INTER-DEPARTMENTAL COLLABORATION

WITHIN NEW PRODUCT DEVELOPMENT PROCESSES

Master Thesis

UNRESTRICTED VERSION

E.M.T. (Emmy) Heerdink

September 2011

UNIVERSITY OF TWENTE.

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IMPORTANT: *This is an unrestricted version. The names of the companies and people involved are replaced with fictional names or left out. Moreover, a substantial part of the case study and cross-case analysis are left out. The final chapter is partly summarized.*

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Preface

Looking back at the last four years of being a student at the University of Twente brings a variety of memories: Being 'the new one' at your first day of college. Finding out that you just skip all the colleges you do not want to join. Having fun and meeting new friends. Being lazy and certainly not waking up at seven o'clock every day. Meeting interesting people of interesting companies. Running as fast as you can to catch the bus. Drinking coffee with fellow students at Study Association Stress. Doing re-exam because the normal exam period is during 'Carnaval'. Celebrating the finish of my Bachelor thesis. And having doubts about choosing the right direction for the Master and then still switch halfway because you do not like your choice anymore and actually prefer another Master. But then... The time is there to find a graduation assignment and after that 'being a student' is nothing more but a memory. As one says: *"all good things come to an end".* However, the end still needed to be reached. After joining a couple of classes at the International Management track, I eventually choose to follow the Innovation & Entrepreneurship track because of my specific interest in innovation. In order to find a graduation assignment about this topic, I wrote an e-mail to Klaasjan Visscher. Klaasjan informed me about the developments recently occurring around innovation at Acme Alkmaar. About two years ago, another student studied the organizing of explorative innovation at Acme Alkmaar. Within this study, factors that negatively influence explorative innovation within Acme Alkmaar are conducted. In line with his study, the management of Acme Alkmaar recognized another problem: the inter-departmental collaboration within their NPD process was not optimal. This problem is the premise of this master thesis.

Acknowledgements

That only my name is on the cover of this report, does not mean that this thesis is the result of my sole efforts. I could not have written this thesis without the help of others. I hereby would like to take the opportunity to thank some people in particular. To learn about the organization and their problem(s) with inter-departmental collaboration, some orienting conversations with managers and directors of Acme Alkmaar have taken place. I would like to thank them all for their cooperation, their time and the provided knowledge and information. Besides, my supervisors of the University of Twente, Klaasjan Visscher and Matthias de Visser, have been of great help in completing this thesis. They helped me in choosing the right direction and supported me by giving critical notes and suggestions to the things I wrote down. I want to thank them both for their guidance and support. Who I also want to mention here is my supervisor of Acme Alkmaar: Jan Janssen. Jan thanks for all your support, feedback and time, and for patiently answering all the questions I fired to you while I was writing my thesis. In addition, my thanks go to all employees of the R&D department who spent a part of their precious time to filling in my questionnaires and answering my questions. And last but not least, many thanks to the employees I have interviewed during my research!

I hope that the results of this study will contribute to a fruitful future of Acme Alkmaar.

Sincerely,

Emmy Heerdink Enschede, 16-09-2011

Management Summary

Innovation is seen as very important by businesses all over the world. A crucial part of innovation is new product development (NPD). Inter-departmental collaboration is recognized as an important factor influencing NPD. However, inter-departmental collaboration seems to have costs and benefits that vary with conditions. An established firm in the purification industry, Acme, puts lots of effort in NPD projects. Especially Acme Alkmaar is performing many projects varying from incremental to radical innovations. The management of Acme Alkmaar indicates that the inter-departmental collaboration within some of these projects it not optimal. They want to know exactly where they have problems with collaboration and what causes these problems, so that they could effectively shape inter-departmental collaboration within their NPD process. The main research question that will be answered in this thesis therefore is: *"How should Acme Alkmaar improve the effectiveness of inter-departmental collaboration within their NPD process?"*

Based on scientific research upon NPD processes, aspects of inter-departmental collaboration and project performance, a theoretical framework is composed. From that point, the research is split-up in two parts: (1) a portfolio analysis and (2) an in-depth case study with a cross-case analysis.

Within the portfolio analysis the characteristics of inter-departmental collaboration, innovativeness, size and performance of the NPD project portfolio of Acme Alkmaar are described. This is done by studying documentation of 25 projects and by a questionnaire that is distributed among all R&D employees. The main findings are:

- Acme Alkmaar switched their focus in the years 2008-2010 from incremental to radical projects. This is good for the long term performance of the company, but a risk for the short-term performance because the portfolio becomes clustered around high-breakthrough projects.
- The number of projects continuously increases. This brings the risk that the innovation capacity becomes over committed. Key individual contributors are assigned to too many projects and managers do not have the necessary time to follow-up the projects.
- In relation to the total amount of hours spent on projects per year, the projects become smaller in the years from 2008 till 2010. There is one (radical) project outstanding in size; project RD.3009. On this project, by far the most hours are spent every year
- Most projects perform well according to the respondents. Incremental projects seem to perform better than radical projects but that is not significantly proven.
- Inter-departmental collaboration takes place in more than half of all projects.
- Inter-departmental collaboration does not hamper operational performance at Acme Alkmaar and inter-departmental collaboration is an important factor for the overall performance of the NPD projects (obtained from presentation Dries Faems, Acme 24-5-2011).

Four specific NPD projects are selected for the in-depth case study on the basis of this portfolio analysis. The case study describes the current organization of inter-departmental collaboration within NPD processes at Acme Alkmaar and the way in which it could be more effective. The cases are studied upon the factors that are described in the theoretical framework. The information to describe this part is conducted from semi-structured interviews held with employees from different departments, by using

the results of the portfolio analysis, by studying documentation and by observation. The departments involved in this research are: Research and Development (R&D), Marketing, Sales, Product Management (PM), Production Improvement and Implementation (PI&I), Engineering and Manufacturing. At the end of this case study, the four NPD projects are compared in a cross-case analysis on differences and similarities concerning the NPD process, different aspects of inter-departmental collaboration and operational project performance. The purpose of this case study and cross-case analysis was to find out how Acme Alkmaar can improve the effectiveness of inter-departmental collaboration within their NPD processes, taken into account multiple factors and influences. Different patterns in the NPD process and underlying causes are elaborated which led to a list of four 'systematic mistakes' in the organization of NPD processes at Acme Alkmaar. These systematic mistakes are:

1. The organization is too fragmented which leads to all kind of inefficiencies regarding to project team composition and the decisions making within the NPD process (especially in radical projects).
2. It is not known how to compose a project team and who should be stakeholders and when they should be informed/involved. For that reason composing a project team happens fully ad hoc and depends on the skills of the project leader.
3. There is lack of formalization within the projects, which has a negative influence on the information transfer within a project team and therefore on project performance.
4. There are two organizational constraints: accessibility restrictions and different budgets for every department. These constraints hamper inter-departmental collaboration within NPD processes.

On the basis of this case study an answer can be given on the main research question of this research. It can be concluded that the effectiveness of inter-departmental collaboration within NPD processes at Acme Alkmaar can be improved by solving the systematic mistakes in the organization of NPD projects. To solve the systematic mistakes, the following recommendations are drawn: (an extensive elaboration of the recommendations can be found on page 82-85):

1. **Restructure the Acme Alkmaar organization, so that the amount of departments and managers, and subsequently the size of the PDR, decreases.** This can be done by taken departments together by discipline and let the managers of the main disciplines take all the decisions.

2. **Use a protocol for composing a project team, so that the project teams fit the project.** There must be made a difference in project teams for radical and incremental projects, even as 'water' and 'beverage' projects. Besides the involvement of the stakeholders needs to be set. The protocol for composing a project team can be found in appendix C.

3. **Make formalization of a project mandatory and let the management ensure compliance.** The management needs to communicate to all project teams that frequently scheduled meetings, a project plan including goals and a business case are mandatory.

4. **a) Partly remove accessibility restrictions.** Members of a project team should be able to view data from other departments in their project team. To keep the information as protected and secret as possible and to make the inter-departmental collaboration more effective, the access to R&D data can be restricted to project teams that collaborate with R&D.

   b) Consider allocating budgets on a project basis. It is difficult to recommend how budgets need to be set at Acme Alkmaar because this part is not studied in depth. There are however several indications that inter-departmental collaboration is hampered or even fails because of budget problems. Therefore the management needs to consider budget allocation on a project basis.

Implementing these changes will have consequences for Acme Alkmaar. The management as well as many employees need to get used to a different way of working (see page 85-86 for the specific consequences).

This research has several implications for theory: **(1)** the results of this study are in line with the view of Song and Xie (2000) who stated that inter-departmental collaboration may not work in every situation. However, the organization of inter-departmental collaboration can be optimized, so that positive effects will be maximized a negative effect minimized. **(2)** During this research it became clear that the effectiveness of inter-departmental collaboration depends on multiple factors and is not necessarily assigned to the innovativeness of the project. **(3)** The results do confirm that there are different effects of collaboration between different departments, as pointed out earlier by Brettel et al. (2011), Swink and Song, (2007), Olson et al. (2001). **(4)** In line with the conclusions of Cuijpers et al. (2007) the overall effect of inter-departmental collaboration on Acme's innovation performance appears to be positive. **(5)**. One of the results is that inter-departmental collaboration, a cross-functional structure, is desired in all projects, which is in contrast with the findings of de Visser et al. (2010) whose results suggest that companies should apply a functional structure for incremental projects and a cross-functional structure for radical projects. **(6)** Where other authors used a firm-level assessment to study inter-departmental collaboration, this research conducted a cross-functional in-depth analysis on the project level and (**7)** the case study and cross-case analysis on the basis of the theoretical framework that is developed in this research, provides a supplementary to the existing literature about the effectiveness of inter-departmental collaboration. For as far as known, qualitative research to improve the effectiveness of inter-departmental collaboration within NPD process is not done before.

Despite the contributions of this study, it is important to reflect upon its limitations that lead to directions for future research. In this study, the focus lays on projects in which inter-departmental collaboration took place. For that reason it is not studied if projects where no inter-departmental collaboration took place should collaborate to be more successful. Besides that, the study only focused on projects within Acme Alkmaar. For that reason it is not studied how other (successful) companies organize inter-departmental collaboration within NPD processes. A comparison with projects of other companies would be an interesting test to see where Acme Alkmaar stands at this moment, but it would also provide a broader insight in the effect of inter-departmental collaboration on project performance. An in-depth research to the way in which the organization can be best structured or how budgets need to be set exactly is not performed in this study. Scholars are encouraged to (1) study all the options for

restructuring the organization, so that the amount of departments and managers decrease, (2) study all the options for appropriate budget allocation, so that inter-departmental collaboration is not hampered, (3) and to implement the best option of both at Acme Alkmaar. Following this study, a logical next question becomes whether the implementation of the solutions to the systematic mistakes at Acme Alkmaar indeed have led to more effective inter-departmental collaboration and therewith increased project performance. Future research is needed to find out if other factors (environment, partners and/or institutes) possible influence project performance as well.

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List of Abbreviations

BD	Business Development
CEO	Chief Executive Officer
CFO	Chief Financial Officer
CTO	Chief Technology Officer
CSI	Cognitive Style Index
NPD	New Product Development
PDR	Project Design Review
PI&I	Production Implementation and Improvement
PM	Product Management
R&D	Research and Development
SC	Steering Committee
TPO	Technology and Patents Officer

1 Research Design

1.1 Introduction

Innovation is studied by many researchers over the past decades. The term innovation is variously defined to reflect the particular requirements and characteristics of a specific study. It is a widely used concept, recognized as very important by businesses all over the world. This is reflected in the following: In 2007, a McKinsey Global Survey[1] of top executives found that seventy percent of the respondents considered innovation one of their companies' top three strategic priorities. In a more recent McKinsey Global Survey (2010)[2], eighty-four percent of executives say innovation is extremely or very important to their companies' strategy.

To be innovative, companies could invest in research and development (R&D). However, investment into R&D activities alone does not guarantee success; successful innovation depends among other things on the development and integration of new knowledge in the innovation process (Thamhain, 2003; Cassiman, Guardo & Valentini, 2009). Past research has shown that it is not easy to manage R&D because several internal and external factors are influencing the R&D projects. With internal factors for example culture, leadership or history is meant. External factors are, for example, stock market, economic expansion and new competition (e.g. Huchzemeijer and Loch, 2001; Pich, et al., 2002; O'Connor et al., 2008). R&D management is recognized as highly important by companies, mostly because they obtain competitive advantage out of their innovations.[3] To facilitate the exchange of innovation-related information in organizations, scholars and business practitioners have promoted inter-departmental collaboration (Olson et al., 2001; Tatikonda and Montoya-Weiss, 2001). Inter-departmental collaboration increases innovation performance but has also been associated with negative consequences for project results (Olson et al., 2001; Swink and Song, 2007; Troy et al., 2008). As many authors describe, inter-departmental collaboration has its costs and benefits (Cuijpers et al., 2011).

1.2 Problem statement

A crucial part of innovation is new product development (NPD). Driven by rapidly advancing technologies, increasing competition and globalizing markets, effective new product development is emerging as the major driver of business success (Damanpour and Evan, 1984; Abernathy and Clark, 1985; March, 1991; Ali, 1994; Benner and Tushman, 2003; Bessant, 2008).

In recently published literature, interdepartmental, cross-functional, collaboration is recognized as an important factor influencing new product development (Cuijpers et al., 2011: De Visser et al., 2010; Troy et al. 2008; Song et al., 1997). Several authors suggest that collaboration between departments improves performance of new product development projects through, for example, better information exchange. Others suggest that interdepartmental collaboration leads to project delay and failure, but

[1] A McKinsey Global Survey: McKinsey Survey on Innovation (2007).
[2] 2240 respondents; McKinsey Global Survey Results, 2010.
[3] McKinsey Global Survey: Upgrading R&D after the downturn (2009) and R&D after the crisis (2010).

not necessarily reduces innovation performance (Olson et al., 2001). Cuijpers et al. (2011) conclude that the overall effect of interdepartmental collaboration on firms' innovation performance appears to be positive. In order to boost innovation performance, managers should provide infrastructure and resources needed for inter-departmental collaboration. De Visser et al. (2010) found evidence that the effectiveness of cross-functional structures is different among different kinds of NPD processes. Previous research has repeatedly examined functional interfaces in the NPD process between three departments; R&D, marketing and manufacturing. Broadly speaking, R&D and marketing are interested in creating change through new products and new technology, but manufacturing's primary objective is the achievement of efficiency in production and cost minimization. Therefore they have different interests. The studies suggest that breaking down the walls among those departments leads to more effective NPD (Song et al., 1997; Ruekert and Walker, 1987; Gupta et al., 1985). Ernst et al. (2010) added sales as a separated department where others took it together with marketing. They found evidence that marketing and sales have distinct functions and have different roles in NPD processes.

Currently, an established firm in the purification industry, Acme, puts lots of effort in different NPD projects. Acme's management indicates that the purification market is still very large. About 70 percent of earth's surface is covered with water but still more than two billion people are deprived of a reliable source of drinking water on a daily basis (Acme.com, 10-3-2011). Lack of clean water is for instance one of the most important causes of child mortality[4]. Because the market is large and still growing, the demand of innovative solutions is growing as well. Acme's ability to successfully identify and launch new products and processes to meet this demand is one of the most important criteria for success. Acme became a large player in their industry by acquiring other companies. The past twenty years they sold several products that include patented technologies. At this moment, their patents are coming to an end or are already expired and Acme feels the pressure to develop new products and upgrade their innovation performance. For this reason, the top management of Acme decided to invest intensively in R&D[5]. Therefore, starting from 2007, the R&D department of Acme Alkmaar put effort in about thirty projects varying from incremental to radical innovations. According to the R&D director and the Innovation Specialist of Acme Alkmaar, some of these innovation projects perform very well while others are disappointing according to the predefined expectations. They think that there could be many reasons, but especially the inter-departmental collaboration within these projects is seen as not optimal. The director of Business Development and the director of Manufacturing also emphasize that there is room for improvement regarding to the inter-departmental collaboration within NPD projects. One of the examples they give is: *"All focus goes to the product of project A and the Manufacturing department does its best to produce everything on time. Then after a while, a Sales-employee walks in to the Manufacturing department and tells them that they cannot sell this product, but they can sell the product of project B. Then Manufacturing switches from A to B which costs a lot of money and time."* The Manufacturing director explains that *"If they would have talked with each other before the Manufacturing department started to produce; they did not have these problems afterwards".*

[4] http://www.unicef.org/sowc09/
[5] Interview with R&D Director Erik Roesink, March 2011.

All mentioned directors and the Innovation Specialist, state that the organization is not transparent enough and that there is not much communication about the content of the projects. Acme also has formal procedures for transferring a project from one stage to another; however these procedures are not completely used that way. For some projects multiple departments need to cooperate, e.g. R&D, Marketing, Manufacturing and Sales. But not for all projects inter-departmental collaboration is desirable, for example, when projects are very confidential. However, inter-departmental collaboration is very important for Acme Alkmaar, because they have many departments. Acme Alkmaar does incremental as well as radical projects. In some of these projects, collaboration is seen as a problem, in other projects it is not. Acme Alkmaar wants to know exactly where they have problems and what causes these problems, so that they could effectively shape inter-departmental collaboration within their NPD processes.

We now know that inter-departmental collaboration - cross-functional structures - definitely influences the NPD process in either a positive or negative way (i.e. Song et al., 1997). Besides, the effectiveness of cross functional structures, also inter-departmental collaboration, appears to be different among different kinds of NPD processes (De Visser et al., 2010). De Visser et al. (2010) did a quantitative study of which the results suggest that companies should apply a functional structure for incremental projects and a cross-functional structure for radical projects. However, they conducted a firm level assessment and there is no cross-functional depth analysis on the project level. Literature suggests that there are several costs and benefits of inter-departmental collaboration within radical and incremental NPD projects. In order to find out whether, in a specific case, inter-departmental collaboration is effective for NPD projects; qualitative research needs to be done. This qualitative research should focus on a case study to mechanisms that make inter-departmental collaboration as effective as possible within NPD processes.

1.3 Central question

To solve the problem stated above, the following main question needs to be answered:

How should Acme Alkmaar improve the effectiveness of inter-departmental collaboration within their NPD processes?

Interdepartmental collaboration will be defined as: *"the exchange of information and the coordination of activities across interdependent organizational units, such as, research and development (R&D), marketing and manufacturing"."* (Tessarolo, 2007; Troy et al., 2008 and Jansen et al., 2009)

The new product development (NPD) process will be defined as: *"multiple activities in which new knowledge is embodied, starting from idea generation, through product development until bringing a product or service on the market."* (Griffin and Hauser, 1996; Song et al., 1997; Olson, 2001 and Brettel et al., 2011)

1.4 Research model

On the basis of a research model (see figure 1) will be explained which research questions need to be answered in order to give an answer to the main question. The research model globally presents the

major activities of this study, which are: describing, analyzing and (re-)designing the inter-departmental collaboration within NPD processes at Acme Alkmaar.

To improve the effectiveness of inter-departmental collaboration within NPD processes, one first needs to know how the current situation concerning inter-departmental collaboration is organized. To say something about the current situation, first a theoretical framework will be developed. Within this framework multiple aspects of effective inter-departmental collaboration will be collected and the framework will be used to describe the current situation at Acme Alkmaar. After all, it is not possible to describe a current situation without knowing which aspects you want to describe from this situation.

Based on scientific research about inter-departmental collaboration within NPD processes and improving the effectiveness of it, a theoretical framework will be composed. Based on this framework, the NPD project portfolio of Acme Alkmaar will be described and analyzed, which will lead to a selection of projects for a case study. In this case study, the selected projects will be described and analyzed upon the effectiveness of inter-departmental collaboration. After that the selected cases will be compared doing a cross-case analysis. The information will be gathered by semi-structured interviews with employees involved in that NPD process, by observations and by studying documentation. The case study and the portfolio analysis will present the current situation concerning inter-departmental collaboration within NPD process and its effectiveness. As a final point, recommendations will be drawn on how Acme Alkmaar should improve the effectiveness of inter-departmental collaboration within their NPD processes.

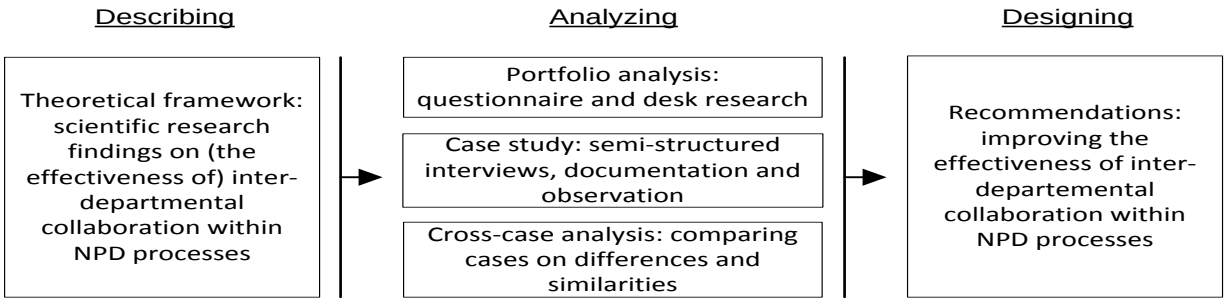

Figure 1: Research model

The theoretical framework will be established based on findings in the literature about (the effectiveness of) inter-departmental collaboration within NPD processes (chapter 2). To draw a theoretical insight on inter-departmental collaboration within NPD processes multiple articles and textbooks in that field will be studied. The articles are found by using the following search terms on scholar.google.nl and isiknowledge.com:

- New Product Development (NPD) processes (Radical and Incremental)
- Inter-departmental collaboration; cross-functional structures
- R&D, Marketing, Manufacturing, Sales
- Information processing theory; communication
- Project teams (development teams)
- Project performance

In selecting the articles, attention is paid to four things. First, of course, the relevance for this study. This is judged by reading the abstracts. Second, the year in which the article is published. The aim is to collect recently published articles (>2005) to be aware of current developments in this area, supported with literature published earlier. Third, the amount of citations is taken into account. An article from 1975 which is cited only twice is not takem into account. However, an article published in 2010 which is only cited twice is not ruled out for this reason, because it is possible that it is still going to be cited many times. At last, the journal in which the article is published is taken into account[6]. Important articles that will be used for this research are those of Cuijpers et al (2011), Brettel et al. (2011), de Visser et al (2010) Ernst (2002, 2010), Olsen et al. (2001), Song (1997, 1998), Clark and Wheelwright (1992), Tushman and Nadler (1978) and Cooper et al. (1975-2004). The books used to get information on the subjects are provided by the Directors of Acme, the Innovation Specialist of Acme and the University of Twente. One of the books is for example: 'Managing Innovation' by Tidd and Bessant (2010).

The remaining part of the research model will be elaborated by answering research questions.

1.5 Research questions

The current situation concerning inter-departmental collaboration within NPD processes of Acme Alkmaar will be mapped in two ways. First their whole NPD project portfolio will be globally analyzed. This analysis will provide information about whether departments collaborated within the project and how intensive this collaboration was, whether a project was successful or not, what size the project has, and whether a project is radical or incremental. The analysis is extensively described in chapter 3 and will form the basis for selecting cases for the case study of the NPD process of Acme Alkmaar (the second way of mapping the current situation). Besides, the analysis will give a global overview of the current inter-departmental collaboration within NPD projects. Through studying multiple documents about these projects and by a questionnaire for the employees of the R&D departments, the following question will be answered:

1. *What are the characteristics of inter-departmental collaboration, innovativeness, size, and performance of the NPD project portfolio of Acme Alkmaar?*

The projects are studied on the characteristics of (the intensity of) inter-departmental collaboration, performance, kind of project activities, project typification, amount of hours spent on a project per month per year and the content of the projects. Performance is measured in two ways; the overall project performance (based on Hoegl et al., 2004) and the operational project performance (based on Griffin and Page, 1996). Project activities are described as either explorative (fundamental research, experimentation and prototyping) or exploitative (standardization, optimization, fine-tuning and up-scaling). The project typification shows whether a projects aims at a market that is new to the world, new to Acme or known to Acme and if the technology is new to the world, new to Acme or known to Acme.

[6] In the master class 2011 a list of top-journals is presented. Most articles however come from subject related journals like Technovation, the International Journal of Project Management, and Organization Science.

To describe how (effective) the current situation concerning inter-departmental collaboration within NPD processes at Acme Alkmaar is organized and which problems arise, cases selected on the basis of the portfolio analysis will be studied in depth. The research question that will be answered is:

2. *How is the inter-departmental collaboration within NPD processes at Acme Alkmaar currently organized, and how could it be shaped more effective?*

By studying the documentation of Acme Alkmaar, by observations and by semi-structured interviews it will become clear how inter-departmental collaboration is organized at this moment and how the collaboration could be shaped more effectively. The semi-structured interviews will be held with project leaders of NPD projects and employees of several departments involved in the NPD project. The differences and similarities between the cases will be mapped and analyzed. This information will be used to answer the last question, the main question of this research:

3. *How could Acme Alkmaar improve the effectiveness of inter-departmental collaboration within their NPD processes?*

The answer to this question will result in an overview of systematic mistakes that need to be solved for improving the effectiveness of inter-departmental collaboration within NPD processes at Acme Alkmaar. Recommendations for solving these systematic mistakes will be given in chapter 7.

1.6 Scope

Acme is a large organization with companies located all over the world. This report will focus on only one company because of the practical reason that studying more than one company is not feasible. This study should not take any longer than six months and studying more than one company would cost too much time. The R&D director and the director of Business Development indicate that Acme Alkmaar is the core company of Acme in the Netherlands and that it functions as a role model to the other subsidiaries (*company names are confidential*) in several fields (e.g. R&D, Marketing, and Sales). Besides, Acme Alkmaar is a 'physical amalgamation' of four companies since 2003, of which at this moment only two companies are left. These companies are expected to cooperate on several projects, products and services. Acme Alkmaar does act like one company, but the just mentioned directors think there is plenty of room for improvement in the effectiveness of inter-departmental collaboration and therefore the focus of this report will be on Acme Alkmaar and not on one of the other companies.

In order to improve the effectiveness of inter-departmental collaboration within the NPD processes, this report will also focus on every department within Acme Alkmaar that is involved in this process. The R&D department will be used as a starting point because every NPD process goes through or is initiated by R&D. The other departments practically involved in the NPD process are different per process. Important for most processes are: Marketing, Sales, Manufacturing, Product Improvement & Implementation (PI&I), Engineering and Product Management (PM). Supporting departments like Quality and Assurance, HR and Controlling are not taken into account because they are only facilitating the process and not influencing it directly.

1.7 Reading guide

In the previous chapter (chapter 1) you have read why this research is done, what will be studied, which questions need to be answered and how this will be done. Chapter 2 proceeds with a theoretical framework which forms the basis for this research. Subjects that are discussed are (1) the effectiveness of inter-departmental collaboration within NPD processes, in which a distinction will be made between radical and incremental projects, (2) different aspects of inter-departmental collaboration such as the structure, stakeholders and content and (3) project performance.

In chapter 3, the NPD project portfolio of Acme Alkmaar will be analyzed. This will be done by studying a selection of twenty-five NPD projects on multiple aspects. The R&D employees will be allocated to projects they are working on in order to answer a questionnaire about different aspects of these projects. The aspects that will be studied are size, innovativeness, project performance and inter-departmental collaboration.

Then, in chapter 4 the methodology of this thesis will be described. The research method, a multiple case study, will be explained here. On the basis of the Portfolio Analysis as described in chapter 3, four cases will be selected for this case study. The way in which data will be collected for these cases is also described even as the way in which the data will be analyzed.

Chapter 5 presents the case study about inter-departmental collaboration within NPD processes at Acme Alkmaar. The four projects will be judged on their NPD process, the structure, stakeholders and content of inter-departmental collaboration and their project performance.

These case descriptions will be used in chapter 6 to provide a cross-case analysis. The four cases will be compared on differences and similarities concerning the NPD process, different aspects of inter-departmental collaboration and performance. This will be done by presenting a general schematic overview of overall differences and similarities between the projects, showing patterns and underlying causes and, giving solutions for improving the effectiveness of inter-departmental collaboration within (different) NPD processes.

Chapter 7 closes this thesis with the conclusion and a discussion. In the first paragraph an answer will be given to the main research question. After that recommendations will be drawn to implement changes within the organization followed by the consequences for Acme Alkmaar. Successively implications for theory will be presented and at last limitations of this thesis and directions for further research are described.

2 Theoretical Framework

In this chapter a theoretical framework will be developed concerning the effectiveness of inter-departmental collaboration within NPD processes. The overall theory used to describe the effect that inter-departmental collaboration has on NPD performance is the 'information processing theory' of Tushman and Nadler (1978). In line with this theory, NPD processes are described in terms of uncertainty and risk. Within NPD processes, much knowledge and information needs to be exchanged by team members, with different backgrounds, multiple opinions and viewpoints, to get a product idea from the development to the commercialization. The information processing theory is very suitable here, because it provides a simple view of how inter-departmental collaboration could have a positive and/or a negative effect on (different) NPD processes.

In the first paragraph costs and benefits of inter-departmental collaboration are described even as the effect that inter-departmental collaboration could have on different NPD processes (radical versus incremental). Paragraph two proceeds with different aspects inter-departmental collaboration (structure, stakeholders and content). In paragraph 3 the measures of project performance will be presented and in the end, paragraph 4, conclusions will be drawn and the theoretical framework will be developed. Eventually, this theoretical framework will form the basis for answering the main question of this report.

2.1 Effectiveness of inter-departmental collaboration within NPD processes

In rapidly changing competitive conditions, companies try to obtain competitive advantage by developing new products. New product development (NPD) is an important factor for business survival and growth, and firms need to be proficient in accelerating their NPD programs (Brown and Eisenhardt, 1995; Kim and Wilemon, 2010). The new product development (NPD) process is defined as: *"multiple activities in which new knowledge is embodied, starting from idea generation, through product development until bringing a product or service on the market."* (Griffin and Hauser, 1996; Song et al., 1997; Olson, 2001 and Brettel et al., 2011). Within NPD processes, team members gather and interpret information on markets, technologies, competitors and resources, and translate this information into a product design and a product strategy (Moeneart, 200; p.361). According to the information processing theory, inter-departmental collaboration has a positive influence on new product development due to the large amount of information that can be processed across departmental boundaries. The information processing theory also suggests that inter-departmental collaboration is a cost, because it consumes *'more time, effort and energy'* to develop new products (Tushman and Nadler, 1978). Song and Xie (2000) suggest that inter-departmental collaboration simultaneously presents costs and benefits that vary with conditions. Therefore inter-departmental collaboration may not work in every situation.

Cuijpers et al. (2011) studied costs and benefits of inter-departmental collaboration and their impact on the NPD process performance. In table 1, on the next page, the costs and benefits of inter-departmental collaboration according to Cuijpers et al. (2011) are summarized.

Benefits	Costs
Increasing firms' innovation performance (Swink and Song, 2007; Troy et al., 2008)	Less efficient decision making (Troy et al., 2008; Song et al., 1998)
Fostering information exchange and resource sharing (Troy et al., 2008; Moeneart and Souder, 1990)	Conflicts over resources and technical issues (Troy et al., 2008)
Enhancing the number of potentially useful ideas (Miliken and Martins, 1996)	Budget overruns (Olson et al., 2001)
Improving functional performance of new products (Olson et al., 2001)	Project delay and failures (Mishra and Shah, 2009; Swink and song, 2007)
Enhancing the information processing capabilities (Gomes, 2003)	Less control and potentially increased response time (Tushman and Nadler, 1978)

Table 1: Costs and benefits of inter-departmental collaboration

Inter-departmental collaboration also has a different effect on different kind of NPD processes. Song et al. (1998) state that the degree of uncertainty surrounding the NPD process differs according to the level of product innovativeness (incremental vs. radical). As the level of perceived uncertainty increases, information processing technology suggest that the need for information increases and therefore the need for coordination in NPD processes increases. De Brentani (2001) suggests that there is also a difference in product development difficulty and performance regarding incremental and radical NPD projects. Besides , Veryzer (1998) and Song and Montoya-Weiss(1998) imply that the effort and resources required when undertaking NPD ventures are also different. In Literature the differenes between incremental and radical NPD processes are extensively described.

2.1.1 Incremental NPD process

An incremental NPD process is focused on the improvement of existing products. According to de Brentani (2001), these processes are less uncertain, less risky, less difficult to develop and the performances are commonly not very spectacular. The incremental process mostly arises from a market pull. These processes do have a high degree of fit with company experience and resources and thus a higher rate of success. The most suitable framework for an incremental NPD process is the linear system. A well known example of a linear system is the stage-gate model of Cooper (2001). Cooper's model starts with the discovery of an idea, which is the first decision to commit resources to a project, and ends with a post-launch review. In between he describes five stages, which are composed of several activities, and five gates in which a go or no go decision will be made. In a linear system, product development goes through a series of steps and activities, which are relatively fixed, discrete and sequentially organized (McCarthy et al., 2006). The system provides a simple and sequential overview of the process structure. Within the process, decisions need to be made about, for example, the progress of the project. Progress decisions are made between every stage. These decisions can be taken as a collective, by an individual, or all kind of forms in between. Besides, the decisions can be taken directly, by a delegation or with the use of intermediaries (Kaats, et al., 2005). Decision making can be hampered when the information is limited, when there are constraints within the organization, or when collaborators have many diverse goals, opinions, values and experiences within the NPD process. However, in an incremental process, which is less uncertain and risky, decisions are relatively easy to make

2.1.2 Radical NPD process

A radical NPD process is focused on the generating of really new products. These really new products need to be combined with new markets; therefore technology-market linking is very important (Dougherty, 1992). According to de Brentani (2001) radical innovations entail a much higher degree of risk and uncertainty. Radical innovations are also more difficult to develop; because of the radical aspect these innovations require greater company effort and resources commitment. According to Ettlie et al. (1984) the radical process mostly arises from a technology push. Cooper, Edgett and Kleinschmidt (2002), stated that the linear perspective fails to fully represent the turbulent and fuzzy aspects of the radical NPD process. In order to manage the development of radical innovation, recursive and chaotic NPD frameworks were developed. Recursive frameworks assert feedback connections and nonlinearity in NPD, whereas the chaotic framework emphasizes that the first stages of the NPD process are chaotically organized and the latter stages are relatively linear and ordered. In a radical NPD process, decision making is also important. Because the processes can be very chaotic, decisions making is more difficult than at the linear incremental process. The radical process is uncertain and risky, which can hamper the decision making because the information is limited.

According to the information processing theory (Tushman and Nadler, 1978) effective collaboration depends on the collection of appropriate information, the movement of information in a timely fashion, and its transmission without distortion. Thus, whatever system the NPD process is following, the system must be suitable for the collection of appropriate information, for the movement of information in a timely fashion and its transmission without distortion. In this case, information refers to data which are relevant, accurate, timely and to the point.

Inter-departmental collaboration can be divided into different aspects. These aspects will be elaborated in the following paragraph.

2.2 Aspects of inter-departmental collaboration

In line with the information-processing theory, inter-departmental collaboration is determined by three different aspects. First, the structure in which collaboration takes place. Second, the stakeholders of the collaboration. And third, the content of the collaboration. These aspects will sequentially be explained below

2.2.1 Structure of inter-departmental collaboration

In NPD processes, departments with specific tasks, dealing with specific aspects of the organization's task environment, are interdependent to varying degrees and their activities must be linked together (Tushman and Nadler, 1978). There are two aspects of structuring the inter-departmental collaboration within NPD processes, these are project team and formalization

2.2.1.1 Project team

In their study, Moenaert et al (2000) observed that the creation of a multifunctional core team is critical to optimizing the information transfer within the NPD process. Clark and Weelwright (1992, p. 10-14) describe four types of team structures for NPD. These are: the functional team, the lightweight team, the heavyweight team and the autonomous team.

Functional team

In a functional team people are grouped by discipline and responsibility for the project. The project passes sequentially -often not smoothly- from one function to the next, also termed 'throwing it over the wall'. The team is often temporary and there is no project manager. Team members are periodically discussing the project. There is no liaison personnel between the different functions and there is a general lack of coordination and communication between the different functions involved. A consequence is that the cycle time is often very long and there is often a lack of fit between customer requirements and product attributes (Schilling and Hall, 1998).

Lightweight team

A lightweight team looks like the functional one, but each functional department designates a liaison person to 'represent' it on a project coordinating committee. The manager is called 'lightweight' because he or she has little status and influence in the organization and the key resources remain under the control of their respective functional managers. Lightweight team members often spend no more than a quarter of their time on a single project. Because of these characteristics, lightweight teams are often unable to overcome inter-functional coordination and communication problems. While the lightweight team has shortcomings, it may be appropriate for imitative or incremental projects, where high levels of coordination and communication are not required (Schilling and Hall, 1998)

Heavyweight team

A heavyweight team includes a group of core cross-functional team members who are dedicated for the duration of the development effort. The 'heavyweight' manager has direct access to and responsibility for the work of all those involved in the project. According to Clark en Weelwright (1992) the 'heavyweight' project team is the most effective for radical NPD, because when they are managed effectively, these teams offer improved communication, stronger identification with and communication to a project and a focus of cross-functional problem solving. These teams have a number of advantages and strengths, along with associated weaknesses. The advantage of ownerships and commitment within the heavyweight team is an important advantage, but sometimes a team expands the definition of their role and gets carried away with themselves and their abilities. Organization should be aware that a heavyweight team can turn into an autonomous team, and that the rest of the organization feels like 'second class'. The organization needs to achieve a balance between the needs of the individual project and the needs of the broader organization. Another advantage is that the heavyweight team can achieve an effective system design by using generalist skills applied by broadly trained team members, with fewer specialists and, on occasion, less depth in individual component solutions and technical problem solving. However, that lack of depth can lead to a disadvantage if, for example, a high level of technical excellence is required which can be attained by a more traditional functional team structure. A company must make sure that sufficient technical specialists review designs at appropriate points so that such weaknesses can be minimized. Besides, there is a risk in allowing core team members to be assigned to multiple projects. In this case they are neither available when their inputs are most needed nor as committed to projects success as their peers. They become secondary core team members, and the full potential of the heavyweight team structure fails to be realized.

Autonomous team

Within an autonomous team, the functional representatives are formally removed from their functions, dedicated full-time to the team, and located with other team members. A critical distinguishing feature of the autonomous team is that the project leader becomes the sole evaluator of the contributions made by individual team members. Autonomous teams have their own policies and procedures like a reward system. Herewith they can increase commitment and involvement of the team members. A possible problem of the team is that they become too independent and get away from the top management control. When a project is complete it is difficult to get members back into the organization again. This team is appropriate for breakthrough projects, particularly when existing routines and cultures counter to the objectives of the project (Schilling and Hall, 1998).

All team structures have a number of advantages and strengths, along with associated weaknesses. These are summarized in the following table (table 2).

Characteristics	Functional team	Lightweight team	Heavyweight team	Autonomous team
Project manager	No	Yes	Yes	Yes
Power of project manager		Low	High	Very high
Primary orientation of team members	Function	Function	Team	Team
Location of team members	Function	Function	Co-located with project manager	Co-located with project manager
Degree of cross-functional integration	Low	Moderate	High	High
Appropriate for	Not appropriate	Derivative / incremental projects	Platform / radical projects	Radical projects

Table 2: characteristics of project teams (source: Schilling and Hill, 1998; p.76)

2.2.1.2 Formalization

Formalization is the regulation of, in this case, the inter-departmental collaboration within NPD processes, on several fields (Kaats et al., 2005). The degree of formalization depends on the kind of NPD process. An incremental NPD process is easier to formalize than a radical NPD process, because the incremental process is less uncertain and risky. However, formalizing the activities of the NPD process is very important in every process because it compels all parties involved to exchange information at regular time intervals. The innovation capacity of a firm is determined by the cohesiveness of the communication flows linking individual competencies (Cohen and Levinthan, 1990). Especially in NPD processes, employees need to exchange information, knowledge and skills in order to develop successful products. Therefore there is need for frequent, direct communication in order to build a trust relationship (Daft and Lengel, 1986). The frequency of collaboration determines the movement of information in a timely fashion and it increases the chance of transmitting information without distortion (Tushman and Nadler, 1978).

In the absence of formal mechanisms, such as action plans and project review meetings, communication depends on the discretionary (and therefore ad hoc) behavior of the team members. A certain level of project protocol is also needed to avoid conflicts and inefficiencies. Other elements that can be formalized are: a stringent follow-up of the documents, and the setting of deadlines and goals. The level of goal congruence between departments is a critical element determining team integration (Moenaert

et al., 2000). Transparency within the team will be improved by formulating congruent department goals. By setting goals, there must be agreement and alignment along the involved employees.

2.2.2 Stakeholders of inter-departmental collaboration

In developing new products various functional departments are involved because it is a multidisciplinary effort (Urban and Hauser, 1993). Interdependencies between functional departments call for high level of interactions as well as for information sharing and resource sharing in order to ensure effective results (Song and Swink, 2002). In literature, R&D, marketing and manufacturing are seen as the main contributors to the NPD process. Their personnel is involved in interdependent tasks and need to collaborate, for example: Marketing and manufacturing need knowledge about the technologic potential of a product, which can be provided by R&D. R&D needs knowledge about customer preferences that lead to desired product features, which can be provided by marketing and will be used to determine the required manufacturing capabilities (Brettel et al., 2011). However, not every stakeholder of the project should always be a member of the project team as well and/or be involved in every part of the NPD process. The effect of inter-departmental collaboration can differ between different functional departments, but also between different phases in the NPD process. Below a short overview will be given of the effect of inter-departmental collaboration between different functional departments (R&D, marketing and manufacturing) and at different phases (early stages and later stages) of the NPD process. There can be many other stakeholders within a company, but they will not be considered in this chapter.

R&D and Marketing

Collaboration between R&D and marketing minimized the need for costly redesigns, increases the possibility of developing a successful product on time and in line with the set budget (Song and Xie, 2000). R&D depends on Marketing to get an evaluation of the commercial potential of a product and in return, marketing depends on R&D for the launch of the new product, because R&D has the technological information and expertise of the product. However, Marketing and R&D should not always be collaborating in the early stages of a radical NPD process, because it can hamper the development of radical new ideas, those who cannot be commercialized yet (Brettel et al., 2011). Griffin and Hauser (1996) and Cordón-Pozo et al. (2006) state that collaboration between marketing and R&D is significantly related to NPD success. The relation becomes especially critical when the degree of uncertainty in the environment is high (radical NPD). Then communication will be used as an information processing mechanism in order to deal with the uncertainty. This view conflicts with the view of Brettel et al. (2011) who point out the negative effect of this collaboration at radical NPD processes. However, Cordón-Pozo et al. (2006), who studied Spanish high-tech firms, showed that their results match with many other research works that highlighted the positive impact that collaboration between the R&D and marketing departments has on the success and performance of new products in different geographical contexts (e.g. Ayers et al., 2001; Griffin and Hauser, 1996; Leenders and Wierenga, 2002; Lu and Yang, 2004; Song and Parry, 1993a).

R&D and Manufacturing

The need to consider the linkage between R&D and manufacturing for NPD performance is stressed in several studies; however few studies actually examined the collaboration of R&D and manufacturing in

NPD processes (Olausson et al., 2009). Brettel et al. (2011) studied the impact of integrating the R&D, marketing, and manufacturing functions on the effectiveness and efficiency of NPD. Olson et al. (2001) studied patterns between these functions in order to find out if increasing the level of cooperation leads to higher innovation performance. Both articles come up with very different results. Olson et al. (2001) state that late-stage collaboration between R&D and manufacturing has a positive influence on project performance of radical innovations but not for incremental innovations. Early-stage collaboration proved to be significantly, positively related to project performance in both processes. Whereas Brettel et al. (2011) indicate that collaboration between R&D and manufacturing is positively connected to efficiency in both stages of the incremental NPD projects and in the later stages of the radical NPD project. In the early stages of radical NPD projects, R&D and Manufacturing should not always be collaborating because it can hamper the development of radical new ideas, those who cannot be manufactured yet.

Marketing and Manufacturing

Increasing the Marketing and Manufacturing collaboration in the NPD process is respectively associated with greater product competitive advantage and a higher project return on investment. A negative effect, however, is that this collaboration significantly lengthens project time, at least in the later stages of the radical NPD process and the early stages of the incremental NPD processes (Swink and Song, 2007; Brettel et al., 2011). Olson et al. (2001) again found very contrasting effects of this collaboration. According to them is early-stage cooperation between marketing and manufacturing associated with superior performance for incremental projects but with poor performance for radical projects. Besides they state that late-stage collaboration between marketing and manufacturing has a positive influence on project performance of radical innovations but not for incremental innovations.

2.2.3 Content of inter-departmental collaboration

Now it is known how inter-departmental collaboration can be structured and who are the stakeholders of the inter-departmental collaboration, one piece of the puzzle remains; how do these stakeholders collaborate in this structure. The content of the collaboration can be seen as how appropriate information is collected, how this information is moved in a timely fashion and how the information is transmitted. This can be summarized as the information transfer, which will be explained in the next paragraph.

2.2.3.1 Information transfer

Moenaert et al. (2000) describe a linear model that defines information transferring as a communication process in which a source transmits information to a receiver through one or more channels. Several empirical studies and normative theories specify the information processing requirements in NPD project teams. For instance, for information to be used, it must be perceived as relevant, novel, credible and comprehensible by the receiver. Also, these studies assume that there are people, equipment, and procedures that assess and distribute the needed information in a timely and accurate way (Moenaert and Souder, 1996). In order to let everyone understand the information that is transferred within the collaboration, the communication within the collaboration needs to be sufficiently clear and accessible, also called transparent. Following the information processing theory, the transparency of communication within the collaboration decreases when the level of complexity and uncertainty

increases. Limited transparency implies that members of the collaboration have problems identifying the relevant persons to transfer information to or to obtain information from.

Now the insights into the different aspects of inter-departmental collaboration are provided, the question remains whether and how these aspects have an effect on the performance of the NPD projects. This issue will be addressed in the next paragraph.

2.3 Project Performance

Performance measurement in NPD projects is a widely addressed topic. In general, project performance can be defined as the extent to which established objectives are met. In NPD projects, specific measures of performance include the adherence to predefined quality (output), schedule (time), and budget (cost) objectives (Hoegl et al., 2004; Olson et al., 2001). This conceptualization of NPD project performance as a multidimensional construct is widely acknowledged in literature (Hackman 1987; Pinto et al. 1993; Hoegl and Gemuenden 2001 and Olson et al., 2001). The three specific performance measures will be explained in the following paragraphs.

2.3.1 Time (schedule)

Time is one of the most constrained, and therefore important, resources necessary for developing new products. Every project has objectives in terms of time, a schedule, when things need to be done. If a project team is able to meet the time objectives, a project is performing well on this dimension. The schedule of a NPD project can, for example, be influenced by the decisions making around the process. If decisions are taken very slow, a project can run out of schedule, and, very logical, when a decision is taken faster than scheduled, a project runs in at time (Altena, n.d.).

2.3.2 Cost (budget)

Next to time, cost is the other most constrained and thus important resource necessary for developing new products. There are some development activities that need to be done because else there is no project (e.g. personnel, prototype material, testing and so on). For every NPD project a budget will be prepared, a certain amount of money available to do this project. Again, when a project stays within the budget (and meets the budget objective), it is performing well. Does the project exceed the budget; it is performing less good or even worse.

2.3.3 Quality (output)

In the context of NPD projects, quality refers to the desired specifications of the output produced within this project. For a project team charged with designing, for example, a car, several specifications can be important, including the weight, the color, the functionality, the manufacturability, the durability and so on (Hoegl et al., 2004). If quality specifications are met, a project performed better than if they are not.

2.4 Conclusion

In this chapter, the effect of inter-departmental collaboration within NPD processes is described according to the information processing theory. First of all, it can be concluded that inter-departmental collaboration has its costs and benefits and that it varies with conditions. A distinction is made between

the innovativeness of NPD processes (radical versus incremental), to show that the degree of inter-departmental collaboration has a different effect on both processes. Radical processes perceive a high level of uncertainty and risk which leads to an increasing need for information sharing and coordination, whereas for incremental processes it is the other way around (lower level of perceived uncertainty and risk; less need for information sharing and coordination). This uncertainty and risk makes that decision making in incremental processes is easier than decisions making in radical processes. For both processes different systems are used (linear, recursive and chaotic). Whatever system the NPD process is following, the system must be suitable for the collection of appropriate information, for the movement of information in a timely fashion and its transmission without distortion. The effectiveness of inter-departmental collaboration depends on these factors.

In line with the information-processing theory, inter-departmental collaboration is determined by three different aspects. These aspects are: structure of inter-departmental collaboration, stakeholders of inter-departmental collaboration and the content of inter-departmental collaboration.

The structure of inter-departmental collaboration is divided into formalization and project team. The extent to which collaboration is formalized is depending on the kind of NPD process. Incremental NPD processes are easier to formalize than radical NPD processes, because they are less uncertain and risky. It is however very important to formalize activities of every NPD process, because it compel all parties involved to exchange information, knowledge and skills at regular time intervals. There are different project teams suitable in different situations. The most suitable project team in radical NPD projects is the heavyweight project team; a team with a group of core cross-functional team members who are dedicated for the duration of the development effort. The 'heavyweight manager' has direct access to and responsibility for the work of all those involved in the project. For an incremental NPD process, lightweight teams are expected to be suitable.

Concerning the stakeholders it can be concluded that, because of the contrasting results of the studied literature, the effect of collaboration between departments is very much depending on the kind of NPD process and the stage the process is in. These effects are summarized in table 3 on the next page.

	Incremental NPD process		*Radical NPD process*	
	Early stages	**Later stages**	**Early Stages**	**Later stages**
R&D and Marketing	A positive effect on innovation performance. Positively connected to efficiency		A positive effect on innovation performance	
			Risk: Hampers the development of radical new ideas	
R&D and Manufacturing	A positive effect on project performance		A positive effect on innovation performance	
			Risk: Hampers the development of radical new ideas	
Marketing and Manufacturing	High project return on investment			Positive effect on project performance
	Superior performance			
	Risk: lengthens project time		Risk: poor performance	Risk: lengthens projects time

Table 3: Effect of inter-departmental collaboration on incremental versus radical processes

How stakeholders collaborate in a structure is described as the content of inter-departmental collaboration. The content of inter-departmental collaboration contains the collection of appropriate information, the movement of information in a timely fashion and information transmission without distortion. This information transfer must be in a clear and accessible way to keep the information transfer transparent. Limited transparency should be avoided so that members of the collaboration can identify the relevant person to transfer information to or to obtain information from.

There are two kinds of processes, radical or incremental. The kind of process has an influence on the aspects of inter-departmental collaboration. The first aspect, structure, describes the context in which inter-departmental collaboration takes place. The second and last aspect, stakeholders and content, can be used to analyze the way in which inter-departmental collaboration takes place in this context. The way in which inter-departmental collaboration takes place in the context has an effect on the performance of the NPD process. The project performance is measured against three specific predefined objectives: time (on schedule), cost (on budget) and quality (output).

Putting this all together, the following framework arises (figure 2):

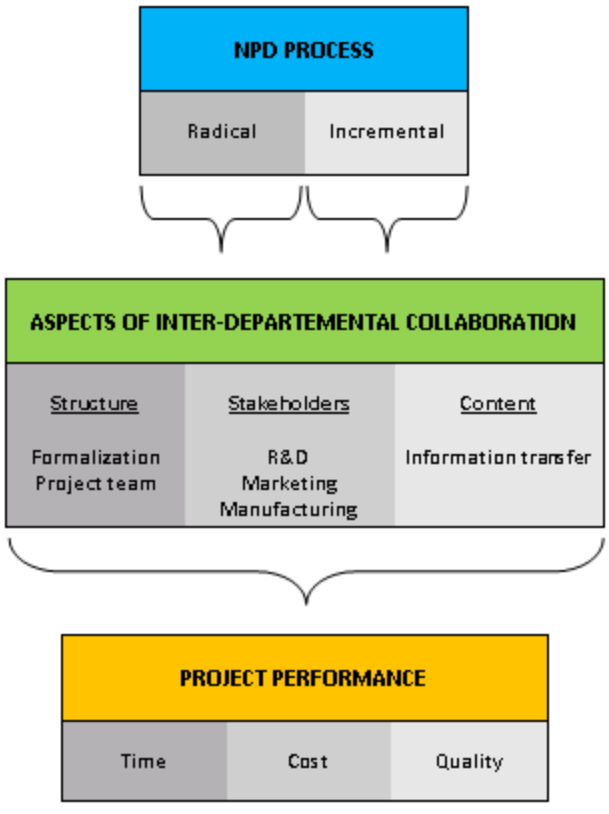

Figure 2: Theoretical Framework

3 Portfolio analysis of NPD projects at Acme Alkmaar

In order to eventually draw conclusions on the effectiveness of inter-departmental collaboration within NPD processes at Acme Alkmaar, their NPD projects need to be studied. Therefore, an analysis of Acme's NPD project portfolio will be done. This analysis will be done in cooperation with Matthias de Visser, a PhD student of the University of Twente. The NPD projects that will be studied are R&D projects. It is a conscious choice to analyze R&D projects, and not for example Business Development projects, because of the fact already mentioned in paragraph 1.6; every NPD process goes through or is initiated by R&D.

The chapter is structured as following: First an overview of the useful NPD projects will be presented. After that will be explained which characteristics will be analyzed and how the data about the NPD portfolio characteristics is collected. Then, the data bout the NPD portfolio characteristics will subsequently be analyzed followed by multiple figures which show (or do not show) relations between the different characteristics. At the end, an answer will be given to the first research question: *What are the characteristics of inter-departmental collaboration, innovativeness, size and performance of the NPD project portfolio of Acme Alkmaar?*

3.1 Overview of the NPD portfolio

Before one can do a project portfolio analysis, one needs to know which projects are going to be analyzed.

- **THIS PART IS CONFIDENTIAL -**

Now it is known which projects will be analyzed, it is important to know which information is necessary to analyze the project and how this information will be obtained. In the next paragraph the kind of data needed and the way of data collection will be explained

3.2 Data collection

The aim of this paragraph is to identify the characteristics of inter-departmental collaboration, innovativeness, size and performance of the NPD project portfolio of Acme Alkmaar. To identify these characteristics, multiple data needs to be collected. This data collection is done by studying several documents of the R&D department and by distributing a questionnaire among the R&D employees. Studying documents of the R&D department is a logical choice, because all the documents are available and they provide a lot of information about the projects. For example, the hours spent on a project, the content of a project, the duration of a project, and so on.

Besides, in order to say something about the inter-departmental collaboration within the projects, the performance of the project and the innovativeness of the project, the employees need to be questioned. This is, again, a logical choice because the employees are the ones that collaborated with other departments or not. Before one can question employees, it is important to know which employee is working on which project, so that the right employees can answer questions about the right projects. In the next paragraph therefore the R&D employees are allocated to the projects that are presented in the previous paragraph.

3.2.1 Projects allocated to employees

In order to eventually allocate projects to employees, it is necessary to know which employees are working on the R&D department. Therefore, an overview of all the employees working at the R&D department is provided by the HR department. With this overview and with the list of the useful projects, a combination list can be made in which projects are allocated to employees. This list is developed in cooperation with the Innovation Specialist and the Technology and Patent Officer (*table is confidential)*

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The list of employees assigned to these projects is a starting point for the questionnaire that will be discussed in the following paragraph.

3.2.2 Questionnaire

To analyze different characteristics of the NPD project portfolio, a questionnaire is distributed among the R&D employees. All 27 employees working at the R&D department of Acme Alkmaar have received this questionnaire (see Appendix A). The primary goal of the questionnaire is to systematically map and measure the characteristics and performances of Acme's NPD project portfolio. The response was 96%, only one of the twenty-seven employees did not fill in the questionnaire. The questionnaire consists of two sections and is compiled by the PhD student, Matthias de Visser. In the first section the employees are asked to fill in a Cognitive Style Index (CSI). This CSI will only be used for the research of De Visser and therefore not elaborated here. In the second section the employees needed to answer questions about the NPD projects they are involved in. De Visser based the questions and statements on Hoegl et al. (2004) and Griffin and Page (1996). The questions are divided into 5 parts: project activities, cooperation, overall project performance, operational project performance and project typification. Examples of questions asked are: *'How was the total amount of project time allocated over the next two types of activities (explorative/exploitative)*', *'did collaboration takes place with other Acme departments within the framework of this projec*t?', *'Going by the status of the project; it can be regarded as successful', 'Going by the status of the project, the project duration is on schedule'* and '*Please position the project in the CT-Matrix'.* Answers to these questions are different: percentages, yes/no, strongly disagree till strongly agree and positioning the project in a matrix. The answers provide insight into how the employees experience the projects and are coded by part, for example (table 6):

PNUMBER	**PNAME**	**PDATE**	**EXPLOR**	**EXPLOIT**	**CO1**	**CO2**	**CO3**	**CO4**
RD.0001	Project one	2010	20	80	1	5	1	5
OV1	**OV2**	**OV3**	**OV4**	**OV5**	**OPER1**	**OPER2**	**OPER3**	**PTYPE**
4	4	3	4	4	5	5	5	4

Table 4: example of questionnaire coding

This coding means that: project RD.0001 started in 2010 (PDATE), was 20% explorative (EXPLOR) and thus 80% exploitative (EXPLOIT), internal collaboration took place (CO1: 1), but not intensive (CO2: 5), external collaboration took place (CO3: 1), but also not intensive (CO4: 5). The overall performance (OV1-OV5) scored relatively well with 3's and 4's, the operational performance (OPER1-OPER3) scored very well with 5's, and at last the project is typified (PTYPE) as a 4, which means that the market of this project was new to Acme and the technology was known to Acme.

In total, twenty employees judged the projects. The remaining six employees only contributed to projects starting in 2011 and did not judge any project for this portfolio analysis. Because some employees work on multiple projects (see paragraph 3.2.1.), some projects are therefore also judged by multiple employees. In a number of cases, the employees judged the same project very different. For example, one employee answered that there was very intensive inter-departmental collaboration within the project, where another employee answered that there was no collaboration at all. In these cases, the employees involved were asked where these differences came from. It appeared to be that, in the case of inter-departmental collaboration, not every employee working on that project was involved in the inter-departmental collaboration. The same problem occurred with employees judging the explorative and exploitative[7] character of the project. Where one employee answered that the project contained explorative activities for 90 percent, another employee judged the same project as containing 10 percent explorative activities. After consultation with the employees involved, it appeared to be that very explorative projects also contained very exploitative tasks. And when an employee performed exploitative tasks in an explorative project, he or she judged the project as exploitative. To properly evaluate and analyze the results, some answers are changed after consulting the employees, and an average number is calculated for every subject (*table is confidential*). The average number is calculated as following: For example, three employees judged project RD.1003 as explorative and answered respectively 70 %, 80% and 100%. Because these answers are in the same direction, there has no consultation taken place about the correctness of the scores. The answers are added together and divided by 3 to get an average number. The average numbers are rounded at a five or a ten and in this case the average score is 85%. All three employees agreed by answering that no inter-departmental collaboration took place (0 in the table) and therefore, logically, there is no indication for the intensity of the collaboration. The performance of the project is based on the answers to eight statements about the overall project performance and the operational project performance. Answers vary from 1 (strongly disagree) till 5 (strongly agree). There are no reverse items, all the statements indicate that answering a '5' means that the project performs well at that point. Again, when the answers were very different, consultation took place with the employees. The three employees of project RD.1003 however agreed very much in all their answers and also on the performance of the project. All the answers are added together (so 3 times 8 answers) and divided, in this case, by 24. The average total performance of RD.1003 was (96/24) 4, which means that the project performs well. All the other average project scores are calculated in that same way as the scores of project RD.1003. The results are shown in a table (*table is confidential*).

One must keep in mind that the results from the questionnaire are very subjective. It is tried to make it more objective by also studying documentation and by discussing extremely different answers with the employees. In the following paragraphs, the characteristics of the NPD portfolio will be analyzed on the basis of the collected data.

[7] Where one reads 'explorative' or 'exploitative', one could also read 'radical' or 'incremental'.

3.3 Characteristics of the NPD project portfolio

The NPD project portfolio can be characterized in multiple different ways. For the aim of this study, the size, innovativeness, inter-departmental collaboration and performance of NPD projects are subsequently analyzed.

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3.4 Conclusion

In this chapter the NPD projects of Acme Alkmaar are analyzed. To give an answer to the first research question (*What are the characteristics of inter-departmental collaboration, innovativeness and performance of the NPD project portfolio of Acme Alkmaar?*) information is conducted from documentation and a survey filled in by employees of the R&D department of Acme Alkmaar. Some of these respondents worked upon multiple projects and therefore judged multiple projects. The projects are compared on several characteristics. Looking at the results in the previous paragraphs, one can conclude that:

The focus of the NPD projects of Acme Alkmaar switched in the years 2008-2010 from incremental projects to radical projects. This is good for the long term performance of the company. However, a risk of an innovation portfolio that becomes clustered around high-breakthrough projects is that it might hamper short-term performance. Another striking point is that the number of projects continuously increases. None of the projects are ending or aborted. That brings the risk of a clogged development funnel; the innovation capacity is over committed, key individual contributors are assigned to too many projects and managers do not have the necessary time to follow-up the projects.

In relation to the total amount of hours spent on projects per year, the projects become relatively smaller from 2008 till 2010. There is one (radical) project outstanding in size; project RD.3009. On this project by far the most hours are spent every year. Most projects, however, perform well according to the respondents. There is a difference between the overall performance of explorative and exploitative projects. Exploitative projects seem to perform better, but this is not significantly proven.

At this moment, inter-departmental collaboration takes place in more than the half of all projects. Dries Faems (presentation at Acme Alkmaar, 24-5-2011) showed that inter-departmental collaboration does not hamper operational performance at Acme Alkmaar and that inter-departmental collaboration is an important factor for the overall performance of the NPD projects.

4 Methodology

In chapter two, there was an outline of the existing theory about the effectiveness of inter-departmental collaboration within NPD processes. How these theoretical insights have been collected is already explained in paragraph 1.5.2. After that, the NPD project portfolio of Acme Alkmaar is analyzed in chapter three. How this analysis is done is extensively described in that chapter. In this chapter the methodology used for the remaining part of the research will be further elaborated. First the research method will be explained, followed by the way of data collection and data analyzing.

4.1 Research method

To give an answer to the second research question (*How is the inter-departmental collaboration within NPD processes at Acme Alkmaar currently organized, and how could it be shaped more effective?)* some internal research has to be done. In chapter three, this research is already started by studying the NPD project portfolio of Acme Alkmaar on several characteristics. It became clear that within most NPD projects inter-departmental collaboration takes place and it became also clear how intense this collaboration was. Besides the performance of the projects is measured. Even as the extent of innovativeness and the total amount of hours spent on a project (size). However, in order to find out how inter-departmental collaboration in the current NPD processes is organized, some of the NPD projects will be studied in depth. Therefore a multiple case study will be used, which will be explained in the next paragraph.

4.1.1 Multiple Case Study

A case study is defined as an empirical enquiry that investigates a contemporary phenomenon within its real-life context (Yin, 2003). The phenomenon that will be studied in this case is inter-departmental collaboration; the context in which this will be studied is the NPD process of Acme Alkmaar. To study the NPD process, multiple NPD projects will be selected for the case study. Which cases will be selected and how they are selected will be described in paragraph 4.1.2. Because the cases have similarities but also differences, the research can be seen as a multiple case study.

Using a case study as research method is very appropriate here, because multiple entities can be examined and multiple data can be collected using several means. Besides, the cases are already available. Moreover, this method fits the exploratory purpose of the research question, enabling the researcher to develop practical guidelines. A disadvantage of the case study is that the results are difficult to generalize because of the risk of subjectivity (van Aken, 1994). However, the aim of this case study is to develop knowledge about several cases to solve problems and not to judge if 'it is truth' (van Aken, 1994).

The cases will be studied according to the theoretical framework that is developed in chapter 2. The factors that will be studied are the NPD process, aspects of inter-departmental collaboration and its effect on project performance. This will be further operationalized in paragraph 4.2.2. To start carrying out case study research, one should collect its cases first (Yin, 2003).

4.1.2 Selecting cases

The case selection is very important, because the main part of the research is depending on it. Therefore multiple criteria will be used for selecting the right cases. These criteria are: inter-departmental collaboration, size, project performance and innovativeness. The criteria will subsequently be explained and elaborated.

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The final case selection consists of the following projects (see figure 3).

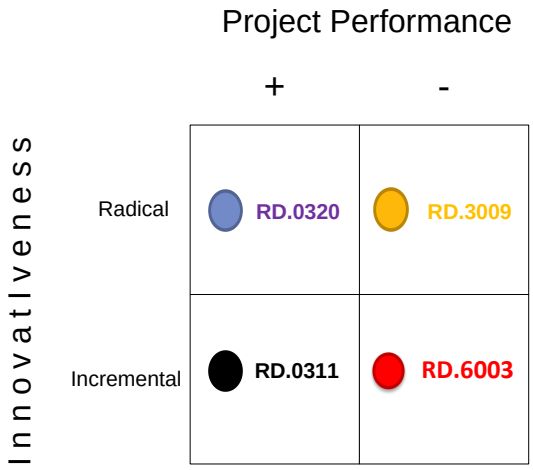

Figure 3: Final case selection NPD projects

For studying these cases, multiple data is required. A certain amount of data is already available and can be obtained from the results of the Portfolio Analysis. The remaining data needs to be collected otherwise. How and why this data is collected will be explained in the next paragraph.

4.2 Data collection

While writing the theoretical framework as presented in chapter 2, orienting conversations have taken place with employees involved in several NPD projects, to find out how NPD processes normally proceed. It was found that most projects start at R&D and then proceed to Product Management (PM) or to Manufacturing, depending on the kind of project they are doing. The project goes to PM when it needs to be sold and a market needs to be found, and a project goes to Manufacturing if the product needs to be produced first. Which department is responsible for the project, depends on the stage the project is in. The NPD process of Acme Alkmaar counts 6 stages from which R&D is responsible in the first three stages, PM or Manufacturing in stage four and five and Operations in stage six (after care). Between every stage, the Product Development Review committee (PDR) or the Steering Committee (SC) decides whether a project goes to another stage or not. The NPD process as such is clear enough to find out how well the mentioned departments (R&D, PM and Manufacturing) are collaborating. Besides these three departments, Marketing, Sales, Engineering, Procurement and Production Improvement & Implementation (PI&I) are also included in the study on inter-departmental collaboration because they also play a role in the NPD processes. Data about the collaboration within the selected NPD projects will

be collected by studying documentation at Acme Alkmaar, by observation and by semi-structured interviews with employees of different departments involved. This will be explained below.

4.2.1 Documentation

For every NPD project many documents are maintained, which will be used to provide insights in the background of the selected NPD project. One could think of all kinds of documentation. It is for example documented which employees are working on that project and from which department they are. Besides, of every project a description is available, even as financial records and information about the progress of the project.

4.2.2 Observation

While studying the cases at Acme Alkmaar, direct observations can be done. Doing observations will strengthen evidence of the case study and will also complement both the interviews and documentation. Observation gives insight in for example attitudes of employees towards other employees or the ease in which they communicate with each other.

4.2.3 Semi-structured interviews

In order to get more information about inter-departmental collaboration within NPD processes at Acme Alkmaar, interviews will be held with employees involved in a selected NPD project. All interviews will be done separately so that the respondent is free to give his or her opinion. Besides the answers will be kept as anonymously as possible, so that the respondents will be less inclined to give political correct answers.

The interviews will be semi-structured. This means that the interview protocol consist of a framework with different themes, which leaves room for adding new questions during the interview as a result of what the respondent says. In this way, the respondent will get enough room to give interesting answers, but it will also ensure that the given answers are in the right direction and provide useful data. Since doing interviews and then analyzing all the results is known as time-consuming, the total amount of interviews is limited to twenty. This means that for every case, a maximum of 5 interviews will be held. Because it is known who is working on a NPD project, it is not difficult to select employees for an interview. Besides, some employees are working on multiple projects, which makes it easier to do twenty interviews, because multiple projects can be discussed successively. The aim is to interview the project leader and at least two employees of different departments. The project leader is chosen because he or she could have another view on for example the decision making within a project, than a team member. Interviewing employees of at least two different departments is important to get insights of different perspectives about the collaboration within the project. Within the case study (chapter 5) it will be mentioned which respondents are interviewed at which case. Since all interviews will be done internally, a response of 100% is expected.

Naturally, every respondent will be interviewed following the same protocol. The names and functions of the employees will not be published because some of the questions can be very sensitive to the respondent and the information provided is confidential. Interview answers will only be known to the researcher. However, to substantiate the results, it can be necessary to mention the department the

answer came from, or to mention if the respondent was a project leader or not. Publishing this information will be discussed with the respondents. The desirable results from the interview involve a meaning about the factors that are studied. These results will contribute to the information already obtained by desk research, observation and orienting conversations. The factors that will be studied in this case are:

- *NPD Process:* radical / incremental
- *Aspects of Inter-departmental collaboration:* structure, stakeholders, content
- *Project performance:* time (schedule), cost (budget) and quality.

These factors will be operationalized in the following subparagraph.

4.2.3.1 Operationalization

To study the factors introduced above, they first need to be operationalized. In this paragraph, subsequently the NPD process, the aspects of inter-departmental collaboration, and project performance will be operationalized.

NPD Process

Radical NPD process = is the core target market / core technology of the project new to the World or new to Acme

Incremental NPD process = is the core target market / core technology of the project known to Acme

Decision making within the NPD process = which decisions, by who, how and when; distribution of responsibilities among project leaders, departments and employees; agreement upon the decisions made; and the availability of input and resources.

Aspects of inter-departmental collaboration

Structure = How is the inter-departmental collaboration shaped

> *Formalization* = The regulation of the inter-departmental collaboration within the NPD process by using several mechanisms and the frequency in which team members or stakeholder are transferring information to each other. Mechanisms are, for example: a project plan including goals, deadlines and a protocol, standard documents, scheduled project review meetings, other communication and information sharing tools such as discussion forums, presentations and a newsletter dedicated to the project.
>
> *Project team* = The composition of the project team, distribution of responsibilities, power of the project leader, involvement of different departments (cross-functional) or involvement of one department (functional).

Stakeholders = Other departments involved in the project. When are they collaborating (early / later stages) and is that desirable, and are they working sequentially or simultaneously.

Content = The collection, moving and transmitting of information within a NPD project

> *Information transfer* = How and which information is transferred from one person or department to another person or department (communication), the ease in which information can be obtained and transferred, agreement about the information transferred, understanding the information that is transferred (clear and transparent).

Project performance

Time = is the project on schedule, is it delayed or faster than expected. .

Cost = is the project on budget, more expensive or less expensive

Quality = does the project meet quality specification, is the quality better or worse.

These operationalized factors are translated into semi-structured interview questions. The interview-protocol can be found in appendix B.

All the information collected by the instruments explained above, needs to be analyzed. The next paragraph describes how this analysis will be done.

4.3 Data analysis

Data analysis within case studies is often concurrent with the data collection phase, rather than subsequent to it. In this case the data will be analyzed using a case description (Yin, 1989). This case description provides an answer to research question 2 (*How is the inter-departmental collaboration within NPD processes at Acme Alkmaar currently organized, and how could it be shaped more effectively*?). The transcripts of the interviews form the main input for the case description, supported by information from the portfolio analysis, documents and observations. To ensure that the answers given at the interviews are correct, every interviewee receives a transcript per e-mail. In this way they get the opportunity to revise their answers if necessary. The projects within the case study will be described as following:

1. Project RD.XXXX
    a. NPD Process
        i. Decision making
    b. Structure of inter-departmental collaboration
        i. Project team
        ii. Formalization
    c. Stakeholders of inter-departmental collaboration
    d. Content of inter-departmental collaboration
        i. Information transfer
    e. Project Performance
2. Conclusion

After analyzing each case individually, the cases will be compared doing a cross-case-analysis. The four cases will be compared on differences and similarities concerning the NPD process, aspects of inter-departmental collaboration and performance. The aim is to find out how Acme can improve the effectiveness of inter-departmental collaboration within their NPD processes, taking into account various factors and influences. This will be done by presenting a general schematic overview of overall differences and similarities between the projects, showing patterns and underlying causes and, giving solutions for improving the effectiveness of inter-departmental collaboration within (different) NPD processes.

5 Case study: Inter-departmental Collaboration within NPD Processes at Acme Alkmaar

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6 Cross-case analysis

Within this chapter, the four cases will be compared on differences and similarities concerning the NPD process, aspects of inter-departmental collaboration and performance. The aim is to find out how Acme Alkmaar can improve the effectiveness of inter-departmental collaboration within their NPD processes, taking into account various factors and influences. By doing this cross-case analysis an answer will be given on the second part of the second research question (*how could the inter-departmental collaboration be shaped more effective*). This will be done by presenting a general schematic overview of overall differences and similarities between the projects, showing patterns and underlying causes and, giving solutions for improving the effectiveness of inter-departmental collaboration within (different) NPD processes.

6.1 Patterns and underlying causes

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Taken this all together, it can be concluded that there are four 'systematic mistakes' in the organization of NPD processes at Acme Alkmaar.

1. As a result of the fragmented organization structure with more than fifteen different departments, all NPD projects are performed by a lightweight project team, approved by the SC and controlled by a so called decisions platform: the PDR. Decision making becomes very difficult because of widely spread power and responsibilities, and different interests of different managers. In this composition, the PDR is suitable as an information platform, but not for taking decisions. The group is too large and too diverse. Because the decision platform does not work how it is supposed to work, the lightweight team structure is not efficient as well. Besides, a striking point is that the Sales and Marketing are not involved in the PDR at all.
2. Despite the fact that there are multiple disciplines collaborating within the NPD projects, the inter-departmental collaboration does not have the desirable effect: creating innovative products and selling it on a suitable market. This can be explained by the fact that there are relatively many technical-oriented employees working on NPD at Acme, and that if market-oriented employees are involved in the project it is often in the later stages. The late involvement of stakeholders (especially Sales and Marketing) in incremental projects at Acme Alkmaar is related to bad time performance. Projects are not ready to be commercialized which causes delay. There is no overall protocol for how to compose a project team and it is also not clear when potential stakeholders are informed or involved.
3. There is no/too little control over the formal part of the project. Some projects are formalized, others are not. The Lack of formalization has a negative influence on the information transfer within a project team and therefore on the project performance. By formalizing a project and therefore ensuring the information transfer within the project team, project performance will improve.
4. Because of confidential and sensitive information and knowledge, Acme works with accessibility restrictions. This is logical, but it is also very inefficient for members of a project team that they

cannot reach data from other team members. Moreover, each department having its own budget instead of having one budget for the whole project hampers the inter-departmental collaboration in NPD processes as well. These constraints are inefficient to work with and will therefore have a negative influence on project performance.

To improve the effectiveness of inter-departmental collaboration these 'systematic mistakes' need to be tackled.

6.2 Solutions

Within this paragraph the four 'systematic mistakes' will be treated. For each mistake a solution will be given.

'Systematic mistake' 1: The organization is too fragmented which leads to all kind of inefficiencies regarding to project team composition and the decisions making within the NPD process (especially in radical projects). To improve this situation there are three possible solutions.

Possible solution (1): *Switch from a lightweight team with a lightweight project leader to a heavyweight team with a heavyweight project leader, so that responsibilities are with the project team and collaboration and decision making becomes easier.*

A big advantage of the heavyweight team is that the project team owns the project and is therefore very committed. A heavyweight team offers improve communication, stronger identification with and communication to a project and a focus of cross-functional problem solving Besides the heavyweight team can achieve an effective system design by using generalist skills applied by broadly trained team members, with fewer specialists and, on occasion, less depth in individual component solutions and technical problem solving (Clark and Wheelwright, 1992). However, that lack of depth leads to a disadvantage in this case, because a high level of technical excellence is required which can be attained by a more traditional functional team structure. At Acme Alkmaar, employees are working on multiple projects on the same time. This because for some disciplines there are only one or two appropriate employees and they are needed to do their job in multiple teams for multiple projects. If Acme Alkmaar should change from a lightweight team structure to a heavyweight team structure, these specific employees will become limited to one or maybe two projects and therefore other projects will not be able to proceed. Acme Alkmaar should hire more specific employees to fill this kind of team structure. Given the current state of financial affairs, this is currently impossible.

Possible solution (2): *Decrease the amount of departments and managers, and subsequently decrease the size of the PDR so that the lightweight team and the PDR become an effective combination for all projects.*

In the figure (*figure is confidential)* the current organizational structure of Acme Alkmaar is presented. As one can see there are 17 different departments at this moment. An advantage is that every department has a specific job, and therefore can deliver a qualitative product or service. However, with so many departments there are also many managers. Department 4 till 10 and 12 are represented in the PDR, supplemented with different managers and specialists in the area water or beverage. That means

that there are about 15 managers and specialists who have something to say about the projects. As stated by Kaats et al., (2005) decision making can be hampered when collaborators have many diverse goals, opinions, values and experiences within the NPD process. Practice showed that many separated departments with their own interests, goals and opinions indeed make decision making very difficult.

To improve the effectiveness of inter-departmental collaboration and therefore the efficiency of decision making within the NPD process, the amount of diverse goals, opinions and interests and therefore the amount of departments needs to decrease. Subsequently the amount of managers that are represented in the PDR need to decrease and the commercial departments should be involved. Therefore a new organizational structure should be established.

Possible solution (3): *Give the power to make decisions to one person, the general director.*

As can be seen in the previous solution, Jürgen von Hollen (general director of Acme Alkmaar) is responsible for all the operational departments. As they are all reporting to him, he knows all the ins and outs and therefore would be the right person to take all the decisions. This will reduce a lot of uncertainty about the decisions making and the responsibilities become clearer. A disadvantage is that this will cost a lot of time for the general director and that he has other tasks to do as well.

Given the feasibility of all three possible solutions, solution 2 is the most suitable for Acme Alkmaar.

'Systematic mistake' 2: It is not known how to compose a project team and who should be stakeholders and when they should be informed/involved. For that reason composing a project team happens fully ad hoc and depends on the skills of the project leader. This leads to the wrong composition of project teams. To improve this situation there is one solution: *Use a protocol for composing a project team with the right combination of technical-oriented and market-oriented employees, depending on the project type (radical or incremental).*

An advantage of using a protocol is that for every project a team will be composed that fits the project. A disadvantage of using a protocol is that it is a general protocol and that it will not always precisely fit the project. So it must be possible to make an exception. Besides, it needs to be controlled that the protocol will be used. And most important, before a protocol can be used, it must be made. Literature prescribes several possible effects of different departments working together at different stages (early / late) of different NPD processes (radical / incremental). The inter-departmental collaboration within the NPD processes of Acme Alkmaar is studied and several important things are noticed. Based on the theory and practice an appropriate protocol can be developed.

'Systematic mistake' 3: There is lack of formalization within the projects, which has a negative influence on the information transfer within a project team and therefore on project performance. To improve this situation there is one solution: *"formalize the project so that the information transfer will be optimized and project performance improves."*

By formalizing a project, one can prevent that communication depends on the discretionary (and therefore ad hoc) behavior of the team. A big advantage of formalization is that team members are

forced to communicate. The possibility to align needs increases and discussion about progress, success and failure is more likely to occur. A disadvantage is that formalizing a project costs time, but this does not outweigh the benefits.

'Systematic mistake' 4: two organizational constraints: accessibility restrictions and different budgets for every department hamper inter-departmental collaboration within NPD processes. To improve this situation there is one solution: *"Remove the organizational constraints."*

A big advantage of removing accessibility restrictions is that collaboration becomes easier. It is a 'threshold' for a team member if he[8] needs need to ask for permission to study data from another department that he needs for his project work. It is also a 'threshold' if he needs to ask another team member if he wants to send the needed information to him. A disadvantage is however that the confidential and sometimes sensitive information becomes more public. To keep the information inside the company all employees already signed an agreement for confidentiality, so in theory the information always stays inside. It is however reasonable that employees who really have nothing to do with the information do not get access to it.

Removing the organizational constraint of different budgets for every department is a more difficult problem to solve. Since this study is about the inter-departmental collaboration within NPD processes, the way in which budgets are set within Acme Alkmaar is not studied in depth. It is known that budgets are set by department because departments need to achieve goals related to the amount of budget they are getting. An advantage of this system is that departments do their very best to achieve their goals so that they get the same, or even more budget, next year. A big disadvantage is however that departmental goals are contrasting each other. For example, R&D needs to develop new working products and Manufacturing may not have a higher rejection rate than 5%. R&D wants to test their new ideas, but Manufacturing wants to keep the rejection rate as low as possible. Setting a budget per project instead of per department could be an option, but this is not studied in depth.

[8] 'He' can also be read as 'she'

7 Conclusion and discussion

This chapter presents the conclusions of this thesis by discussing the thesis results. First an answer will be given to the main research question followed by recommendations for Acme Alkmaar. After that the implications of this research for Acme Alkmaar and the implications for theory will be presented. At last the limitations of this research and directions for future research will be described.

7.1 Answering the main research question

The theory behind this thesis says that inter-departmental collaboration will result in better information processing capabilities and therefore improves project performance. There are however also negative effects of inter-departmental collaboration on project performance. The main research question that will be answered in this paragraph is: *How should Acme Alkmaar improve the effectiveness of inter-departmental collaboration within their NPD Processes?*

To give an answer to this question the research is split up in two parts. The first part consists of a Portfolio Analysis of twenty-five NPD projects at Acme Alkmaar; the second part provides an in-depth case study of four selected NPD projects followed by a cross-case analysis. By doing a Portfolio Analysis of the NPD projects at Acme Alkmaar it became clear that inter-departmental collaboration takes place in more than the half of all projects. Within some projects departments collaborated very intensive, in others they did not. How (effective) the collaboration was shaped still needed to be find out.

Based on the data retrieved from the portfolio analysis, documentation, observation and interviews, an extensive case description of four NPD projects is created. These case descriptions give a clear view of how inter-departmental collaboration is currently organized at Acme Alkmaar. The four NPD projects are compared in a cross-case analysis on differences and similarities concerning the NPD process, different aspects of inter-departmental collaboration and operational project performance. Different patterns in the NPD process and underlying causes are elaborated which led to a list of 'systematic mistakes' in the organization of NPD processes at Acme Alkmaar. For these systematic mistakes solutions have been developed.

On the basis of this case study, it can be concluded that the effectiveness of inter-departmental collaboration within NPD processes at Acme Alkmaar can be improved by solving systematic mistakes in the organization of NPD projects. In the previous chapter, three systematic mistakes and three corresponding solutions are presented. To improve the effectiveness of inter-departmental collaboration within NPD processes, these solutions need to be implemented. In the next paragraph, recommendations are drawn to implement these solutions.

7.2 Recommendations

In order to improve the effectiveness of inter-departmental collaboration within NPD processes at Acme Alkmaar, some changes need to be made in the organization of the NPD processes. In this paragraph recommendations will be drawn to do so.

Recommendation 1:
Restructure the Pentair Enschede organization, so that the amount of departments and managers, and subsequently the size of the PDR, decreases.

To decrease the amount of departments and managers the departments should be taken together by discipline. It is however difficult to decide which departments fit with other departments. Some current departments, for example Business Development, can be matched with multiple other departments. It depends on what kind of perspective one takes. In the figure (*figure is confidential)* a proposal of a new organizational structure can be found. In this proposal the main disciplines are: Finance, Technology, Product Management, Commercialization, Manufacturing and Operations. The numbers behind the disciplines show which previous departments are included in the new departments. With the reduction of departments, there will be six 'main-managers' instead of eleven 'sub-managers'. For as far as it fits within the building, the 'new departments' should be physically allocated. By decreasing the amount of departments and managers, the amount of managers in the PDR can easily be reduced. Only the six main disciplines (1 till 5 and 6) should be represented in the PDR, including the general director: Jürgen von Hollen. The SC therefore can be abolished and only a smaller PDR remains.

There are many possible other persons within the organization who can give their perspective on the decisions that need to be made. But it is a conscious choice to keep the PDR small. It is experienced that decision making goes much quicker in smaller groups than in a large group as it is happening now. Besides, decision making can be hampered by collaborators having many diverse opinions and interests within the NPD process (Kaats et al., 2005). By decreasing the amount of managers in the PDR, the amount of different interests and opinions decreases as well. Moreover, the designated persons have much experience and are sufficiently suitable for this job. Because of the big difference between water projects and beverage projects, *Confidential name* and *Confidential name* (Commercialization) can join the PDR for their own category of projects. The composition of the PDR then will be as following:

Water project PDR: *Confidential name* (CEO), *Confidential name* (CFO), *Confidential name* (CTO), *Confidential name* (Director PM), *Confidential name* (Director Operations), *Confidential name* (Director Manufacturing) and *Confidential name* (Director Water Sales).

Beverage project PDR: *Confidential name* (CEO), *Confidential name* (CFO), *Confidential name* (CTO), *Confidential name* (Director PM), *Confidential name* (Director Operations), *Confidential name* (Director Manufacturing) and *Confidential name* (Director Beverage Sales).

Recommendation 2:
Use a protocol for composing a project team, so that the project teams fit the project.

For the composition of a project team there must be made a difference in radical projects and incremental projects. Within an incremental project, collaboration between all parties has a positive influence on innovation performance. There is only one risk and that is that the project time will be lengthened if Manufacturing and Marketing are collaborating (among others: Brettel et al., 2011; Swink and Song, 2007; and Olson et al., 2001). At radical projects, several collaborations form a risk for the project, but these collaborations also positively contribute to innovation performance. The main risks are: hampering the development of radical new ideas, poor performance and lengthening project time (among others: Brettel et al., 2011; Swink and Song, 2007; and Cordon-Pozo et al., 2006). In all cases it is necessary that the market-oriented employees (marketing and sales) are involved in the project. It is however not necessary that these employees are represented in the project team and discuss along with the technical-oriented people every two weeks. In both projects, incremental as well as radical, the market-oriented employees should be stakeholders. To prevent that the 'radicallness' of an innovation is hampered by the influence of market-oriented people, it is a judicious choice to involve market-oriented employees at the start of a radical project and then involve them again if the project is in stage 3 (design). It is not necessary that the market-oriented people are interfering the development process of a radical project, but they should be informed now and then about the progress. For an incremental project it is important that the market-oriented employees are involved at all times. This because incremental projects are often updates of earlier projects and with the interfering of market-oriented people, the projects can become more customer-focused. By involving market-oriented employees there is a risk of lengthening the project time, but is also has multiple positive effects. For example, innovation performance and efficiency are improved. It is important to maximize the positive effects and minimize the negative effects. Lengthening the project time can, for example, be minimized by formalizing the transfer of information.

Besides these differences between incremental and radical projects, a (logical) difference must be made between 'water projects' and 'beverage projects'. For both projects the specialists on that area need to present in the project team. Another important point is that the project teams must involve all the necessary employees to complete that project, but the team must also stay relatively small. It is experienced that small teams are more effective because the communication lines are short and the team can work more effectively together.

The protocol for composing an appropriate project team can be found in appendix C.

Recommendation 3:
Make formalization of a project mandatory and let the management ensure compliance.

An incremental NPD process is easier to formalize than a radical NPD process, because the incremental process is less uncertain and risky. However, formalizing the activities of the NPD process is very important in every process because it compels all parties involved to exchange information at regular

time intervals (Cohen and Levinthan, 1990). For that reason, every NPD project should have pre-scheduled frequently meetings, so that information will be frequently transferred. The frequency of meetings within the NPD process of Acme Alkmaar depends on the stage a project is in; once in two weeks is very common. Meeting each other frequently costs time, but eventually needs of different departments will be better aligned and project performance will improve. Besides the meetings, the project team should write a project plan including goals before the project starts. With a project plan, goals are clear for all team members and there is a plan to stick on and to discuss. By setting goals, there must be agreement and alignment along the involved employees (Moenaert et al., 2000).

Besides these formalization mechanisms, the project team should also build a business case. A business case is important for the commercialization of the project. One should not only know what a product is capable of, but also who wants to buy this product. By shaping the project in this way, people are forced to communicate. Besides, it also contributes to avoiding conflicts and inefficiencies. The management must ensure that these formalization mechanisms are used in the right way. The management needs to communicate to all project teams that frequently scheduled meetings, a project plan including goals and a business case are mandatory.

Recommendation 4:

a) Partly remove accessibility restrictions and b) consider allocating budgets on a project basis.

Members of a project team should be able to view data from other departments in their project team, if they need the data to do their work properly. Currently there are accessibility restrictions concerning the R&D data because of confidential reasons. Despite the fact that all employees at Acme Alkmaar signed an agreement with a confidentiality statement, it is never superfluous to be careful. However, the employees experience the restrictions as a lack of trust and moreover the restrictions are very inefficient to work with. To keep the information as protected and secret as possible and to make the inter-departmental collaboration more effective, the access to R&D data can be restricted to project teams. This means that every project team that collaborates with the R&D department needs to get permission for entering the R&D data network. All the employees who are not collaborating with R&D in a project team do not have access, except when they have got permission because of other reasons.

It is difficult to recommend how budgets need to be set at Acme Alkmaar because this part is not studied in depth. There are however several indications that the current way of allocating budgets within the organization is not always efficient. One indication is already mentioned in the previous chapter (the contrast between the goals of R&D and Manufacturing). Another indication is that projects fail because there is no budget for it in further stages. Inter-departmental collaboration fails because of budget problems. Therefore the recommendation is to consider budget allocation on a project basis.

7.3 Consequences for Acme Alkmaar

To make inter-departmental collaboration within NPD processes at Acme Alkmaar more effective, several changes need to take place and systematic mistakes need to be solved. Implementing changes in a relatively large organization as Acme Alkmaar is often difficult, time necessitating, and not everyone will be just as happy with it. The consequences of making the inter-departmental collaboration more effective will apply for the entire company. However, one will have more to do with it, others less.

Taking departments together by discipline will face resistance from managers who need to return some of their 'power'. Not every manager can stay at the same 'height' in the organization. To make responsibilities more clear and the power less distributed, the amount of decision making managers needs to decrease. The same goes for the PDR. To decrease the amount of managers in the PDR, some of the current PDR members need to step out of the committee. The managers that will not be represented in the PDR anymore will no longer be involved in decisions about the progress of the NPD projects. This will not be appreciated by everyone and the management can also expect resistance here.

Technical-oriented employees and market-oriented employees need to collaborate more than they did before. This does not have to be a problem at all, but all parties have to get used to it. Besides it can be difficult sometimes because, overall, both parties have different perspectives on how things should go. Another thing is that there is a new protocol to follow. Employees could think that it is only a 'paper-thing' and that it may be a lot of work to follow this protocol. The job of the management here is to convince their employees that it is easier to use this protocol so that the project has a clear start. Employees need to start thinking about the composition of the team at the start so that they do not need to rectify it afterwards.

By formalizing the projects, communication within the team will be forced and therefore improved. The quality of the project will improve because needs are aligned and therefore the project wins in time. However, formalization could also cost more time because the employees need to spent time on, for instance, the project meetings. As the project progresses, the team will be better aligned and this risk can be reduced. Nevertheless, the management should bear in mind that the introduction of mandatory formalization costs time.

A consequence of giving project teams access to R&D data is that it needs to be registered. This will cost some extra administrative time. In addition, considering budget allocation on project basis costs time as well. Still, because both organizational constraints definitely harm the effectiveness of inter-departmental collaboration within the NPD processes, it is important to remove them.

7.4 Implications for theory

The theory behind this thesis, information processing theory, states that inter-departmental collaboration has a positive influence on NPD due to the large amount of information that can be processed across departmental boundaries. The information processing theory also suggests that inter-departmental collaboration is a cost, because it consumes 'more time, effort and energy' to develop new products (Tushman and Nadler, 1978). Different aspects of inter-departmental collaboration, based on the information processing theory, are studied. The results show that if these aspects are organized

in an optimal way; inter-departmental collaboration is very effective and results in better innovation performance. However, if there are systematic mistakes in the organization of inter-departmental collaboration, inter-departmental collaboration costs a lot of time, effort and energy and it does not result in better innovation performance at all. This is in line with the view of Song and Xie (2000) who stated that inter-departmental collaboration may not work in every situation. The effectiveness of inter-departmental collaboration varies with conditions.

Many scholars have argued that there are several costs and benefits of inter-departmental collaboration (among others: Cuijpers et al., 2011, Brettel et al., 2011; Troy et al., 2008; Swink and Song, 2007; Olson et al., 2001, Song et al., 1998). These authors point R&D, Marketing and Manufacturing as the main contributors to NPD and describe many different effects of their collaboration within different NPD processes (radical and incremental). Overall, scholars agree that inter-departmental collaboration has a positive influence on innovation performance. Though, for example, collaboration between certain departments leads to the risk of lengthening project time and hampering radical ideas. During this research a distinction is made between radical and incremental NPD projects as well. It became clear that the effectiveness of inter-departmental collaboration depends on multiple factors and is not necessarily assigned to the innovativeness of the project. For example, the 'nature' of the employee plays a role in how effective the inter-departmental collaboration was. Technical-oriented employees appeared to work more easily together with each other than with market-oriented employees. The results do confirm that there are different effects of collaboration between different departments.

Cuipers et al. (2007) concluded that the overall effect of inter-departmental collaboration on firms' innovation performance appears to be positive. This is in line with the results of this research. On the basis of the answers that were given about the relation between (none) collaboration and performance, it can be assumed that inter-departmental collaboration has a positive effect on project performance at Acme Alkmaar. A note that must be made in here is that this 'relation' only holds when the positive effects (like improved information exchange and functional performance) are maximized and the negative effects (like lengthening project time and difficulties concerning decisions making) are minimized. In fact, project RD.0311 is a good example of a project in which the innovation performance increased by well organizing the inter-departmental collaboration.

De Visser et al. (2010) did a quantitative study of which the results suggest that companies should apply a functional structure for incremental projects and a cross-functional structure for radical projects. However, they used a firm-level assessment to study inter-departmental collaboration, where this research conducted a cross-functional in-depth analysis on the project level. The analysis of this study showed that in the current NPD process at Acme Alkmaar, there is no difference in approaching radical and incremental projects. One of the results is that inter-departmental collaboration, a cross-functional structure, is desired in all projects. This because multiple departments are needed to fulfill every NPD process. For example, Marketing and Sales are hardly involved in the NPD processes and it appears that the important link between technology and market is missing in most of the products. So, whenever a project is radical or incremental, companies should apply a cross-functional project team.

The case study and cross-case analysis on the basis of the theoretical framework that is developed in this research provides a supplementary to the existing literature about the effectiveness of inter-departmental collaboration. For as far as known, qualitative research to improve the effectiveness of inter-departmental collaboration within NPD process is never done before. The framework with different aspects of inter-departmental collaboration, based on information processing theory, can be used as a basis for testing how effective inter-departmental collaboration is shaped in any company or institution.

7.5 Limitations and future research

Despite the contributions of this study, it is important to reflect upon its limitations that lead to directions for future research.

In this study, the focus lays on projects in which inter-departmental collaboration took place. For that reason it is not studied if projects where no inter-departmental collaboration took place multiple disciplines should collaborate to be more successful. Besides that, the study only focuses on projects within Acme Alkmaar. For that reason it is not studied how other (successful) companies organize inter-departmental collaboration within NPD processes. A comparison with projects of other companies would be an interesting test to see where Acme Alkmaar stands at this moment, but it would also provide a broader insight in the effect of inter-departmental collaboration on project performance.

In paragraph 7.2 it is recommend to restructure the Acme Alkmaar organization by taking disciplines together and create six main departments. This is a way in which these disciplines can be taken together. An in-depth research to the way in which the organization can be best structured is not performed. Another recommendation is to consider budget allocation on a project basis. As already stated before, it was very difficult to recommend how budgets need to be set exactly, because this part is not studied in-depth either. Other scholars are encouraged to: (1) study all the options for restructuring the organization, so that the amount of departments and managers decrease, and (2) study all the options for appropriate budget allocation, so that inter-departmental collaboration is not hampered, (3) and implement the best option of both at Acme Alkmaar.

The conclusion of this research is that the effectiveness of inter-departmental collaboration within NPD processes at Acme Alkmaar can be improved by solving systematic mistakes in the organization of NPD projects. A logical next question then becomes whether the implementation of the solutions to the systematic mistakes at Acme Alkmaar indeed have led to more effective inter-departmental collaboration and therewith increased project performance. Information processing theory, and consequently this research, highlights the internal structure and process of a company, but it puts the environment in a passive role. The environment of Acme Alkmaar could have an influence on the performance of the NPD process. Besides, this study only highlights the effectiveness of internal collaboration. External collaboration (with partners and institutes) possibly influences project performance as well. Future research is needed to address this important question.

8 References

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9 Appendix

[A] – Questionnaire Portfolio Analysis

Dear respondent,

The primary goal of this questionnaire is to systematically map and measure the characteristics and performance of Acme's innovation portfolio. We sincerely appreciate your efforts in completing this survey.

In the first section, we will ask you some questions about your cognitive style. In the second section, we will ask you to answer a limited number of questions for each innovation project in which you have participated during the past three years.

Please note that **all individual responses will be strictly confidential** and only known to the research team. We also signed a non-disclosure agreement with Acme, assuring that we cannot publish results of this research without the consent of Acme. We will only report results to the Acme management on the portfolio level. This implies that we will not provide information on individual characteristics of the respondents and/or respondents' opinion about specific projects to Acme's management.

If you have any questions regarding this survey, please feel free to contact Matthias de Visser (m.devisser@utwente.nl / 053 489 2768).

Thank you very much for your cooperation!

COGNITIVE STYLE INDEX

People differ in the way they think about problems. Below are 38 statements designed to identify your own approach. If you believe that a statement is *true* about you, answer **T**. If you believe that it is *false* about you, answer **F**. If you are *uncertain* whether it is true or false, answer **?**. This is not a test of your ability, and there are no right or wrong answers. Simply choose the one response which comes closest to your own opinion. Work quickly, giving your first reaction in each case, and make sure that you respond to every statement.
Indicate your answer by completely filling in the appropriate oval opposite the statement:

T True	**?** Uncertain	**F** False

		T	**?**	**F**
1.	In my experience, rational thought is the only realistic basis for making decisions.	0	0	0
2.	To solve a problem, I have to study each part of it in detail.	0	0	0
3.	I am most effective when my work involves a clear sequence of tasks to be performed.	0	0	0
4.	I have difficulty working with people who 'dive in at the deep end' without considering the finer aspects of the problem.	0	0	0

.....

RD.XXXX / Project Name / Project start date

Project activities

How was the total amount of project time allocated over the next two types of activities?

		Share
1)	Explorative activities such as fundamental research, experimentation and prototyping	…… %
2)	Exploitative activities such as standardization, optimization, fine-tuning and up-scaling	…… %
		100%

Cooperation

1)	Did collaboration take place with other Acme departments within the framework of this project?	yes	☐				☐	no
			1	2	3	4	5	
2)	If yes, how intense was this collaboration?	very intensive	☐	☐	☐	☐	☐	not intensive
3)	Did collaboration take place with other companies /organizations within the framework project?	yes	☐				☐	no
			1	2	3	4	5	
4)	If yes, how intense was this collaboration?	very intensive	☐	☐	☐	☐	☐	not intensive

Overall project performance (Based on Hoegl et al. 2004)

1) Going by the status of the project, it can be regarded as successful	strongly disagree	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	strongly agree
2) Going by the status of the project, all project goals have been achieved	strongly disagree	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	strongly agree
3) Going by the status of the project, the output of the project is of high quality	strongly disagree	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	strongly agree
4) Going by the status of the project, the team, which is responsible for this project, is satisfied with its performance	strongly disagree	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	strongly agree
5) Going by the status of the project, our top management can be fully satisfied with the progress of this project	strongly disagree	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	strongly agree

Operational project performance (based on Griffin & Page, 1996)

1) Going by the status of the project, the project expenditures are on budget	strongly disagree	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	strongly agree
2) Going by the status of the project, the project duration is on schedule	strongly disagree	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	strongly agree
3) Going by the status of the project, the project meets quality specifications	strongly disagree	1 ☐	2 ☐	3 ☐	4 ☐	5 ☐	strongly agree

Project typification (Based on Roussel, 1997)

Please put a mark in the table on the right;
Where would you position this particular project in the matrix?

Core target Market of the project	known to Acme	new to Acme	new to the world

known to Acme | new to Acme | new to the world

Core Technology of the project

[B] – Protocol for a semi-structured interview

Thanks for being available for this interview

Introducing

- *Myself* (Emmy Heerdink, student MBA at the University of Twente, Graduation assignment at Acme Alkmaar)
- *This research (*tracking down problems concerning inter-departmental collaboration within NPD projects and writing recommendations for improvement)
- *This interview* (duration of max. 1 hour, questions about project RD.XXXX and the inter-departmental collaboration within the project).

Please be honest in answering the questions, there are no good or bad, or right or wrong answers. All answers will be kept strictly confidential and only known to the researcher. Names will certainly not be mentioned in the report, nor to the management of Acme Alkmaar. However, in the report there can be referred to an employees' function or the department he or she works in order to substantiate the results.

Interview [NR. 01]	Interviewee
Project number:	Name:
Date:	Age / sex:
Time:	Department:
Place:	Function:

Please explain every answer and give examples where possible.

[A] The NPD process

1. Please describe the NPD process within this project:
    a. Is the process going stage by stage or are stages going parallel?
    b. In which stage is the project officially? And in practice?
    c. How are responsibilities distributed over time (early / late stages)?
2. Please describe the decision making within this NPD process:
    a. Who makes decisions, how, when?
    b. Is there enough input to make decisions?
    c. Are decisions taken on time?

[B] Aspects of inter-departmental collaboration (based on; Tushman and Nadler, 1978 and Moenaert et al., 2003)

Structure

1. Please describe the project team:
    a. Which departments are involved, how many people?
    b. Who is the project leader? How much influence does (s)he has in the organization? Does (s)he has the power to take decisions about the project?
2. Please describe the formalization of the project:
    a. How often does the project team meet? Are these meetings pre-scheduled? What is discussed in these meetings?
    b. Is there a project plan, if yes; when is it written, by whom, what is written in it, and is it distributed among all team members?
    c. Are there goals set for this project, if yes: by whom, for whom, and what kind of goals?
    d. Is there a business case; if yes; when is it written, by whom, what is written in it and is it distributed among all team members?

Stakeholders

3. Please describe the remaining stakeholders of this project:
    a. Which other departments outside the project team are involved/informed?
    b. When are these stakeholders informed/involved and how often?
    c. What do you think of the involvement of these stakeholders?

Content

4. Please describe the information transfer within the project:
    a. How is information transferred?
    b. When is information transferred? (early / late stages)
    c. Between who? (project team – stakeholders)
    d. What kind of information is transferred? Clear for everyone?

For all these questions: what is the effect on the time (schedule), cost (budget) and quality (output) of the project?

[C] – Protocol for composing a project team

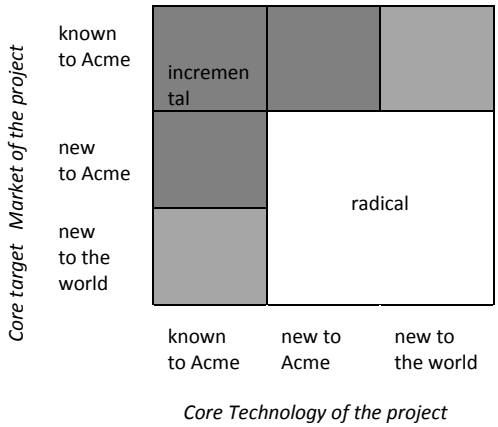
PROJECT TEAM COMPOSITION

What kind of project is this?

- ○ Radical
- ○ Incremental

Is this project aimed on water or beverage?

- ○ Water
- ○ Beverage



Who do I need for this project?

Team members (name & function)

Technology and Innovation 1. 2. 3. 4. 5.	**Operations (Engineering)** 1. 2. 3.
Manufacturing 1. 2. 3.	**Procurement** 1. 2.

Team members work together during the whole project process.

Stakeholders:

Commercial (Marketing / Sales) 1. 2. 3.	

*Incremental projec*t: stakeholders are involved during the whole process.
Radical project: stakeholders are involved at the start-up and then starting from stage 3 (design)

Stakeholders join a project-meeting about once in two months.