steps taken in this research.

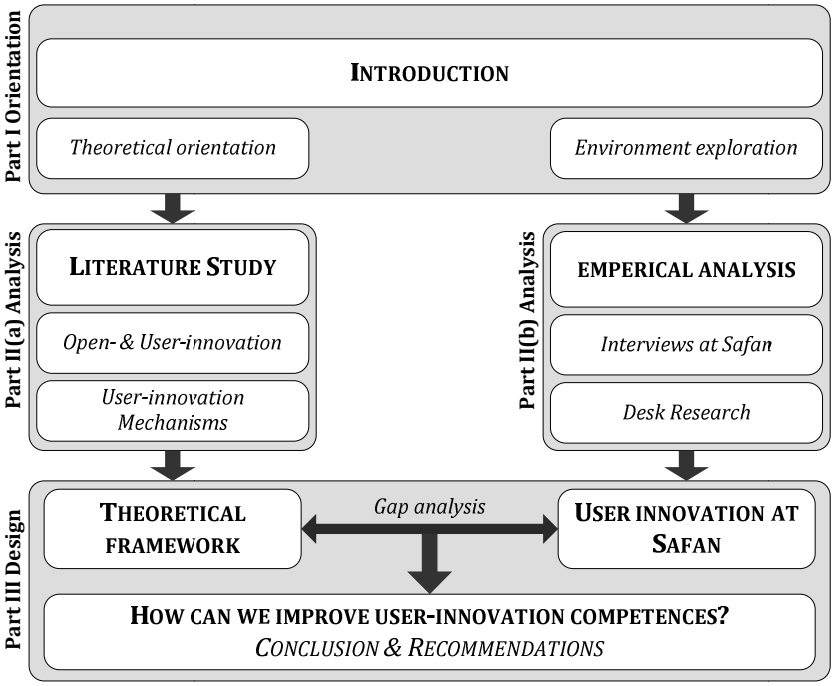


Figure 2: Research model

1.4 Research structure

So far I have presented a brief overview on the topic to be discussed. From this point forward the research shall be divided in *three* parts. The first part is the extensive literature study in which I will present my theoretical model. This chapter is structured in four major paragraphs in which paragraph 1 will give the methodology as used in the literature study and paragraph 2 will discuss the role of open innovation and the role of user innovation within the scope of open innovation. Paragraph 3 provides a research model based on the different dimensions concerning user innovation, while paragraph 4 extents this model by looking at the different user innovation mechanisms. The *second* part, containing chapter 3 presents the empirical analyses based on the current situation at Safan, considering the topics of the current innovation-structure and NPD process, the role of the users in the NPD

process, and some past events concerning the user in the NPD process. Finally, based on these findings I will present my conclusion and recommendations in chapter 5 and will answer the research question of this research by giving the conclusions of this study, recommendations towards better innovative competences and finally the limitations of this research and some suggestions for further research. A visual representation of the structure is given in figure 3.

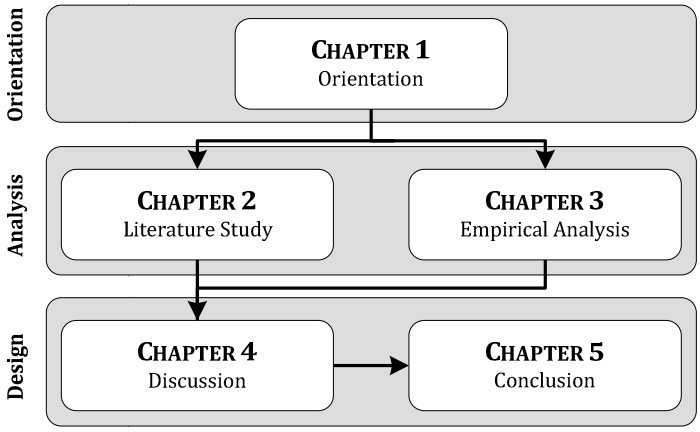


Figure 3: research structure

2 LITERATURE STUDY

This chapter will focus on the theoretical part of the analysis phase and will answer the first research question as formulated in chapter 1:

- *In what way should the user be involved in the innovation process according to literature?*

In order to do so I will start in §2.1 by explaining the methodology used to conduct the theoretical analyses. Secondly I will concentrate on the focus of user innovation within the scope of open-innovation in §2.2. Based on these basics I will go into more detail towards the role of the user in the innovation process in § 2.3. I will conclude with §2.4 in which I will concentrate on the mechanisms to involve the user.

2.1 Methodology

In the light of the theoretical analysis, the first step will be a global literature study on the subject of open-innovation and the role of the user to provide a theoretical fundament on which I can build my theoretical model. To come to the theoretical model I conducted an extensive literature study on the subject of user innovation. In both cases, theory was found by using books, articles and other sources available by search engines at the University of Twenty, and the Internet. A kind of *'snowball method'* was used to get to the core of some subjects.

This analysis *first* concentrates on the paradigm shift from traditional- to open innovation models. After this step I will focus on the role of the user in the open- and closed innovation philosophy to create a common understanding on the subject and highlight some points of attention. The next step will depart from the clearly defined research boundaries and will concentrate on user innovation in more detail. By splitting up the research questions in terms of innovation (*user, innovativeness, involvement* and *outcomes)* I conducted a theoretical analysis resulting in a generic model on user innovation. The *second* step is to investigate what mechanisms are to be distinguished in literature and can be used to organize user innovation. To do this I look at different mechanisms as recognized in literature, and focused on the constraint of this study: *the mechanism had to deal with user involvement*. Besides these mechanisms I will treat some feedback mechanisms and finally I present an overview.

2.2 A paradigm shift and the role of the user

§2 is the first part of the theoretical analyses. This part will sharpen the scope of this research by focusing on the shift towards the open innovation paradigm and the role of the user in this context. I will start with the shift from the closed to the open innovation paradigm in §2.2.1. In §2.2.2 the importance of collaboration in this new way of thinking is discussed, followed by §2.2.3 in which I will link user innovation to the open innovation paradigm. Finally I will emphasize the difficulties of translating the actual user-needs. This paragraph will end with a short résumé on the discussed topics.

2.2.1 Rise of the open innovation paradigm

Since ages, innovation and change are seen as important and even crucial for the long-term survival and growth of a firm (e.g. Schumpeter, 1939). The nature of the innovation process however, has become more costly, uncertain, riskier and interdisciplinary. In today's rapid changing business environments, there is no task more vital than the management of these innovations and changes (Tushman, 1986), and it's unending process to reengineer and reorganize the new product development (NPD) processes and structures (e.g. Cooper & Kleinschmidt, 1995). Traditionally this NPD and technology development was done within the scope of the closed innovation paradigm, which is called a closed system because projects can only enter and exit in one way, as illustrated in Figure 4.

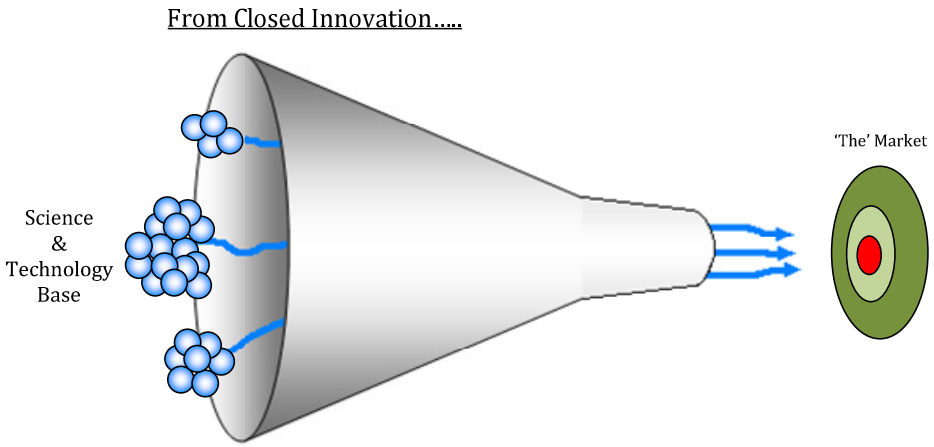


Figure 4: The closed innovation model [Source: Based on Chesbrough, 2006]

This traditional, inwardly focused, vertical integration model can be understood as a process where NPD and technology development is the result of internal R&D activities, which then are distributed by the firm itself (Chesbrough et al., 2006). In the old paradigm the firm is the locus of innovation and the processes are focusing on internal knowledge, and underestimate or even neglect the use of external knowledge; it is related to self-reliance: "*If you want something to be done right, you've got to do it yourself*"(Chesbrough, 2003a, p. 36).

With the introduction of the open innovation paradigm, a new philosophy was born that shed a new light on the innovation process. The main idea of open innovation is to gain better access to ideas, knowledge and technology when you look outside the boundaries of the innovation funnel, rather than solely trust on your own resources[6]. It is not only about securing the best and brightest anymore, the 'man of genius' who is trusted on its research talent, heavily funded and expected to eventually create innovations which need to be successful. A famous saying used to emphasize the role of open innovation says *'not all the smart people work for us'*.

TEXTBOX 1

Open Innovation in Practice: *The Automotive Industry*

Consider how an automobile manufacturer would apply open innovation; "*If the company wanted to design an innovative braking system, it might start by trying to find out if any innovations had been developed by groups with a strong need for better brakes, such as auto racing teams. The automaker wouldn't stop there, however. Next it would look to a related but technologically advanced field where people had an even greater need to stop quickly, such as aerospace. And, in fact, aerospace is where innovations such as antilock braking systems were first developed: military aircraft commands have a very high incentive to design ways to stop their very expensive vehicles before they run out of runway.*" *(Von Hippel, 1999, p. 48)*

As said, the model stresses the importance of the use of a broad range of sources and an externally focused perspective. These external sources for the innovation and invention activities include customers, rivals, academics, and firms in unrelated industries (Chesbrough et al., 2006). As shown in Figure 5, projects in the open innovation model can enter the process from either an internal or an external technology base, whereas the latter can enter during the later stages as well.

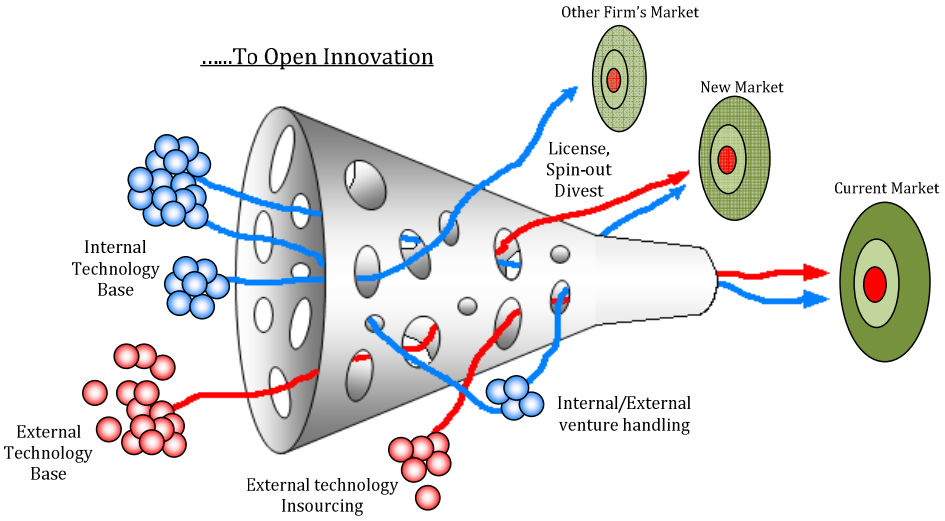


Figure 5: The open innovation model [Source: Based on Chesbrough, 2006]

[6] See Textbox 1

To create a better understanding, some practical differences shall clarify the contribution of this '*new way of thinking*'. When going a step back and look at the closed model, it can be said that because of this inward focus, spillovers (unwitting outbound flows) are a logical outcome in this process (Chesbrough, 2003b; Chesbrough et al., 2006). They were always seen as a cost, but in the new paradigm they are seen as an opportunity to expand the company's business model, or to discover different markets by a technology spin off. Another difference lies in the area of intellectual property (e.g. patents). Traditionally, patents gave the internal R&D a degree of freedom, a mechanism to avoid the burden of litigation. However, a lot of these patents were never used and were worth a little. Instead, in the open innovation model these patents are seen as an asset to create additional revenue or a tool to direct a business model towards new markets and opportunities (Chesbrough et al., 2006). Table 1 gives an overview of the primary differences between the open and closed innovation model.

Table 1: Contrasting principles of Closed and Open Innovation [Source: Chesbrough 2003a, pp. 38]

Closed Innovation Principles	Open Innovation Principles
The smart people in our field work for us	Not all of the smart people work for us, so we must find and tap into the knowledge and expertise of bright individuals outside the company
To profit from R&D, we must discover, develop and ship it ourselves	External R&D can create significant value; internal R&D is needed to claim some portion of that value
If we discover it ourselves, we will get it to the market first	We don't have to originate the research in order to profit from it
If we are the first to commercialize an innovation, we will win	Building a better business model is better than getting to market first
If we create the most and best ideas in the industry, we will win	If we make the best of use of internal *and* external ideas, we will win
We should control our intellectual property (IP) so that our competitors don't profit from our ideas	We should profit from others' use of our IP, and we should buy others' IP whenever it advances our own business model

2.2.2 Inter-organizational collaboration

As recognized above, to use the external resources in an effective way, different actors must be involved into the innovation process. As so, in this paradigm it is important to focus on activities concerning collaborating with other actors (Chesbrough et al., 2006). These inter-organizational activities are becoming more and more important, and are recognized as a valuable contribution to the expansion of the innovative scope towards an external focus (Faems, Van Looy, & Debackere, 2005; Hagedoorn, 2002; Hagedoorn & Duysters, 2002). The different actors involved, can range from existing and potential suppliers, customers and lead users, universities and research centres, to competitors (Faems et al., 2005). All of these actors are potential partners and sources to collaborate with, and all of them have different capabilities to attribute to the innovative Competences of the firm. Through these forms of collaboration firms hope to increase their innovative potentials in several ways. For example,

collaborative activities can generate complementary assets needed to make an innovation successful, stimulate the transfer of tacit and codified knowledge, become familiar with new Competences that are rising in a firm's own industry, or analogue industries, and it can reduce risks by spreading costs etc. Despite the numerous possibilities in the field of collaboration, the locus of this research will be on user innovation. Therefore the only collaborative relation treated in this study will consist of the interaction between Safan and its users.

2.2.3 User innovation as part of the open innovation philosophy

The term user and the shift/meaning of the open innovation paradigm are thoroughly discussed in the former paragraph, but now we need to concentrate on the actual role of the user within the scope of the open innovation model. According to Joel West (2008) open innovation can be divided in three focus-models; *Vertical integration, cumulative innovation* and *user innovation.* As you can see in Table 2, all different actors are covered by the open-innovation model.

In short, in the case of *vertical integration* firms need to integrate several practices in order to supply inputs and control outputs. R&D is an essential part of the integration, and technology-based industries require large R&D labs. *Cumulative innovation* is based on the assumption that initial innovation is rarely complete, and thus enables later technological processes. Therefore cooperating with your competitors is essential. However, you need to have rights to each others' work and some IP regimes can hinder this cumulative innovation. The goal of *user innovation* is to engage the user in its innovation process; users know their needs best. In this context you can think of using empowerment or other motivations, or you can engage them directly in the process with toolkits or indirect with feedback mechanisms. Processes, tools and designs are required in this case. This paragraph links user innovation to the open innovation paradigm and from this point forward the focus will solely be on the role of the *user as an innovator.*

Table 2: Sources of Innovation [Source: Joel West, 2008, sl. 4]

	Focal firm	User	Supplier	Rival
Vertical Integration	X			
User innovation	X	X	†	
Cumulative Innovation	X			X
Open Innovation	X	X	X	X

X: Sources of Innovation; †: Limited emphasis

2.2.4 A shift in user-involvement practices

According to Prahalad and Ramaswamy (2000), user involvement in the past could be compared with traditional theater. On stage the roles were clearly defined, and customers paid for their tickets and watched passively. Nowadays this scene is shifting to the more experimental theatre, where both parties are involved in the play; *everyone and anyone can join*. Based on their findings a few important trends on user-involvement in the NPD process are outlined.

Till the end of the last century users were seen as passive buyers with a predetermined role of consumption, whereas now users are actively involved in the NPD process as collaborators, co-developers and where they are seen as part of the enhanced network of a firm (Prahalad & Ramaswamy, 2000). Also the managerial mindset on users was evolving from the view of a user as an average and individual statistic, to a person whom you can build up trust and a relation with, and finally the view of users as part of an emergent social cultural fabric. These changing dynamics also involved change in the interaction between a company and its users, and the purpose and flow of the communication. In the new situations the user is more actively involved in the NPD process. Instead of the use of traditional market research and one-way communication, the focus now stimulate users to be co-developers and join in the active dialogue with firms to shape expectations to create 'buzz'.[7] Of course there has been considerable attention in the literature on market orientation, such as market-driven or customer-focused development, but they are not the same as user involvement (Pinegar, 2000).

The traditional process leaves the user more or less outside the NPD process, and the firm and its users have distinct roles of production and consumption, respectively. The user, most of the time aggregated into "meaningful segments" for ease of exchange, only gets involved at the actual point of the exchange, not in the NPD itself (Prahalad & Ramaswamy, 2004). This old fashioned way of thinking could be best described as the firm-centric approach. The primary role of this firm-centric view is to exchange and extract value, not to create value through co-creation (Figure 6).

According to Prahalad and Ramaswamy (2004) the new firm-user interface shifts towards a more personalized user experience. The users of today are better equipped with knowledge, are informed, networked, empowered, and active, and are able to co-create value with a firm. They believe that the interaction between the user and the firm is becoming more and more important. *The market will change towards a forum for conversation and interaction between users, user-communities, and firms* (Prahalad & Ramaswamy, 2004, p. 5) .

[7] Appendix 2 gives a schematic overview of these evolutions in user involvement.

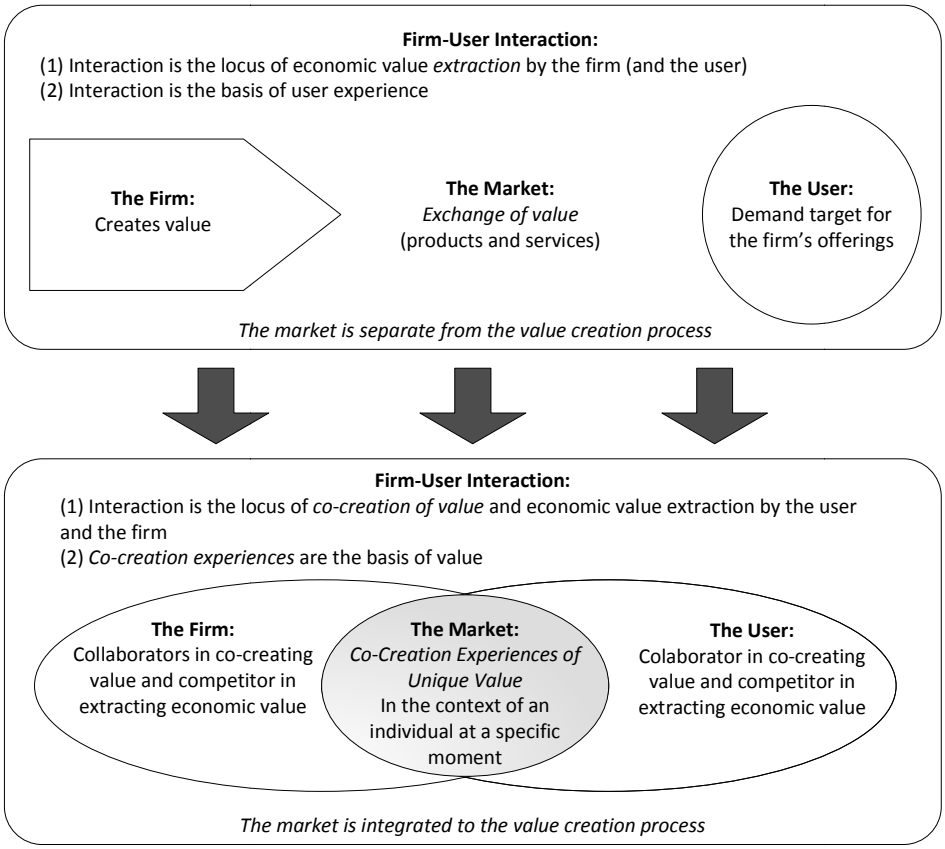


Figure 6: The shift in firm-user interaction [Source: Based on Prahalad & Ramaswamy, 2004, p. 7 and 11]

It is clear that the awareness on the possibilities of user involvement is there, but what are the consequences, advantages and disadvantages when involving the user in the NPD process?

2.2.5 The difficulties of translating user-needs

There is no doubt that users are a valuable source of information in the NPD process. However, it has been proved to be difficult for manufacturers to conceive these actual 'needs' of the user (e.g. Prahalad & Ramaswamy, 2000; Thomke & von Hippel, 2002). It is a costly and time-consuming process due to the fact that 'needs' are often complex, subtle, and fast changing. And even if the user knows exactly what it wants, it is difficult to translate this information (or as some say; *sticky-information*) clearly and completely to the manufacturer (C. Luthje, Herstatt, & Von Hippel, 2005; Thomke & von Hippel, 2002). Users and manufacturers tend to develop different *types* of innovations. This is due in part to information asymmetries: users and manufacturers tend to know different things (von Hippel, 2005, p. 8). Users tend to develop innovations that are functionally novel, requiring a great deal of user-need information and use-context information for their development. In contrast, manufacturers tend to

develop innovations that are improvements on well-known needs and that require a rich understanding of solution information for their development.

Also problematic is the fact that users often are not aware of, or fully understand their needs until the moment they actually try out a certain product (e.g. a prototype). Von Hippel (2005) states that in the traditional model of innovation, "*a user's only role is to have needs, which manufacturers then identify and fill by designing and producing new products*" (von Hippel, 2005, p. 3). The traditional marketing instruments to recognize these needs manage to skim the surface for new ideas, but they do not manage to get to the core of the user's needs (Kristensson, 2004; Tidd, Bessant, & Pavitt, 2005). This tactic results in a trial-and-error interaction between the manufacturer and the user. These difficulties makes it interesting and most of all very important to find a way to translate these needs in an effective way and positively influence the outcome off the NPD process.

Discovering these user needs is not only important for the NPD process, it can be useful for the entire business as well, providing value beyond the development of any single product because (Patnaik & Becker, 1999, pp. unknown, list found in and quoted from Kankainen, 2002, pp.14):

- Needs last longer than any specific solution. Thinking of the company as a provider of a solution might lead to continuously improving that solution but it rules out creating completely new offerings that satisfy the same need in different ways
- Needs are opportunities waiting to exploited, not guesses at the future. Strategic product development does not have not to depend only on predicting the future because a crucial part of that future already exists in the form of human needs.
- Needs provide a roadmap for development. A company may not have all those capabilities to satisfy needs but discovering them can help in determining what corporate skills, strategic alliances, and core Competences should be developed.

2.2.6 Concluding comments

To recapitulate, as we saw in this chapter, the open innovation paradigm shines a new light on the innovation process. The inwardly turned focus of the traditional model is changing to a new and external orientation. This external focus makes collaboration with different actors in the firm's environments very important, and the user can be seen as one of these actors. When looking at the role and involvement of the user in the innovation process, user innovation can be seen as a part of this open innovation paradigm. The involvement of the user changed quit dramatically and is shifting in the light of the open-innovation paradigm; *collaborate with others*. The involvement of the user in the NPD process was normally done at the actual point of transaction, and the needs of these users

were generated by traditional marketing instruments which only skimmed the surface, without getting to the core. At this moment in time the awareness of the *'need for change'* is there, and the shift of thinking towards a more integrated involvement of the user in the NPD process is becoming more and more visible. Now the question rises; *how can these users get involved in the NPD process in the right way*?

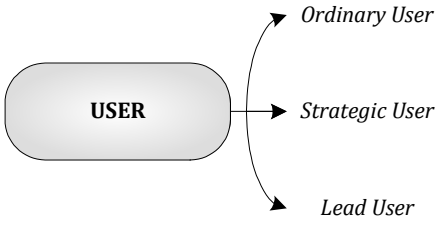
2.3 Users as innovators

Now the focus of this study and the difficulties of involving the user are clear I can focus on the role of the user as an innovator. In order to give a well structured discussion on the role of the user as an innovator, I first want to zoom in further on the characteristics of a user, the degree of innovation, the degree of involvement of the user, and the outcomes of the NPD process. Therefore, I will look in §2.3.1 at the *ordinary user,* the *strategic user* and the *lead-user*, at the degree of innovativeness in the form of *exploration* and *exploitation,* the role of the involvement of the user by looking at the *degree of user involvement* in terms of *Breadth* and *Depth,* and the actual outcome of the NPD process in terms of *radical, platform* and *incremental* innovations. At the end these different topics will be combined in a research model. In §2.3.2 the research model will be worked out in more detail to explain relations and create a clear view on the different influences. The results of this paragraph will be discussed in §2.3.3 by giving the results of the analyses. I will end this paragraph with a short concluding comment.

2.3.1 The user and innovation

2.3.1.1 Users

Based on research by Von Hippel (1988, 2005), Schreier and Prügl (2008), and Bonner (2004), I will make a distinction between three categories of users; *ordinary users, strategic users* and *lead-users.* Ordinary users are those users who drift well on stability in the market, are risk-averse and are satisfied with products that are designed to meet the need of a large number of users (von Hippel, 2005). Strategic users bare almost the same characteristics as the ordinary user, but the main difference is that strategic users are the large and most powerful customers, which are closely related to the firm. They also have more in-house knowledge, experience, expertise and resources. The ordinary and strategic users represent most of the users, and therefore are in many cases a strategic target for manufacturing firms. In contrast, lead-users are positioned in the leading edge of the market.



Von Hippel (1988) defines "lead users" of a novel or enhanced product, process or service as those displaying two characteristics with respect to it:

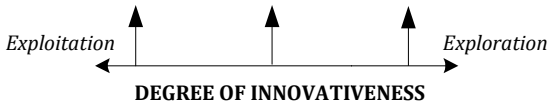
- *Lead-users face needs that will be general in a marketplace – but face them months or years before the bulk of that marketplace encounters them,* and
- *Lead-users are positioned to benefit significantly by obtaining a solution to those needs*

Shreier and Prügl (2008) describe the rationale of this theory as;

> *"The 'ahead of trend' component is assumed to explain the commercial attractiveness of user innovation. The rationale behind this idea is that market needs tend to evolve along the lines of certain underlying trends. Users residing at the leading edge of these trends will therefore experience needs today that the majority of the market will not experience until tomorrow. If users who are ahead of trends innovate in response to their own needs, the resulting solutions might subsequently become highly attractive to broader parts of the market." (Schreier & Prügl, 2008, p. 333)*

In other words, lead-users have a high incentive to solve a problem, and so they may innovate. After all, necessity is the mother of invention. They also are ahead of the target market in an important dimension, so that what they want in the present is what the market (ordinary users) as a whole wants in the future. In literature (e.g. von Hippel, 2005), lead-users are also recognized in analogues markets, but with the scope of this study in mind the focus will be on lead-users in the existing market.

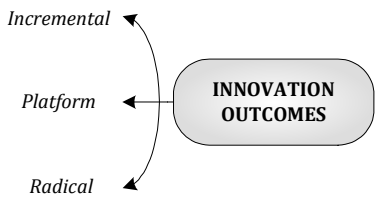
2.3.1.2 Degree of Innovativeness



Many studies state that innovation can be classified along two domains; *exploration* or *exploitation* (e.g. Benner & Tushman, 2003; Jansen, Van den Bosch, & Volberda, 2006). The exploration of new possibilities and the exploitation of old certainties therefore are a central question in several studies on innovation management (Benner & Tushman, 2002; Faems et al., 2005; Gupta, Smith, & Shalley, 2006; He & Wong, 2004; March, 1991; Uotila, Maula, Keil, & Zahra, 2007). In this case explorative activities are best described using terms as *search, variation, risk taking, experimentation, flexibility, discovery and innovation,* or "*the experimentation with new alternatives. Its returns are uncertain, distant and often negative"* (March, 1991, p. 85). In contrast, exploitation includes such things as *refinement, choice, production, efficiency, selection, implementation and execution,* or; "*the refinement and extension of existing competences, technologies, and paradigms. Its returns are positive, proximate and predictable"* (March, 1991, p. 85). Or as defined in terms by

Benner and Tushman (2002, p. 679) *"exploitative innovations involve improvements in existing components and build on the existing technological trajectory, whereas exploratory innovation involves a shift to a different technological trajectory".*

2.3.1.3 Innovation Outcomes

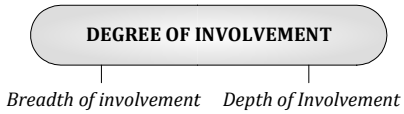


While explorative and exploitative Competences are more or less the 'activities' and 'thinking patterns' applied to generate innovations, I will use the terms *radical, platform* and *incremental* innovations to describe the actual outcomes of these processes. For example, when you think in an explorative way the outcome will, theoretically seen, result in a more radical innovation, while incremental innovations are a typical result of exploitative thinking (Leifer et al., 2000). A radical innovation can best be defined as stated by Leifer et al. (2000, p. 5); "*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".* The focus lays on management of opportunities (resource leverage) and on creativity and entrepreneurship. They will cost you money on the short term, but they are essential for the continuity of the firm's performance. In contrast, an incremental innovation is an improvement to an existing product or process. Incremental innovations contribute to the management of operations (efficiency). There is a dominant role of planning and control, and it brings you money on short term, but there is no guarantee for the long term. Where incremental and radical projects form both ends of the innovation spectrum, platform innovations can be found in the middle of the innovation spectrum. Wheelwright and Clark (1992) state that these platform innovations entail more product changes than incremental innovations do, but they don't introduce breakthrough technologies or materials like radical innovations do. They suggest that "*well-planned and well-executed platform products typically offer fundamental improvements in cost, quality, and performance over preceding generations (…) Platforms also represent a significantly better system solution for the customer" (Wheelwright & Clark, 1992, p. 73).* Table 3 captures the main characteristics of the different outcomes in a useful way.

Table 3: Differences in Types of R&D Projects [Source: (Based on Narayanan, 2001, p. 316)]

	Innovation Outcomes		
Characteristics	**Incremental**	**Platform**	**Radical**
Business objectives	Support existing business	Alter the rules of rivalry Create new Businesses	Enhance technical capability
Probability of success	High	Moderate to low	Low
Potential rewards	Low	Medium to High	High
Risks	Low	Moderate to low	Uncertain

2.3.1.4 Degree of involvement



Based on a study by Fang (2008b), user-involvement will be added as the fourth dimension, because the author states this dimension has an important impact on the success of an NPD project. It consists out of the breadth of the involvement and the degree of involvement in the NPD process. As stated by Fang (2008), the breadth *"captures the scope of participation across the product development process, where a user could be involved in just one activity (e.g., product testing) or in a wide range of activities from new concept generation, prototyping, up to and including product testing"* (Fang, 2008b, p. 324). While the depth represents "*the level of user involvement in a phase of the product development process, where some users may only be superficially involved and other may be deeply involved"* (Fang, 2008b, p. 324).

2.3.1.5 Research model

Based on the findings above I generated the following research model (figure 7). The next step is an extensive literature study on how the involvement of the different users and characteristics influences the outcomes of innovation projects.

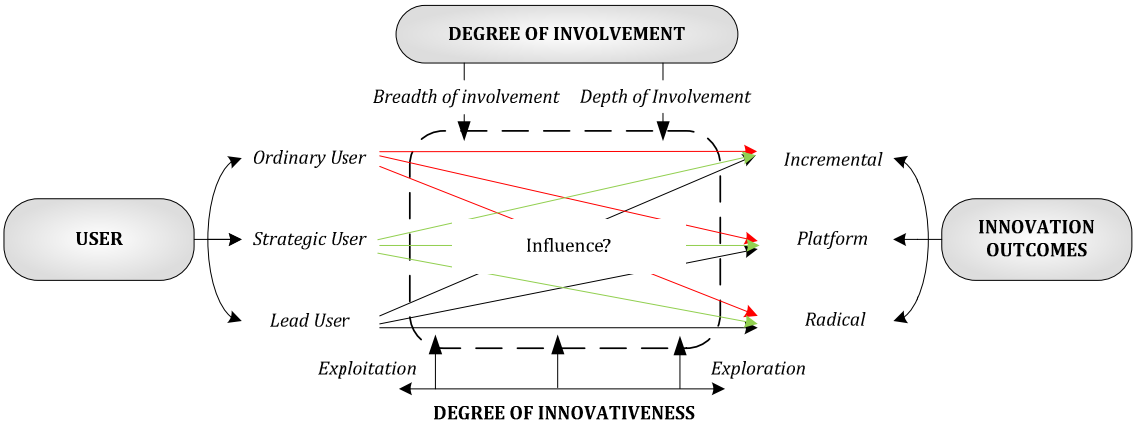


Figure 7: Research model [own research]

2.3.2 Analyses of the research model

2.3.2.1 The user and innovativeness

It is well accepted in literature that organizations need to balance their explorative and exploitative activities in order to optimize their innovative performance (Benner & Tushman, 2002; Gupta et al., 2006; Uotila et al., 2007). But because exploration and exploitation are believed to draw on different structures, processes and resources it is hard to find this balance (He & Wong, 2004; March, 1991). I will illustrate this with an example; if you emphasize

your innovative activities on improving the efficiency and reduce variety, the short-term performance will increase. However, it will also increase the risk of becoming trapped in old skills and habits, which threatens the performance on the long run. The other way around, if firms over-emphasize exploration in order to stimulate the long-term performance, it will fall into the cycle of spending the scarce resources resulting in a little pay-back on the short-term.

Although this balance is important, in the literature written about exploitation and exploration in a *user-context*, the emphasis lays on exploitation. According to Benner and Tushman (2003) and Bonner (2004) the involvement of the user in the NPD process is most of the time exploitative-oriented, because they are building upon existing organizational knowledge and resources. And even more specific, exploitation serves the current user, while exploration searches for emerging customer sets. Christensen and Overdorf (2000b) and Bower and Christensen (1995) even state that working together with the current user will not support innovation projects with a more explorative nature at all. They state that the more companies listen to the existing users, the more aligned the innovations will be with the needs of the customer. In this respect Lettl et al. (2006) recognizes two important barriers of involving these users in explorative projects. First they state that cognitive limitations can hinder users in delivering valuable input. Or in other words '*The barrier of not knowing';* when generating new ideas, users can be 'functionally fixed' to their current situation, which makes it extremely hard to develop radical new ideas. This especially is the case when involving ordinary users, but is less obvious when involving strategic users. This is because strategic users usually have more in-house knowledge, expertise and resources, which are valuable sources for NPD stimulating platform innovations (Schreier & Prügl, 2008; Wheelwright & Clark, 1992). Therefore, in the case of strategic users, the focus in the innovative spectrum can't be pinpointed solely to exploitation and the development of incremental improvements, but can be found in the middle of the spectrum; between *exploitation* and *exploration*.

The second barrier as stated by Lettl et al. (2006) is based on the assumption that users might not be willing to contribute to an explorative project. This can stem from high anticipated switching costs and the fear existing knowledge becomes obsolete (Lettl et al., 2006, p. 26). According to Bonner (2004) this last point is especially the case if a firm is dealing with its largest and most powerful users; *the strategic users*. He suggests that a firm's largest and closest users can be resistant towards major change in either a technology or a product. The new situation can be very different and not meet the needs as effective as in the user's current position. These users are more interested in incremental or platform improvements to existing products. In this situation users often represent a *'user needs'* view, which is based on a homogeneous and short-term interest.

An exception to the characteristics of the 'ordinary' and 'strategic' user as discussed above is the role of the lead-user. In contrast to the role of ordinary and strategic users, many theories recognize the lead-user as a valuable partner in research to radical solutions (e.g. Lettl et al., 2006; Thomke & von Hippel, 2002; Von Hippel, 1988, 2005). As defined in paragraph 3.1 the lead user is operating in the leading edge of the market, and has a high incentive to solve a problem. Lead-users will therefore experience needs today, where the other users will not experience them until tomorrow. To solve these problems, lead-users are strongly linked with explorative research; they not only provide the needs, but also the solutions (Lilien et al., 2003). A major drawback in the lead-user method is the fact that there is limited understanding of whom a firm's lead-users are, and identifying them is one of the biggest challenges. But once you manage to succeed in this search the advantages and gains can be large. Table 4 gives an example of empirical evidence found by Lilien et al. (2003) concerning the influence of different users on the innovativeness.

Table 4: Idea type generated by Lead user vs. non Lead User methods [Source: Lilien, 2003, p.48]

	Idea Type Generated	
	Incremental	**Breakthrough**
Non lead-user method	41	1
Lead-user method	0	5

2.3.2.2 User involvement

According to Tidd et al. (2005) a successful innovation process depends on maintaining a strong user perspective over time; not the one-off information gathering instruments, but a continuous interaction with the user. Involving the user over the total breadth off the process will reduce redesigns and mismatches with user needs. However, this is especially the case in exploitative projects involving ordinary and strategic users, because incremental and platform innovations are serving the current needs, while lead-users and radical innovations 'create' them (von Hippel, 2005), or as Vanhaverbeke (2008, p. 8) states; "*Lead Users will have to negotiate up front about the different outcomes/scenarios"*. Fang (2008) suggests that the NPD process will improve if user participation increases in the form of information sharing and coordination between firms and users which; "*has the potential to prevent costly mistakes, redirect efforts to higher return features, and optimize the numerous product versus cost tradeoffs required during NPD"* (Fang, 2008b, p. 332). This involvement must be organized on important moments in the NPD process like the concept generation phase, prototyping or testing, up to and including all NPD activities. Figure 8 shows the effect of constant involvement of the user and will give an impression of what could happen. I will illustrate this with an example; based on the incomplete information from the user needs, a firm introduces a

product on the market, but because it results in a mismatch with the actual needs of the user, the product needs to be adapted or in the worse case redesigned. These product changes and redesigns are costing significantly more money and time when you get further in the innovation funnel, which makes it quite important to prevent rather than react. Besides the positive effect on matching user-needs, the active involvement of the user also has a positive effect on the time-to-market of R&D projects. This can be explained by the argument that the discussion about user's demands is happening in early stages, and not only in later review stages (Naveh, 2007).

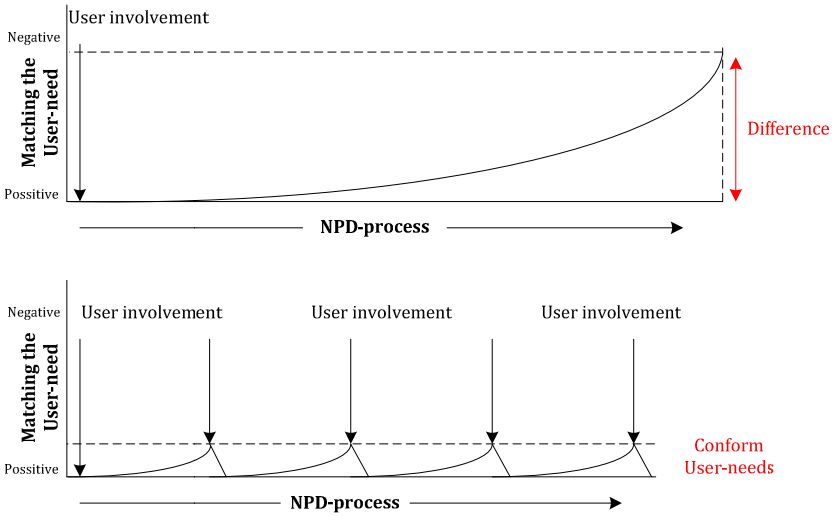


Figure 8: User-involvement in the NPD process [Source: own research]

When looking at the depth of involving the user, it can be stated that in-depth sharing of information in explorative activities (Von Hippel, 1988, 2005) as well as in exploitative activities (Fang, 2008a) will positively stimulate the NPD process. Fang (2008b, p. 332) states that; "*closer interaction allows both parties to uncover high return value-creating opportunities and possibly reduce each parties perceived risk via increased monitoring and stronger relational bonds*." However, the process of exploration requires more in-depth knowledge sharing with lead-users while exploitation requires more knowledge sharing with a firm's ordinary or strategic users. Or as Bonner (2004) suggests; "*the exchange of in-depth and proprietary information – detailed exchanges on product ideas, applications, problems with existing products, and evaluations – with closely related users supports incremental product development more than it does to highly innovative projects" (p. 164).* In the case of smaller exploitative activities, the involvement will be less in-depth and more superficial and concerns the ordinary user in most of the cases. However, when in-depth information is required in exploitative activities, the strategic users are the best partners to involve (Bonner, 2004). Information sharing involving lead-users is focusing on users operating in the leading edge of the market and not on ordinary or strategic users, which off course is closely related to the findings

of Lettl et al. (2006) concerning cognitive limitations and lack of willingness to cooperate by the latter. An important point to notice is the fact that lead-user involvement only forms a part of the NPD process, therefore, interacting with lead-users doesn't happen over the total breadth of the NPD process, but in-depth information sharing is very intense at these moments.

2.3.3 Results

In general, explorative and exploitative activities are both important, but finding the balance is difficult. Information sharing over the breadth of the NPD process positively influences the results in both exploration and exploitation and in-depth involvement is important in both exploration and exploitation. In a user-context more attention is given to exploitative research but there are possibilities to explorative research as well.

2.3.3.1 Ordinary User

When looking at the involvement of the different types of users, involving the ordinary user stimulates exploitative research and will result in incremental changes, but hamper exploration. This is mainly because of the 'barrier of not knowing'. Ordinary users must be involved over the whole breadth of the NPD process in order to prevent costly and time consuming mistakes. Information sharing is not in-depth and most of the time superficial. Figure 9 will illustrate this visually.

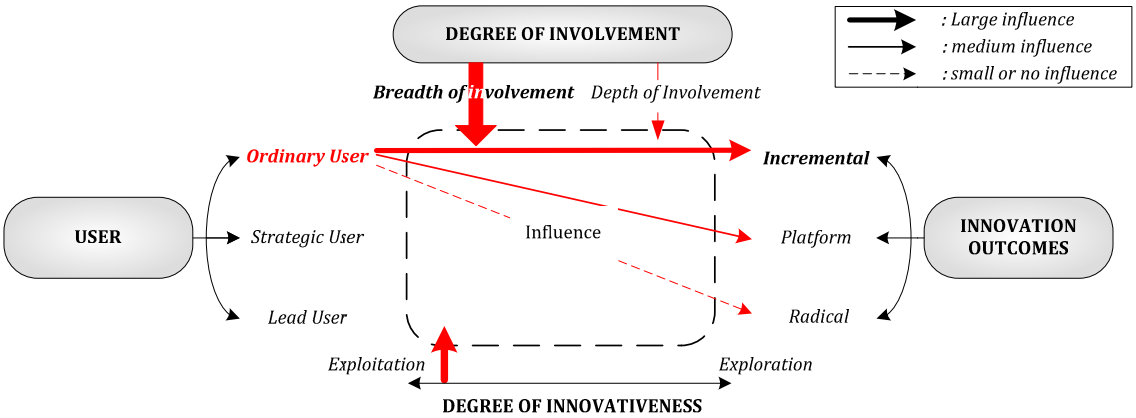


Figure 9: Ordinary users [source: own research]

2.3.3.2 Strategic user

The strategic user stimulates research which is more centered in the middle of the spectrum of innovation. Just like ordinary users the strategic user's involvement will not stimulate hardcore explorative activities. However, different than the incremental focus of the ordinary user, the strategic user will be focused more on platform improvements. They do have a 'user needs' view, but because of their in-house knowledge and resources they can stimulate and

contribute to these major improvements more effectively. Where smaller exploitative activities are usually concerned with superficial information sharing, large and closely related customers are more involved in in-depth sharing. Just like the ordinary user, the strategic user must be involved over the total breadth of the NPD process. Figure 10 will illustrate this visually.

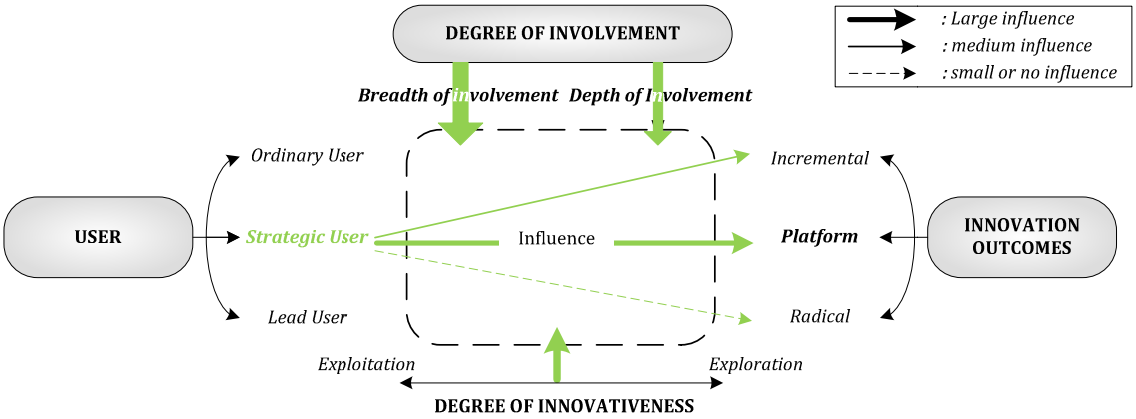


Figure 10: Strategic users [source: own research]

2.3.3.3 Lead user

Lead users are recognized as the only valuable users to effectively stimulate explorative research resulting in breakthrough or radical innovations. Where ordinary and strategic users are most of the time risk averse or lacking cognitive knowledge, lead users are ahead of the market and are willing to radically innovate. However, recognizing and selecting these lead-users is quite difficult and a major drawback. The actual lead-user involvement is only a part in the lead-user method. Therefore they only get involved in the NPD process a few times. These interaction moments are very intensive and involve in-depth information sharing. Figure 11 will illustrate this visually.

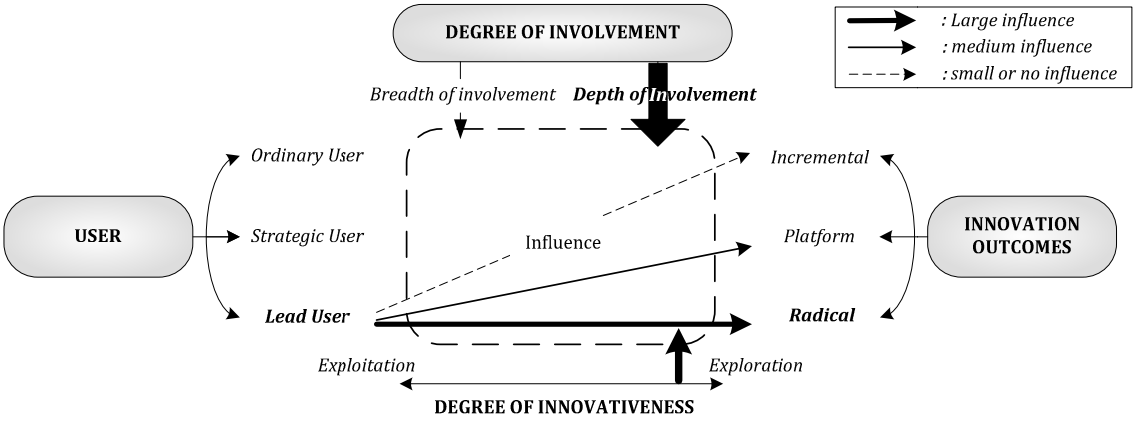


Figure 11: Lead-users [source: own research]

2.3.4 Concluding comments

As you can see, different users draw on different structures and will stimulate different innovation outcomes. You need to clearly define your goal in order to effectively select your user and add value to the NPD innovations. Now the models and its different influences discussed above are clear, the next question is; *what user innovation mechanisms must or can be used to organize these different processes most effectively?*

2.4 How to involve the user

In order to overcome the problems and flaws in the traditional NPD process, theorists gave rise to the introduction of new and more sophisticated ways to involve the user in the NPD process. In this paragraph I will search for mechanisms which involve the user in the innovation process. In § 2.4.1 I will shortly discuss the relation between the mechanisms to involve the user and the research model from § 2.3. The mechanisms will be described in § 2.4.2 till § 2.4.7. I will end this paragraph with a summary on which mechanism to use in what situation and finally some concluding comments.

2.4.1 How to act in different cases

Involving the user in the NPD process can be done in many different ways. But as described in paragraph 2.3, there are many influences and differences to deal with when involving the user in the NPD process. Combining the influences on user involvement and the mechanisms to actually involve the user forms the basis to answer the question *how and when to involve the user as effective as possible*. The research model can be extended as shown below.

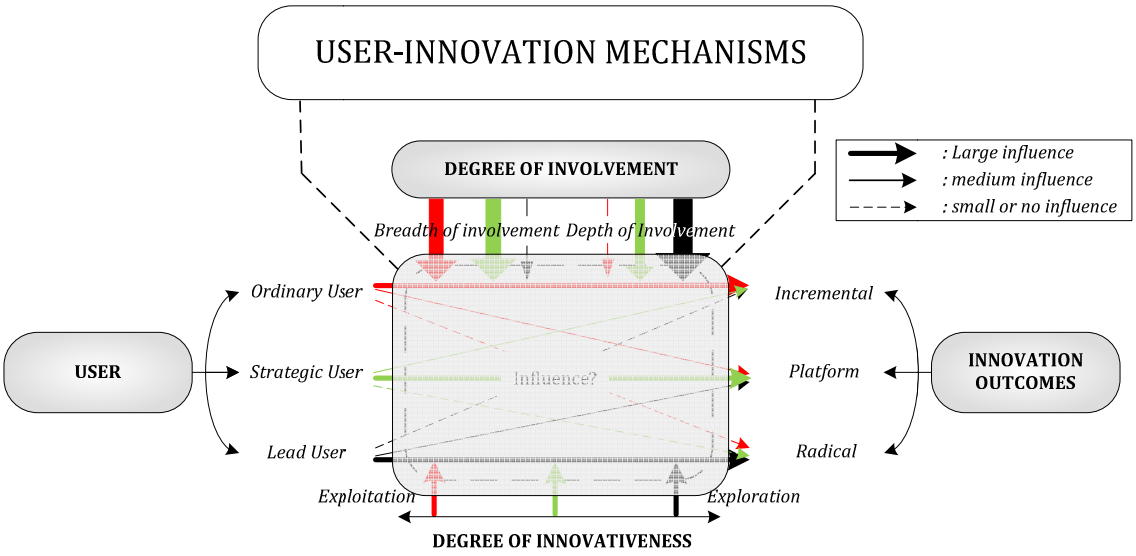


Figure 12: How to involve the user in the User innovation model

It is now the case to recognize some suitable mechanisms which can structure or stimulate the organization of the NPD process.

2.4.2 Alliances

2.4.2.1 Definition

Because of the globalization and networked economies, alliances are more and more used in order to keep up with fast moving changes[8]. The scope of these alliances is rather broad, and can range from specific functional agreements (e.g. contracts related to R&D, product development, marketing and distribution), to full scope joint-ventures and/or consortia (Daft, 2007). Sheth and Pervatiyar (1992) define an *alliance* as; "*an ongoing, formal, business relationship between two or more independent organizations to achieve common goals. This definition encompass any formalized organizational relationship between two or more firms for some agreed purpose"* (p. 72). Parise and Casher (2003) state that an alliance is; *"an open ended agreement between two or more organizations which enables cooperation and sharing of resources for mutual benefit, as well as enhancement of the competitive positioning of all organizations in the alliance"* (Parise & Casher, 2003, p. 26).

TEXTBOX 2

Alliances in Practice: *MinAqua Fisheries and Southern Minnesota Beet Sugar Cooperative.*

This alliance was formed so that by partnering resources needs could be met at less expense. MinAqua raises live tilapia, a fish that requires water that's at least 80 degrees Fahrenheit. Since heating water is quite expensive, the company now can obtain the water already heated from the SMBSC. The sugar beet cooperative will now get paid for a resource that used to be costly to cool down. This alliance is working so well that the city of Renville, where both companies were founded, is trying to attract other businesses that need hot water to relocate to the area. (*Martin & Stiefelmeyer, 2001, Strategic Alliances and Cooperatives Aiding in Rural Development in North America)*

2.4.2.2 Advantages

An alliance can be an effective mechanism to actively involve the external actor. Especially in the situation both parties have different resources which can fulfill a complementary role. Faems et al. (2005) also recognizes, that first of all, firms want to collaborate in an alliance to enhance their current resources needed to turn a potential idea in a successful product. Second, they try to create access to tacit knowledge, which otherwise isn't available for the firm, and finally, the possibility to spread costs and risk over the involved actors. For example, large companies can compete by doing the most R&D because of the great amount of resources and well developed processes

[8] See textbox 2 for an example

without being really innovative, while small companies with brilliant ideas often face the burden of high set-up costs and a lack of these resources and processes, which makes it uncertain to succeed (Chesbrough, 2003a; Christensen & Overdorf, 2000b).

2.4.2.3 Disadvantages

Despite these potentials there are also some limitations. One of the most striking observation in previous research (e.g. Bleeke & Ernst, 1991; Parkhe, 1993) is that many alliances fail if not organized and managed in a proper way. Parkhe (1993) even estimated that almost 70% off all alliances fail. Then there is also the dangerous topic of trust in an alliance; *"Organizations enter into alliances to take advantage of partners' knowledge and strength, but most alliances are characterized by lack of trust"* (Sivadas & Dwyer, 2000, p. 32). Besides these two points, the choice to join in a certain alliance also must be well defined. When looking at what type of innovation an alliance supports, it can be said that explorative alliances are mostly based on collaboration with universities and research institutes, and positively influence radical innovation performance. In contrast exploitative alliances, which are based on collaboration with suppliers and customers, positively influence incremental and platform innovation performance (Faems et al., 2005). These different types of innovations and different types of partners could lead to mismatches resulting in failures. Because of these disadvantages firms are often reluctant to join in an alliance.

2.4.3 The Lead-user method

2.4.3.1 Definition

As the definition of a lead-user has already been discussed in §2.3.1.1 I will solely focus on the method. The lead-user method (as the name might suggest) is a mechanism to involve the lead-user in the innovation process[9]. Herstatt and Von Hippel (1992) and Luthje (2004) recognizes four major steps needed to be taken in order to organize lead-user innovation activities.

The *first* step is about the start-up of the lead-user project. In the *second* step you specify lead user indicators. It involves identifying the trends on which the leading edge of the market is operating, and if those users expect relatively high benefits of these solutions to their trend-related needs. To identify these indicators a survey of experts is needed. This panel of experts could exist out of external experts, internal experts, market specialists etc.

In the *third* step a firm tries, based on the indicators defined in step two, to identify a sample of potential lead users which could be contacted in the search for lead-user innovations. Based on this sample a selection of the most suitable lead-users is made. This group of lead-users will continue to step four.

[9] See textbox 3 for an example

TEXTBOX 3

The Lead-user method in practice: *Webasto*

Webasto went through a systematic approach to understand what lead users are and how to identify them. It identified four aspects that really drive people's propensity to innovate: cognitive complexity, team expertise, general knowledge, willingness to help. Based on this information it developed a questionnaire and sent it out to up to 5000 people. About 20% returned the questionnaires, and eventually a lead user group of between 10 and 30 was selected. The lead users committed to come for an entire weekend, and without pay. (*Bessant, 2008, p.46)*

In the *final* step, the group of lead-users is brought together with company specialists from R&D and engineering and marketing personnel to engage in a 'group problem-solving session'. Ideas coming forth from these sessions are discussed and judged by the participants in order to look at producibility and feasibility etc. Then the firm looks if the ordinary users also value the concepts developed by the lead-user. Figure 13 summarizes the steps of the lead-user method in a visual representation.

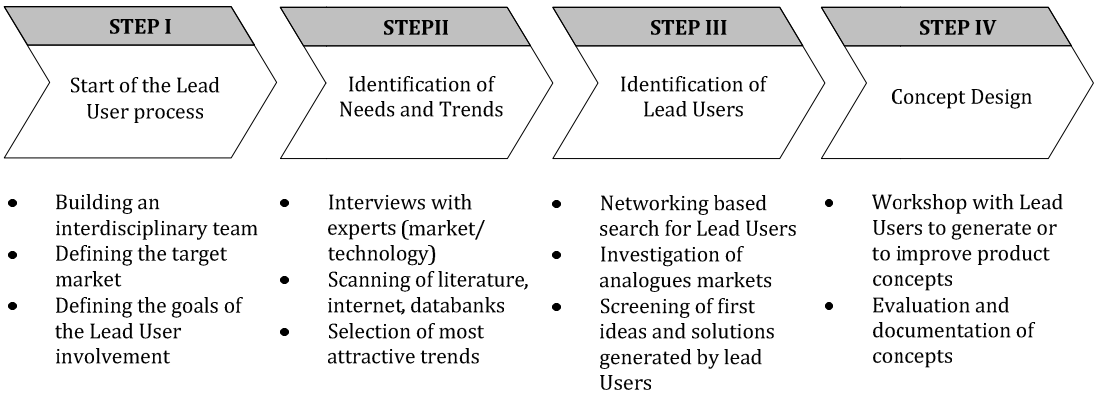


Figure 13: The lead-user method [Source, Luthje, 2004, p. 561]

2.4.3.2 Advantages

Lead-user projects have resulted in interesting and very successful outcomes (e.g. Lettl, Hienerth, & Gemuenden, 2008; von Hippel, 2005). One of the strengths is the possibility to look at existing problems from different, sometimes unexpected angles. This mechanism searches for new possibilities in a very broad scope. Were traditional mechanism often stay within the target market, during the course of a lead-user project, research teams seek out lead-users within the target markets, but also in other fields and industries (see figure 14). Innovations in automotive braking systems are an example of the use of different users than those in their target market. A well known automotive manufacturer decided to search in analogue markets and came to aerospace, because braking

technology was much more sophisticated in aerospace. Aerospace first saw the need and importance of stopping an aircraft at the end of the runway. So you could see that the incentive to do the same stopping problem was there in aerospace as well as in the automotive industry, but that they were concerned with incentives of different magnitude. This cooperation resulted in ABS. This doesn't mean the lead-user method can't be used within a user context, on the contrary; *it could lead to great results*. Though, the awareness of the possibilities/limitations must be clear.

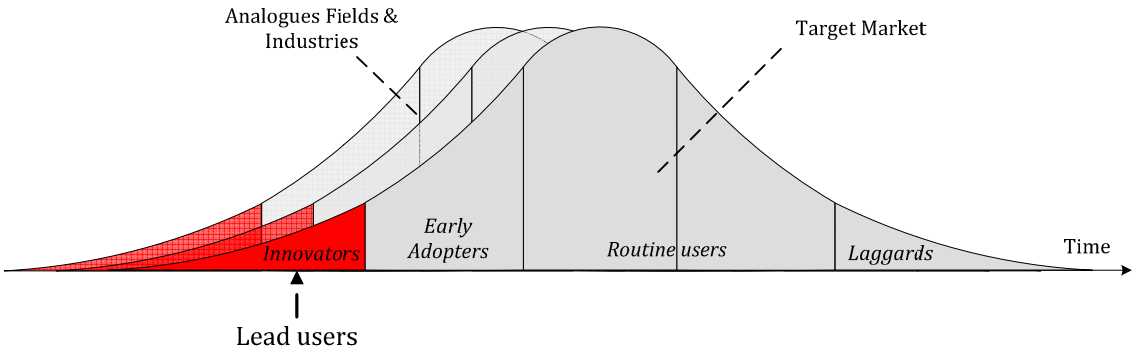


Figure 14: Lead user and its markets [Von Hippel, 2005]

2.4.3.3 Disadvantages

The main disadvantage of this mechanism is the difficulty to recognize and select suitable lead-users. Lead-users are great partners to cooperate with, but they often represent a small group in the total market. It costs time and resources to extract suited data from and about the user which makes a firm often quite reluctant to use this method. Also users can be reluctant with sharing information. Because the method is about sharing radical new ideas and solutions, a user could feel threat by the idea to share everything without getting anything back (e.g. think of IP rights). This could lead to a failure, while a firm did select the right partners.

2.4.4 Multidisciplinary teams

2.4.4.1 Definition

Another way to organize innovation is through multi disciplinary teams, or as Bougrain and Haudeville (2002) state; *"Overlapping knowledge across individuals is crucial to ameliorate internal transfer while diversity of knowledge elicit learning and problem solving that yields innovation"* (Bougrain & Haudeville, 2002, p. 743). There are many different team structures to be distinguished in literature. But within the scope of this research not all teams are suited. Therefore I will exclude teams organized solely on internal activities out of this research and will focus on

those team structures with the focus on involving the user in their activities. I chose to take a closer look at the *heavyweight team* as described by Burgelman et al. (2002) (see also figure 15).

A heavyweight team[10] is build up out of core group members how are physically collocated, but team members are not assigned permanently and still operate on their functional terrain. Heavyweight teams are especially suited for platform innovations because team members typically are not purely specialized in one subject, but have a more general view (Burgelman et al., 2002). While in the Lead-user method the focus lays on lead-users, with heavyweight teams strategic user are more suited to involve. A small remark that must be made is that heavyweight teams are described as internal mechanisms (Christensen & Overdorf, 2000a), but can be extended to external oriented mechanisms. Or as stated by Wheelwright (2009);

> *"We have seen customers involved in heavyweight teams, and the idea of having a supplier employee resident on a customer's premises - such as is common in the auto industry - is completely consistent with this idea. Since most of the heavyweight teams we've seen are collocated, the customer needs to be willing to dedicate someone to a supplier team in order to make this work." (Wheelwright, S., 22-01-2009)*

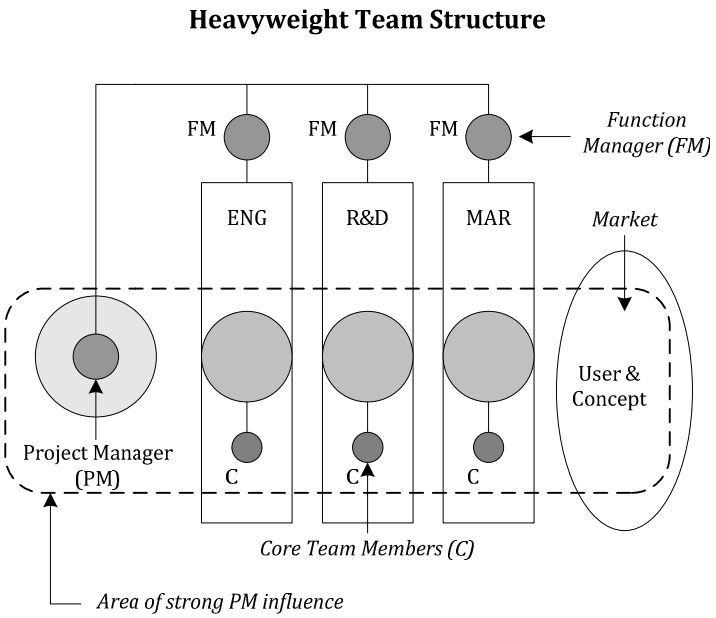


Figure 15: Heavyweight Team Structure [Source: Burgelman et al., 2002, p. 950]

[10] See textbox 4 for an example

2.4.4.2 *Advantages*

One of the most striking advantages is the advantage of ownership and commitment. The project leader can create sense of esprit and identification with the product in order to stimulate team members to extend themselves and want to help the team succeed (Burgelman et al., 2002). Another advantage is; "*the integration and integrity it provides through a system solution to a set of customer needs" (Burgelman et al., 2002, p. 951).* Address the requirements of core customers effectively and getting the components and subsystems to complement one another can result in a winning platform or product (Burgelman et al., 2002).

TEXTBOX 4

Heavyweight team in Practice: *Chrysler*

At Chrysler the boundaries of the groups within its product development organization historically had been defined by components – power train, electrical systems, and so on. But to accelerate auto development, Chrysler needed to focus not on components but on automobile platforms – the minivan, small car, Jeep, and truck, for example – so it created heavyweight teams. This resulted in more efficient integration of various subsystems into new car designs. *(Christensen & Overdorf, 2000, p.73)*

2.4.4.3 *Disadvantages*

A danger could be the fact that team members get carried away with themselves and by expanding the definition of their role the scope of the project. And even if the team stays focused the rest of the organization could feel second-class (Burgelman et al., 2002). Another potential concern is that these teams also want control over secondary activities (e.g. prototyping). They could demand top-priority and if not granted search for external sources. Also the lack of depth in a team could result in problems which could have been prevented by specialists. A last point is, as Wheelwright (2009) stated that it is important but could be hard to find a user which is willing to dedicate someone to the team to make it work.

2.4.5 *User innovation networks*

2.4.5.1 *Definition*

Increased internal networking and computational capabilities of a company, increases the ability to change and reconfigure workflows and information flows. But moreover, companies can interact externally on a different level with its suppliers, users and other partners which may result in new business models (Plant, 2004). The term *user network* means; "*user nodes interconnected by information transfer links which may involve face-to-face, electronic or any other form of communication"* (von Hippel, 2007, p. 294). These networks can exist within the boundaries of a membership group, but can also include the qualities of a *community* for participants. The community is defined

as "*…networks of interpersonal ties that provide sociability, support, information, a sense of belonging, and social identity"* (von Hippel, 2007, p. 294). Von Hippel (2007) states that networks can flourish when;

- At least some users have sufficient incentive to innovate,
- At least some users have an incentive to voluntarily reveal information sufficient to enable others to reproduce their innovations, and
- User-self production can compete with commercial production and distribution.

Von Hippel (2007) also elaborates on the point that an extra dimension is shaped by the fact that non-users also can participate in the network (e.g. the manufacturers of complementary goods or other services). These non-users can also benefit from new innovations to the original product or ideas with new products as a consequence. A hardware manufacturer for example can gain additional benefits if the new developed software is more compatible with its product. Non-users with no incentives or use for the innovation can join in the process as well, only driven by enjoyment of the work itself, or reputation effects, etc.

2.4.5.2 Advantages

A network can bring together a variety of skills and experience and could form the basis for potential new ideas and combinations. These networks do not serve as channels for the diffusions of existing knowledge and Competences, but rather generate a recombination potential in view of new knowledge creation. This results from earlier findings (e.g. Burt, 2004; Gilsing, Nooteboom, vanhaverbeke, Duysters, & Van den Oord, 2008) that "*values and behavior are more homogeneous within groups than between groups, so that firms connected across groups have more access to alternative ways of thinking, giving them more options for creating new combinations"* (Gilsing et al., 2008, p. 1720).

TEXTBOX 5

Network in practice: *Lego*

"Lego has set up the Lego Factory website where users can build their own model online and then have the 'ready to assemble set' sent out to them (http://factory.lego.com). A benefit was seen to be that is supports direct communication with users that could be difficult to identify otherwise, such as train enthusiasts. In this way LEGO receives feedback from its most advanced users and can use this information to enhance mainstream products." *(Bessant, 2008, p.45)*

One form of a user network is the online user community[11]. Plant (2004) states that; *"The combination of low-cost access to increasingly powerful computing and networking capabilities combined with a deregulated internet has facilitated the rapid development of a new social phenomena; that of the online community"* (p. 51). Plant (2004)

[11] See textbox 5 for an example

also suggests that an online community fulfills two basic desires which are; first to reach out and get in touch with others and second to obtain knowledge. According to a study by Bughin, Cgui and Johnson (2008) users are more and more willing to participate with firms online, and that they can *"tap into that willingness today".* Rewards and fame are motivators to share knowledge, but also the possibility to discover something new and seeing it become a reality has a big impact. Firms starting an online community need "*a combination of incentives to encourage consumer participation"* (Bughin et al., 2008, p. 6). Trust and affinity are also important elements.

2.4.5.3 Disadvantages

Some authors have some critical notes regarding user networks however (e.g. Harhoff, Henkel, & Von Hippel, 2003). A network is based on the knowledge flowing from one to another. But knowledge tends to be 'sticky' and tends to reside in individuals and is very context specific (Brown & Hagel III, 2006). Free revealing violates a central tenant of the economic theory of innovation. It states that agents must keep the knowledge or technology secret or protect it by patents (or other means) in order to secure returns of the innovation. *"After all, non-compensated spillovers of innovation-related information should represent a loss that innovators would seek to avoid if at all possible, even at some cost"* (Harhoff et al., 2003, p. 1754). Another remark is that the user must see and experience the value of cooperation by repeated interaction and feedback loops. A network can be managed loosely but that doesn't mean it can be managed sloppy (Brown & Hagel III, 2006).

2.4.6 Sending out scouts

2.4.6.1 Definition

Bessant (2008) argues that there is an important role for scouts or 'idea hunters' in the search for new ideas to trigger the innovation process[12]. These scouts can work full time or part time, and can search in any field for new technological input, special needs, competitor behavior, emerging markets, etc. The magnitude of the search can differ however. There are other incentives involved when looking for incremental or radical innovations for example. Scouts must be selected based on these differences.

TEXTBOX 6

Scouting in practice: *Procter and Gamble*

"Procter and Gamble's Connect and Develop open innovation approach sets a target of sourcing 50% of innovation inspiration from outside the company. It employs around 80 'technology entrepreneurs', scouts, licensed to roam the world with a wide remit to find and bring back interesting new ideas." *(Bessant, 2008, p. 45)*

[12] See textbox 6 for an example

2.4.6.2 *Advantage*

The search for new ideas that could trigger innovation is a continuous happening and can be performed by a large group of people. Thereby, ideas could be everywhere so there is a lot of potential outside the boundaries of a firm.

2.4.6.3 *Disadvantage*

Though time and resources must be invested in the search for ideas, there is no certainty that at the end there are useful ideas which could lead to innovations. Another point of attention is that these search scouts must be capable to recognize ideas or technologies which could be valuable in the innovation process. If you don't know where to look and what to look for, you will never find it.

2.4.7 *Feedback mechanisms*

2.4.7.1 *Definition*

Feedback can be described as the process in which part of the output of a system is returned to its input in order to regulate its further output[13]. Because it is common to see a deviation in the predicted and real product performance, Magniez et al. (2009) state that field feedback mechanisms must be introduced to proactively react quickly and efficiently on these deviations. These mechanisms must *"generate rich enough information for both corrective actions in the existing products and preventive actions in the future products"* (Magniez et al., 2009, p. 356). These mechanisms can range from an on-line user interface to feedback through service engineers in face-to-face conversations. Or as Magniez et al. (2009) argue; "*All information on the customer environments and the customer uses should be analyzed to determine the impact they might have on the failure. Contact with the service engineer or directly with the customer if possible should be established"* (Magniez et al., 2009, p. 363).

TEXTBOX 7

Probe and Learn in Practice: *Novo Nordisk*

"An example is the Danish pharmaceutical firm Novo Nordisk which is making extensive use of 'probe and learn' approaches in trying to understand the possible evolution of new diabetes-related services and care pathways which may represent an important new direction for this traditional pharmaceutical firm with its emphasis on drugs and delivery systems. Much of this work is going on in laboratories where very different conditions apply – for example, in Africa where the need is for holistic solutions involving education, clinics and treatment centres and prevention methods – all delivered from a very low cost base". *(Bessant, 2008, p.47)*

[13] feedback. (n.d.). *WordNet® 3.0*. Retrieved January 27, 2009, from Dictionary.com website: http://dictionary.reference.com/browse/feedback

An example of a feedback mechanism is the principle of *'probe and learn'*[14]. Bessant (2008) describes it as; *"Use prototyping as mechanism to explore emergent phenomena and act as boundary object to bring key stakeholders into the innovation process" (p. 44).* It's about getting your hands dirty by prototyping the product in an early stage of the NPD project, rather than spend ages on planning.

2.4.7.2 Advantages

Information and data generated by feedback mechanisms are mainly concerned with incremental change, but nonetheless might provide useful input for platform changes. Especially in small incremental projects the involvement of the user is limited and superficial, which makes feedback a valuable mechanism to match the needs of the user with the product in a cheap and easy way.

2.4.7.3 Disadvantages

A disadvantage of feedback mechanisms in the search for innovative input is that the concept is already there. Though user feedback is vital and useful for incremental innovation, for breakthrough innovations customers are normally bounded by current solutions and insights about new technologies may be scratchy at best. Therefore user input will not stimulate radical change but stimulate the reduction of deviation in user expectations and actual performance instead. Another disadvantage could be found in the example I gave about probe and learn. Such a method could be very expensive and technologically hard to realize.

2.4.8 Which mechanisms to use in what situation?

The last remaining question is; *what mechanisms are best in what situation?* I will shortly elaborate on each of the mechanism and what characteristics of the research model they support and will visually summarize in figure 16.

- *Alliances* with users are suited to stimulate exploitative research with the goal to generate platform innovations. In this context, strategic users are the best partner to cooperate with. Ordinary users are too small to be involved in such a process, while the lead-users are more suited in explorative research such as the lead-user method.
- The *lead-user method* is suited to contribute to explorative research. The main purpose of this method is to stimulate radical changes. The lead-user is the most valuable user to cooperate with, but the difficulty is to recognize these users in the market.
- *Multidisciplinary teams* are especially suited in research towards platform innovations. As literature states strategic users would be the best partners to involve in these projects.

[14] See textbox 7 for an example

- When looking at the question if ordinary users, strategic users or lead-users are the best participants in a *user network*, the answer is that it seems to be a key to involve as many kinds of motives as possible in order to create the possibility to reinforce each other. Innovation outcomes can range from small incremental to radical new ones.
- *Sending out scouts* is a mechanism which scans the environment and market for new opportunities. Users are not directly involved; *it is more about orientating on possible innovations*. Therefore all users could be involved. Important is to define what you are looking for in order to search effectively.
- Feedback mechanisms are especially suited for exploitative input. But different sources of information combined can lead to new insights and better understandings of customer needs resulting in interesting possibilities. Also in the case of feedback mechanisms, all users can provide for useful information but ordinary and strategic users suit this mechanism best.

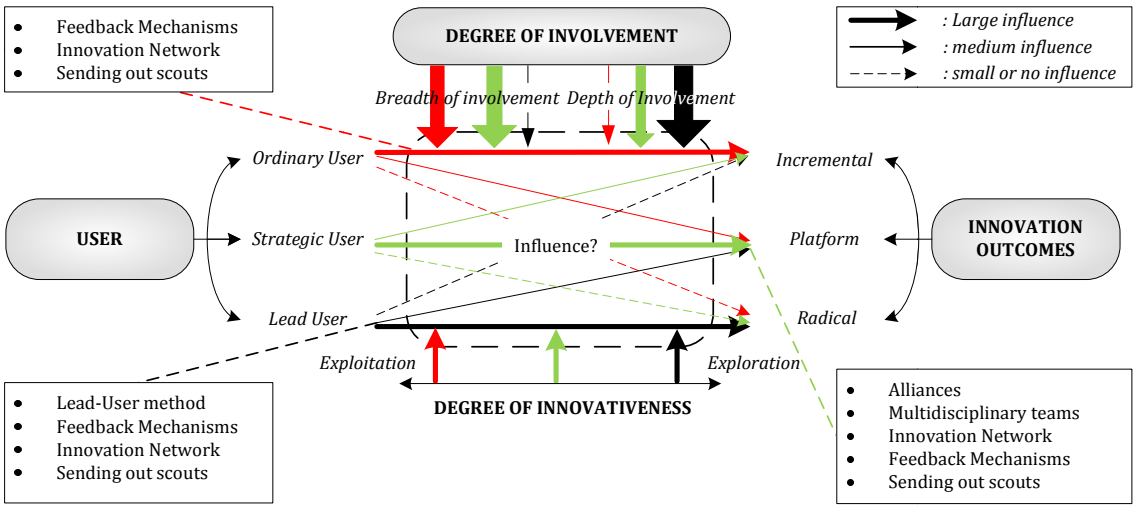


Figure 16: User Innovation and its mechanisms

2.5 Concluding comments

Looking back on the topics discussed in chapter 2 we can conclude that different innovations draw on different structures. It is important to know what user or mechanism to select and what innovative focus must be used when organizing your NPD process. Quite some projects have failed in the past because of using the wrong combinations (e.g. strategic users for radical innovations, or explorative activities with ordinary users). The next step is to see how Safan organizes her NPD activities concerning user involvement.

3 SAFAN AND USER INNOVATION

At this point the first part of the analyses is completed, so now I will focus on the second part of this phase; *the empirical analysis*. This part serves to answer the second research question as formulated in chapter 1;

- *What is the current situation at Safan concerning user innovation?*

The chapter will start with the methodology used to conduct the analyses. §3.2 in short will explain the two streams of user innovation as recognized at Safan, and §3.3 and §3.4 will focus on these two streams in more detail. This chapter will end with some concluding comments.

3.1 Methodology

3.1.1 Qualitative case study research

I will answer the question by looking at different aspects at Safan concerning user innovation in the form of a case study. The questions in this research are aiming to solve *how, why* and *what* questions and in this respect a case study is the most appropriate method (Babbie, 2004). One strength of a case study *"is the opportunity to use many different sources of evidence"* (Yin, 2003, p. 97). Furthermore, *"the need to use multiple sources of evidence far exceeds that in other research strategies, such as experiments, surveys, or histories"* (Yin, 2003, p. 97). To examine the current situation at Safan concerning user innovation, the views and opinions of the actors involved in this innovation process had to be analyzed. Opinions of these different actors on how they experienced the past and see the future can vary in many aspects. Therefore, these different ideas and points of views all had to be considered. The best way to capture these results is by conducting qualitative research. The strengths of qualitative research can be found in the arguments that it is flexible, relatively inexpensive and it can be provide in-depth understanding of a phenomenon (Babbie, 2004). Furthermore *"field research seems to provide measures with greater validity than do survey and experimental measurements, which are often criticized as superficial and not really valid* (Babbie, 2004, p. 307)*"*. However the weakness of qualitative field research is the potential problem of reliability, due to the ability of the research to influence the results (Babbie, 2004). This is also mentioned by Eisenhardt (1989), who argues that qualitative research may keep the researcher from being carried away by personal, false impressions of qualitative data. In order to overcome the problem of getting carried away too much I decided to collect the data by

conducting semi-structured open-ended interviews. This method is often used in qualitative research because it can provide for in-depth information in a relatively short time, and can be redesigned during the project.

3.1.2 Interviews

The first step in the qualitative research was to create a global overview of the current situation and future possibilities by interviewing two employees from both marketing and R&D during an unstructured interview session. Based on these interviews and on theoretical considerations, the interviewees for the second step were selected.

I interviewed Safan employees who are active in departments concerned with the user because they are potential valuable sources of information. The interviewees comprise the following departments; *Sales, Engineering, R&D, Service, Quality* and the *Management Team* (MT). Table 5 gives a short summary of the interviewed population.

Table 5: Interviews

Total number of Interviewees	**12**	
Service years	< 1:	1
	1-5:	2
	5-10:	3
	10-20:	1
	20 <:	5
Number of respondents per Department	Service	1
	R&D	3
	Engineering	2
	MT	2
	Sales	3
	Quality	1
Position	All Permanent	
Working Hours	All Full-Time	
Interview form	Recorded	9
	By notes	3

The main goal of these interview sessions was to create a transparent and complete overview of the current situation on user innovation and thoughts and opportunities for the future on user involvement. To leave room for discussion I chose to organize the interviews as semi-structured and to enable the interviewees to speak without feeling restrained, I chose to interview them separately and face-to-face. I used audio recording equipment to tape the interviews. The use of this recording equipment can "*record the respondent's words with greater accuracy than can be achieved through obtrusive and disruptive on-the-spot note taking, and relieves the researcher from any subsequent attempt to reconstruct what the respondent had said" (Drew, Raymond, & Weinberg, 2006, p. 28).* This flexible approach leaves room for new and unexpected input, but within the scope of the research. The questions

during the interviews were initially structured along an interview protocol[15] based on the sub-questions of the first research question. In order to establish a reasonable trusting atmosphere, I first clarified my research goals and answered questions from the interviewees on unclear aspects.

After the first interview I already noticed that the interview protocol had to be adjusted, because it happened that some problematic issues became clear which were clouded until that moment. I only focused on the *search* for user innovation, but hadn't thought about the information entering Safan without the active involvement of Safan (e.g. complaints or special wishes). Therefore I changed my initial strategy and divided the interviews in two parts. In one part I questioned in more detail about the search for user innovation and during the other part I questioned in more detail about the capturing of this information and the ventilation in the organization of this information. This resulted in some lengthy accounts, anecdotes and stories which gave me a clear and more accurate view on historic events and future expectations. It enriched the initial situation by some interesting critical notes, which will of course be discussed later on in this chapter.

3.2 How does Safan involve the user

The first step in mapping the current situation at Safan concerning user innovation is by looking at the information flow between Safan and its users. As I mentioned above, we can recognize, in a general sense, two important ways in how the information of the user enters Safan. On the one hand the user will provide Safan with information without the initiative of Safan (e.g. complaints or wishes from the user), and on the other hand Safan takes the initiative in collecting information as input for their NPD processes. These two forms of user information are both valuable to the organization but are organized and captured in a different way. Figure 15 globally shows these two flows and will serve as my basic model in this part of the research.

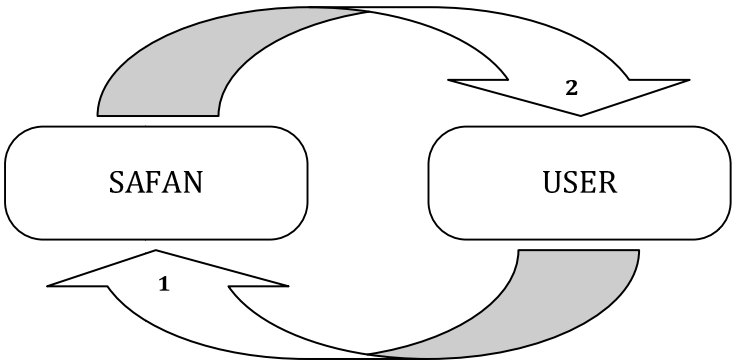


Figure 17: The involvement of the user at Safan

[15] See appendix 3

3.3 Receive information from the user

In this paragraph I will zoom in on the first arrow as shown in figure 17. In this case my interviewees were selected from the departments of *the MT, quality, service, sales, R&D* and *engineering*. My first question will focus on where the information enters the organization of Safan, while the second question describes how this data is used in the NPD process. The third point will describe the way of capturing and documenting the information and finally I will give some future perspectives as given by Safan employees. Safan recognizes three types of information sources: *internal* input, input from the *supplier-side* and input from the *user-side*[16]. I will solely focus on the user-side.

Figure 18: Information sources concerning Safan

3.3.1 Where does what user information enter the organization?

As described earlier[17] the user can be divided in potential- and existing users. When looking at the information entering the organization, Safan makes a distinction between *complaints*[18], *ideas, wishes and comment*s and *specials*. Both user groups provide different information. For example; because potential users have got no or little experience with a Safan machine, the user simply cannot have complaints about it. However, the potential user can have unique needs and wishes concerning a new product which must be considered before the actual acquisition. These are called Specials by Safan. In the case of existing users, it can be the case that they have ideas or comments which are no complaints, but nonetheless valuable input for 'idea generating' activities. In short it could be said that;

- *Complaints:* are concerned with user problems needed to be solved. These complaints can range from small assembly mistakes to large component failures. Complaints normally originate at existing users. If a user has got a complaint there are two ways to communicate this to Safan. In the case of a 'young' user a complaint is normally entering at the sales consultant, but in the case of the more 'mature' user, they normally directly contact service.

[16] See figure 18
[17] § 1.2.2
[18] Safan rather call complaints 'points of improvement', but for the sake of brevity I will use the term complaints

- *Ideas and comments:* can range from small remarks to major ideas. They are no complaints, but can be valuable as well. You can think of remarks in the light of; *why did Safan chose a certain Software program*, or *why didn't Safan thought about a simple component X which could improve the efficiency of the machine?* Also ideas and comments most of the time come from existing users. It must be said that most of this information is incremental. Normally they are small remarks coming directly from the work floor.
- *Specials:* A special is a request from a user for a unique machine or component. It is a customized solution which matches the specific user needs to an adapted Safan product. These wishes can range from small incremental changes to large platform changes, and don't match the normal production routines. These requests for specials most of the time comes from potential users. During the last few years Safan mainly focused on the standardized machines, but during the current crisis Safan allows and approves more customized products.

Now the distinction is made between the users and the different forms of information, we can look at the borders of Safan; *where does the information enter the organization?* There are three main information entry points that can be distinguished at Safan; through *Sales consultants, Sales & specials* and *service.*

- *Sales consultants:* They serve as a contact person between Safan and the user. The major roles of the Sales consultant are selling Safan products and maintain a long-term relation with the user. During the acquisition trajectory the focus lies on selling standardized products. Only in cases where there is no other solution, a request for a customized product (special) is made. Normally these potential user wishes are redirected by the sales consultant directly to Specials, but in some case (e.g. if the request has occurred before) a sales consultant acts on his own experience. After the acquisition is finalized and the machine is functioning, the sales consultant visits the user to evaluate the whole acquisition trajectory. These evaluations normally happen on a higher level in the organization of the user. Direct comments or wishes normally do not occur on this level. After this evaluation the sales consultant visits the user occasionally in order to sustain a good relational contact.
- *Sales & Specials:* The specials department is a pre-engineering department. It serves as the bridge between sales and engineering (and in some cases R&D). If a potential user has got a unique request which can't be solved by Sales directly, the specials department will deal with this wish. Up to a certain amount in costs of the special, in combination with the experience of the specials department, the department decides if the request is lucrative and technically possible. Above certain specs other departments or even the MT is involved in the decision process.

- *Service:* The third way of user-information entering Safan directly can be addressed to the service department. This department provides all technical support, on-site assembly support and service activities on location. The department comprises 15 service engineers which visit the user and provide for the desired service. Contact normally happens at the lower levels of an organization (e.g. work floor). The contact moments can be reactive (e.g. complaints) and preventive (e.g. in the case of service contracts). The user can also provide for additional information in the form of ideas and remarks. A service engineer argued that: "*Almost every visit results in a remark from the user … (I7, 8.05)* and later on he added that: "*there are a lot of users who come up with good ideas which make me think; 'hey…he could be right'" (I7, 16.42).*

The different users, information types and information entry points can be combined in the model as represented in figure 19.

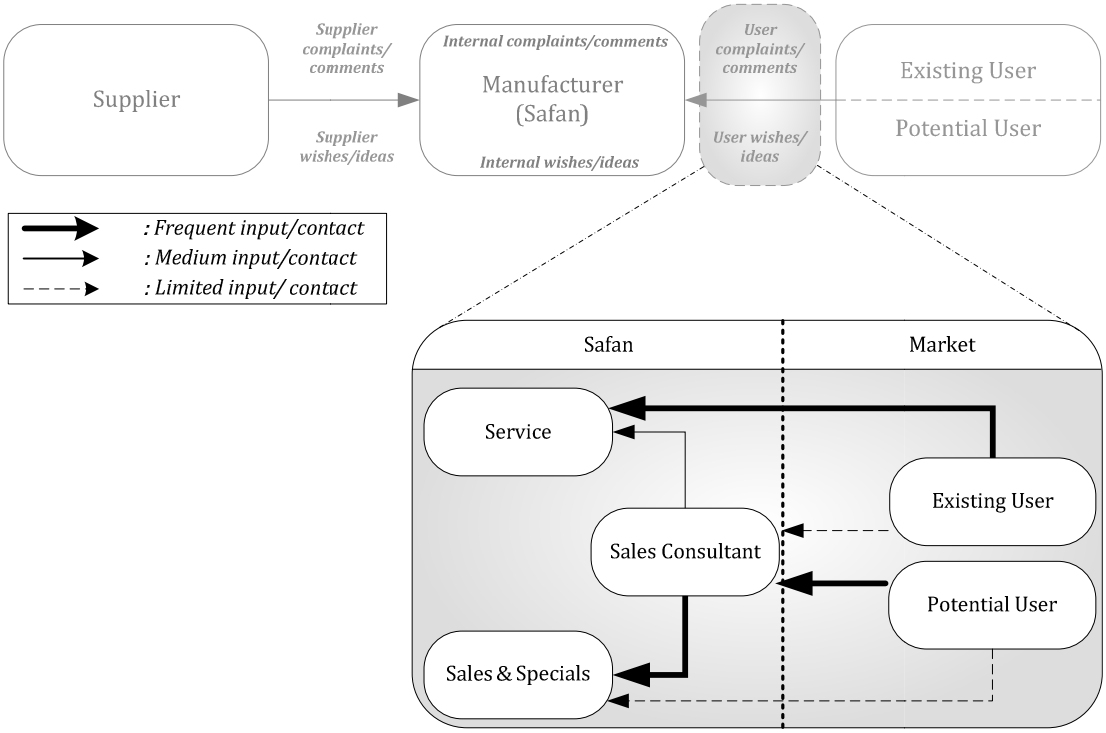


Figure 19: Information entry points at Safan

3.3.2 Which other departments are involved and how is the information processed and documented?

The next question will focus on how this information is translated and communicated deeper in the organization of Safan. To answer this question it is important to first take a closer look at the departments involved in the information sharing process. Secondly the complaints and ideas wishes and comments will be analyzed.

3.3.2.1 *Departments*

- *Engineering:* The engineering department's main task is to engineer user specific products; *the specials*. The department has got four employees which are divided in two mechanical engineers and two electric engineers. Engineering is acting on the short term and works with well defined deadlines. Engineering normally hasn't got contact with the user, usually all contact happens through specials. Only in very large projects they receive more feedback.
- *R&D:* R&D needs to secure the long term success of Safan. The focus therefore is on developing new innovative products which can create new market share, and they develop, redesign or adjust products in the current product portfolio. They have grown from four employees to twelve employees in only two years time. R&D normally hasn't got direct contact with the user concerning the second arrow.
- *Quality:* in the case of user involvement, Quality treats the complaints from the users and communicates them to R&D or if necessary to sales. Since a year Safan has a new Quality Assurance Manager who must provide for more structure in the communication and documentation of data concerning quality. The user complaints most of the time enters via service or a sales consultant.

3.3.2.2 *Handling of Complaints*

The old way of reporting complaints or deviations was by filling in a *deviation report*. These deviation reports where stored together with *change control forms*, which are used for ideas, wishes or comments (everything besides complaints). Safan used *'change meetings'* in order to treat and decide on every complaint and change proposal, but it wasn't a success; *"…there are change proposals from 2007 that still need to be treated, then you've got a problem"* (I9, 72.14). Even if a complaint was judged urgent by some departments, the change commission could decide different and put the change on hold.

Since the beginning of 2009 Safan switched to a new way of dealing with this user information. The first important step Safan took was the introduction of the 8D reports, which replaced the deviation reports. This 8D method is concerned with complaints from *suppliers, internal* and *user* activities, and information is shared in one database. While in the past R&D treated all the complaints, now quality is responsible for organizing this procedure; *"With these 8D reports we want to map problems, but also solve problems in a structured way"* (I9, 6.35). The role of quality in this information sharing is normally only limited to gathering and process the information and communicate it to R&D when necessary. Only in extreme cases (e.g. design failures) quality directly contact R&D. Also service is positive about the introduction of 8D reports; "*It is useful to structurally use these 8D reports"* (I7, 29.40). But because the recent introduction they didn't work with them enough to judge properly.

Through these 8D reports quality tries to solve every complaint within three weeks, and to give this tool even more power, quality is acquiring a new software package which could integrate the 8D method with other control systems (e.g. BAAN, ERP). With this program quality can monitor the complaints and signal extreme deviations or a repeating failure. In this last case quality can act directly and warn R&D to take action and solve the problem. 8-D stands for Eight Disciplines for Problem Solving and comprises the next stages;

1. D1: Use a Team: Establish a team of people with product/process knowledge.
2. D2: Define the Problem: Specify the problem by identifying in quantifiable terms; the '*who, what, where, when, why, how* and *how many*' (5W2H) for the problem.
3. D3: Implement and verify Interim Actions: Define and implement containment actions to isolate the problem from any customer.
4. D4: Identify and Verify Root Causes: Identify all potential causes that could explain why the problem occurred.
5. D5: Choose and verify Permanent Corrective Actions (PCAs): Through pre-production programs quantitatively confirm that the selected corrective actions will resolve the problem for the customer.
6. D6: Implement and validate PCAs: Define and Implement the best corrective actions.
7. D7: Prevent recurrence: Modify the management systems, operation systems, practices and procedures to prevent recurrence of this and all similar problems.
8. D8: Congratulate your Team: Recognize the collective efforts of the team. The team needs to be formally thanked by the organization.

However, there is one exception. If a complaint is quit complex and more than one department must be involved to solve the problem, a change control form is used in parallel. This is because an 8D report is very brief and is suited to report on less complex problems, where a change control form is more elaborate, which creates the opportunity to provide more structure, guidance and feedback. These complaints turning into both an 8D report and a change control form are not judged by the change commission, but are solved directly.

3.3.2.3 Handling of Ideas, wishes and comments

Safan still uses the change control forms which are managed by R&D. As said these forms are used to report on every wish, comment and idea which could be treated, changed or solved. There still is a *change commission* and a *change meeting*, but the major difference between the old and the new way of working is that they don't treat the complaints anymore so they can focus on the other input. The Change commission meets once a month and prioritize the change proposals in categories; 1 *we must do*, 2 *we want to do* and 3 *we will do it later.* In the ideal

scenario, the change commission would first solve all priority 1 proposals and then transfer the priority 2 proposals to priority 1 and so on. A drawback of this structure is that this database doesn't give a good overview on what could be useful for innovative projects, and ideas are treated as second or third class categories most of the time. Wishes ideas or comments with an incremental character are treated more easily as a first category change than then a more radical idea*; results on the short term count*. Service states that filling in these change controls often takes too much time, and they don't get enough feedback on what they filled in.

3.3.2.4 Handling of Specials

The information entering at Specials is valuable in a different way. As said the wishes for user specific solutions could open new innovative doors, but the communication of this information could be ventilated into the organization more effectively. Information entering through the specials department usually only is transferred to engineering. Engineering than develops and designs the special and transfers the information to manufacturing etc.. Only in large projects R&D is involved. The decision making process on R&D involvement is normally done by Sales, but if the decision is concerned with large amounts of resources (e.g. working hours, costs) the MT is involved and will decide on accepting or canceling the request for a special. Normally there is not much contact between engineering and R&D about the information involved with specials. On the question *'if information concerned with specials enters R&D in a structured way',* an engineer states that; "*I don't think R&D is aware of it" (I1, 9.40).* On the same question to R&D the answer was *"… not much (I5, 21.33)"* and they added that; *"A lot of information enters engineering, but their knowledge doesn't reach R&D" (I5, 21.41).* Of course there is informal contact between engineering and R&D but there is no structured or organized feedback mechanism or central sharing point. On the question if engineering has got a central database to collect data which is also visible to, for example R&D, they answered: *"No, not really… No" (I6, 9.55)* but they added that; *"… we do have an Excel sheet for me and my colleague to store some data (…) but this is just for personal use…"* (I6, 10.37) and *"I do keep a list for myself"* (I1, 4.30). Or as R&D argues; *"If engineering says the same problem came across for the fifth time, we just need to know"* (I5, 28.52). Also Specials say that they have a database, but again this is for their own use. Of course all projects are documented and drawings and changes are numbered, but there is not such a thing as a database where every department can look at the realized specials or future possibilities. Another striking remark is that there is no or hardly any communication between the technology related departments and the user. All communication is entering at the more market related departments which might influence the quality of knowledge and information transfer. When information is communicated deeper in the organization a biased view could hamper the quality of a certain solution.

Figure 20 gives an overview of the major communication lines and bottlenecks concerning user innovation at Safan. In appendixes 4 and 5 the detailed information flows of *complaints*, *ideas wishes and comments* and *specials* are added.

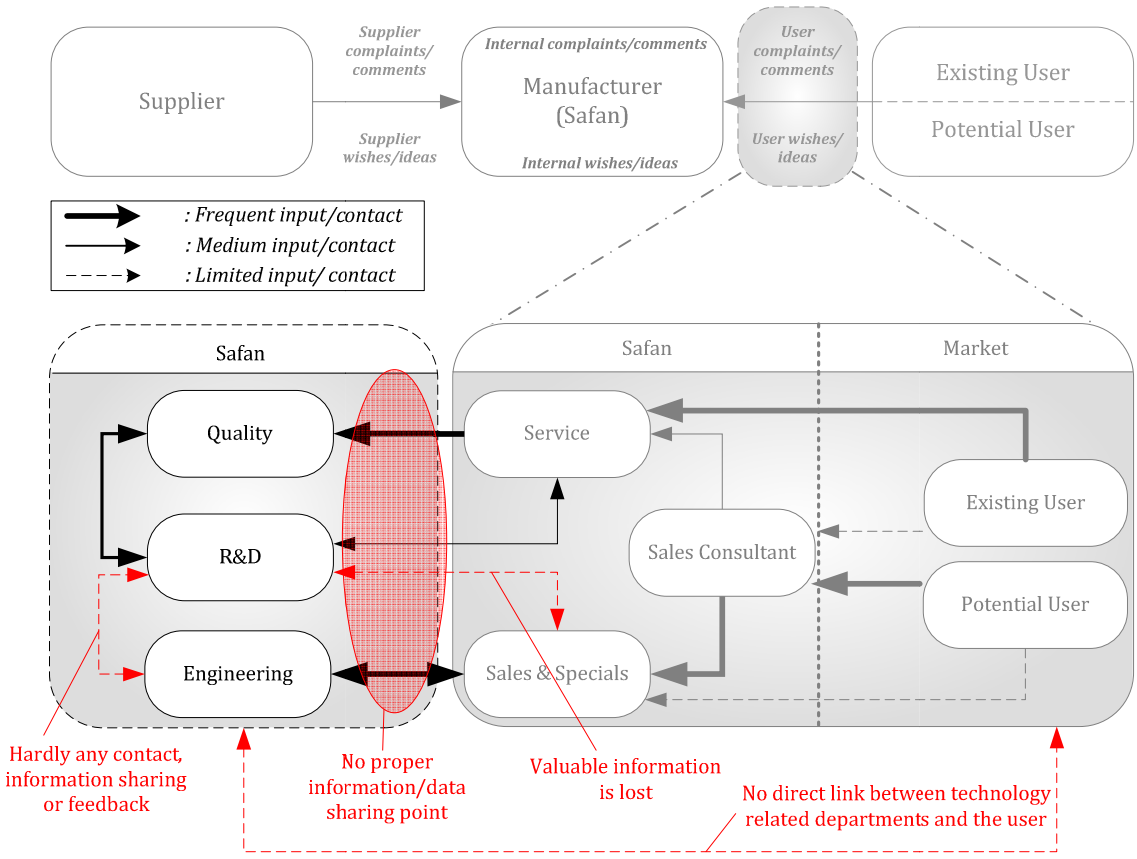


Figure 20: Information treated further in the organization

3.3.3 Future possibilities as recognized by Safan employees

Every department I interviewed recognized the possibilities to improve the communication concerning user innovation. I will give some examples which came along during the interviews. Specials argue that: *"There should be a standard procedure"* (I4, 66.30). R&D states that; *"The information is in the heads of Safan's employees (…) We need to go to a system which organizes the data from engineering and sales in order to create more accessibility for the rest of the organization" (I5, 57.42).* And engineering says; *"It would be very useful to have a central database"* (I6, 11.24) and later on he added; *"I would like to be more involved with the user (…) work with them, look at their site"* (I6, 30.55). Service recognizes the possibilities of a central database; *"I think it is important to have a central sharing point (…) to prevent that information gets lost" (I7, 24.20)* and he added *"… to have a sharing point in which you can store remarks and wishes, where you can find information and show information to others (…) that would*

be very positive and will trigger service to register information" (I7, 35.50). To conclude I will give a quote from R&D which probably is the best conclusion of this part; "*You can search for information in the market, but what's the point of doing it if you already receive a lot of information which you don't use?"* (I5, 60.40)

3.3.4 Bottlenecks

Now the first arrow from figure 17 has been described thoroughly I will filter out the main bottlenecks which hampers the efficiency and organization of the handling of user information.

- The ideas entering Safan are not stored in a structured way. A lot of information which could have been valuable in future NPD projects is lost.
- A lot of valuable information enters at Specials, but the contact and information sharing between R&D, Engineering and Specials is lacking structure and efficiency. Therefore a lot of this valuable information is lost or stays in the minds of the different departments.
- Safan employees receive no or hardly any feedback on their input, and do not have access to this information. At this moment there you can store this data in the change report database, but because of the major workload concerned with treating these so called proposals (e.g. there are still change proposals from 2007) a lot of these ideas are not treated anymore and will eventually disappear in the lot.
- There is no direct link between more technology related departments and the user. Market related departments are the information buffer and valuable information could be biased or even lost during the communication.

3.4 The search for information

This paragraph will explore the role of Safan and the user as represented by the second arrow as shown in figure 17. This arrow emphasizes the *search* for user information that could be valuable in NPD projects. At Safan this search for user input in the NPD projects is normally done by the responsible project team. These project teams can consist out of several departments or just one or two, depending on the scale of the project. Besides the search as part of a NPD project Safan also generates information coming in through Service and Sales Consultants. These actors get in touch with the user quite often and have the possibility to recognize new features, components or ideas at the user's site. Interviewees for this first group were therefore selected from the departments of *sales, R&D, MT, service* and *Engineering*. During the interviews it was made explicit that in the case of *'user-involvement in NPD projects',* I aimed at the active involvement, not just the use of traditional marketing tools.

Figure 21: The search for information

3.4.1 Does Safan actively involve the user in the NPD process?

3.4.1.1 In general

All interviewees agree that there is no doubt about the lack of user involvement in NPD projects. Answers on the question if Safan actively involved the user in the NPD process included amongst others; *"…Not enough"* (I3, 2.49), *"…with the I-Brake project for the first time, but before that… not really"* (I4, 5.43), *"… involvement of users is rare* (I1, 1.26), *"… rarely, besides the I-Brake and TS project"* (I5, 1.30), and *"The only project I'm sure off when it happened was with the I-Brake"* (I2, 2.01).

On the question why the trend aims in this direction, one interviewee (MT) expressed the most commonly heard opinion about the lack of user-involvement; *"They do not provide enough added value to the product development process…"* and he added that; *"They know what their current needs are, but it gets trickier when they must ventilate their needs for the future* (…) *When you talk with them about the future, for let's say two or three years, you totally lose them"* (I3, 3.39). Sales argued about it in a different way and stated; *"I think Safan already made up their own plan, and I don't think the user gave any guidance or major input… it was 'listening' what they did…"* (I8, 7.55) and he added; *"I haven't thought a single time, hey… this is really resulting into something valuable for Safan"* (I8, 8.22).

However, most of the interviewees who were involved in recent projects, argue that there were made some attempts to involve the user in two recent projects; the *I-Brake* and *TS*. From this point forward I will describe these two projects and the other projects separately.

3.4.1.2 The I-Brake project and the TS project; a short introduction

These two projects initially started off as one project in 2004, but were divided in two (closely related) projects in a later stage. The I-Brake[19] is the first electronic press-brake with integrated robots which is patented by Safan. The robotic arms can work simultaneously for the handling of one long sheet, but can also bend two products at the same time, in one cycle. These robot arms are mounted in the frame horizontally. By doing so, the floor in front of the press-brake will be free for the pallets containing the sheets to be bent. In addition, the robots can run the bent

[19] See figure 22

products through the machine and stack them at the back of the machine. This innovative idea started in 2004 as the RD-38 project (I will call it the I-Brake project during the remainder of this thesis) and was initiated by the R&D manager who was active at Safan at that time. This was also the first project which involved the user in an early stage. In 2005 five users where contacted and asked for their opinion on the concept of the I-Brake. These meetings led to some interesting insights regarding the lay-out of the machine or as an R&D employee said: *"otherwise we would have ended up with a normal press-brake again"*. The first concept model was introduced in 2006 at the BLECH in Hannover (Germany), world's largest sheet metal working technology exhibition. On this exhibition Safan showed the machine without the actual handling of products, tool-changing and gripper-changing, but it still was a big success. In 2008 Safan showed the I-Brake again and now with the options lacking in 2006. They received the *'Platina Techni-Show innovation Award',* and its name gained on reputation again, but still there is no I-Brake sold yet. As the R&D manager described: *"We introduced the I-Brake as a prototype, but in that stage it wasn't prototype worthy but still a concept; the project phases are not in line with the technical progress" (I5, 13.10).* During the development of the I-Brake there were some mechanical problems (e.g. accuracy, the distance between under- and upper-beam) and software problems (e.g. current software is not compatible with I-Brake). These problems were the reason to divide the project in two separate projects to create more structure; *The I-Brake* and *TS project*, where the I-Brake project focuses on the mechanical part and the TS project focuses on the software and controls of the I-Brake. The TS aims on the feature that all products can be bent using graphic programming. In the case of the TS project the workload was underestimated.

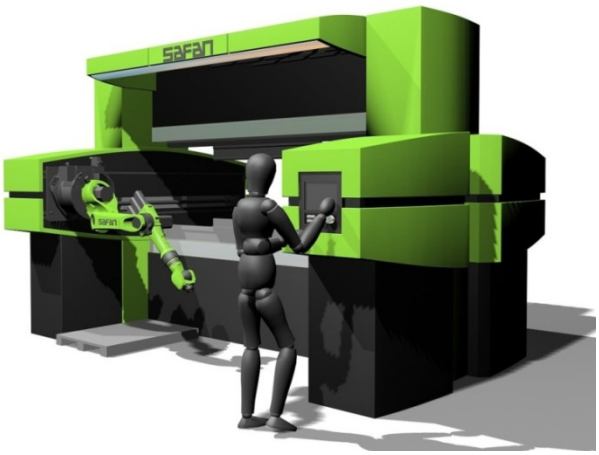


Figure 22: The I-Brake [Source: Safan]

3.4.1.3 Service and Sales consultants

Besides the NPD projects, it must be said that every visit to a user's site is a possibility to observe the working conditions and activities of the user. During these activities, service engineers and sales consultants get in touch with the user quite intensive. Therefore a very important and interesting way of gaining information from the user is the ability of service engineers and sales consultants to observe a user's activities. For example, there are quite a few cases where users introduced new components to their machines without the involvement of Safan (e.g. the idea of placing a robot at a Safan machine was initiated by a small user in the 80's).

3.4.2 What users do they involve and how are they selected

3.4.2.1 I-Brake and TS

In the case of the I-Brake project, users were selected based on both intuition and criteria, or as sales argued; *"I think Safan looked at how important a user was and if the user already had a robot system, so at least some experience in automated bending solutions"* (I8, 2.58). The criteria selected were based on some technical specifications and functional requirements, and were judged as sufficient to collect proper input in the NPD process. But on the question by whom or what means these criteria were formulated they were not sure. In the line of this reasoning the product manager Automated Solutions argues that at this moment there are three potential users who are extremely interested in the I-brake, which do not have any form of automated solutions in their company, and he therefore thinks; *"The selection criteria were to narrow"* (I2, 38.23) and later on he added *"…We canalized our direction"* (I2, 52.55). During the TS project the user involvement was more focused on log-data. This feedback had to provide for information to give a transparent view on the use of software and control options. Therefore the initial thought was to select users from every category, but because of the workload they again selected only a group of important users.

3.4.2.2 In general

The users involved in other projects, are most of the time users which have a good relation with Safan, are large, have a good reputation, and are quite sophisticated in what they are doing. On the question *how* Safan selected these users, one of the most mentioned words which describes the selection process was; *"…Intuition"* (e.g. I5, 2.03). Safan hasn't got a structured selection procedure and trusts on the skills and experience of Safan employees[20]. If involved, in most cases users were selected by sales (consultants) and the MT, and from that point foreword the NPD team had to *'work'* with these users; *"R&D asked sales who to pick, and sales gave them the users"* (I8, 3.30).

3.4.2.3 Service and Sales consultants

Service and sales consultants get in touch with all users. This is just because of the logical reason that every acquisition involves a sales consultant and every product delivery and service appointment involves a service engineer. In the lifecycle of a product the sales consultant will visit the user a few more times. A service engineer only goes to a user if they have a complaint which needs to be solved or when a user has a service contract.

[20] There is hardly any data available concerning these selection procedures, besides the I-Brake and TS project

3.4.3 By the means of what mechanisms do they involve the user

3.4.3.1 I-Brake and TS

In the case of the I-Brake, Safan used a more personal way of gathering information. First some users were selected and then they visited these users and gave a presentation on how they thought about the new product. In order to extract the user information they needed in their NPD process, Safan used a survey which treated some general info and user opinions on how they thought about the specs and features[21] as discussed in the presentation. Based on this information they continued with the NPD project. In a later stage, when the concept was worked out in more detail the users were contacted again to discuss the progress and provide feedback on recent developments. After processing this information a field test had to be conducted at a users site, but in the case of the I-Brake these field tests came too early, or as R&D described: "*We were pushed by the MT and Sales to perform a field test, but the time wasn't ripe at that moment*" (I5, 9.15). At this moment Safan thinks they have solved all accuracy problems and are able to launch a pilot.

In the case of the TS project Safan makes use of log-data in order to provide for input regarding the use characteristics of software by the user. This Log-data can be seen as a feedback mechanism which provides Safan with information on what use-frequency of different options the user shows, and is very valuable in order to streamline Safan's software with the needs of the user. However, Safan isn't processing this data in a structured way. They say it is time consuming to process this data into workable information, which was the reason that it was moved to the second plan. However, several employees see the added value of this mechanism.

3.4.3.2 In general

Marketing normally provides R&D and the project teams with user-information, but this information usually is a result of standard marketing research: *'skimming the surface'*. So if the users are 'selected', in most cases they use surveys, questionnaires or other marketing tools. This information usually is gathered in an early stadium of the project. In a later stadium Safan also uses field tests at a user's site. These tests provide for the feedback to fine-tune the machine in (mostly) incremental terms. Besides these mechanisms, Safan uses confidentiality contracts for two years now. Until that moment there hasn't been any form of formalization in relation to the user. Now all users involved in large scale projects must sign this confidentiality contract[22]. These contracts were introduced to keep information safe from being transferred to the market (e.g. to competitors).

[21] See appendix 6
[22] See appendix 7

3.4.3.3 *Service and Sales consultants*

Where service stands positive against the 8D reports[23], they have got some remarks regarding the possibilities for documenting wishes, remarks or other ideas from the user through observations. Service engineers who observe and recognize future possibilities try to report this, or as one stated: *"…if we see users who for example adjust roller belts in order to reduce physical effort, we try to take a picture to use for other purposes"* (I7, 6.50). But in the line of this reasoning service also argues that; *"Of course you remember some important parts, but if you do not capture this information, most of it will be lost (…) there is no structured rooting or a place where we can store this information which is also visible for others… such a thing is just not there"* (I7, 8.15) and he added that; *"Most remarks from service are not treated in a proper way and disappear in the end"* (I7, 9.40). Even specials argues that; *"Sales consultant and service engineers do not report enough on what they see"* (I4, 66.04). The only way to store this information is through the change control forms. Also quality recognizes possibilities to give more value to this input, but also clearly states that it must be stimulated and organized in a proper way. The communication lines and its major bottlenecks are visually represented in figure 23.

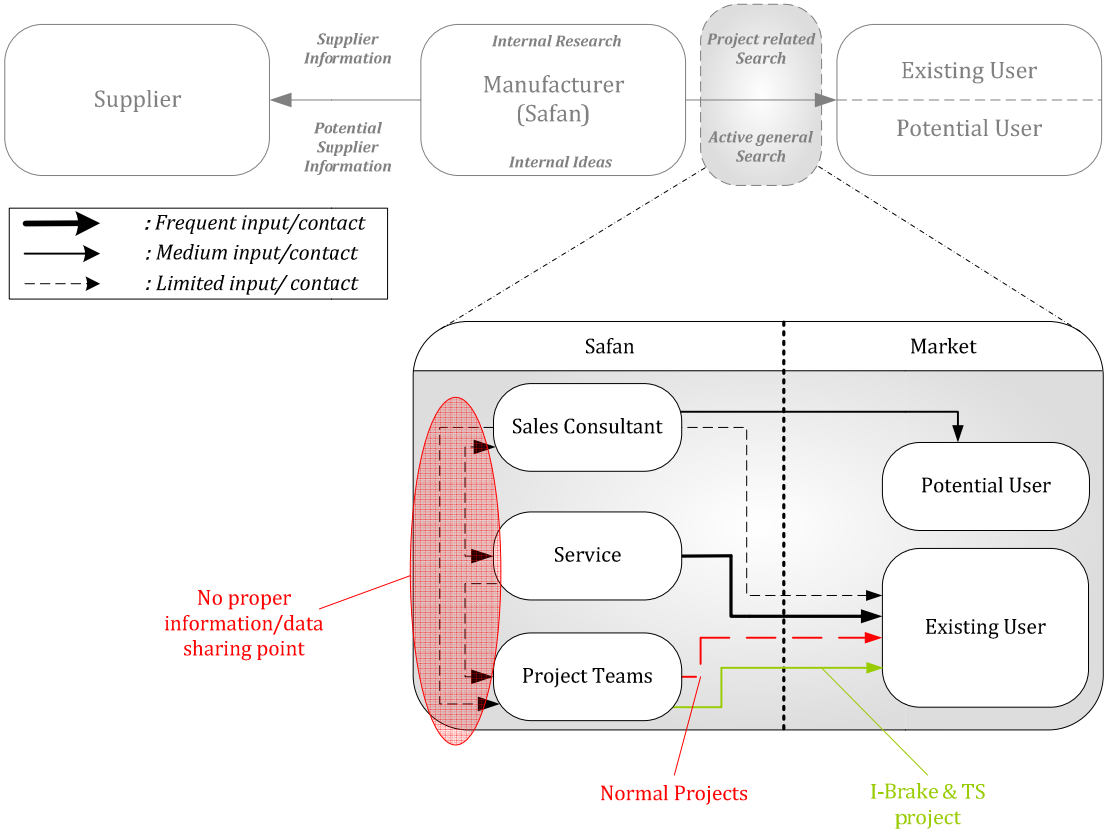


Figure 23: The search for information

[23] See § 3.3.2.2

3.4.4 At what point in the NPD process are users involved

3.4.4.1 I-Brake and TS

When looking at the I-Brake project, an attempt was made to involve the user in an earlier stage. This tactic resulted in some new insights, but it was still not in the first stadium of the project. Or as sales stated; *"We already had our plan worked out about what product it was going to be"* (I8, 9.09). After this first meeting a second meeting was arranged, but the involvement didn't go much deeper than normal. During the TS, the user also was involved in an early stadium. But then again, the concept was already there, so the input was based on incremental information.

3.4.4.2 In general

When looking at the stage users normally get involved, it could be said that they are involved in the NPD process after the first concepts are worked out. In most cases the user only get involved for the second time when a prototype is ready for testing.

3.4.4.3 Service and sales consultants

In the case of service and sales consultants the involvement is not in a project context. It is more about observation at the user's site. Service only gets in contact with the user, after the acquisition of a machine. A sales consultant is normally concerned with the actual acquisition and the after sales activities.

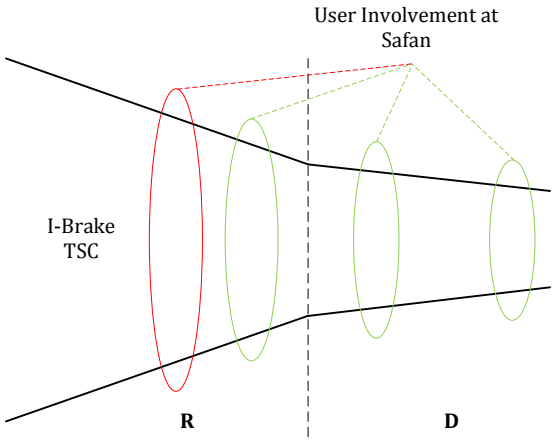


Figure 24: Points of user-involvement

3.4.5 Future possibilities

Not a single one of the interviewees responded negatively on the question if active user-involvement could be of value in the near future. The only question repeatedly asked was on how to do it, how to structure this process, and

how could it be organized? Some future possibilities as seen by Safan employees were amongst others; *"At Safan it is too predictable (…) it could be better to select other users than the ones you normally involve"* (I3, 6.40). And another interviewee added; *"The users who are most critical and come up with the best ideas (…) are 9 of the 10 times small users who are keen on change and new features"* (I2, 39.50). Also the use of log-data was a point of attention.

3.4.6 Bottlenecks

- Users are selected on intuition and not on well discussed and elaborated criteria. The users selected are most of the time strategic users.
- User-involvement is normally limited to traditional search mechanisms (e.g. market research or questionnaires and surveys). The I-Brake and TS did an attempt to bring the user involvement to a higher level, but the results were still not satisfying.
- Both sales and service see and feel the need to store information in a structured, more formalized way. At this moment there is no central database were all incoming information is stored or accessible for other departments involved in the NPD process.
- Users are involved only in later stages of the NPD process; *concepts and ideas are already shaped at that moment*.

3.5 Concluding comments

Based on paragraph 4.3 and 4.4 it could be stated that there definitely are some points of improvement and some very positive points which Safan already introduced. Besides that, there is certain awareness in every department towards the possibilities which can enrich the innovative competences regarding users. In the next chapter I will focus on these points of improvement and positive developments by discussing the similarities and deviations as recognized in theory.

4 DISCUSSION

Let's first recall the research questions as formulated in the first chapter; (i) *in what way should the user be involved in the innovation process according to literature?* And (ii) *what is the current situation at Safan concerning user innovation?* This chapter will discuss the similarities and differences between the theoretical model as described in chapter 2 and the current situation concerning user innovation at Safan. I will start by discussing the *pro-active* involvement of the user and organize this section by first looking at existing user involvement activities, second at the absent user involvement activities and finally I will sum up my findings and give some concluding comments. The second part will discuss on the *passive involvement* of the user. However, in my theoretical analyses I focused on ways to involve a user actively and not on how to deal with user information without the active involvement of Safan. Therefore I will elaborate in this part on possible causes of the findings as recognized in the empirical analyses.

4.1 Pro-active user involvement

4.1.1 Existing user involvement initiatives

4.1.1.1 I-Brake and TS

Safan only had two NPD projects where they actively involved the user, the I-Brake and the TS project. But did Safan involved the right user, used the proper selection method or structured this in the correct innovation context? At first, when looking at Safan's selection procedure of the users during these projects, there is no real structure to be recognized. They were selected based on employee skills, intuition and experience, and also on some predefined technological criteria (e.g. such as the need for robotics or automated solutions at the users site). This way of selecting is in sharp contrast with theory, which states that the selection of the user must be structured and requires a proper reasoning (e.g. March, 1991; Pinegar, 2000; Tushman, 1986; von Hippel, 2005). If you chose to actively involve the user, the selection and search of the suited user are important steps in order to make a NPD project to a success. To select the right user it is important to know in what innovative context you want operate, because based on the research model as discussed in chapter 2, it is believed that different innovative activities, such as exploration and exploitation, draw on different structures, processes and resources (Benner & Tushman, 2003; Gupta et al., 2006; Uotila et al., 2007).

A second important point in this reasoning is that these different innovative activities are stimulated by different users and require different involvement tactics (e.g. depth and breadth of involvement). The users selected in the two projects were large established users which had a good relation with Safan. In user innovation literature these users are recognized as the strategic users (Schreier & Prügl, 2008). These users are well suited for platform innovations and the I-Brake project can be seen as such a platform innovation. Speaking in terms of theory it is a match and could therefore result into a successful innovation. But if so, why did it not lead to the success it supposed to? The explanation can be found in another dimension of the model: *the degree of involvement.*

When looking at the breadth and depth of involvement there are some striking differences with the model. First of all, according to literature you need to involve the strategic user over the total breadth of the project (Fang, 2008a; Tidd et al., 2005; Vanhaverbeke, 2008). During the I-Brake project the user was only involved during a few contact moments. The first time they were involved in a relatively early stage, and the second time they evaluated the concept and some additional ideas of the I-Brake. But the involvement must be organized on a frequent base and must be planned on important moments such as the concept generation phase, prototyping and testing phase (e.g. Safan did not organize a field test). However, Safan did not involve the user in the very first beginning, while literature emphasizes the importance to involve the user in an early stage; when there are only global ideas or when you start from scratch (Naveh, 2007). An explanation is that when involving a user in the process at a later phase of the project, the mind of the user could already be constrained by the ideas of Safan; *they already are forced to think in boxes.* In the case of Safan the involvement happened in a phase when concepts were already shaped and ideas were already there. Safan focused on its own technology base to much and shaped their ideas to fast. This influenced the user in such a way that they didn't come up with valuable new ideas. A striking remark was made by a Safan employee that the user was only *listening* and *not actively cooperating*. The involvement in the innovation funnel is visually represented in figure 25.

Secondly, theory also clearly states that the information sharing in platform innovation projects must be in-depth (Bonner, 2004; Fang, 2008a). In the case of the I-Brake project Safan tried to involve the user in a different, more cooperative way. The user was involved by a few visits and a survey about the concept, and they even had to sign a confidentiality rapport. But this involvement never reached the depth of involvement necessary to really innovate. Safan did organize some contact moments where they discussed the concept of the I-Brake but the input was minimal because the survey they used didn't gave much space to elaborate on new ideas. This can be explained by the fact that active involvement is not the same as filling in a survey or questionnaire; *it requires in-depth information sharing*. This is important to bear in mind because user involvement success in large innovative projects

will fail if you only use these *'surface skimming'* traditional mechanisms. These mechanisms are contributing to incremental input at most, but will never result in platform or radical innovations.

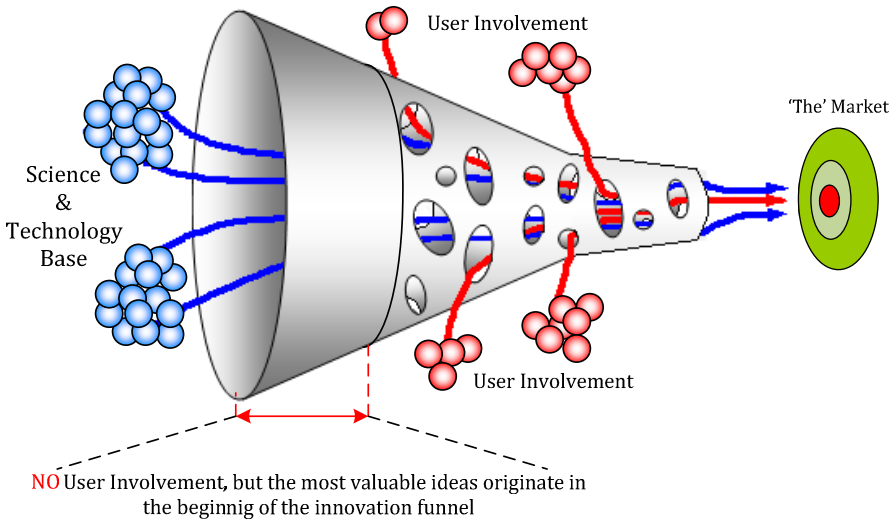


Figure 25: User involvement at Safan

This shows us that the selection of a mechanism is also very important for the input a user will provide; *different mechanisms stimulate different innovative activities.* But were theory suggests for mechanism like alliances, multidisciplinary teams or innovation networks, Safan did not actively organized the NPD along any of these mechanisms. Yes, they had a multi-disciplinary team, but they were organized internally and the user wasn't an active partner of the team. And the few times the team did involve the user they visited the user's site only by two or three members of the team, which could lead to biased input.

Another example is the input through the log-data feedback mechanism in the TS project. According to literature this mechanism is a perfect source for valuable user-information[24], but at Safan it is not organized in a structured

TEXTBOX 8

Configurators in the automotive industry

Think of an embedded auto toolkit as a user interface that is supposed to enable drivers to change certain features or vehicle characteristics of their car at any time after the purchase. This idea is based on the assumption that users develop new customer needs during the usage period of a product. By using the product the users realize (they have) needs that they did not think about when buying the product. Thus, by the means of an "embedded configurator", certain design decisions are postponed into the user domain and the fit to market can be improved. *Frank Steiner, January 27, 2009*

[24] See textbox 8 for an example of such a mechanism in practice

way. The data is present, but it needs to be processed to become useful information. The selection for strategic users in this case is not wrong but could be spread out over the whole range of users as identified in literature to get a better understanding of the total spectrum of needs.

When we summarize the findings and combine them in the context of the conceptual model, it will result in the model as represented in figure 26;

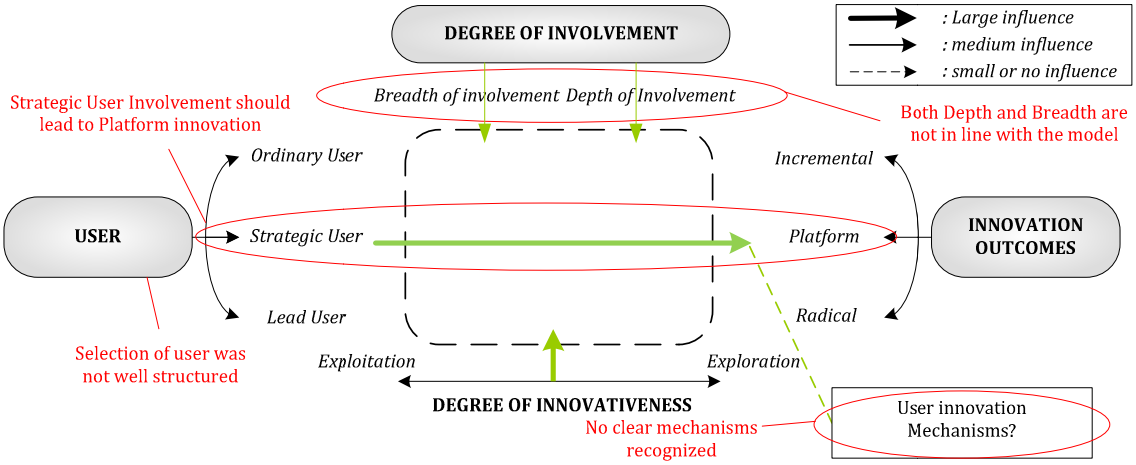


Figure 26: Conceptual model based on Safan

4.1.1.2 Other activities

Besides the active involvement in the two projects as described above, also service engineers and sales consultants are able to provide pro-actively for valuable input in the NPD process of Safan. This way of searching, as described in chapter 3, can best be compared with the mechanism as described as *'sending out scouts'*. Service engineers provide for incremental input most of the time, because they only get in contact with the people on the work floor at the user's site. But in contrast with the principle of sending out scouts, the scope of a service engineer is rather limited and ends at the borders of the existing users, while sending out scouts must also stimulate the search outside these borders (Bessant, 2008). Besides the service engineers there are also the sales consultants. In contrast with the service engineers they get in contact with higher levels in the user's organisation which could stimulate other innovative input than just incremental input. However, because of their incentive to sell standard products they could hamper the search and have, in an indirect way, a lack of awareness for new innovative ideas. Another point in this reasoning is that the skills and know-how of the employee (both service engineers and sales consultants) are very much decisive on what they see, how they interpret it, and what they look for. Therefore the

search could be focused too much on one part of the total spectrum of possibilities, which leaves many possible ideas undiscovered.

Other mechanisms used in the NPD process by Safan are the field feedback mechanisms as described by Magniez et al. (2008). Where Safan, strange enough, did not used this mechanism in the I-Brake and TS project (until now), other projects did include a field test. One small remark is that Safan only uses these mechanisms in later stages, but the effect would be larger if they used them in an earlier stage. This could be costly however, and in the case of Safan there is a lot of technology involved which makes it even harder. Therefore the choice of Safan to test the concepts in a later stage is a valid one.

The way of organizing the current activities as mentioned above resulted in differences between the expectations of Safan and actual outcomes several times. Because of these unsatisfying results, Safan indirectly developed a certain lack of willingness, motivation and trust towards user-involvement and its added value. However, with a bit more organization, structure and awareness of the possibilities the input could have been much more valuable.

4.1.2 Absent user involvement activities

If we look at the conceptual model as described in chapter 2 and the characteristics of Safan described above in paragraph 4.1.1, you can clearly see some absent user involvement possibilities. First of all there is no active involvement of the ordinary user and the lead-user, while theory clearly emphasizes the need to involve all types of users (e.g. Benner & Tushman, 2003; He & Wong, 2004).

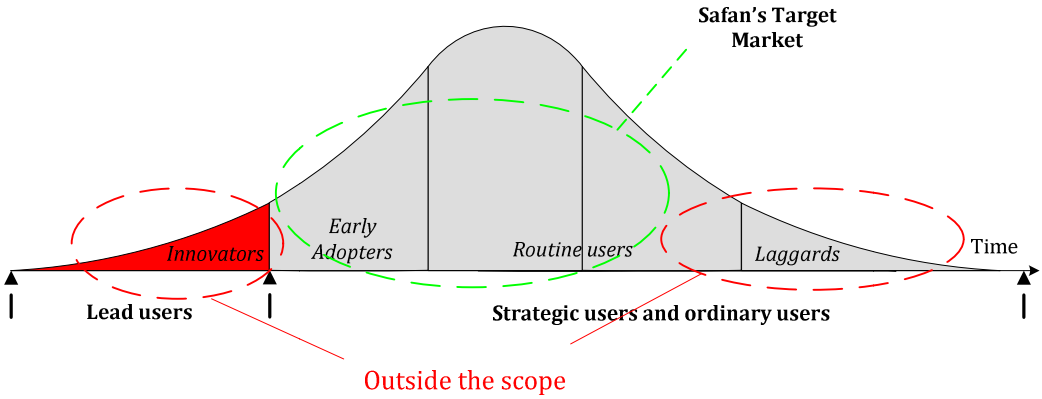


Figure 27: Selection area of Safan

One clear argument which supports this finding is that an organization will only succeed if they focus on both exploitative and explorative activities. These different activities will result in different innovative outcomes (e.g. incremental and radical innovations) which will influence the short term and the long term effects. But these activities also need the involvement of different users. When concentrating only on strategic users in the innovation

process, the innovative output will be too much focused on platform innovations. Safan's selection area of the user is concentrating too much on the strategic user and therefore Safan must broaden their scope towards the lead-users and ordinary users to cover the whole range of possibilities in order to increase its innovative strength.

A second point concerning the differences between theory and Safan is, besides the ones mentioned in the previous section, the lack of several possible mechanisms to actively involve the user. Safan has strong incentives towards traditional marketing tools such as surveys or questionnaires, but as theory states this is no suited method to actively involve the user (Prahalad & Ramaswamy, 2004). Were Safan's current involvement is concerned with strategic users, the lead-user method for example could stimulate radical change. And feedback mechanisms could lead to a continuous incremental input to reduce deviations in user need. Magniez et al. (2009) mention the numerous possibilities in this context, where mechanisms can range from an on-line user interface to feedback through service engineers in face-to-face conversations.

4.1.3 Concluding comments

Based on the conceptual model it can be stated that Safan did select the right user in the context of the I-Brake and TS project, but they are not aware of *'why they did it right'*. Intuition and experience is not sufficient to select the right user. Theoretically seen there was a match, but the input of the strategic users involved in the project was minimal and resulted in unsatisfying results. This was mainly caused by the lack of breadth and depth of involvement during the project. Besides that there were no well organized mechanisms present in the innovation process. There are several opportunities in this context, but Safan did not utilized the possibilities to improve mechanisms which are already present (think of the feedback mechanism in the form of log-data, the role of service engineers and sales consultants in the role of scouts and the role of the user in multidisciplinary teams). When looking at absent activities, Safan didn't focus on lead-users and ordinary users, and was not aware of absent user innovation mechanisms which can improve the innovative competences (e.g. lead-user method or feedback mechanisms).

4.2 Passive user involvement

As discussed in the empirical analysis in § 3.3 there are besides active user involvement activities also *passive user involvement activities*. By the means of *specials, wishes and ideas* and *complaints* there is valuable input entering Safan without their active involvement. However, after entering Safan a lot of this information is lost, not well captured or effectively ventilated throughout the organization. Before I will continue with the discussion, one must understand that in the discussion on active user involvement I could refer to my conceptual model, while in this

case I do not have such a theoretical frame of reference. This is why this part is serving as a global discussion on possible explanations of the findings from the empirical analysis. They are the trigger for future research.

4.2.1 Knowledge management at Safan

The problems at Safan concerning the passive involvement can be summarized in terms of *loss of information, limited intra-organizational communication, no proper mechanisms to facilitate knowledge sharing*[25] and *inter-organizational contact does seldom involve technology driven departments.* Because the bottlenecks point in the direction of unstructured knowledge and information management, I will discuss these topics by using the concept of knowledge management (Nunes, Annansingh, Eaglestone, & Wakefield, 2005, p. 101) and in particular the transfer of this knowledge within an organization (Goh, 2002).

In holistic terms Nunes et al. (2005) state that, "*Knowledge Management must be seen as a strategy to manage organizational knowledge assets to support management decision making, to enhance competitiveness, and to increase capacity for creativity and innovation (Nunes et al., 2005, p. 106).*The importance and difficulties of knowledge transfer is well defined by Goh (2002); *"Knowledge transfer requires the willingness of a group or individual to work with others and share knowledge to their mutual benefit. This implies that knowledge transfer will not occur in an organization unless its employees and work groups display a high level of co-operative behaviors – that is, unless employees and groups have a natural tendency to share and collaborate with each other" (Goh, 2002, p. 25).*

In order to stimulate knowledge transfer between individuals and groups within an organization, Goh (2002) state that it is an important prerequisite to have a strong co-operative and collaborative culture. When co-operation is poor, it will result in a reduction of the frequency of communication and the degree and willingness to share information. This could partly be the explanation why communication between Specials, R&D and engineering is not optimal. Information often resides at one department or flows only between let's say specials and engineering. Valuable information resulting from the interaction between specials and engineering is therefore not easily accessible for R&D. This is recognized as one of the most common problems in organizations; *in many organizations expertise is held locally*, or as Burgelman et al. (2004) state, *"Knowledge must spread quickly and efficient throughout the organization. Ideas carry maximum impact when they are shared broadly rather than held in a few hands" (Burgelman et al., 2004, p. 1170)*. But as Goh (2002) argues, "*Without appropriate mechanisms to encourage co-operation, structured or technological interventions to facilitate knowledge transfer may not work"* (Goh, 2002, p. 25). It must be said that with the introduction of the 8D method Safan made a first step to structure the incoming

[25] This is about the encountered problems and do not comprise the treatment of complaints by the means of the 8D method

information. The results are promising and all departments are aware of the possibilities. However the treatment of other incoming information (e.g. ideas or specials) still happens in the old fashioned way by the means of the change proposals. This was also underlined by service who feels that they do not receive enough feedback on their input; *they lose faith in the procedure*. In this line of reasoning Goh (2002) recognizes some fundamental variables which influence the co-operation between groups or individuals. One of the most important variables in this context is the level of trust; "*A high level of trust is an essential condition for a willingness to cooperate"* and he adds *"unilateral decision-making, a secretive environment, and a lack of information will inhibit trust" (Goh, 2002, p. 26).* Fair treatment of employees, openness of information and rewards are examples of management practices which could increase this level of trust. Burgelman et al. (2004) for example suggest that, *"Knowledge is more likely to be transferred effectively when the right incentives are in place. If employees know that their plans will be evaluated (…) progress is far more likely" (Burgelman et al., 2004, p. 1171).* This explains why the *change control forms* are not successful; there is no trust. And it also explains why the 8D method seems to be successful; *employees believe in it.*

This was also the trigger for service to make the remark that there is no proper mechanism which facilitates knowledge sharing. The need for such mechanisms is emphasized by Nunes et al. (2005); *"Adequately capturing, storing, sharing and disseminating knowledge can lead to greater innovation and productivity" (Nunes et al., 2005, p. 101).* Also Goh (2002) emphasizes the importance of the use of a mechanism. He states that an appropriate infrastructure to reinforce and support knowledge transfer is very important. *S*pecials, R&D and Engineering also see the importance of more formal ways to share knowledge, so the support is present. Burgelman et al. (2004) recognizes several mechanisms which could spur this process such as, written, oral and visual reports, databases, site visits and tours, personnel rotation programs, education and training programs, and standardization programs. Transferring employees to, or let them mingle with other departments helps to share this wealth (e.g. cross-functional teams).

The last point aims on the inter-organizational contact between Safan and the user. It became clear that the more technology driven department do not (or seldom) get in contact with the user. Sales driven departments and service form the entry points of the information and transfer this information deeper into the organization. Goh (2002) state this way of working could be dangerous because; "*… a recipient's lack of motivation, absorptive capacity, or retentive capacity can result in poor transfer of knowledge" (Goh, 2002, p. 27).* During this knowledge transfer, it is important to see the differences in terms of the characteristics of the knowledge recipient, the knowledge source and the context in which the transfer occurs (Goh, 2002). When reflecting this for example on service (recipients), it can be said that they operate on the same level as the people on the work floor at the user's site (source). But when

translating this information to, let's say R&D, will the information be of the desired quality? Or could direct contact between technology driven departments and the user result in different, more valuable information[26]?

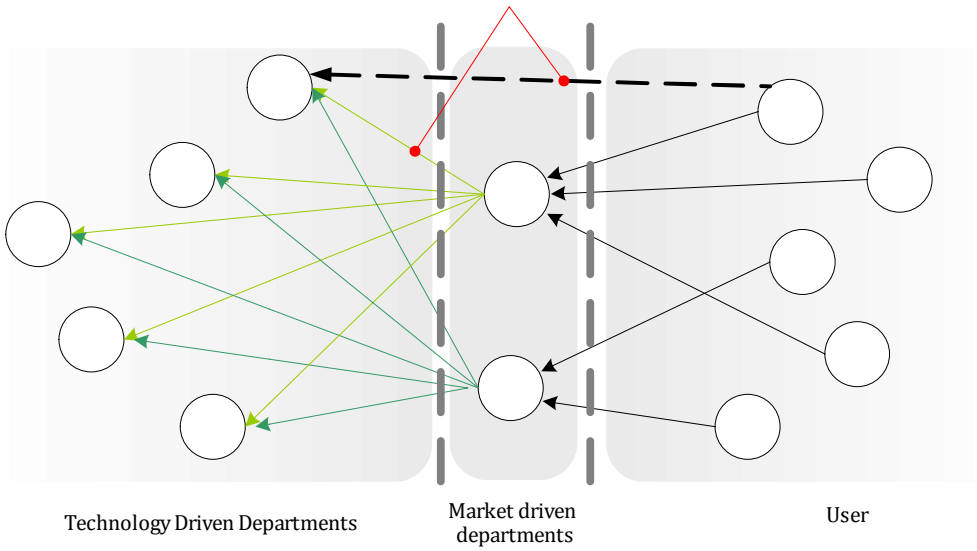


Figure 28: Knowledge transfer

4.2.2 Concluding comments

The bottlenecks found concerning the passive involvement of the user are mainly focused on the organization, capturing and sharing of the incoming information. Because the passive involvement is about information entering Safan, they must focus on how to capture, store and communicate this information throughout the organization. The issues as recognized at Safan cannot be seen as separate problems, but are parts of the bigger picture. Just a database would not solve the problems, the whole culture and strategy must stimulate these activities in order to make it work. The points discussed above show a clear direction towards the needs and possibilities to improve the communication strategy and the knowledge management. If Safan does not change their information structure, it could imply severe risks in terms of understanding of the business environment, user relationships and needs, as well as loss of business opportunities and innovative thinking; *Safan is not taking advantage of potential opportunities.*

[26] See figure 28

4.3 Concluding comment

In this discussion on active and passive user involvement some interesting findings were revealed. Not only active search is valuable but also the passive input can be of great value. However, were the active involvement focused more on possibilities to involve the user in the innovation process; the passive involvement was more focused on how to deal with the information that enters Safan. However, they both are valuable sources for the innovation process.

What remains a matter of debate is to what degree a firm needs to listen to a user? I really think that when it comes to NPD, the technical knowledge of Safan far exceeds the knowledge of the user. Therefore we need to accept the fact that Safan cannot be entirely user-driven. But this internal knowledge and the knowledge of the user must be seen as complementary. When possessing superior internal knowledge, like Safan, it is tempting to stay within your own boundaries and focus on your own skills. And maybe most users do not have the knowhow to develop or create complex components or programs, but they can come up with the *'out of the box'* ideas which are so important to innovate. It is not about replacing a source of knowledge, but about strengthening your own fundaments with external knowledge. Safan needs to be aware of the possibilities and not get trapped in their own fixed mind. After all, *you cannot discover new oceans unless you have the courage to lose sight of the shore*.

5 CONCLUSION

While the last chapter discussed the results from the empirical analysis and the theoretical implications, this chapter will reflect on this research with the theoretical contribution, the managerial advice and finally the limitations and future research possibilities. First I will look at the theoretical contributions comprising the conceptual model and the additional view on passive involvement. Secondly I will look at how these findings can contribute to a better understanding of user-involvement in a managerial context. In this part I will also give recommendations towards the practical applicability and answer my central question. I will end this thesis by looking at the limitations of this research and the possible directions for future research.

5.1 Theoretical contribution

Conceptual model

Previous research on user innovation has revealed several possible directions on how to organize processes concerned with user innovation. However, an integrative framework combining these different concepts and dimensions is not there yet. While some theories focus on the role of exploitation and exploration (e.g. Jansen et al., 2006; March, 1991; Uotila et al., 2007), some on user characteristics like the role of lead-users or strategic users (e.g. Lettl, 2007; C. Luthje & Herstatt, 2004; von Hippel, 2005), and others on the translation of user-needs (e.g. Prahalad & Ramaswamy, 2000; Thomke & von Hippel, 2002), I tried to combine all these dimensions into one conceptual model. My findings demonstrate that the dimensions of user innovation as recognized in theory can't be seen as separate entities, but must be seen as complementary dimensions which influence one another significantly. The choice for an innovation type, a context and a mechanism pretty much decide on when you need to involve what user and the other way around.

Active vs. passive involvement

A second contribution to literature on user innovation is that user involvement is not only organized in a pro-active way, but also happens in a passive way. During my extensive literature study I didn't came past an article, theory or book which elaborated on both the passive and active involvement of the user. However during this research it became clear that there is a lot of valuable information entering an organization without their active involvement. Complaints, ideas, wishes and comments can result in valuable input without any effort of the firm. Important

however is to manage this information. Without a proper knowledge management structure and strategy valuable information will reside within the minds of employees or departments will become obsolete or even get lost.

With this study I hope to contribute to a better understanding on the complex topics concerned with user involvement in the NPD process. I tried to find more insights in the exact influences concerning user involvement in different innovative contexts and its different mechanisms. Besides that I hope this study will contribute to the understanding of the open-innovation model and will trigger others to research the many other possible directions of user-innovation.

5.2 Managerial advice

As recognized in literature, user involvement could be valuable to the input of a NPD project. The selection of the user is very important in order to make such an involvement to a success. Do you want to explore or exploit? Focus on current concepts or something radically new? All these choices influence the decision on what user to involve and how to involve them. The model could serve as a guideline in order to make these decisions. However, many firms are not aware of the importance and added value of a well defined user involvement strategy. But as theory states there are a lot of projects failing or losing value by selecting the wrong users or organize these processes inefficient. In order to give more structure to this process I will provide some recommendations. By combining the findings from the theory and the current situation at Safan into a practical consensus, recommendations can be made on the possibilities towards a more effective involvement of the user in the innovation process. The output of this research shall be an advice that contains the most suitable user innovation strategy for Safan, and will answer the central question of this thesis: *In which way can current mechanisms for user innovation be optimized and which new mechanisms for user innovation can be introduced in Safan's innovation process?*

My recommendations are twofold. First I will give recommendations in the active user involvement context to optimize current mechanisms and introduce new mechanisms. And secondly I will give recommendations in the passive user involvement context to optimize current mechanisms and introduce new mechanisms.

5.2.1 Recommendations on active involvement

First off all, if Safan decides to involve the user in the NPD process, they must realize the importance of selecting the right user in the right context. Selecting by the means of intuition and experience must be substituted by a well structured selection procedure. Therefore it is important to know your market and the characteristics of the different users, and it would be wise to map the current user portfolio by *ordinary, strategic* and *lead-users*.

Secondly, because innovative success depends on both exploration and exploitation it is important to balance your research on these activities. Therefore it is important to involve all users and not only the strategic users. When involving all users, you will stimulate research towards incremental, platform and radical innovations. I will now look at which mechanisms can be optimized or introduced.

5.2.1.1 Current mechanisms

- *Multi-disciplinary teams:* in the future multi-disciplinary teams at Safan must involve the user in a more active context. Theory states that it is important to make the user part of the team. The strategic user is the best partner to involve and the outcome will most likely stimulate platform innovations. Important is to involve them in an early stage when concepts and ideas are not yet developed. Especially these first phases are important to extract ideas and input from the user. Involvement must be in-depth and must be spread over the total breadth of the NPD project, on the most important stages (go, no-go).
- *Log-Data Mechanism:* the feedback mechanism which provides for the log-data must be re-launched. This data is very valuable, but needs to be processed to become useful information. It is best to involve all groups of users in order to create a transparent view on the user-characteristics. A positive aspect is that involvement doesn't need to be in-depth or on a high frequency, as long as it is well organized. The needs of the user can be matched more easily and even be personalized. The data and the method are not only valuable for the TS project but could also serve other projects.
- *Sending out scouts:* Service and Sales Consultants must be aware of their role in order to search for valuable information. Service engineers most likely provide for incremental feedback, while sales consultants could provide for more explorative input. It is important to involve all users, but it would be wise to involve the technology driven departments in visits involving strategic and lead-users. These departments see other things and will provide for different input.

5.2.1.2 Recommended Mechanisms

- *Lead-user method:* where Safan is focusing on strategic users in most cases, I recommend involving the lead-user in a more frequent way. To stimulate radical idea generation the lead-user is the best partner to cooperate with. The lead-user method as described in chapter 2 is the most suited method to involve these users. The most difficult part will be the identification and the selection of these users, but it will pay off at the end. It is crucial to involve them without any concept or product idea. Because the main

strength of this method is to generate '*out of the box*' ideas. When you approach them with ideas and concepts they will automatically think in boxes, and results will be disappointing.

- *More feedback mechanisms:* besides the Log-data feedback system, Safan must introduce more feedback mechanisms in order to structurally receive feedback on user characteristics. Think of bending frequencies or cycle times. Based on this information, Safan can introduce customized services, and even develop new financial structures (e.g. configurable software or pay a standard amount for a product and charge per bend)

5.2.1.3 Additional recommendations

- *Central Sharing point of Innovative Ideas:* It would be wise to create a central sharing point were observations from all departments could be stored and be accessible for the ones involved in a NPD project. This point of attention must be integrated in the recommendation I make in the next section about information storage possibilities and knowledge management.

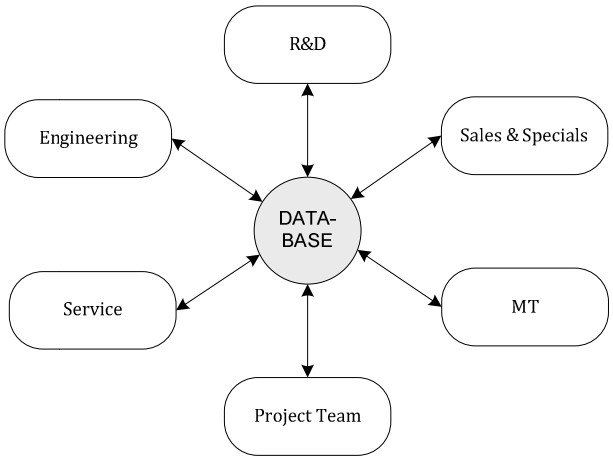


Figure 29: Global structure of Central database

5.2.2 Recommendations on passive involvement

There is a lot of valuable information entering Safan for free, without any effort. Could it be any better? Of course this gives a lot of potential input in the NPD process, but without a well organized structure to process and store this data, it will be useless. But as the discussion made clear, a recommendation towards a single database or a reward system to stimulate innovative thinking will not be sufficient. Therefore the main recommendation is to organize and structure the incoming information at Safan. As emphasized in the discussion on passive user-involvement, it is very important to create a common understanding concerning the added value of registering and

sharing knowledge. Therefore I recommend Safan to do a follow up study which focuses on knowledge management. This research must comprise at least the following issues;

- Information storage possibilities in order to prevent loss of information and stimulate knowledge sharing. This could be in the form of an innovation database or even integrated with the 8D database. The Change Control Forms have lost their credibility as a central sharing point and must be re-organized under different conditions in order to make it work. Trust must be rebuilt to make such a mechanism work.
- Intra-organizational information sharing must be re-organized. Main target is to structure knowledge sharing between Specials, Engineering and R&D because in this case valuable information is lost or not shared. The problem of *'not knowing what is going on at the other side of the wall'* must be history. R&D and Engineering are both important in the development of products at Safan. They have to know what is going on in other departments.
- Technology driven departments must be more often involved in Inter-organizational contact moments. Different skills and different incentives will automatically results in different perspectives.

5.2.2.1 Recommended mechanisms

Figure 30 and 31 present two possible research models which could contribute to structure the follow up study and show the different factors influencing the organization of knowledge management and knowledge transfer.

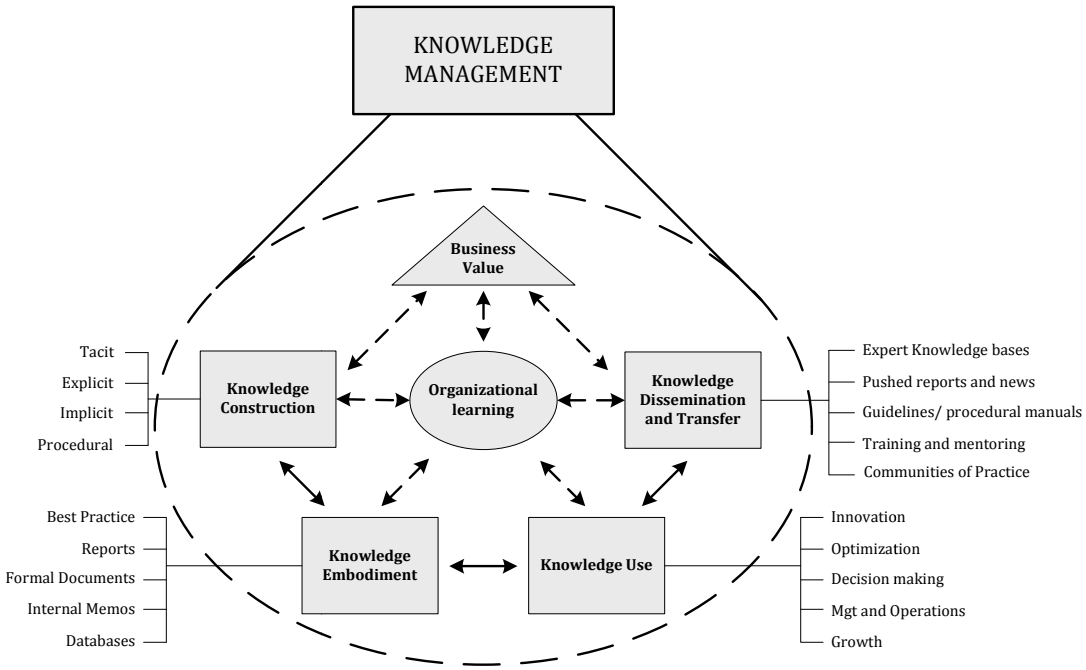


Figure 30: The Knowledge Intensive Model [Source: based on (Nunes et al., 2005, p. 110)

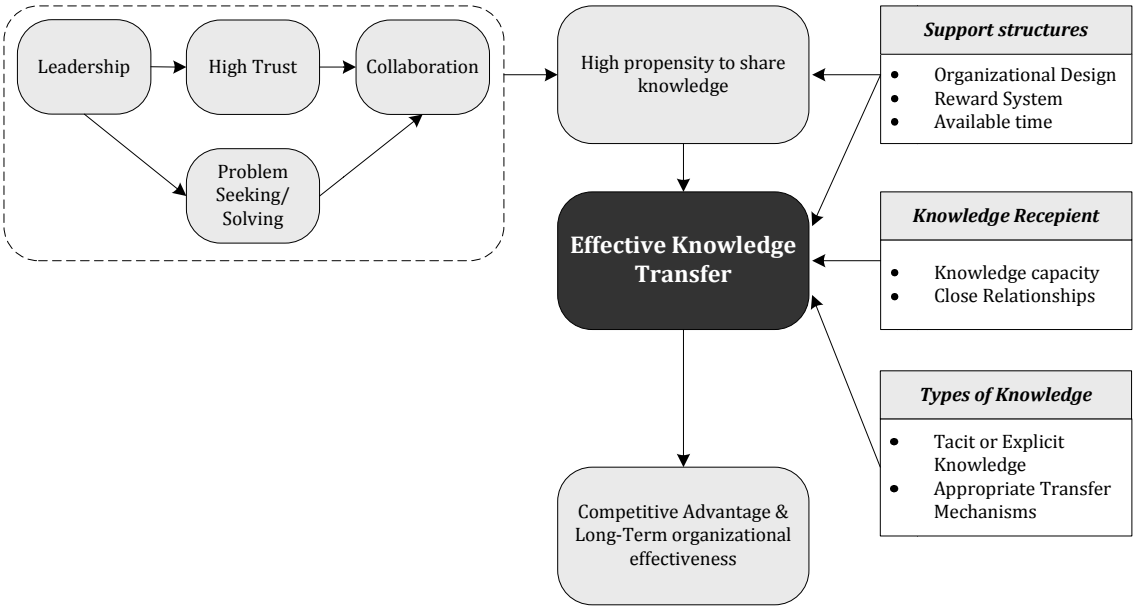


Figure 31: An Integrative framework: factors influencing effective knowledge management [Source: (Goh, 2002, p. 28)]

5.3 Limitations and issues for further research

In this last paragraph I will discuss some limitations and future research possibilities which are the result of my findings on the complicated topic of user innovation. Like most studies, this study also has some limitations that should be considered when evaluating the results and possibilities towards future research.

My first remark is that one must understand that because of this study's qualitative nature, there will always be some subjective elements involved. There was not as much data as I hoped for, and therefore the analysis is solely based on this qualitative input. And though this study is enriched with an extensive literature study, it is only tested by one in-depth examination at one company. In future research, more data must be obtained to create more reliability. Longitudinal data would help shed light on how NPD projects evolve over time and how the relations build up through user involvement could influence future projects.

Secondly, though this study gives some valuable insights on how to involve the user in the innovation process, at the same time the scope is rather limited. The user is just one of the many external sources which could be involved in the NPD process and is off course only part of the open-innovation philosophy (Chesbrough et al., 2006). Besides the involvement of the user, also the role of suppliers, research institutes, competitors and analogues markets as mentioned by, amongst others, Von Hippel (2005) must be analyzed to complement this study. In this line of

reasoning it could also be interesting to look at the different levels of interaction. What characteristics are present in *entrepreneurial* or *large firms*, and which mechanisms do they use to involve the user in their NPD process?

A third, but important point to mention is that this study mainly focused on the active involvement of the user, and left the passive involvement pretty much untouched. Though I gave some interesting starting points in order to structure and reorganize the passive involvement, an in-depth study towards the organizational structure must be performed. You can think for example of topics as optimizing communication lines, knowledge management and the learning organization.

Finally, one must understand the complexity of user involvement in the NPD process. It is easy to say you want to involve the user in your NPD process, but identifying and selecting these users is a time consuming process, and a more in-depth examination towards a pragmatic toolkit on how to search, select and involve the right user could be wise.

In sum, this research has contributed to a better understanding on the possibilities and traps concerned with user innovation and highlight the need to be aware of the importance of this phenomenon. Hopefully firms who want to involve the user in their NPD process are stimulated to organize this underestimated field in a structured way. I hope that with this study some interesting and useful doors are opened and that it could be the starting point for further research on the exiting topic of user innovation.

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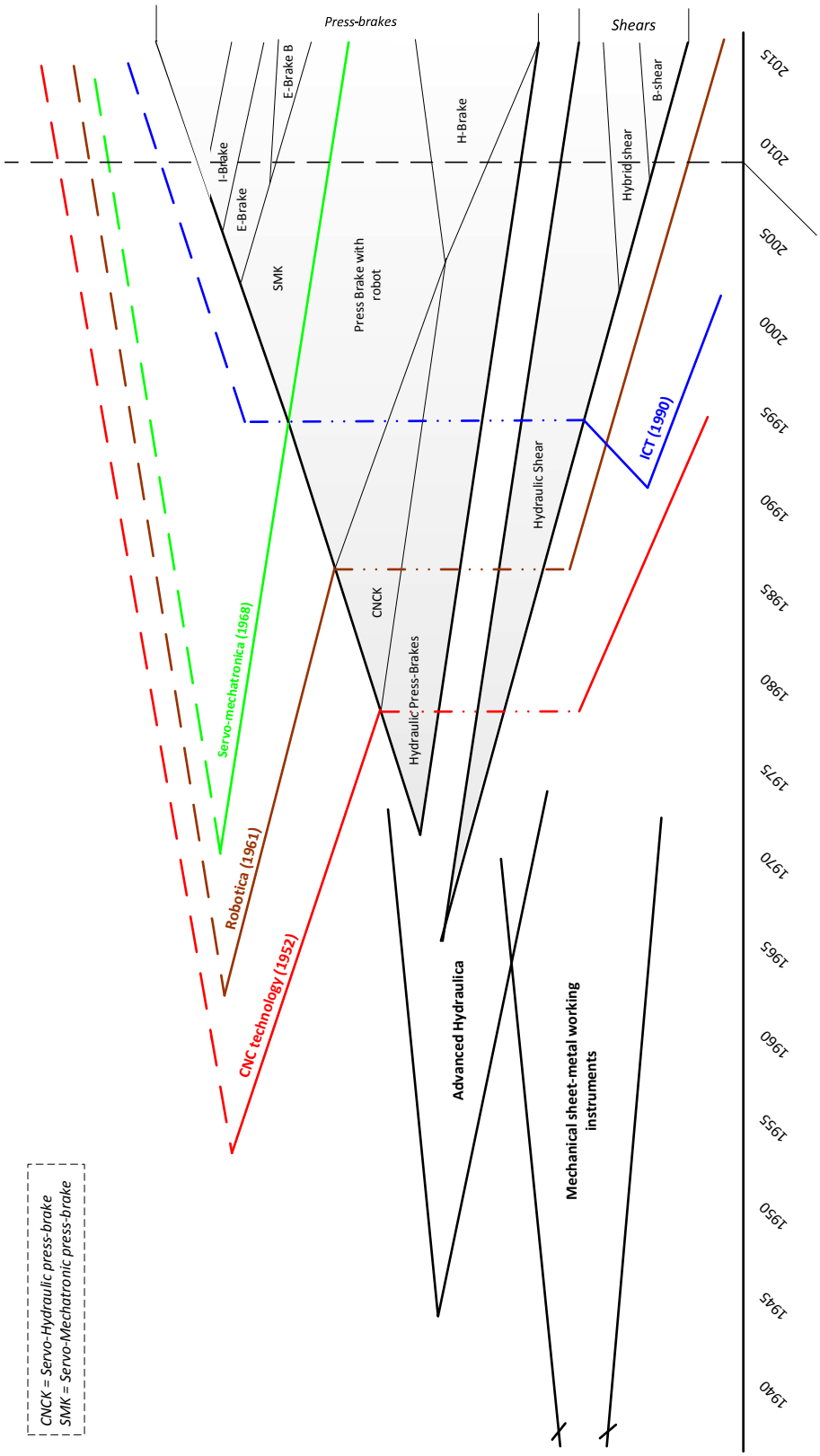
APPENDIXES

Appendix 1: Technological evolution at Safan



Appendix 2: A shift in User Involvement

	Users as a passive audiance			*Users as active players*
	Persuading predetermined groups of buyers	**Transacting with individual buyers**	**Lifetime bonds with individual users**	**Users as cocreators of value**
Time Frame	*1970s, early 1980s*	*Late 1980s and early 1990s*	*1990s*	*Beyond 2000*
Nature of business exchange and role of users	Users are seen as passive buyers with a predetermined role of consumption			Users are part of the enhanced network; they cocreate and extract business value. They are collaborators, co-developers, and competitors
Managerial mindset	The user is an average statistic; groups of buyers are predetermined by the company	The user is an individual statistic in a transaction	The user is a person; cultivate trust and relationships	The user is not only an individual but also part of an emergent social cultural fabric
Company's interaction with users, and development of products and services	Traditional market research and inquiries; products and services are created without much feedback	Shift from selling to helping users via help desks, call centres, and customer service programs; identify problems from users, then redesign products and services based on that feedback	Providing for users through observations of users; identify solutions from lead users, and reconfigure products and services based on deep understanding of customers.	Users are co-developers of personolized experiences. Companies and lead users have joint roles in education, shaping expectations, and cocreating market accaptance for products and services
Purpose and flow of communication	Gain acces to and target predetermined groups of buyers. One-way communication	Database marketing; two-way communication	Relationship marketing; two-way communication and access	Active dialogue with users to shape expectations and create buzz. Multilevel access and communication

Appendix 3: Interview protocol

Innovatie met de klant

Naam:

Functie:

Dienstverband:

I) Introductie

- ***Doel van het onderzoek:*** kijken hoe we de klant beter of anders bij het innovatietraject kunnen betrekken, om zo de innovatieve competenties van Safan te verrijken.
- ***Doel van het interview:*** kijken hoe het betrekken van de klant in het verleden georganiseerd was, op dit moment wordt georganiseerd en in toekomstige situaties georganiseerd zou kunnen worden.
- ***Onduidelijkheden of vragen?***

II) Vragen: Active involvement

- **Worden of zijn er ooit klanten bij het ontwikkeltraject betrokken?**
  - ***Zo ja, wanneer, bij welke klanten, hoeveel klanten bij een project en bij wat voor soort projecten***
  - ***Zo nee, waarom niet?***

- **Hoe werden deze klanten geselecteerd?**
  - ***Op basis van interne kennis en ervaring, op basis van grootte zonder structuur, op basis van project specificaties?***

- **Welke mechanismen of methodes om de klant bij het ontwikkeltraject te betrekken zijn er door de jaren heen gebruikt**
  - ***Bijvoorbeeld; allianties, projectgroepen, lead-users of on-line communities***

- **Hoe werd dit proces georganiseerd**
  - ***Bijvoorbeeld; formele afspraken, contracten, frequentie van contact***

- **Hoe kijk je terug op deze processen en wat zou je graag anders willen zien**

- **Hoe sta je tegenover…**
    - Allianties:
    - On-line User communities:
    - Networks:
    - Lead-user methode:
    - Feedback
    - overig

II) Vragen: Passive involvement

- **Waar komt de informatie Safan binnen?**
    - ***Welke afdelingen?***
    - ***Welke soort informatie: klachten, specials etc.***

- **Hoe wordt dit binnen de organisatie doorgecommuniceerd?**
    - ***Verschillende afdelingen?***
    - ***Databases?***

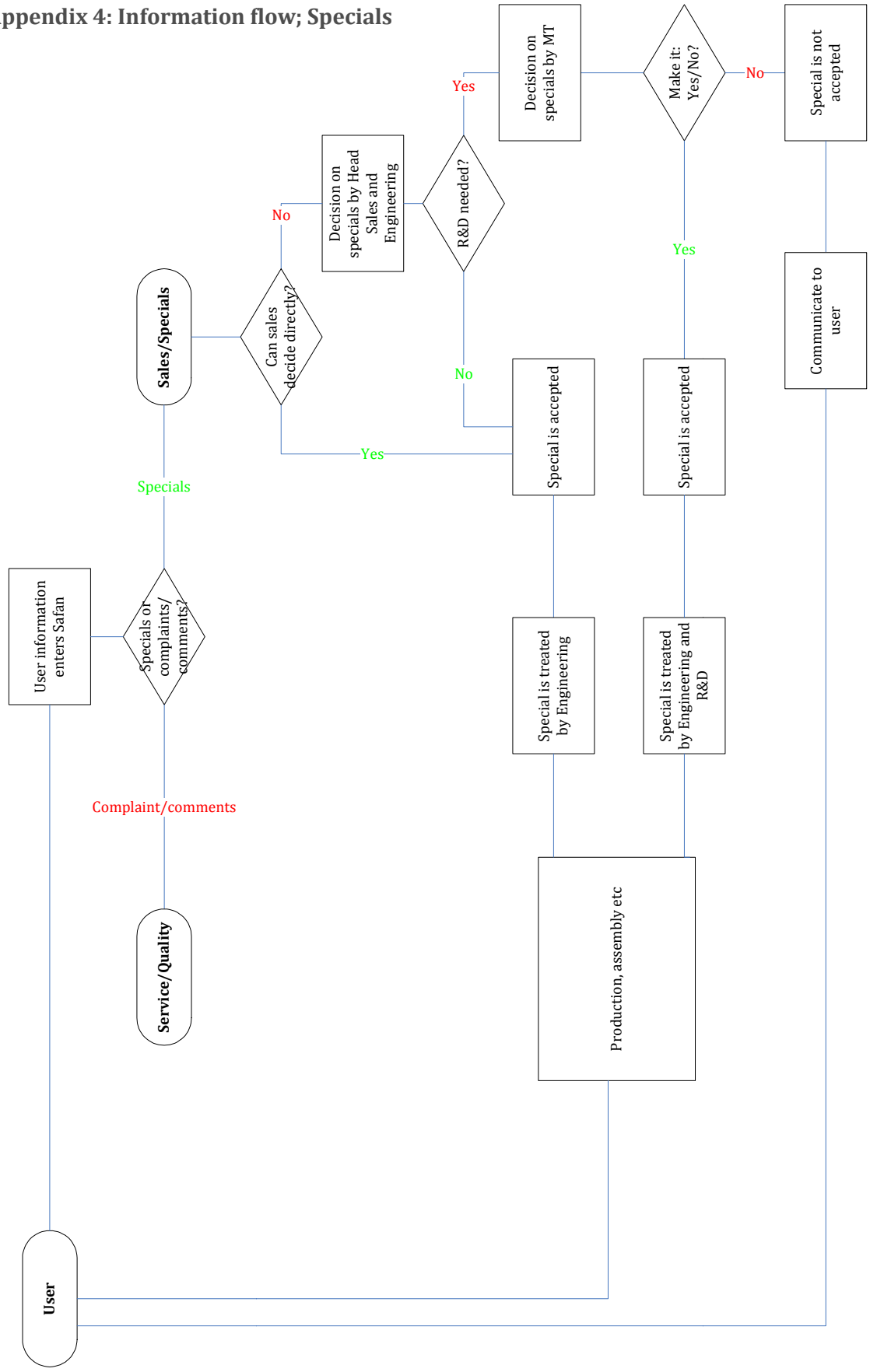
- **Wie is verantwoordelijk voor de afhandeling en opslag van deze informatie?**

- **Wat zou je graag anders willen zien in dit proces?**

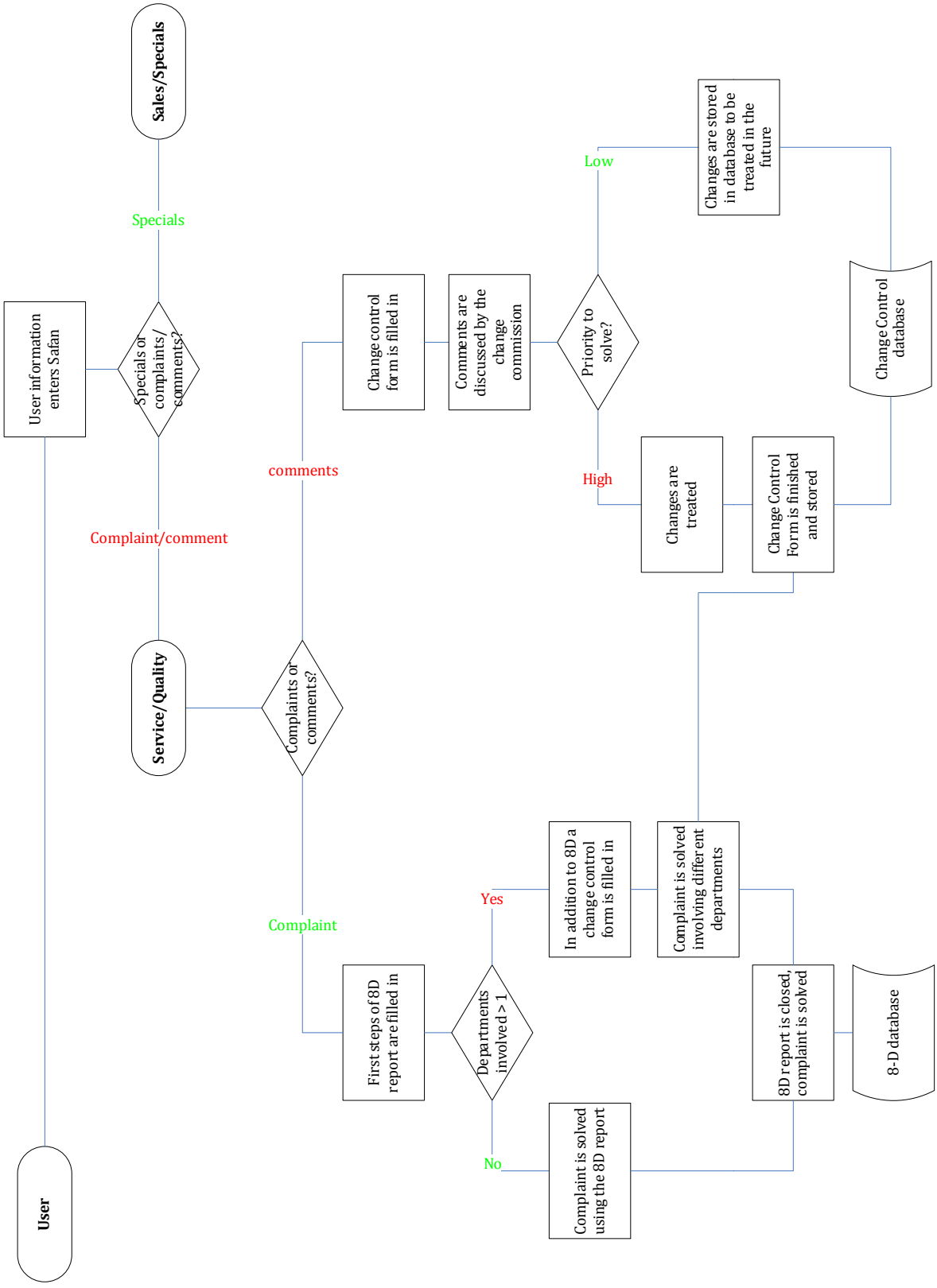
III) Afsluiting

- *Overige opmerkingen, vragen of aanvullingen?*

Appendix 4: Information flow; Specials



Appendix 5: Information flow; complaints



Appendix 6: Survey I-Brake

Vragen met betrekking tot I-Brake ontwikkeling.Week5 2005. W.v.k+TS	**TROX (A)**	**TROX (N)**	**DISSELHORST**	**ADDMETAL**	**GOMA**
Wat is de gemiddelde batchgrootte van een serieproduct?	10.000-20000	300	200-500	300	100
Wat is de kleinste batchgrootte van een serieproduct?		1	200	1	1-20
Hoe lang duurt het produceren van een gemiddelde batchgrootte?				3 uur	3-4 uur
Hoe lang duurt het produceren van een kleine serie?		5 min		0,5 uur	
Hoe vaak komt het voor dat een bepaalde serie in herhaling wordt geproduceerd (meerdere keren per jaar)?			60% herhaling		Maandelijks
Wat verwerkt u aan verschillende plaatdiktes en van welk materiaalsoort zijn deze?	0,7-1,5mm(80%)	0,7-1mm(80%)	1-6 mm	6 diktes 4 soorten	0,75-3mm
Hoe is de procentuele verdeling		2-2,5mm(10%)	70% tot 2 mm		50% 1-1,5 mm 2mm 30% 0,75 10%
	80%Verzinkt staal	80%Verzinkt staal	80% staal		
<100x100			5%	12,5%	5%
100x100-250x250	40%		5-10%	12,5%	15%
250x250-600x600	50%		40-50%	50%	50%
600x600-1000x1000	10%	600X600 70000/jaar	30-40%	12,5%	15%
>1000x1000				12,5%	15%
Hoeveel zettingen heeft een gemiddeld serieproduct?	6 zettingen	8zettingen	5-10	3-4	5
Wat zijn de gemiddelde eisen aan de hoeknauwkeurigheid?	+/- 1 gr	+/- 0,5 gr	+/- 0,5 gr	+/- 1 gr	+/- 0,5 gr
Wat zijn de gemiddelde eisen aan de nauwkeurigheid van de beenlengtes	+/- 0,1 mm-0,15mm	+/-0,2mm	+/- 0,1 mm	+/- 0,15mm	+/- 0,15mm
Hoe worden de plaatuitslagen aangeleverd bij de kantpers (netjes gestapeld, door elkaar op een pallet of in doos)?		gestapeld	Gestapeld op pallet	Netjes gestapeld	Gestapeld op pallet
worden er bij serieproducten plaatuitslagen aangeleverd enkelstuks verpakt (tegen beschadiging)?	nee	Nee	Nee	Ja 30%	Nee
Worden er bij serieproducten plaatuitslagen verwerkt welke zijn voorzien van folie?	Weinig folie	Weinig folie	Ja RVS en voorgelakt	5%	<10%
Hoe worden de gekante producten bij de kantpers afgevoerd (gestapeld op pallet of in doos, door elkaar in	10% krat rest gestapeld	Pallet en krat	Pallet en krat		80% gestapeld op pallet

pallet of in doos)?					
Hoeveel tijd kost het om een machine om te stellen voor een ander serieproduct?	15 minuten	½ uur gem.	15 20 minuten	½ uur gem.	½ - 1uur Robot 3-4 uur
Wat is de gemiddelde doorlooptijd van order tot uitlevering?	7 dagen	3-7 dagen	1,5-2 weken	1-2 weken Streven =paar dagen	4 weken
Welk percentage van de doorlooptijd wordt door het kantproces (inc. aan- en afvoer) gebruikt ?	1dag	1 dag aan de pers			25%
Wie bepaalt de buigvolgorde en gereedschapkeuze in uw bedrijf (werkvoorbereiding of de kanter zelf)?	Kanter	Kanter	Kanter	Kanter	Kanter
Indien u in het bezit bent van een buigcel, waarom heeft u hiervoor gekozen?		Aantallen te laag	Capaciteit	Men heeft er de producten niet voor	
Welke voordelen heeft de buigcel?					
Welke nadelen heeft de buigcel?			Buigvolgorde achter elkaar Buighoogte 127 mm Min 400x130 mm 650x250 bij automatische gereedschapwisseling		
Indien u in het bezit bent van een FPA-project, waarom heeft u hiervoor gekozen?		Ergonomie		Vroeger wel maar nu niet meer.	
Welke voordelen heeft het FPA-project?		Efficiëntie	Nog niet voldoende uitontwikkeld	Kostprijs+ergonomie	Output Eenvoud +snelheid
Welke nadelen heeft het FPA-project? Flexibele productie automatisering		Nog geen nadelen.			
	Om vertrouwd te geraken met techniek . Groot product gekozen.				Liever een zwaardere robot 50kg 100 kg
		Gereedschapwisseling?			
					Technische kennis wordt een probleem Meer naar de werkvoor-bereiding
Kunnen er tekeningen beschikbaar gesteld worden van diverse serieproducten?					
Algemene opmerking I-Brake	Interessant Wat men zich heeft voorgenomen kan men ook produceren.	Interessant	Interessant	Minder Interessant Andere bedrijfsstrategie	Interessant zorgen over nauwkeurigheid.

Appendix 7: Secrecy Declaration

GEHEIMHOUDINGSVERKLARING

Opgesteld door :

Ten behoeve van: SAFAN B.V.-, Kwinkweerd 11 7241 CW, Lochem

(hierna te noemen "SAFAN")

Met betrekking tot: **Vertrouwelijke informatie**

1. Ondergetekende …….. zal met SAFAN gesprekken voeren over de ontwikkeling van een nieuwe machine, **I-Brake** genaamd, en daarop betrekking hebbende methoden, en zal van SAFAN informatie verkrijgen gedurende de tijd dat informatie daaromtrent wordt uitgewisseld.

2. Ten behoeve van de uitwisseling van informatie kan SAFAN aan …….. bepaalde informatie verstrekken, hetzij mondeling of schriftelijk, hierna te noemen Informatie. De Informatie bevat beschermde kennis van SAFAN die als zodanig waardevol eigendom is van SAFAN.

3. …….. stemt er mee in dat de Informatie vertrouwelijk zal worden behandeld en dat …….. deze Informatie niet zal gebruiken voor enig ander doel dan voor de bovenvermelde uitwisseling, en dat …….. deze Informatie niet bekend zal maken aan derden in welke vorm of wijze dan ook. In zoverre zij toegang hebben tot de Informatie, zal …….. van zijn/haar medewerkers verlangen dat zij deze voorschriften in acht nemen.

4. De bovenvermelde beperkingen aangaande bekendmaking en gebruik door …….. zullen niet van toepassing zijn in het geval dat zulke informatie

    - op wettige wijze is verkregen door …….. voorafgaand aan de bekendmaking ervan door SAFAN;
    - onderdeel is of wordt van het publiek domein anders dan door middel van een onrechtmatige daad van ……..
    - op wettige wijze is verkregen door …….. uit handen van derden niet gehouden tot geheimhouding jegens Safan.

Op deze Geheimhoudingsverklaring is Nederlands recht van toepassing; geschillen welke hieruit mochten voortvloeien zullen worden voorgelegd aan de bevoegde rechter te Den Haag.

Getekend op ……te ……

Naam ……

Handtekening …….