Bringing shop floor ideas into practice

Research on the idea management process within a Dutch train maintenance company.

UNIVERSITY OF TWENTE.

NedTrain

Master thesis
J.J. Elskamp
NedTrain B.V.
22th of August 2010

Bringing shop floor ideas into practice. Research on the idea management process within a Dutch train maintenance company.

General information

Author:	J.J. Elskamp
Student number:	0064165
E-mail:	j.j.elskamp@student.utwente.nl
Date:	22-08-2010
Documentname:	masterdocument_versie220810
Title:	Bringing shop floor ideas into practice. Research on the idea management process within a Dutch train maintenance company.

University of Twente

Study:	Business Administration
Master track:	Innovation & Entrepreneurship
Faculty:	School of Management and Governance
Address:	Drienerlolaan 5 7522 NB Enschede
Primary supervisor university:	Dr. D.L.M. Faems
Secondary supervisor university:	Ir. E. Hofman

NedTrain B.V.

Address:	Kantorencentrum Laag Katreine Stationshal 15 3511 CE Utrecht
Internship supervisor:	J. Hoetmer

Quality Online

Initiator of assignment:	Quality Online
Address:	Business & Science Park Hengelosestraat 501 7521 AG Enschede
Supervisor Quality Online:	P. Reinhard

Preface

During a meeting with Dr. D.L.M. Faems about available graduation assignments in June, 2009, I became interested in an assignment created by Quality Online. The formulated assignment was to evaluate a formalized idea management system at NedTrain. I saw this assignment as a challenge to execute a tangible research on a, at that moment, vague concept of idea management.

During the research at NedTrain, the subject of research shifted from idea management system towards process. Nevertheless the results are meant for University of Twente, NedTrain and Quality Online. For University of Twente this research forms the final assignment for my master Business Administration. For NedTrain the results of this research have led to different recommendations that contribute to improvements of their idea management process. And for Quality Online this research gains insight in the process behind their system. This helps Quality Online better understanding their product, which gives them the opportunity of providing advice about implementation of the system in the organization to future clients.

For me this thesis indicates the end of my life as a student. Several persons helped me realizing this research. I am very grateful for all the advice and criticism given by my supervisors of the University of Twente, Dr. D.L.M. Faems and Ir. E. Hofman. I also would like to thank my external supervisors P. Reinhard and J. Hoetmer, my colleagues at NedTrain and my friends who took care of enough distraction the moments I needed this. And last, but certainly not least a special thanks to my family and my girlfriend, who were always willing to listen to me, talking about this thesis over and over again.

Utrecht, 22th of August, 2010

Jan Jaap Elskamp

Management Summary

Idea management is about generating ideas, keeping track of ideas an selecting or rejecting ideas to create a clear overview of the organization's innovations projects. NedTrain developed an idea management system, 'MijnIdee', where all shop floor employees can register ideas that could improve NedTrain's products or processes. NedTrain's idea management process contains seven stages that focuses on the registration, development and selection of ideas. NedTrain believes that in order to become 'best in class' they need to bring the best shop floor ideas into practice.

Introduction

From the moment NedTrain started with 'MijnIdee', June 2008, up to the beginning of this research, October 2009, 2569 ideas were registered, of which 506 were implemented, 827 were rejected and 1236 were pending. The average lead time was 15 weeks. NedTrain's idea management department noticed that the number of pending ideas in the system is increasing and that a great majority of these ideas is inoperative. The idea management department has the ambition of creating an idea management process that is able to process a continuous flow of shop floor ideas. The objective of this research therefore has been formulated as 'creating an in-depth assessment of the idea management process, from generation to implementation or rejection'. Goal of this research is to provide NedTrain with recommendations on how the process can be improved.

Theoretical framework

In order to create an in-depth assessment of NedTrain's idea management process it is important to gain insight in the concept of idea management, involved players and elements or circumstances that contribute to a functioning idea management process. The literature of different scholars has been used to develop a model. This model divides the process in three stages, generation, development and selection. The two major players in the idea management process are the management and petitioner. Different success factors relate to the process, management or petitioner. The ten success factors identified for the process are; Strategic guidelines, systematical structure, difference in type of ideas, enough resources, capture area, encouragement, clear preference, cross functionality, tolerance for failure and commitment. The success factors that relate to the management are; involvement of top and middle

management, high level of inter-functional coordination and integration and management archetypes. The three success factors that relate to the petitioner are; feedback, transparency and petitioner archetypes.

Methodology

To assess the idea management process of NedTrain, two different studies have been used. The content analysis and the case study. The content analysis is a method that generates information from documents, media and reality. The project description and status of 971 ideas have been collected from the system 'MijnIdee' for this analysis. All ideas have been coded based on a coding scheme in order to gain insight in how different ideas move through the process. Eight cases have been used for the case studies. Three different analyses have been executed, within-case analysis, cross-case search for patterns and between-group analysis (Eisenhardt, 1989). The within-case analysis involves detailed case study write-ups for each case. The cross-case search for patterns is about selecting groups or dimensions, and then searching for within-group similarities. The different dimensions in this study are: implemented ideas, currently running ideas and rejected ideas. The last analysis that has been executed is the between-group analysis and is about comparing the patterns, found in the previous analysis, and comparing these with other dimensions. These different analyses resulted in an assessment of NedTrain's idea management process.

Results

The conceptual analysis gains insight in how different ideas move through the process. The ideas have been divided in idea category (primary, secondary and tertiary ideas), idea type (product, process and social ideas) and scope (local or companywide). The results of the conceptual analysis show that there are no significant differences between type and scope of ideas and the lead time. The idea category shows a significant difference between the three categories. Tertiary ideas have a significant lower lead time than the primary and secondary ideas. For all ideas count that the steps 'sharing with colleagues' and 'sharing with experts' show the most pending ideas. In the three dimensions (implemented ideas, currently running ideas and rejected ideas) the eight cases have been divided into, different patterns occurred. Between the dimensions there was a difference in the role of the coach, the role of the expert and role of the idea manager. In the dimension 'implemented ideas' the coach was able to approach the expert and decision maker and these often were involved from the start. This pattern did not occur in

the other two dimensions. There were also differences in the complexity of the idea and the development of the idea at point of registration.

Conclusions and recommendations

The above described studies and their results led to seven conclusions and four recommendations. First conclusion is that NedTrain's classical idea management mostly introduces ideas with the objective of process innovations and improvements within the company. This form of idea management rarely triggers radical innovations for new products and processes. Second conclusion is that different type of ideas move through the process in the same way. There are no significant differences between the types of ideas, the scope of ideas and their lead time in the idea management process . Third conclusion is that the coach is essential for the involvement of the expert and decision maker in the idea project. Fourth conclusion is that coaches often experience problems in approaching the experts and decision makers. Two recommendations relate to the above mentioned conclusions, appoint coaches in all levels of the organization, also higher in the organization. And approach the expert and decision maker earlier in the process. Fifth conclusion is that experts and decision makers are scarcely involved in the idea management process of NedTrain. A recommendation that arises out of this conclusion is making all departments that can act as an expert or decision maker aware of their role in the idea management process. Last conclusion is that the different responsibilities of the different parties involved in idea cases (e.g. petitioner, idea manager, coach, expert) are not clear. Resulting in the recommendation to define responsibilities of all involved parties and make these responsibilities known.

Limitations and future research

First limitation is that is the willingness of the NedTrain employees to participate in the idea management process has been left out of consideration. Though their process is dependent of the willingness of the employee to participate. Second limitation is that the literature only discusses two roles, management and petitioner. But the coach isn't automatically a manager, and the same applies for the expert. Though they aren't always managers, the theoretical assumption have been made that the success factors for management also can be applied on NedTrain's coaches and experts. Third limitation is the choice for the qualitative research method. A quantitative research method could provide more evidence for causal relationships between the presence of success factors in the process and a lower lead time. Last limitation is

focuses on the different archetypes. This success factor was mentioned in the theoretical framework but left outside the analysis. Besides limitations there are three subjects for future research. First, though the petitioner only forms a part of the content of this research, the willingness of the petitioner to intrapreneur can be a research on its own. A future research can be designed as a quantitative research in which hundreds of ideas can be analyzed. Possible causal relationships between the idea management process and the presence of success factors could be found. Last subject for future research are the different types of petitioners and different types of managers and their effect on the idea management process. These types can be measured by taking psychological tests.

Table of content

List of tables and figures

1. Introduction

This chapter begins with a small introduction on the organization of NedTrain and the organization of idea management within NedTrain. The reader might benefit from more background information about the organization which has been used for this empirical research. The second half of this chapter (paragraph 1.3), discusses the structure of this research and the research framework.

1.1 Introduction on NedTrain B.V.

NedTrain is the leading provider of rolling stock maintenance in The Netherlands. It is a hundred percent subsidiary company of the Dutch national railroad company, NS, which is at the same time NedTrain's largest customer. NedTrain has a 150-year history of specializing in rolling stock maintenance, servicing, cleaning and overhaul, and employs about 3500 employees, of which 1500 mechanics and managers on the shop floor. The employees of NedTrain are spread over 38 locations in the Netherlands. Maintenance and the larger repair work are done in the four bigger locations, the maintenance depots (Onnen, Maastricht, Leidschendam and Amsterdam). The other locations provide smaller repairs, technical check-ups and daily cleaning. The maintenance depots employs around the 200 people, of which 120-150 are mechanics, these are supervised by a technical manager. In the maintenance depots the mechanics work in shifts and therefore the depots are open 24 hours, 7 days a week.

Changing environment

During the 1990's the Dutch government, stimulated by the European Union, started to privatize three industries; the phone, electric current and railway industry. Due to the privatizing of the railway industry, NedTrain is experiencing competition. The environment of NedTrain can become unstable, because of the stimulating behavior from the European Union, to create honest, European competition through whole Europe. In 2015 the railroad contract between NS and the Dutch government expires. From this moment NedTrain can lose their reason for existence to a stronger foreign player on the European market.

Therefore NedTrain is aware of the possible changing environment and the urge to respond to this change. Innovation research has grown apace especially over the last 20 years as organizations have needed to respond to changing environments by becoming more flexible and adaptive, more dependent upon team-based structures, and by downsizing and flattening their structures to facilitate more responsive and flexible decision-making (Axtell, Holman, Unsworth, Wall, Waterson & Harrington, 2000).

Choose, guarantee and innovate

NedTrain responded to this possible changing environment by creating a new vision in 2007 for the entire organization, based on three core values: 'choose', 'guarantee' and 'innovate'. The value 'choose' stands for the focus on the actual core business of NedTrain. The core business is maintenance, service and revision of the material of the Dutch railroad company and a number of regional forwarders (e.g. RET, Connexxion). As a result of this focus, some activities within NedTrain will be stopped (e.g. damage recovery of goods locomotives). 'guarantee' refers to the number of railroad carriages extracted from the railroad network. The number of railroad carriages extracted from the network in 2008 was 400, and this number has to diminish to 200. This will lead to enormous cost savings. The value 'guarantee' must lead to better quality in maintenance, higher availability of railroad carriages and higher reliability of the material for the customer. The last value is 'innovate', NedTrain believes that this new vision only can be realized in a work environment where all employees can participate and deliver input in the form of ideas how to improve their work and the core business of NedTrain.

1.2 Introduction on idea management within NedTrain B.V.

By stimulating the employees to come up with ideas about improving their work or the core business, NedTrain wants to become 'best in class' in 2015. To manage all these shop floor ideas, NedTrain gave order to Quality Online to create an idea management System, 'MijnIdee', in which every employee can register his or her idea.

The vision of NedTrain on idea management

The will of improving the work environment and NedTrain's core business must become a part of the normal work tasks. Decision-making about the ideas must be kept as low as possible in

the organization. The petitioner, which is always an NedTrain employee, that registers the idea has to be the initiator of all actions that he or she can undertake for his or her idea to become a success. NedTrain wants the petitioners to become an entrepreneur within the organization, an intrapreneur. Registering an idea must be rewarded by letting the petitioner implement his or her own idea and by celebrating the successful ideas.

To create more innovative potential among the NedTrain employees, shorter lead time, and faster implementation of ideas, NedTrain decided to structure the process and create a central idea management system that helps realizing new targets. Eventually pursuing of employee creativity and innovation have to become a natural, smooth and measurable process.

Before NedTrain started focusing on a new idea management process, all depots had a fixed suggestion box. Each year 250 ideas were thrown in these suggestion boxes. With a structured idea management process this number has to increase to 3000-10.000 ideas. The number of petitioners that threw an idea in the suggestion boxes was about 100. Eventually NedTrain wants this number to grow to 300-2000 petitioners each year. And the number of implemented ideas has to be about 25-100 each year.

1.2.1 The idea management process of NedTrain

To realize the above mentioned targets, a seven-stage idea management process has been designed. The process is supported by an idea management system developed by Quality Online. The central idea behind the process is that the petitioner that registers the idea has to be the initiator of all actions that he or she can undertake for his or her idea to become a success. In appendix B, p 72, a table can be found with all actions and the end-responsible for the different actions in NedTrain's idea management process. The seven different stages of process are:

Stage 1: Registration - Registering the idea in the idea management system. The petitioner registers the idea in 'MijnIdee'. When the petitioner has no access to a PC, the registration will be done by his executive or the local idea manager.

Stage 2: Rules of the game– Is about testing the idea to the 'rules of the game' and assigning a coach. In this stage the idea becomes visible in the system for the local idea manager. The idea manager tests if the registered idea fits the 'rules of the game'. These rules are:

- the registered idea has to be an improvement of the process or product of NedTrain,
- the idea must be an original idea within NedTrain
- and the working area of the new idea has to be NedTrain or the material of the client.

When the idea fits these rules, the local idea manager approves the idea. When the idea is approved by the local idea manager, the petitioner will be linked to a coach. This coach supports the petitioner with his idea. When the idea has a companywide focus, the local idea manager passes the idea on to a central idea manager. This manager will assign a central coach to the idea.

Stage 3: Sharing with colleagues - This stages focuses on sharing the idea with colleagues. As mentioned before, NedTrain believes it is important that new ideas are shared within the organization. In this stage the petitioner has to share his or her new idea with colleagues to collect feedback and develop the idea. When the petitioner concludes that his or her new idea isn't what he or she expected, the process can be stopped here.

Stage 4: Sharing with an expert - Is about sharing the idea with an expert in the work area of the idea. Like stage three, this stage is about further developing the idea. NedTrain has a large number of strict rules in order to guarantee the safety of the employee and the passenger. Therefore the knowledge and approval of experts plays an important role within NedTrain and this process. The employee must share his or her idea with an expert. Goal of this stage is to give the idea a real shape. When the expert thinks the idea is feasible the idea will be criticized on costs, assets, attainability and risks. The petitioner and coach decide who will be, based on their function, criticizing the new idea and who will take the decision about the implementation.

Stage 5: Criticizing - The assessor, described in stage 4, will be criticizing the idea based on costs, assets, attainability and risks.

Stage 6 Decision making - Is the decision stage and the fore last stage. Based on the critique, a manager at the location in which the idea is applicable, will make the decision about implementing or not. The same manager also decides who will be implementing this idea, together with the petitioner that registered the idea. The moment the manager decides that the idea will be implemented, the coach rewards the petitioner with a check of 75 euro. When the new idea contains exceptional value for NedTrain or when the petitioner delivered a remarkable achievement, the coach can decide, together with an executive, to give an extra reward.

Stage 7: Implementation - Last stage is the implementation stage. The employee that was chosen by the decision maker to implement the new idea, is responsible for the implementation.

Figure 1 visualizes the idea management process, stage 2 has been divided into two stages, a testing stage and a stage where the idea is assigned to a coach. These are two different actions that need to be undertaken by the local idea manager, though NedTrain considers it as one stage.

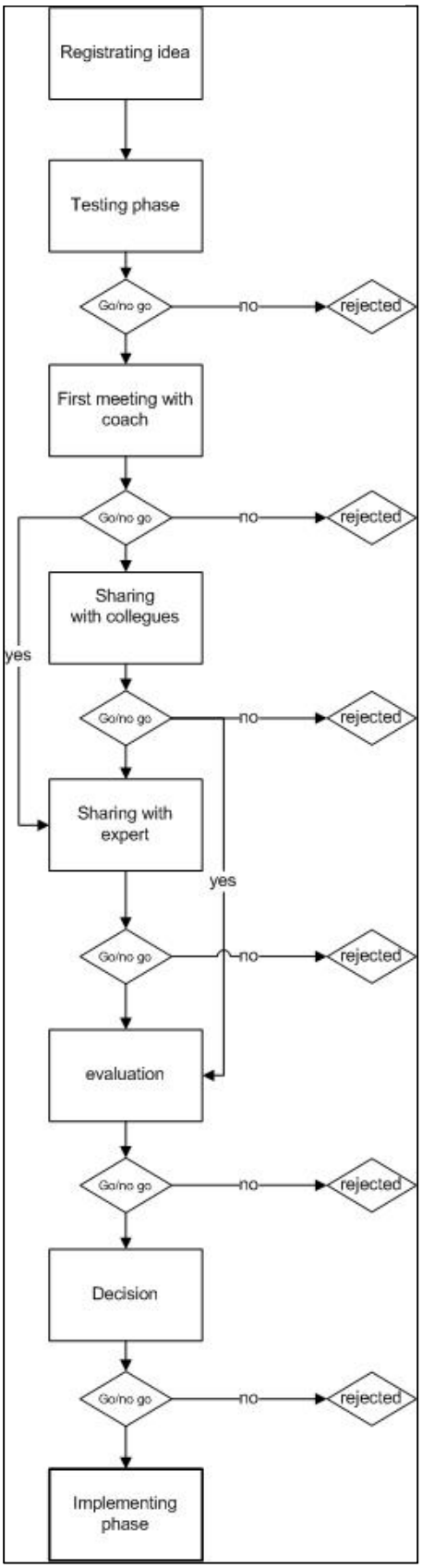
1.3 Structure and research framework

This paragraph discusses the problem statement, research objective, points out the main research questions and discusses the relevance of this study. Last, this paragraphs provides an introduction of the methods that have been used for this research.

1.3.1 Research objective

In the above given introduction of NedTrain and its idea management process it becomes clear that the expectations about the idea management process were high. On the 1th of October 2009, the idea management system contained 2569 registered ideas of which 506 were implemented, 827 were rejected and 1236 were pending. The average lead time was 15 weeks. Though over half of all registered ideas have been processed, a great number of ideas are still pending. The national idea management department of NedTrain noticed that the number of pending ideas in the system is increasing and that a great majority of these ideas is inoperative. The national idea department stated that they want to know how they can improve the process in order to create a continuous flow which decreases the number of inoperative ideas.

Figure 1 Process Layout NedTrain



By comparing implemented, still running and rejected ideas, further understanding can be created about why some ideas are still running and others are rejected or implemented. Together with theoretical findings this will result in recommendations towards the idea management process of NedTrain and its idea management system 'MijnIdee'.

The research objective of this research can be formulated as;

> *Creating an in-depth assessment of the idea management process, from generation to implementation or rejection.*

The problem statement formulated by the idea management department and the research objective can be divided in different research questions,

- How do the shop floor ideas flow through NedTrain's idea management process?
- Do different types of shop floor ideas flow in a different way through the process?
- What are the bottlenecks and opportunities for the different ideas in the idea management process?

1.3.2 Scientific and managerial relevance

For this research a distinction can be made between the scientific and managerial relevance. Both discussed in this paragraph.

Scientific relevance

A great amount of literature has been published about creativity in general (e.g. Davis, 1989, Martindale, 1989), and increasing literature on innovation at work (e.g. King & Anderson, 1995, West & Farr, 1990), but very little specifically on shop floor employees. While recent research on innovation has provided a number of interesting findings, it also has some limitations. Most studies of innovation have tended to measure either idea suggestions/ creativity (Amabile & Gryskiewicz, 1989, Oldham & Cummings, 1996), or idea implementation (Bunce & West, 1994, Damanpour, 1991) but rarely both at the same time (Axtell et al., 2000). The research of Axtell et al. (2000) examines the impact of individual perceptions of individual, group and organizational factors on both elements of innovation. In this research the focus will be on not only idea implementation or idea generation, but on the idea management process as a whole.

And the consequences of different types of ideas for the idea management process.

Managerial relevance

The managerial relevance for this research is to assess the idea management process in order to gain insight in the process of NedTrain and uncover possible bottlenecks. This must lead to recommendations to improve the idea management process. With these recommendations, the idea management process, the flow of new shop floor ideas and systematic processing and implementing can be improved.

1.3.3 Research approach

Table 1 shows the different research questions and by means of which methods the answers to these questions are going to be found.

methods

The methodology of this research contains two methods, the first method is a content analysis of the database of NedTrain's idea management system and the second method is case-studies.

Table 1 Overview of research question and methods

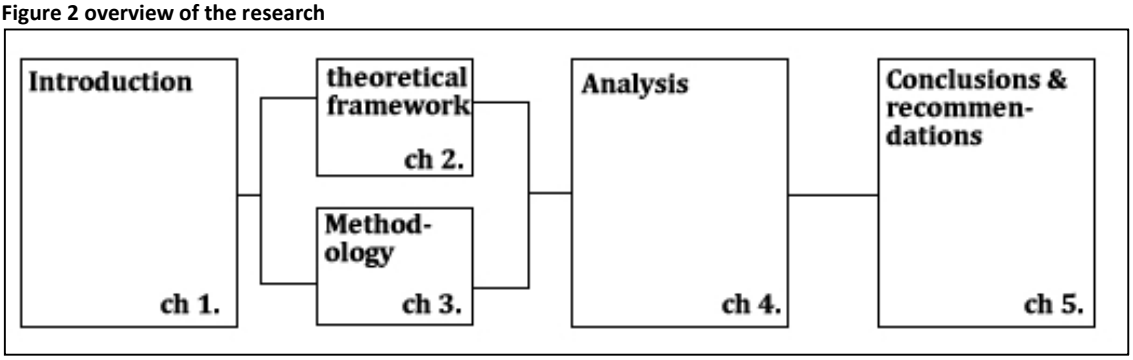
Research questions	Research method
How do the shop floor ideas flow through NedTrain's idea management process?	Content analysis / case studies
Do different types of shop floor ideas move in a different way through the process?	content analysis/ case studies
What are the bottlenecks and opportunities for the different ideas in the idea management process?	Case studies

With the content analysis the data in the idea management system 'MijnIdee' will be analyzed by using a coding scheme. The second method is case studies. With different data sources (e.g. interviews and document analysis) different cases have been compared in order to find an answer to the previous formulated research questions. These interviews are held with al involved parties of different ideas that are positioned in different steps in the idea management process.

Structure

The next chapter, chapter two, discusses the definition of idea management, the process and its characteristics and the success factors of the idea management process. The third chapter contains the methodology used for this empirical research and an elaboration on the chosen data analysis. Chapter four discusses the results from the different analysis and the last chapter, chapter six, provides conclusions, recommendations and limitations. Figure 1 gives an overview of the research.

Figure 2 overview of the research



2. Theoretical Framework

As elaborated in the first chapter the focus of this research is on the concept of idea management. The innovation literature has been used to conduct a theoretical framework. The first half of this chapter is an introduction of idea management: the definition of idea management within the literature (paragraph 2.1.1), the process of idea management (paragraph 2.1.2) and the benefits of idea management (paragraph 2.1.3).

The second half of this chapter focuses on: the success factors of the process (paragraph 2.2), the success factors for management (paragraph 2.3), and the success factors for the petitioner (paragraph 2.4).

2.1 Introduction on idea management

As mentioned above this paragraph is an introduction of the concept idea management and the idea management process.

2.1.1 Capturing the concept idea management

The innovation literature has been used to formulate a clear and understandable definition of the concept of idea management. It should be noted that there is currently no generally accepted definition of idea management in innovation management literature (Winzer, 2003, in Brem & Voigt, 2007). Therefore the definition of idea management that will be used in this research is constructed from different authors. The different definitions of the authors within the innovation literature are summarized in table 2.

Idea management is the systematic storage of ideas generated within and outside the organization, keeping track of ideas and selecting or rejecting ideas, to provide clear overview of the organization's innovation projects (Von Stamm, 2001, Kijkuit & van den Ende, 2007, Brem et al., 2007, Vandenbosch, 2006).
Different authors link the concept of idea management with new product development and the fuzzy front end (e.g. Boeddrich, 2004, Kijkuit et al., 2007). Different authors agree that within innovation management, idea management identifies and select suitable innovation fields (Hausschildt, 2004, in Brem & Voigt, 2007, Kijkuit et al., 2007, Von Stamm, 2001).

Table 2 overview of definitions of idea management

Author	Idea management	process
Von Stamm (2001)	"Idea management involves the storage of ideas generated in focused sessions as well as through those coming from suggestion schemes"	idea generation development selection
Kijkuit & van den Ende (2007)	"Are not writing about idea management but about the Front End, this is the process during which ideas are born and further developed, ending in a go/no-go decision for the start of the project. The network contributes to the quality of the idea."	idea generation development idea evaluation
Brem & Voigt (2007)	Idea management as a sub process of innovation management. Goal is effective and efficient idea generation, evaluation and selection. Discusses the differences of classic and integrated idea management	Idea generation Accaptance Idea realization
Vandenbosch, Saatcioglu & Fay (2006)	"the process of recognizing the need for ideas, and generating and evaluating them."	Recognize Generate evaluate
Gaspersz (2002)	All actions that an organization undertakes in order to spot, evaluate, reward and improve ideas to get them implemented.	Catch Administer select
Boeddrich (2004)	"Idea management is the phase before the project decision. And an approach towards organizing the Fuzzy Front end. "	Generation Collection Adoption Clustering Screening Selection Improvement decision

And therefore, idea management actually contributes to all sectors of internal innovations: product, procedure or process, as well as social (Brem et al., 2007).

Development of the concept idea management

Though the definition of idea management has been captured, it is useful to discuss the development of idea management

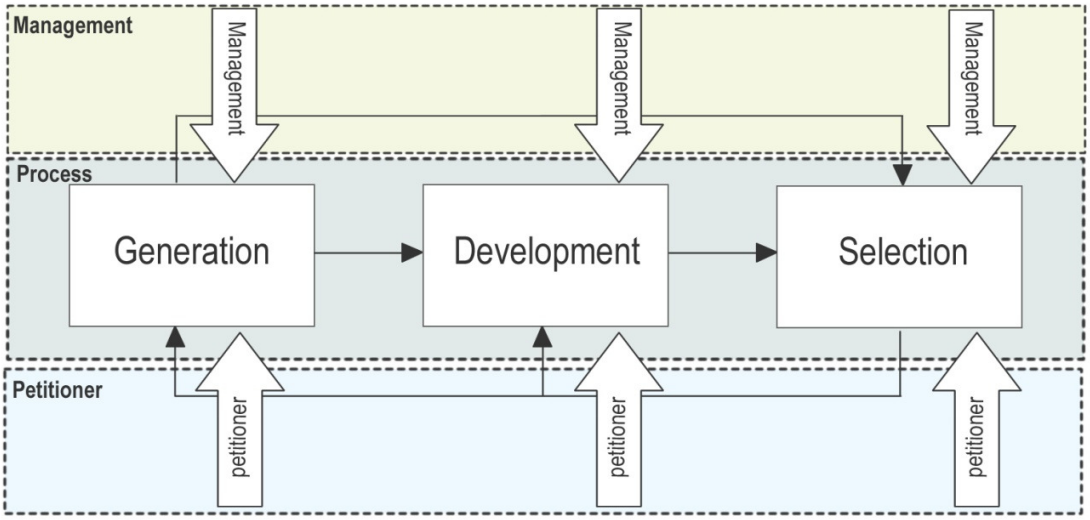
Brem and Voigt (2007) distinguish different forms of idea management. Classical idea management and integrated idea management. The goal of the classical form of idea management is to optimize existing processes systematically. Idea management in its classical form, only introduces ideas with the objective of process innovations and improvements within the company. It therefore concerns only the employees and the ideas are mainly operative ones and consequently rarely trigger radical innovations for new products and processes (Brem et al., 2007). Integrated idea management is about serving as a coordinating and tracing platform that gathers all relevant ideas from inside and outside the company. Idea management can be seen as the logical development of the suggestion system. This suggestion system is used to harness employee creativity. It is an instrument for business wide advancement and improvement, helping with the creation of ideas and innovations (Conert and Schenk, 2000; Sphal, 1975, in Brem and Voigt, 2007). Idea management on the other hand has the aim on a "systematic coordination, linked to strategic ideas, with other operational instruments of rationalization and innovation advancement" (Thom 2003, Brinkmann and Heidack, 1984, Conert and Schenk, 2000, Winzer, 2003, Bumann, 1991, in Brem et al., 2007).

Von Stamm (2001) outlines the relationship between suggestion systems and idea management. Idea management involves the storage of ideas generated in focused sessions, as well as those coming through suggestion systems. Keeping track of ideas, what happens to them, why a certain idea is selected, and why others are rejected can provide a powerful trail that helps understand an organization's innovation projectory (Von Stamm, 2001). Suggestion systems are described as a idea generating tool within the idea management, it is the systematic storage of ideas generated within and outside the organization that characterizes idea management (Brem et al., 2007, Von Stamm, 2001).

2.1.2 The idea management process

The idea management process model contains a process level (centered in the model) and two major players, the management and the petitioner. The process level consists of three different idea phases, named: generation phase, development phase and selection phase (Von Stamm, 2001, Kijkuit et al., 2007, Brem et al., 2007, Vandenbosch, 2006). This paragraph discusses the three different phases within the idea management process, the relationship between these phases, and the different roles that are involved in the process (management and petitioner). Figure 2 depicts idea management in these three phases. The process levels and the two major players shape the structure of the different paragraphs of this chapter.

Figure 3 the idea management process



Idea management can be seen as a sub process of innovation management, with the goals of structured idea generation, development and selection. Hence, the key issue is the structured collection and generation of both internal and external ideas, as well as the logical evaluation and selection of those that offer the biggest potential for future corporate success (Brem et al., 2007, Vandenbosch, 2006). The idea management process can be distinguished into three phases (Von Stamm, 2001, Kijkuit et al., 2007, Brem et al., 2007, Vandenbosch, 2006); idea generation, idea development and idea selection.

Idea generation

This phase is about generating ideas, most important in this phase is the question what kind of ideas are submitted and why these ideas are submitted. Ideas can have various origins, therefore relevant knowledge and motivation from the organization can accelerate idea generation (Gaspersz, 2002). Communication and information about important themes from top management towards the future petitioners can lie the focus on possible problems that need to be addressed. Because of this focus, petitioners are given better direction and more information about possible ideas that can be submitted. Also focus will help the organization to relate the idea to the process (Brem et al., 2007, Koen, Ajamian, Boyce, Clamden, Fisher, Fountoulakis, Johnson, Puri, Seibert, 2002). The exploration of ideas can only be successful if you know what you are searching for (Brem et al., 2007). Management must have a clear strategy, a lack of strategy and simply innovate will lead to poor performance (Cooper et al., 1990, in Flynn, Dooley, O'Sullivan, Cormican, 2003). Therefore management and petitioners are strongly involved in this phase. The collection of ideas can be done with more platforms than only an IT-platform, other collection methods are for example expert meetings and suggestion boxes (Gaspersz, 2002).

Idea development

The development phase is about evolving the idea, from an idea that is just one line on a piece of paper to a mature idea that is enriched and pilot-tested. The development phase concerns response generation and concept developing (Kijkuit et al., 2007). Important for this phase is that the development of an idea cannot be given any time limit, some ideas take a couple of months to develop, others even years (Gaspersz, 2002).

Idea selection

The last phase of the idea management process is about screening ideas and decision-making (Kijkuit et al., 2007). Some ideas that are underdeveloped can be send back to the development phase. Other ideas that are submitted as a mature, enriched idea can directly go to the selection phase. First step for an organization is to formulate clear selection criteria for this phase (Cooper, 2008).

Relationship between the process phases

The previous paragraphs discussed that the idea management process can be distinguished into three phases. However, different types of ideas ask for different processes. The innovation process can be visualized as a series of stages, with each stage there is a gate, or a Go/Kill decision point (Cooper, 2008). Rothwell (1992, in Tidd, Bessant, Pavitt, 2005) describes this process as the first and second generation of innovation models, simple linear models. Rothwell (1992, in Tidd et al., 2005) describes the fifth generation of innovation models as flexible and customized response, and it describes innovation as a multi-actor process which requires high levels of integration at both intra- and inter-firm levels and which is increasingly facilitated by IT-based networking.

Cooper (2008) underlines that the innovation process, of which the idea management process is a sub process (Brem et al., 2007), is not linear. Cooper's stage gate also changed to a scalable process, to become flexible (Cooper, 2008). In the first innovation processes the rule was, "one size fits all" (Cooper, 2008, Rothwell, 1992, in Tidd et al., 2005). This has evolved to a process in which the number of stages and gates are tailor-made per idea type (Cooper, 2008, Boeddrich, 2004). The stages are not sequential but interdependent (Cooper, 2008, Boeddrich, 2004, Khurana & Rosenthal, 1998). Further development of an idea can lead to an almost completely new idea, a negative evaluation can lead to further development of an idea. This does not change the fact that the three phases as described in an earlier paragraphs do represent the major phases that most ideas go through before they are considered for funding (Khurana & Rosenthal, 1998). Brem and Voigt (2007) give the example of the idea for a new product, this idea needs multiple selection phases. The idea management process is a flexible process with tailor-made stages that are interdependent. Ideas can shift back, forward and even skip phases.

2.1.3 The benefits of idea management

While the previous paragraphs focused on the definition of idea management and the construction of the idea management process, this paragraph focuses on the benefits of idea management.

Employee ideas as starting point of innovation

Each innovation begins with an idea. In the first stage of the innovation process, successful innovative enterprises try to generate a sustainable flow of ideas before starting innovation projects (Barnard, 1938, March and Simon, 1958, Simon, 1957, Weick, 1979, in Vandenbosch, 2006, Boeddrich, 2004). Employees play a major role as internal idea 'suppliers' because they have the best knowledge of the products, services and corresponding interrelated business processes. In many cases, the co-worker in the frontline is the only one who has the knowledge to solve a certain problem (Getz & Robinson, 2003, Boeddrich, 2004). It is the creativity of the employees that forms a source of new ideas, which in their turn create the starting point for innovations (Twiss, 1992, Voorendonk, 1998).

Many practitioners and academics endorse that the ability of organizations to foster, develop and use the innovative potential of their shop floor employees is integral to their success (Oldham & Cummings, 1996, Amabile, 1988, Shalley, 1995, Wolfe, 1994, in Axtell et al., 2000). Though most practitioners and academics are aware of the innovative potential of their shop floor employees, most companies underline innovation in their strategy but, inconsistent with that strategy, fail to fully utilize the creativity of their employees (van Dijk & van den Ende, 2002). If ideas remain in the brains of employees, there will be no effective use of the key competences (Boeddrich 2004, Vandenbosch, 2006, von Stamm, 2001). To employees, ideas are highly valuable products of their thoughts about companies' problems. So managers should pay full attention to these ideas. Ignorance about ideas discourages people from solving problems, they lose interest in companies' goals (Boeddrich 2004). Another positive outcome of managers attention of employees ideas and realizing ideas is a great way of motivating employees and keeping them in best of health (Zur Linden, 1996, in Boeddrich, 2004)

2.2 The success factors of idea management

Paragraph 2.1 introduced the concept of idea management and the idea management process, paragraph 2.2, discusses the success factors of the process level of idea management and its two players as depicted in figure 2. This paragraph starts with the success factors of the process of idea management, followed by the success factors for management and petitioner.

In the ideal situation of idea management an employee reports his or her idea to the direct executive. The executive will give his or her verbal reaction to the petitioner within three days. The idea will be accepted, developed or rejected (Getz & Robinson, 2003). Key for creative idea submission is the support from a safe environment that accelerates idea generation and testing of ideas (Gaspersz, 2002). The ideal situation of idea management needs a process framework and a consistent set of tools (Brem et al., 2007). Within this process framework a set of success factors arise for the process, management and petitioner. Different authors discuss the existence of these success factors and describe these factors as elements or circumstances that contribute to a functioning idea management process (Brem et al., 2007, Flynn et al., 2003).

2.2.1 Success factors for the idea management process

As described in the previous paragraph, the different success factors as discussed by several scholars can be divided into factors for the process, management and petitioners. Some of the success factors of the process influence the total process, others influence specific stages. Table 3 summarizes all success factors for the process level.

Strategic guidelines

The first success factor of the process level is ´strategic guidelines´. Idea management without any focus is useless for companies (Boeddrich, 2004). The exploration of ideas can only be successful if you know what you are searching for (Brem et al., 2007). Research has repeatedly shown that organizations that lack a strategy for innovation, and simply innovate on purpose are poor performers (Cooper et al., 1990, in Flynn et al., 2003). By defining a strategy a number of things will be achieved, the organization will define a direction, everyone within the organization will be clear of this direction and their responsibilities. This direction will provide a framework within creativity can be focused and a number of potential stimuli, in terms of requirements, can be defined (Flynn et al., 2003). Cooper (2008) describes these requirements as criteria against which an idea can be judged. Knowing what you are looking for can set the strategic guidelines, which form a requirement for managing a flow of ideas (Brem et al., 2007, Boeddrich, 2004, Kijkuit et al., 2007).

Table 3 Overview of success factors of the idea management process

Success factors of the process	Description
General	
Strategic guidelines	Defining a strategy, knowing what you are looking for.
systematical structure	Structured collection, generation, evaluation and selection of ideas
Difference in type of ideas	Is the idea a 'quick hit' or a homerun
Enough resources	Idea management process requires a time consuming and costly system, need for enough resources
Generating phase	
Capture area	Clear capture area helps approaching future petitioners
Encouragement	Stimulating the individual to express creativity
Clear preference	Translation of strategic guidelines by managers to the (future) petitioner
Development phase	
Cross functionality	The possibility of sharing the idea leads to redefining the idea
Tolerance for failure	Stimulating employee creativity involves encouraging risk taking
Selection phase	
Commitment	The selection criteria requires commitment to these organization-specific selection criteria

Systematical structure

Second general success factor is that idea management within the organization must be structured systematically (Boeddrich, 2004, Brem et al., 2007, Kijkuit et al., 2007). In accordance with empirical research on the success factors for innovations, the very early stages of the innovation process (fuzzy front-end, concept development phase, preliminary phase before starting innovation projects etc.) have to be structured systematically (Cooper, 1992, Ernst, 2001, Montoya-Weiss & Calantone, 1994, in Boeddrich, 2004). Brem and Voigt (2007) state that

the success factor for the biggest potential for future corporate success is a structured collection and generation of ideas, as well as structured evaluation and selection. A lack of systematic and structured procedures at the beginning of the idea management process has a substantial effect on the innovation management of an enterprise (Boeddrich, 2004).

Difference in type of ideas

As mentioned earlier, different type of ideas ask for different processes (Brem et al., 2007). And some ideas are easier to implement than others and have more impact (Kijkuit et al., 2007). Organizations need to understand and interpret whether an idea is a 'quick hit' or a 'home run' (Gaspersz, 2002, Cooper, Edgett, Kleinschmidt, 2002). And treat the idea this way throughout the whole process.

Enough resources

The last general success factor concerning the idea management process is having enough resources at ones disposal. Previous research on idea management has advocated the need to generate as many ideas as possible and select the best ones from this set (Wheelright & Clark, 1992, in Kijkuit et al., 2007). But such a process also requires a time consuming and costly system to provide feedback to the idea submitters and runs the risk of frustration among the many employees whose ideas are rejected (Van Dijk et al., 2002). When not having enough resources the lead time of each idea can increase. Because the idea management process is characterized by a high degree of complexity and must be organized systematically in order to work efficient in the long run, investing in resources and organizational integration like an 'idea management department' is necessary to utilize idea management successfully (Brem et al., 2007). The investment in resources is important for the process as a whole, though the importance of enough resources for the development phase is worth mentioning. Within the idea management process pilot testing ideas can be crucial. This pilot testing is an important part of the development phase and is dependent on the available resources within the organization (Koen et al., 2002, Desouza, Awazu, Jha, Dombrowski, Papagari, Baloh & Kim, 2008). The key to creative contribution of employees is creating an organization in which employees can provide new ideas and pilot test their ideas (Gaspersz, 2002).

Capture area

Flynn et al. (2003) claims that it is in the organizations best interest to create a broad capture area (internal and external ideas collected through different channels). The collection of as much ideas as possible can be difficult to handle. It is an unrealistic assumption that managers find the few very good from a pile of mediocre ones (Kijkuit et al., 2007). Strategic guidelines (success factor) creates focus and requirements. Once knowing what kind of ideas you want, the questions raises where to generate these ideas. Idea management in its classical form, only introduces ideas with the objective of process innovations and improvements within the organization (Brem et al., 2007). It therefore concerns only employees and the ideas are mainly operative ones and consequently rarely trigger radical innovations for new products and processes. Integrated idea management serves as a coordinating and tracing system of ideas, not just for process innovations, but also radical product innovations from inside and outside the company, as the ability to identify, acquire and utilize external knowledge that could be critical to a firm's success (Zahra and George, 2002, in Brem & Voigt, 2007). These different types of idea management focus on different capture areas. The success factor of a clear capture area helps approaching future petitioners.

Encouragement

If ideas remain in the brains of employees, there will be no effective use of the key competences (Boeddrich 2004, Vandenbosch, 2006, von Stamm, 2001). The employee needs to be motivated to do something with his or her idea (Amabile, 1983, 1996, Getz & Robinson, 2003). This will only happen in a direct organizational culture that stimulates the individual to express creativity (Farnham, 1994, in van Dijk et al., 2002). One of the most important factors belonging to this organizational culture are alignment, possibility of reflection and clarity (van Dijk et al., 2002). Alignment means an environment that envelops employees, bombarding them with a consistent set of signals so that the company's ideology and its attitude towards creativity cannot be misunderstood (Collin & Porras, 1994, in van Dijk et al., 2002). The importance of strategic guidelines have been discussed. One other part of encouragement can be created by fitting out sounding boards for the ideas of the employees (Delbecq and Mills, 1995, Ekvall, 1971, Tropman, 1998, in van Dijk et al., 2002). This is called the possibility of reflection. Last factor that belongs to the encouragement is the clarity with which an organization welcomes creative initiatives (Voorendonk, 1998). Encouragement through the complete organization to

developing individual initiatives is the basic success factor of idea management (Getz & Robinson, 2003, van Dijk et al., 2002).

Clear preference

Preferences of managers are often vague and contradictory and develop over time. Whether an idea is accepted is thus not only dependent on whether a generated idea meets some predetermined criteria, but also on the shaping of the idea and the criteria during the process (Kijkuit et al., 2007). Kanter (1983, in Flynn et al., 2003) describes environmental factors which may obstruct the development of creative culture. One of these factors is unfocused innovative activity. Strategic guidelines that give direction towards innovation can help create focus in the innovative activity (Flynn et al., 2003). Managers have to translate the strategic guidelines into a clear preference towards the internal and external creative resources that enhance the innovative ability of the organization (Brem et al., 2007, Flynn et al., 2002).

Cross functionality

In the development phase, response generation (Amabile, 1996) and concept development are the most important activities (Urban & Hauser, 1993, in Kijkuit et al., 2007). During this phase the idea moves from a one-liner into a detailed proposal. People that generated the idea may dive into relevant research or consult colleagues, experts and friends to clarify key issues (Kijkuit et al., 2007). The possibility of sharing the idea may lead to exploring alternatives and searching in new directions, making the idea more robust and perhaps even resulting in a redefinition of the idea (Kijkuit et al., 2007). Comments on ideas are the first step towards enrichment that helps to develop introduced concepts within an idea (Gaspersz, 2002, Kijkuit et al., 2007).

Tolerance for failure

One other success factor in the development stage is, besides sharing the idea with colleagues and friends and testing the ideas, is the tolerance for failure (Cumming, 1999, Dooley, 2000, in Flynn et al., 2003, Gaspersz, 2002). Stimulating employee creativity involves encouraging risk taking. Invest in resources to create the possibility for testing new ideas. This pilot testing can resolve in disappointing outcomes, but these failures are just useful feedback, an invitation to succeed at another trail (Gaspersz, 2002).

Commitment to the selection criteria

According to Kijkuit et al. (2007), the selection will be based on the decision maker's personal opinion and in part on information provided by relevant experts and their management peers. The 'decision makers' are people who have the authority to make or participate in a go/no-go decision on the idea. Boeddrich (2004) and Cooper (2008) emphasize that the first step in the decision-making process is to formulate predefined and transparent criteria which will be used to select and implement ideas. Cooper (2008) underlines the importance of these transparent criteria, to weed out misfit projects quickly. One important note that can be made is that the selection criteria requires a certain commitment to these organization-specific selection criteria, especially with regard to the "knock-out" criteria for approved projects (Boeddrich, 2004). When decision makers are not committed to these criteria, the idea management can lose the systematic structure and transparency.

2.2.2 Success factors for the management

This paragraph discusses the success factors for the management involved in the idea management process. Table 4 gives an overview of the different success factors in the management level.

Table 4 Overview of the success factors for the management

Success factors of the management level	Description
Involvement of top and middle management	Pro-active top and middle management strengthen the idea management process
High level of inter-functional coordination and integration	Employee ideas can meet barriers that only can be taken by the right individual
Management archetypes	Employ people with the characteristics of a creative archetype

Involvement of top and middle management

To employees ideas are highly valuable products of their thoughts about companies' problems. So managers should pay full attention to these ideas. Ignorance about ideas discourage people from solving problems. They lose interest in companies' goals (Boeddrich, 2004, Gaspersz, 2002, Vandenbosch, 2006, Getz and Robinson, 2003, Flynn et al., 2003, Sander, 2006). Pro-active top

management governing circumstances and prospects strengthens the idea management process (Vandenbosch et al., 2006). Top and middle management must encourage the employees' creativity and must be committed to the idea management process and the predefined criteria (Getz & Robinson, 2003, Boeddrich, 2004). Thus, management support and encouragement of creativity, both financial and psychological (Flynn et al., 2003).

A difference can be made between the role of top management and middle management. Top management must show, in a tangible way, that the ideas of the shop floor employees got their priority. A transparent alignment and a clear set of guidelines are essential. Middle management must translate the strategy of the top management into a clear preference, encourage employees to come up with ideas, and support these employees and. Team leader and management support leads to more implementation (Axtell et al., 2000). In best practices the first line managers will be evaluated explicit based on average number of ideas registered and implemented by his team as well as the level of participation of the team (Getz & Robinson, 2003).

High level of inter-functional coordination and integration

The support of team leaders and management in the idea management process plays a large role (Axtell et al., 2000). Every innovation leads to changing circumstances within the affected company, which means that numerous barriers must be overcome in order to innovate (Cooper and Markus, 1995, in Brem et al., 2007, Boeddrich, 2004). Often these barriers cannot be taken by the petitioner, therefore the management of ideas means high level of inter-functional coordination and integration (Adams, 2006, in Kijkuit et al., 2007, Brem et al., 2007). Employees' ideas can concern changes within multiple levels in the organization which can form a number of barriers that only can be taken with the support of the right individual (Brem et al., 2007).

Management archetypes

Last success factor of the management level is the existence of management archetypes. Most success factors mentioned above concern creating an environment that is conducive to idea management. But creating an environment that is conducive to idea generation may not be as fruitful as employing people who have characteristics that are similar to those of the more seemingly creative archetypes (searcher, debater, assessor) (Vandenbosch et al., 2006).

Vandenbosch et al. (2006) elaborates four different archetypes; incrementalists, searchers, debaters, assessors.

Incrementalists are managers who place a great deal of importance on what they already know. They evaluate new information on basis of how well it fits with their existing mental models. 'Incrementalists' are experience-based decision makers.

The creative archetype 'searchers' employ a network of information sources. They are very broad in their quest. They search out differing points of view and are comfortable with inconsistency and multiple perspectives. They easily accept new information into their excising mental models. They argue to resolve rather than to win over.

Debaters theorize and create through experiments to understand. Debaters believe that a better solution emerges from debate and the dialectic process.

The last creative archetype is the assessor, the assessor is a manager that is characterized by frequent, dramatic, and unpredictable change. Finding an answer is less important than finding a better question.

Vandenbosch (2006) emphasizes that managers engage in recognizable patterns of idea management and that the use of these archetypes can provide an insight into the idea management. Creativity theorists (Amabile, 1988, Koestler, 1964, in Vandenbosch et al., 2006) consider incrementalist to be unimaginative and bereft of creative ideas because of their rigidity. Though one might argue that there is a little bit of incrementalist in every manager (Vandenbosch et al., 2006), employing people with the characteristics of a creative archetype is fruitful for the idea management process.

2.2.3 Success factors for the petitioner

The last success factors focus on the petitioner in the idea management process. This paragraph discusses these three success factors. Feedback, transparency and petitioner archetypes.

Table 5 Overview of the success factors of the petitioner

Success factors of the petitioners	Description
Feedback	Understandable feedback is important to prevent employee frustration
Transparency	Clear picture of 'how the game is played' will lead to an acceleration in idea generation
petitioner archetypes	A successful process works only with awareness of the complexity of individual behavior involved in idea transformation

Feedback

Involvement and interaction with petitioners in a transparent process is vital to create an optimal situation for all players (Brem et al., 2007, Vandenbosch et al., 2006). Important is that the petitioner has an overview of the complete idea management process and is acquainted with the expectations of the roles of the different players in the process. And the employee may expect to be well informed about the kind of ideas the organization is looking for. Also, when submitting an idea, the employee must be held informed regularly. Especially when an idea is rejected, transparent criteria and understandable feedback are important to prevent employee frustration (Getz & Robinson, 2003, Gaspersz, 2002). The evaluation and further development of ideas should be based on fixed rules, set by the top management (Geschka & Schwarz-Geschka, 2000, in Boeddrich, 2004).

Transparency

Transparency has been mentioned multiple times within the description of other success factors. When generating ideas it is important to communicate and provide information about important themes towards (future) petitioners in order to accelerate idea generation (Gaspersz, 2002). The focus in the idea management leads to idea requirements (Cooper, 2008), when the petitioner is not aware of the requirements this will result in poor idea generation.

The selection of ideas will be based on the personal opinion and in part on information provided by relevant experts and their management peers (Kijkuit et al., 2007). The 'decision makers' are people who have the authority to make or participate in a go/no-go decision on the idea.

Boeddrich (2004) and Cooper (2008) emphasize that the first step in the decision-making process is to formulate predefined and transparent criteria which must be used to select and implement ideas. The importance of these criteria is that all petitioners are aware of these criteria and that all ideas will be selected in the same systematical manner and weeds out misfit projects quickly (Cooper, 2008). These transparent selection criteria tend to create a clear picture of "how the game is played". Petitioners of the idea management know what to expect, which leads to a acceleration in the idea generation.

Petitioner archetypes

As with management not all petitioners act the same. Maslow (2000) describes that before people produce problem solutions there will be a inner struggle between a certain creative impulse and a certain hesitation to put their ideas to the test in the real environment. The extent of the creative impulse depends on how extraverted people are and how inclined they are to solve problems creatively. The degree of hesitation is influenced by how introverted people are and how inclined they are to solve problems in a rational (linear-analytical) way (Maslow, 2000). A distinction can be made between four archetypes (Kolb, 1984, Smith & Kolb, 1986, in Boeddrich, 2004):Emotional perceiver, Reserved scientist, Open communicator, Dominant entrepreneur.

The first archetype is the emotional perceiver. He prefers creative problem-solving in his daily work but hesitates to publish his own work.. Places a huge emphasis on traditional values, is a great listener and perceives emotions in the workplace.

The reserved scientist likes achieving sophisticated results in his work and always wants his work to be appreciated. He prefers linear-analytical problem solving, but is afraid of publishing his own ideas because he hates being criticized.

The third archetype likes to be the 'star' and focuses on bright and brilliant presentations, the open communicator. He likes an ad-hoc organization, is great at convincing others and enjoys creative problem-solving. He starts communicating his ideas anywhere at any time.

Last archetype is the dominant entrepreneur. He integrates top contributions to achieve company goals and always focuses on accepted objectives. He is a dominant ruler, great at delegating work and prefers linear-analytic problem-solving. But accepts creative problem-solving if the other method seems to be exhausted.

No employee completely fit in with these extreme types. Every employee has a certain individual proportion of all four types. There is not one 'best' archetype. These archetypes demonstrate the complexity of idea adoption and the diversity of employee needs with regard to idea management (Boeddrich, 2004). Success can be found in the awareness of the existence of the different petitioner archetypes. A successful idea pipeline works only with sensitive leadership that is aware of the complexity and individual behavior involved in idea transformation (Boeddrich, 2004).

3. Methodology

This chapter discusses the different methods that have been used in order to find an answer on the research questions. Main objective of this research is creating an in-depth assessment of the idea management process and provide the practice of NedTrain's idea management with usable recommendations.

3.1 Subject of research

The research focuses on the idea management process and its success factors. This study emphasizes questions in the empirical research as to how, why and what (Babbie, 2004).

The practice of NedTrain's idea management has been chosen for this empirical research, because the organization has given idea management a central position in the organization. NedTrain has an idea management department at its disposal, the process is supported by a idea management database, and shop floor innovation has been adopted in their mission statement.

To assess the idea management process of NedTrain, two different methods have been used, the content analysis within the field of quantitative research and the method case study within the field of qualitative research. For the content analysis the project description of 971 ideas have been collected from the idea management system 'MijnIdee'. All ideas were registered between 1th of January 2009 and the 1th of July 2009. For the case study eight cases have been chosen out of the 971 ideas that were collected for the content analysis. These cases contain three successfully implemented idea projects, three still running idea projects and two rejected idea projects, the two rejected projects have been added after the other cases were selected.

The case study protocol consists of three parts of methods, document analysis, observations and interviews. The use of multiple methods is stated as triangulation and will increase the reliability of the qualitative research, where the validity is considered to be high (Yin, 2003).

The idea management literature contains a limited number of empirical researches, the majority of the researches contain a literature review or a detailed description of an idea management process in practice. Therefore the use of an existing methodology design for idea management is not possible. The chosen solution is to use the definitions for idea management, the process and its success factors extracted from the theory to design a process model (as shown in the chapter 'Theoretical framework'). And link this model and its success factors to the practice. Conceptual analysis (Berelson, 1952) and within-case analysis, cross-case search for patterns and between group analysis (Eisenhardt, 1989) have been used to assess the process.

3.2 Methods

Different methods have been used for this research. Content analysis has been used to describe the process of NedTrain and the content of the idea management system. The method case study have been used to describe the process of eight specific cases and their bottlenecks and success factors.

3.2.1 Content analysis

The content analysis is a method that generates information from documents, media and reality. For a frequent number of researches content analysis is a major part of obtaining relevant research data. Reason is that relevant documents (like the idea database 'MijnIdee') are great in number and diversity and therefore an important extension of interviews or observations (Verschuren & Doorewaard, 1995). The content analysis has been used to analyze 971 ideas and their processes that have been registered between the 1th of January 2009 and 1th of July 2009 in the idea management system 'MijnIdee'.

3.2.2 Case study

To gain insight in the current idea management process of NedTrain, the views of different actors involved in this process had to be analyzed. Best way to collect these results is by conducting a qualitative research. One strength of case studies is the opportunity to use many different sources of evidence (Yin, 2003, p 97). The case study protocol consists of three different methods, which improves the reliability (Yin, 2003). Observations, document analysis and interviews. These methods have been used to describe the process and the bottlenecks and success factors of eight selected cases.

The method observation has been used to gain a better understanding in the process of NedTrain's idea management. Observations have been executed during six coach-petitioner meetings in Onnen, which is one of the largest maintenance depots of NedTrain. Because these observations only have been used to gain a better understanding of the process for the researcher, results of this observations cannot be retrieved in the analyses.

The document analysis has been based on notes of coach-petitioner meetings, documents containing advice given by experts and numerous e-mails between petitioner, coach, idea manager and decision-maker. The documents covered the eight selected cases.

The interviews focused on eight cases (3 successes, 3 currently running cases and 2 rejected) and all involved parties (e.g. petitioner, coach and idea manager). Goal of these interviews was to gain insight in the processes of the different cases, their bottlenecks and success factors. The interviews contained open-ended questions and were recorded with a voice recorder. The interview protocol can be found in appendix C. The interviews were semi-structured interviews because semi-structured interviews have the advantage of being reasonably objective while still permitting a more thorough understanding of the respondent's opinions and the reason behind them that would not be possible using a mailed questionnaire (Borg & Gall, 1983).

The respondents of the interviews were all involved in the eight different cases as a petitioner, coach, idea manager, expert or decision-maker. Different requirements for selecting respondents for the interviews were utilized. The main requirement was the type of ideas. The idea type with the largest number of ideas was subject for the interviews. This was dependent of the results of the content analysis. This type represents the most ideas of NedTrain in the idea management system. One other logic requirement was that the respondent still work for NedTrain. Table 6 gives an overview of the different respondents.

After the interviews all respondents received an e-mail (see Appendix D, p 75) with the interview transcript. The respondents were asked to read the transcript carefully and reply when the transcript contained inaccuracies. Four respondents replied, but all inaccuracies had to do with misspelled names or departments.

Table 6 overview of the respondents

Location respondents	
Rotterdam	N=4
Maastricht	N=5
Haarlem	N=5
Onnen	N=3
Zwolle	N=2
Job function respondents	
Mechanic	N=6
Idea manager	N=8
Production Manager	N=1
Manager Technical service	N=3
Manufacturing Engineer	N=1

3.3 Data analysis

In chapter 4 the actual analysis will be made. The different analyses are conceptual analysis (quantitative), within-case analysis (qualitative), cross-case search for patterns (qualitative) and between-group analysis. The different ways the data have been analyzed will be discussed in the following paragraphs.

3.3.1 Conceptual analysis

The analysis used for the content analysis is the conceptual analysis (Berelson, 1952). With conceptual analysis the researcher is interested in different terms or concepts in documents. It is important to define the different concepts before analyzing (Berelson, 1952), this can be done by coding the content categories. For the conceptual analysis of the 971 ideas from the idea management system a category scheme have been used to analyze the different project descriptions. Table 7 visualizes this scheme, all concepts have been defined below table 7.

Idea category

The different idea categories that NedTrain distinguishes are primary, secondary and tertiary ideas. The primary ideas are the ideas that have a direct link with the core business of NedTrain. This core business is the maintenance, overhauling and cleaning of railroad material. Secondary

ideas are ideas that don't have a direct link with the core business of NedTrain but deliver a contribution to this core business. The tertiary ideas are the registered ideas in the database that don't have any link with the core business and don't deliver any contribution to the core business. These are the remaining ideas.

Table 7 coding scheme for the conceptual analysis

Idea category	
	Primary
	Secondary
	Tertiary
Idea type	
	Product
	Process
	Social
Scope of ideas	
	Local
	Company wide
Workflow step	
	Step 1: Register
	Step 2: Examine
	Step 3: Share
	Step 4: Expert
	Step 5: Criticize
	Step 6: Decide
	Step 7: Implement
Status	
	Open
	Closed
Lead time	
	X days

Idea type

The second concept is the idea type. These are the product, process and social ideas. Ideas are generated with the intention to lead to an innovation (Kijkuit et al., 2007). Therefore different innovation definitions are used to distinguish the different idea types when coding the 971 ideas. The definitions of product and process ideas are deducted from the common used innovation definitions of Tidd, Bessant and Pavitt (2005). Product ideas are changes in things (products/services) which an organization offers. Process ideas are changes in manufacturing methods and equipment used to produce the car or the home entertainment system, or in office procedures (Tidd et al., 2005). Not all ideas could be captured in the definitions of process and product ideas. The remaining ideas are captured in the definition of social innovation. Social innovation is the strategic change of organizing and organizational behaviour. Behaviour in organizations can be interpret as a capability of the organization. This capability can consist of

four sources: strategic orientation, flexible working, smarter organizing and product-market improvement (Oei, Kraan and Vaas, 2010).

Scope of ideas

The third category from the content analysis category scheme is the scope of the idea. For each of the ideas is determined if they can be seen as a local idea or a companywide idea. Some of the registered ideas can be implemented on other locations of NedTrain, other ideas are only applicable for one location.

Lead time and workflow step

The last two categories are lead time and workflow step. For every idea, in the idea management system 'MijnIdee', the lead time of this idea have been registered in days. The workflow steps in NedTrain's process are the seven steps discussed in chapter 1. Every idea (1 Jan. 2009 – 1 July 2009) have been coded (table 7). A large number of ideas have a technical background. Therefore all the coded ideas have been checked by an internal expert of NedTrain to improve the reliability. This expert has been active in different parts of the organization and has great 'NedTrain-specific' technological knowledge.

3.3.2 Within-case analysis

The interview transcripts, observations and different documents have been used to conduct a within-case analysis. Because 'one cannot ordinarily follow how a researcher got from 3600 pages of field notes to the final conclusions, sprinkled with vivid quotes though they may be' (Miles & Huberman, 1984, p 16, in Eisenhardt, 1989), the within-case analysis is a key step to generate insight in the cases.

The within-case analysis involves detailed case study write-ups for each case. These write-ups are often simply pure descriptions, but they are central to the generation of insight (Gersick, 1988, Pettigrew, 1988, in Eisenhardt, 1989). There is no standard format for such analysis. The overall idea is to become immediately familiar with each case as a stand-alone entity (Eisenhardt, 1989).

The data analysis of the interview transcripts, observations and different documents starts with this within-case analysis for each of the eight selected cases, an in depth study of each individual

case. This helps to create an in-depth understanding of each of the cases, before moving to the next step of the analysis. This entails shifting through the data, discarding whatever is irrelevant, and bring together what seems most important. This allows the most important data to emerge while reducing the volume of data.

To facilitate the cross-case analysis, al the eight cases have been written in the same format, starting with a brief introduction of the idea. Followed by a detailed description of the process of the idea, from registration to implementation or rejection, with a focus on the different parties involved in this process and a description of all actions that have been undertaken by the different parties.

3.3.3 Cross-case search for patterns

Coupled with within-case analysis is the cross-case search for patterns. The cross-case search for patterns is the second step of the analysis. The tactics are driven by the reality that people are notoriously poor processors of information. The danger is that investigators reach premature and even false conclusions as a result of information-processing biases (Eisenhardt, 1989).

Though there are different tactics for the cross-case search for patterns, one tactic fitted this research best. This is the tactic to select groups or dimensions, and then to look for within-group similarities. These dimensions can be suggested by the research problem, existing literature, or the researcher can simply choose some dimensions (Eisenhardt, 1989). The eight cases were already divided in dimensions namely, successfully implemented cases, currently running cases and rejected cases.

The elements that have been used to find within-group similarities are comparable to the elements of the within-case analysis. The first two elements are about the idea, namely the complexity of the idea and the development at the point of registration. The other four elements are about the different parties in the process and actions they have undertaken during this process.

Yin (1994) suggests beginning the cross-case search for patterns by taking the data collected from the first case to build a logic sequence of events explaining the case outcomes. The hypothesized set of events can then be verified in the second case within the same dimension

and if it's confirmed, there can be moved to the next case, if this case confirms the hypothesized set of events there can be moved to the third case. If at any point in the process the hypothesized explanation don't hold, an alternative explanation can be developed and verified again until one holds good for all the cases in the group or dimension.

This way of analysis suggested by Yin (1994, in Yin, 2003) have been done for all the cases for each dimension (successful implemented cases, currently running cases and rejected cases). A matrix has been used to compare the different cases, based on the elements described above, in order to find within-group similarities.

3.3.4 Between-group analysis

The last step of analysis is the between-group analysis and follows on cross-case search for patterns. The cross-case search for patterns leads to a pattern that every case in a dimension meets. The elements about the complexity of the idea, the development at the point of registration and the actions that have been undertaken by the different parties involved in the idea management process have been used in order to find these patterns within every dimension.

This research distinguishes three dimensions, therefore the patterns of all three dimensions can be compared. This comparison between the three dimensions forms the between-group analysis. The comparison of the three patterns of the dimensions have been done based on the elements that also have been used to determine the patterns within the dimension.

4. Analysis

The analysis of this empirical research is based on the methods described in chapter 3. The conceptual analysis, within-case analysis and cross-case pattern analysis have been used to assess NedTrain's idea management process.

4.1 Results conceptual analysis

The conceptual analysis has been used to gain insight in the way different ideas move through the idea management process. 970 ideas registered in the idea database 'MijnIdee' have been coded, as discussed in chapter 3. The used definitions of these codes can be found in paragraph 3.2. In short, the ideas can be primary, secondary or tertiary, this depends upon the link between the idea and the core business of NedTrain. The idea types are product, process or social ideas. Concerning the scope of ideas a difference can be made between local ideas and companywide ideas.

The results of the conceptual analysis provide some insight in how the different ideas move through the process. By coding the project descriptions of 971 ideas a clear overview of the composition of the content of the idea management system arises. Tables 8, 9 and 10 show the frequencies and mean lead time of the different ideas.

Table 8 frequencies and mean lead time based on the different idea categories

		Frequency	Percent	Mean lead time for all ideas in days
	Primary	389	40,2	188,61
	Secondary	392	40,5	171,37
	Tertiary	187	19,3	145,62
	Total	968	100,0	173,33
Missing	System	1		
Total		970		

Table 8 shows the differences between the primary, secondary and tertiary ideas. The mean lead time of the tertiary ideas is significant lower than the primary and secondary ideas (F= 11,47 P<0,005). Note that can be made is that the frequency of this group is also smaller than the other two categories. The mean lead times of the primary ideas and secondary ideas don't show significant differences (P>0,05).

Table 9 frequencies and mean lead time based on the different idea types

		Frequency	Percent	Mean lead time for all ideas in days
	Process	886	91,4	174,87
	Product	65	6,7	152,25
	Social	18	1,9	179,50
	Total	969	100,0	173,43
Missing	System	1		
Total		970		

Table 9 shows that over 91 percent of all ideas registered between 1th January 2009 and 1th July 2009 are process ideas. Though the table shows small differences between the mean lead time of the product, process and social ideas, there are no significant differences between the lead time and type of ideas (F=1,508 P>0,10).

Table 10 frequencies and mean lead time based on the scope of the idea

		Frequency	Percent	Mean Lead time for all ideas in days
	Local	529	54,7	167,95
	company wide	433	44,8	180,99
	not for NedTrain	5	,5	119,60
	Total	967	100,0	173,54
Missing	System	1		
Total		970		

Last category in which the ideas are divided is the scope of the ideas. 'Local ideas' is the largest category in table 10. Though almost 45 percent of all ideas are companywide ideas. By far the smallest category is 'not for NedTrain'. The last category has the lowest mean lead time, but there are no significant differences between the scope of the idea and the mean lead time (F=2,629 P>0,05).

To summarize, the differences between the different lead times are small. 91,4 Percent of all the registered ideas are process ideas.

The different ideas also have been coded based on where they have been rejected or currently are in the process of NedTrain. Table 11 gives an overview of the ideas in the different steps of the process and their status and mean lead time.

Table 11 Mean lead time per workflow step for still running and rejected ideas

Workflow step	current running/rejected	Mean lead time in days	N
Step 1: Registration	Rejected	123,25	4
Step 2: Testing	current running	256,94	18
	Rejected	95,08	159
Step 3: Sharing	current running	259,57	209
	Rejected	146,43	61
Step 4: Expert	current running	257,00	110
	Rejected	96,13	61
Step 5: Criticize	current running	244,76	55
	Rejected	128,41	37
Step 6: Decision	current running	238,33	18
	Rejected	99,90	10
Step 7: Implementation	current running	252,82	39
	Implemented	93,92	189
Total	current running	255,58	449
	Closed	103,47	521

Table 11 shows that the highest mean lead time can be found in the third and fourth workflow step instead of in the last workflow steps of the process. And by far the most ideas that are currently running can be found in these two steps, the third and the fourth step.

When focusing on the implemented ideas, the table shows that the 189 ideas that are implemented have a mean lead time of about 94 days, much lower than the currently running ideas. The observation can be made that the largest number of current running ideas can be found in the step where the petitioners have to share their idea with colleagues, and in the step where they have to consult an internal or external expert. This counts for all the different idea categories and idea types (shown in appendix E, F).

To summarize, there are no significant differences in mean lead time based on the different types of ideas and scope. Only the tertiary ideas have a significant lower mean lead time than

the primary and secondary ideas. For all ideas counts that the most of the current running ideas can be found in the third and fourth step of the idea management process of NedTrain.

4.2 Results within-case analysis

The within-case analysis typically involves detailed case study write-ups for each site. These write-ups are often simply descriptions, but they are central to the generation of insight (Gersick, 1988, Pettigrew, 1988, in Eisenhardt, 1989), because they help the researcher to cope early in the analysis process with the often enormous volume of data. However there is no standard format for such analysis, there are as many approaches as there are researchers (Eisenhardt, 1989). The within-case analysis for each site of NedTrain is divided in a part that explains the registered idea and one part that describes the process the idea went through. The within-case analysis is based on eight cases, three implemented idea projects, three still running projects and two rejected projects. For the within-case analysis 19 interviews are held, as mentioned in the methodology chapter, and archival records uploaded in the idea management database 'MijnIdee' have been used.

Case 1: Cleaning process locomotives

Table 12 status of case 1 'cleaning process locomotives'

Date registered	Status idea project	Last step taken	lead time in days
20-04-2009	Implemented	Implementing	92 days

The idea

This idea has been created in Rotterdam, Rotterdam Cargo is NedTrain's maintenance depot fully focused on locomotives. Operations are short-term maintenance and repairs in the maintenance depot, repairs on location and 24 hour malfunction service.

All locomotives are being cleaned at Rotterdam Cargo at the end of their service, after the final inspection. A great number of locomotives run aground with a malfunction after this final inspection. Two mechanics registered the idea to clean the locomotives in between the different operations instead of at the end of the maintenance or repair service. The petitioners believed that by cleaning locomotives in between, the number of locomotives that run aground with a malfunction would decrease. Both mechanics agreed that the cleaning process regularly

damaged the locomotives, which couldn't be noticed because the final inspection had to be done before the locomotive were cleaned. Therefore they registered an idea to clean the locomotives in between the different operations and before the final inspection.

The process

Registering the idea was no problem. Both petitioners had access to a pc, because of their function. The petitioners registered the idea on 20th of April 2009, after a discussion with their colleagues about the cleaning process of the locomotives. A week after registering the idea, they were approached by the local idea manager. He told the petitioners that their idea fitted the rules of the game and the idea could be further developed. However, what these rules were was not explained by the local idea manager. Both petitioners were not informed about the process, the rules of the game and their responsibilities when they registered their idea. That same week the petitioners were asked to come to the office of the production manager. The production manager is the head of the location Rotterdam Cargo. During this meeting it became clear that the production manager would be their coach and the decision-maker. As a coach he suggested to develop a plan for a pilot test. The production manager gave the both petitioners some time to prepare this pilot test. The petitioners arranged a meeting with their team in May to discuss the best way of planning the cleaning process of the locomotives. In the same month the coach approached the external cleaning company to discuss the new cleaning process. The cleaning company didn't foresee any problems in the split up of the cleaning process. After these preparations the petitioners and the coach had a new meeting to make new agreements. There would be a pilot test of two weeks on two types of locomotives. The team of the petitioners would execute the test. One of the petitioners was foreman of this team. He discussed with the team between which operations which parts of the locomotive could be cleaned. During the pilot test only a few locomotives ran aground caused by moisture malfunction. After the pilot test the coach and petitioners evaluated the project, both petitioners and coach were very positive about this change. On the 26th of May the petitioners and the coach started to implement this new way of cleaning locomotives in all teams at Rotterdam Cargo. The idea was successfully implemented on 21th of July 2009.

Case 2: Location of the windscreen wiper pump

Table 13 Status case 2 'location of the windscreen wiper pump'

Date registered	Status idea project	Last step taken	lead time in days
27-01-2009	Implemented	Implementing	64 days

The idea

The petitioner of this idea, is a mechanic at the refurbishment and overhaul depot in Haarlem. Main operations in Haarlem are the overhaul, transformation and modernization of trains, and repairing collide damage. The idea of is about moving the pump of the windscreen wiper. This pump had to be fixed in the cabin of the ICM MBFK and SBK, a type of carriage, on a concrete plate with an iron floor on top of it. Installing this pump demands a lot of effort because the mechanic has to drill through a concrete plate and iron floor. The mechanic registered the idea to hang the pump on the wall of the cabin. Because of this change the mechanics didn't have to drill through the concrete plate anymore, during the installation of the windscreen wiper pump.

The process

The petitioner of this idea handed in the idea before the new system 'MijnIdee' was launched. The old system contained forms that had to be filled in. The petitioner had done this a couple of months before his registration in 'MijnIdee' on the 27th of January 2009. All individuals that were interviewed couldn't point out when exactly this had happened. An estimation was three months before the petitioner registered his idea in the database 'MijnIdee'. The petitioner gave his form to his superior. The superior, on his turn, handed it on to the local idea manager the same week and asked if the local idea manager could coach this idea. After the idea manager received the form, he arranged a meeting in which the petitioner could explain his idea. Between the moment the idea manager received the form and the moment the meeting was held were several weeks. This meeting was held on the shop floor. The idea manager pointed out that he didn't check if the idea answered the rules of the game. During the meeting between coach and petitioner the 'pump expert' was on the shop floor and the idea manager, who also was the coach, immediately approached the expert and asked him to give his opinion on the petitioner's idea. The expert, an engineer, was enthusiastic but pointed out that the idea wasn't possible because of the way the pump worked. This same day the petitioner and the coach rejected the idea. On the 27th of January 2009, the petitioner contacted the local idea manager, for the second time. He told the idea manager that, against all strict rules, he had

installed the windscreen wiper pump on the wall of the ICM cabin above the floor. And that the pump was working properly. That same day, petitioner and local idea manager/coach registered the idea for the second time, this time in the new database 'MijnIdee'. After the registration they called the engineer and asked him to come to an urgent meeting. Coach, petitioner and engineer observed the working pump, which now was installed on the cabin wall. This same day, 27th of January, the engineer gave a manufacturing engineer the order to contact the supplier of the pumps about this way of installing the pump. About one month later the supplier did send different calculations that approved the new way of installing the pump. The engineer and manufacturing engineer discussed the calculations and decided to change the way of installing the pump in the official work descriptions.

Case 3: Replacing the rectifier

Table 14 Status case 3 'replacing the rectifier'

Date registered	Status idea project	Last step taken	lead time in days
23-01-2009	Implemented	Implementing	321 days

The idea

This idea has been registered in Maastricht. Maastricht is one of the four largest maintenance depots of NedTrain. The maintenance and the larger repair work of different types of carriages is done in Maastricht. One mechanic, a specialized electrician, registered the idea of replacing the rectifier. A rectifier is a convertor that converts alternating current to unidirectional current. These rectifiers are being used for recharging batteries of different types of trains. The size and weight of the old rectifiers was something a lot of mechanics were complaining about. These old rectifiers weigh about 1000 kilo and have a dimension of one and a half meters at one and a half meters. Often the tires are worn and the floor is not graded. New modern rectifiers are compact and weigh about thirty kilo. The idea of the mechanic was to replace the old rectifiers by modern rectifiers.

The process

The petitioner registered this idea on the 23th of 2009 after a conversation with multiple colleagues where there was heavy complaining about the rectifiers. The registration had been done on one of the PC's on the shop floor and was quite easy according to the petitioner. After

this registration the petitioner went to his superior and told him his idea. His superior was also the local idea manager back then. The superior did assign a coach at the same day the idea was registered. But both petitioner and this coach mentioned that there had been almost no contact between them about this idea. Because the local idea manager was also the superior of the petitioner of this idea, the petitioner mainly went to his superior when having questions about his idea. The original coach and petitioner mentioned in the interviews that the local idea manager (and also direct superior of the petitioner) took over the tasks of the original coach and became the new coach of this idea. There hasn't been an introduction meeting between the petitioner and the original coach. The petitioner pointed out that the rules of the game and the responsibilities of the petitioner were not clear to him. He also mentioned that he told his superior about his idea because he didn't knew what else to do with it. The petitioner believed he couldn't execute this idea and that registering the idea was the only action he could undertake. Several months went by without any activity. Eventually the petitioner's superior passed the idea on to the head of technical service. The petitioner didn't receive any feedback about this action. The head of the technical service discussed this idea with his other team members and they knew that there were a lot of complaints about the rectifiers. One of the team members of the technical service eventually was responsible for this idea and had to investigate new possibilities for a new rectifier. This team member became the decision maker of this project. He merged this idea with another idea about the rectifiers, that was about making the rectifier multifunctional. The decision maker corresponded with different suppliers of rectifiers and on the 20th of August he decided to purchase two new rectifiers. The petitioner was informed about this action. The mechanics and technical service have been testing the two new rectifiers, however these new rectifiers were not suitable for every type of train. Because of the negative results of the test, they haven't purchased more new rectifiers. Nevertheless the petitioner received a reward of € 75,00 for his idea and the idea have been closed on the 10th of December 2009.

Case 4: New lock system for the air-conditioning box

Table 15 Status case 4 'new lock system for the air-conditioning box

Date registered	Status idea project	Last step taken	lead time in days
29-01-2009	Still running	Sharing with colleagues	322 days

The idea

This idea has been registered at the maintenance depot Maastricht, and is currently running. This idea hasn't been rejected or implemented yet. The idea has been registered by a mechanic, specialized in electricity. He registered an idea about a new lock system for the air-conditioning boxes on the ICM (type of train). The old air-conditioning boxes can be closed by screwing different bolts, unscrewing all the bolts is very labor-intensive and the different bolts rust. The petitioner came up with the idea of using sliding bolts for the air-conditioning boxes, these are less labor-intensive, can't rust and the mechanics don't need tools to open the boxes.

The process

All air-conditioning mechanics at the maintenance depot in Maastricht received a form at the end of 2008 or beginning of 2009. On this form they could fill in improvements about the air-conditioning systems of the ICM (type of train). This type was about to get modernized in Haarlem and all mechanics were asked to come up with ideas. These ideas have been registered in 'MijnIdee' by the mechanics. The idea about a new lock system for the air-conditioning boxes has been registered on the 29th of January 2009. The same week as the registration a coach was assigned to this idea. There has been a short meeting between the coach and the petitioner. This meeting was held on the shop floor. The petitioner was asked to explain his idea to the coach. Both coach and petitioner couldn't mention how many days there were between the registration and the first meeting. Both estimated a couple of weeks. The coach told the petitioner that it was the petitioner that had to undertake some action. The petitioner, on his turn, told the coach that this idea was an adaption of the construction of the train and that this idea had to be approved by an engineer (expert). The petitioner told the coach that he didn't understand what his role was except registering the idea. Until August the coach asked several times about the progress of this idea. From August until now there hasn't been any contact between coach and petitioner. The idea is still running, but the revision of the ICM in Haarlem already started. The petitioner pointed out several times that ideas about adapting the construction of trains need the approval of engineers and therefore are their responsibility. The mechanic can register the idea, but that is all a mechanic can do according to this petitioner.

Case 5: Replacement of the windshield

Table 16 Status case 5 'replacement of the windshield'

Date registered	Status idea project	Last step taken	lead time in days
24-04-2009	Still running	Expert	236 days

The idea

The 'replacement of the windshield' idea has been registered by a mechanic at the refurbishment and overhaul depot in Haarlem. As mentioned in the within-case analysis of one of the ideas above, one of the main operations in Haarlem is the overhaul and modernization of carriages. The process of the overhaul and modernization is designed like an assembly line. The depot is divided in different stations and at every station a different part over the modernization is executed. When the carriage is finished at one station it will move on to the next.

The petitioner registered an idea of which he believed could be an improvement of the order of operations in the overhaul process of the ICM (type of train). The windshield of the ICM is being replaced, glued and cleaned at station twelve, the station where the petitioner works. This station is positioned after the painters removed the oxidation with sandpaper and repainted the body of the ICM. When the mechanics at station twelve want to remove the windshield, the slits of the screws of the windshield have been removed. This because the painters have been sandpapering and painting the complete body. The mechanics have to clear the different screws to replace the windshields, and therefore chop in the painted body of the ICM. The petitioner's idea was to replace the windshield at the station before the body of the ICM moves to the painters.

The process

The petitioner went to his superior with this idea on the 24th of 2009. The petitioner and his superior registered the idea in the database 'MijnIdee'. The superior and the petitioner assigned a coach during the registration. The database send an e-mail with the new idea to the local idea manager. The great amount of registered ideas at this time caused that the idea manager didn't check all the ideas as good as he had to, also he didn't use the rules of the game as he supposed to. Therefore nothing happened with this idea for a couple of months. The local idea manager, the coach and the petitioner didn't undertake any action. January 2010, the idea manager in Haarlem started to clean up his list with idea coaches. The coach of this idea admitted that he

wasn't a very active coach. His ideas were adopted by other coaches. This idea was assigned to a new active coach in February 2010. The new coach, the petitioner and the local idea manager arranged a meeting about this idea. During this meeting the petitioner was asked to explain his idea to his new coach. Both the petitioner as the new coach concluded that it had to be possible to replace the windshield before painting the body of the ICM. But the Manufacturing Engineers officially had to plan in this new way of working before the petitioner could start working the way he proposed. Therefore the coach arranged a meeting with a manufacturing engineer where the petitioner could present his idea. The manufacturing engineer told that the replacement of the windshield could be done before painting the body but he pointed out that when the painters would sandpaper the oxidation, the slits of the screws still would be gone. And the next time the windshield had to be replaced, this still would be a problem. Sandpapering the oxidation had to be done before painting the body according to the manufacturing engineer. No agreements have been made during this meeting. The petitioner contacted his coach several times after this meeting. He was willing to do the sandpapering as long as the replacement of the windshield could be done before the painters painted the body. The coach explained several times that the manufacturing engineers had to plan in the new way of working before he could start. The coach believed that this was the last thing that needed to be done to implement this idea. The coach contacted the manufacturing engineers several times, but there hasn't been any action or feedback. Therefore the coach asked the petitioner to contact the manufacturing engineers. In the interviews the coach has been pointing out that approaching the manufacturing engineers is very hard because of the irregular working hours and the fact that they are not very familiar on the shop floor. This idea is still running.

Case 6: The use of gel batteries

Table 17 Status case 6 'the use of gel batteries'

Date registered	Status idea project	Last step taken	lead time in days
17-06-2009	Still running	Expert	181 days

The idea

The idea about the use of gel batteries is registered by a coordinator technical service at Maintenance depot Onnen (near Groningen). The petitioner observed that a lot of equipment broke when mechanics would refill the batteries with distilled water. This is caused by the fact

that there is no perfect equipment for refilling the batteries. Refilling the batteries with distilled water is a time-consuming and accurate operation. This is the reason that the coordinator technical service started looking for alternative batteries that needed less maintenance. He discovered that the automotive industry is using 'gel batteries'. These batteries form a closed system and don't need to be refilled with distilled water all the time. The petitioners idea is to find out if these gel batteries can be used by NedTrain.

The process

The petitioner registered this idea by himself behind his own desk on the 17th of June 2009. The petitioner has chosen his own coach during the registration, this was his direct superior. After the registration of this idea the idea management system 'MijnIdee' send an e-mail with the idea to the local idea manager. The idea manager studied the idea en checked it based on the rules of the game. The local idea manager mentioned that he did the 'idea-checking' based on his own feelings. Except the rule that the idea has to be a new idea. Therefore the search engine of the idea management database 'MijnIdee' has been used. The idea manager approved the new idea and the chosen coach. The idea manager mentioned that his role ended there for this project. After this approval by the local idea manager there hasn't been an introduction meeting between the petitioner and the coach. Because of his function, the petitioner was capable of contacting different suppliers of gel batteries. The petitioner arranged a meeting with one of the suppliers of gel batteries at the maintenance depot in Onnen. This meeting took place in the fall of 2009. The supplier indicated that there were possibilities for the use of gel batteries by NedTrain. But in order to start a pilot test, he needed more data about the different types of trains. The petitioner consulted his coach about who he had to contact within NedTrain in order to get these data and who could make decisions about pilot testing with gel batteries. The coach mentioned that he wasn't able to give a clear answer to these questions, he works at the technical service and his knowledge is limited. Both the petitioner and the coach have approached different colleagues with this problem, but most colleagues did not respond to their request. The petitioner and coach mentioned that this project is inoperative now.

Case 7: The development of the water pressure control

Table 18 Status case 7 'the development of the water pressure control'

Date registered	Status idea project	Last step taken	lead time in days
28-01-2009	Rejected	Expert	138 days

The idea

This idea resulted from a great frustration the petitioner and his colleagues experienced during his daily work. The petitioner was a mechanic at the Service Depot Zwolle, working on the DM'90 (type of train). He noticed that it wasn't possible to measure the water pressure, therefore mechanics couldn't check if the water pump was working properly. Resulting in unnecessary replacements of the water pump on the diesel engine of the DM'90. The petitioner developed a control mechanism for the 3406 II diesel engine. The development of the control mechanism has been registered by the petitioner in the idea management database. The advantages of this idea were no more unnecessary replacements and saving of time.

The process

This rejected idea has been registered on the 28th of 2009 on a pc on the shop floor in Zwolle. During the registration of the design for a control mechanism, the petitioner selected a coach in the idea management system. This was the only available coach at the Service Depot Zwolle. After the completion of the registration of the idea, the system e-mailed the idea to a idea manager of the national idea management department of NedTrain at the head quarters in Utrecht. This because the Service Depot didn't have a local idea manager in the days of the registration of this idea. The idea manager forwarded this idea to the only coach available in Zwolle. This happened a week after the registration. This was the only action the idea manager had undertaken for this idea. The coach received the e-mail from the idea manager and arranged a meeting with the petitioner, the same week. During this meeting the petitioner explained his idea and the coach told the petitioner that he had to take all the initiatives and when necessary the coach would help. During this meeting, coach and petitioner walked to the manufacturing engineer for the DM'90 (type of train). They continued discussing this idea at the manufacturing engineer's office. Coach and petitioner asked the engineer to look at the feasibility of this idea. Direct response of the manufacturing engineer was that he was very busy and that he would take a look at it, when he had time for it. One week later the coach asked the manufacturing engineer's supervisor to provide the engineer with more time for idea management. There was no reaction on this request. After this request the coach and petitioner waited for a reaction from the manufacturing engineer for about three months. The coach mentioned that he felt very powerless, because he was dependent on the expert and he did not

have any influence on the process from this point. Half April the coach and the petitioner lunched together and discussed the status of this idea. The petitioner told his coach that he hadn't heard a thing from the expert. One month later the coach decided to e-mail the end responsible for the DM'90. This e-mail has been send on the 28th of May. One week later, on the 8th of June the coach received an e-mail from the end responsible. In the e-mail he wrote that the idea was rejected, based on costs for this modification and the possible origination of a leakage. The coach contacted the petitioner one week later and showed him the received e-mail. The idea had been closed this same day, June 15, 2009.

Case 8: Replacing steal with galvanized flats

Table 19 Status case 8 'replacing steal with galvanized flats'

Date registered	Status idea project	Last step taken	lead time in days
20-03-2009	Rejected	Expert	124 days

The idea

This idea has been registered at Haarlem, as mentioned before, Haarlem is the refurbishment and overhaul depot of NedTrain. The petitioner is active in the supply department of Haarlem, responsible for the supplies of different articles used in the overhaul and refurbishment process. One of the articles used in the overhaul process is made of normal steel, and needs to be worked before it can be used in the process. The idea of the petitioner is to create this product out of galvanized flats instead of normal steal. This would spare different operations per article. The petitioner calculated that this idea would save 9 working hours per order (600 pieces).

The process

The petitioner came up with this idea before the idea management process, as described in the first chapter, was implemented. He wrote down his idea and handed it on to the local idea manager in Haarlem. The local idea manager couldn't remember how long before the introduction of the idea management system 'MijnIdee' this was. On the 20th of March 2009, the local idea manager registered this idea in the new system 'MijnIdee'. This same day the local idea manager assigned a coach to manage this idea. The local idea manager didn't get involved in this projec. A couple of days later the assigned coach informed the local idea manager that he wasn't able to coach this idea. The coach didn't mention a reason. On the 30th of March a new coach was assigned to this idea project and this coach informed the local idea manager as well

that he wasn't able to coach this idea. The petitioner wasn't informed about the difficulties of finding a coach for his idea. April the 17th a third coach was approached to manage this project and he accepted the assignment. The coach, a employee of the department 'production support', approached the petitioner. This was the first time the petitioner was involved in the process. During the coach-petitioner meeting they talked about the idea, not about the different steps of the process, the rules of the game or the responsibilities of the petitioner. The coach tried to approach an expert for this idea. This expert has been e-mailed twice, on the 14th of May and again on the 27th of May. Coach and petitioner waited until half July. The expert didn't respond to the different e-mails, therefore coach and petitioner decided to close this idea. The coach closed the idea in the system on the 22th of July, 2009.

4.3 Results of the cross-case search for patterns

As mentioned in the methodology chapter, coupled with within-case analysis is the cross-case search for patterns (Eisenhardt, 1989, p 540). This search for within-group similarities have been based on different elements; complexity of the idea, the development of the idea at the point of registration, the role of the petitioner, the role of the idea manager, the role of the coach and the role of the expert and decision maker.

This paragraph discusses the results of the cross-case search for patterns within the three different dimensions, the implemented ideas, the currently running ideas and the rejected ideas. The dimensions and the different elements can be found in table 20.

4.3.1 Patterns in dimension 1, the implemented ideas

When searching for inter-group similarities in the first dimension, no pattern can be found for the first three elements (complexity of the idea, development at point of registration, role petitioner). The different implemented ideas differ from complexity, development and actions undertaken by the petitioner.

Table 20 Overview of the case studies

	Case 1 Cleaning process locomotives	Case 2 Windscreen wiper pump	Case3 Replacing rectifier	Case 4 Lock system airco-box	Case 5 Replacement windshield	Case 6 Use of gel batteries	Case 7 Water pressure control	Case 8 Replacing steal with galvanized flats
	DIMENSION 1 Implemented ideas			DIMENSION 2 Still running ideas			DIMENSION 3 Rejected ideas	
complexity idea	Simple	Complex	Complex	Complex	Simple	Complex	Complex	Complex
development at point of registration	Not developed	Developed	Not developed	Not developed	Not developed	Not developed	Developed	Not developed
Role petitioner	Petitioner is also expert	Petitioner designed a prototype	Petitioner only registered	Petitioner only registered	Petitioner only registered	Contacted external supplier	Petitioner designed prototype	Petitioner only registered
Role idea manager	Limited	Linked idea to expert/DM[ii]	Linked idea to expert/DM[ii]	Limited	Limited	Limited	Limited	Limited
Role coach	Linked idea to expert/DM[i]	Linked idea to expert/DM[ii]	Linked idea to expert/DM[ii]	limited	Tried to contact expert	Limited	Linked idea to expert	Tried to contact expert
Role expert/ decision maker	Involved from the start	Involved from the start	Adopted the idea from petitioner	Not involved	Partly involved	Not involved	Involved at the end	Not involved

i= Coach and decision maker is the same person

ii= Idea manager and coach is the same person

A pattern can be found based on the actions undertaken by the coach. In all the cases in the dimension of implemented ideas, the coach involved the expert and decision maker. One important note has to be made for this pattern. In two of the three implemented cases the coach is also the local idea manager. These local idea managers fulfill a double role. In the first case of the implemented ideas the coach also fulfills a double role. He was the coach of the idea and also the decision maker for this idea, this accelerated the process.

One other pattern within this dimension can be found. All experts and decision makers were involved. In two out of three cases even from the moment the idea management process started. In the other case, the expert adopted the idea from the petitioner. The expert developed the idea and implemented it.

4.3.2 Patterns in dimension 2, the currently running ideas

In the dimension of the currently running ideas, not patterns can be found for the elements 'complexity of the idea' and the 'role of the petitioner'. The element 'development at point of registration' shows a clear pattern. All the currently running ideas were not developed when they were registered. The assumption can be made that the development of the idea at the point of registration influences the lead time of the idea in the idea management process. And that therefore these ideas not implemented or rejected. The role of the local idea manager also shows a clear pattern. All local idea managers involved in the currently running cases haven't undertaken more actions than checking if the idea fits the rules of the game and assigning a coach. The element 'role of the coach' doesn't show a clear pattern. The element 'role of the experts and decision makers' doesn't show a clear pattern in the first place, nevertheless this element contains a pattern. In two of the three currently running cases the experts and decision makers are not involved. There is one case that states that the expert has been involved partly. In the interviews the coach and local idea manager of this case stated that the experts appeared at a meeting about this idea once, gave their opinion and were unapproachable from this moment, despite the numerous calls and e-mails.

4.3.3 Patterns in dimension 3, the rejected ideas

The third dimension, with the cases about the rejected ideas, shows two clear patterns. Both cases are based on complex ideas, ideas that cannot be developed and implemented by the petitioner and its superior. In both cases the role of the local idea manager was limited. The other elements (development at the point of registration, role of the petitioner, role of the coach, and role of the expert and decision maker) don't show a clear pattern.

4.4 Results of the between-group analysis

As discussed in the Methodology chapter, the between-group analysis follows on the cross-case search for patterns. This analysis is about comparing the different patterns in the three dimensions, can patterns in one dimension also be found in the other dimensions? This paragraph starts with comparing the patterns of the first dimension (implemented ideas) with the other two dimensions, followed by the patterns of the second dimension (currently running ideas) and the third dimension (rejected ideas).

4.4.1 Between-group analysis of the role of the coach

The first pattern in the dimension of the implemented ideas was that all coaches of the implemented idea cases involved the expert/decision maker in the case. During the different interviews the coaches of these cases stated that they had undertaken different actions themselves to get the expert and decision maker involved in the case as soon as possible, as they saw it as their responsibility. In the first idea case the coach was also the decision maker, which made it very easy, though he did contact an external expert (the petitioner was an internal expert).

The patterns of the coach getting the expert/decision maker involved in the idea case does not recur in the other two dimensions. The role of the coaches in the other dimensions was very limited or the coach did try to reach the expert but without success. The coaches that had a limited role in the case both gave different reasons for their limited role. The first stated: *"Sometimes, because of all my other normal work, an idea escapes my mind, this is one of those examples. But the petitioner has to keep me aware".* The other coach with a limited role stated: "*I just didn't had the right knowledge to coach this idea. I told the petitioner that he was responsible for undertaking all actions in order to get this idea implemented".* Two of the

coaches had tried to involve the experts in the case, but during these interviews the coaches underlined that despite all the effort, the experts were unapproachable for them. One of the coaches told: "*They see these ideas as their lowest priority. They don't even return my e-mails and phone calls"*. This coach stopped trying to get the experts and decision makers involved, and gave this responsibility to the petitioner.

Only one other coach in the other two dimensions (currently running and rejected ideas) managed to involve the expert and decision maker in the case. Though this coach also stated that it was almost 'mission impossible'. "*They tell you that they are too busy and that's it. But I do need their knowledge and approval in order to make this idea work. As a coach I felt very powerless".*

The pattern of the coach as a link between the expert and decision maker, and the idea, can only be found in the dimension of the implemented ideas.

4.4.2 Between-group analysis of the role of the experts and decision makers

One pattern found in the dimension of the implemented ideas, that is connected with the above mentioned pattern, is that all experts and decision makers were involved in the dimension of implemented ideas, in two cases even from the beginning of the project. This pattern was not found in the other two dimensions. The second dimension shows another pattern, namely that the experts and decision makers are not involved.

Where in the first dimension the coach approached the expert and decision maker with success, the other two dimensions show three cases where the expert and decision maker haven't been reached. In two of these cases the coaches tried to reach the experts without success, in one case the coach told it was the petitioner's own responsibility to get experts and decision makers involved in his idea case. The experts and decision makers that have been reached in the dimensions 'currently running' and 'rejected ideas' stated that these ideas are not their main priority and that they will get involved in the different cases when their work schedule permits this. In one case in the dimension 'rejected ideas' the coach did involve the expert, but this was very hard for this coach and cost him a lot of time.

The pattern of experts and decision makers being involved in the cases can only be found in the dimension of the implemented ideas. The dimension of the currently running ideas shows a pattern of experts and decision makers that are not involved.

4.4.3 Between-group analysis of the development at point of registration

In the second dimension, the currently running ideas, a clear pattern has been found about the development of the idea at point of registration. All currently running ideas were not developed yet when registered. These ideas were all three, nothing more than an idea that was written down. As mentioned before an assumption can be made that the development of the idea at the point of registration influences the lead time of the idea in the idea management process.

When comparing this pattern with the other two dimensions (the implemented ideas and rejected ideas), the matrix shows no other clear patterns of the development of ideas at the point of registration. The dimensions of implemented ideas and rejected ideas contain undeveloped and developed ideas, therefore when an idea is undeveloped at the point of registration, the idea still can be implemented successfully or become rejected.

4.4.4Between-group analysis of the role of the idea manager

The dimensions of the currently running ideas and rejected ideas both show a clear pattern in the behavior of the local idea manager. All idea managers in these cases had a very limited role, which means that all five of the idea managers checked if the registered idea fitted the rules of the game and assigned a coach to the petitioner and its idea. When comparing this pattern with the dimension ‘implemented ideas’, a difference can be found. In only one of the three implemented idea cases the idea manager had a limited role. In the other two cases the idea manager was also the coach for the petitioner and its idea. He was actively involving the experts and decision makers in the case. In the interviews with the two idea managers/coaches they could not give a clear answer if involving the experts and decision makers was the responsibility of the coach or the idea manager. Four of the five idea managers from the cases in the dimensions of the rejected and currently running ideas stated that involving the experts and decision makers is the responsibility of the coach or the petitioner itself.

One idea manager of a rejected case explained that for the case he had been interviewed about, he had a limited role, but nowadays he is much more proactive. When he receives a new idea he tries to get the different experts and decision makers involved.

In sum, the pattern of the local idea manager with a limited role can be found in the dimensions 'rejected ideas and currently running ideas', but does not recur in the dimension 'implemented ideas'.

4.4.5 Between-group analysis of the complexity of ideas

The last pattern in this between-group analysis can be found in the dimension 'rejected ideas' and relates to the complexity of the idea. As discussed in the cross-case search for patterns a clear pattern can be found in the complexity of the ideas in the dimension of rejected ideas. All cases in this dimension are complex ideas. In the other two dimensions no clear pattern can be found. These dimensions contain as well simple as complex ideas. Therefore the registration of a complex idea does not mean that this idea cannot be implemented.

5. Conclusions and recommendations

The research objective was to create an in-depth assessment of the idea management process, from generation to implementation or rejection. This chapter provides a clear overview of the theoretical implications and the most important conclusions. Followed by the limitations and recommendations for further research.

5.1 Conclusions

The practice of NedTrain's idea management has been used as a basis for different empirical studies. The idea management process is NedTrain's way of innovating and getting shop floor employees involved in order to create organizational improvement. The contribution of this research is the in-depth assessment of the actual idea management process, and to provide NedTrain with possibilities for process improvement.

In chapter two a model of the idea management process has been developed based on idea management literature and this model and influencing success factors have been discussed. The focus on the idea management process gives us a better understanding of three phases in the idea management process and influencing success factors.

In the idea management literature no clear accepted definition was generated (Winzer, 2003, in Brem & Voigt, 2007). This research attempted to create an understandable definition developed out of the existing literature. In the second place this study gives an clear overview of all success factors in the idea management process and involved parties, where the existing literature often focuses on one part of the process.

The existing idea management literature discusses two major parties that influences the idea management process; the manager and the petitioner. This research recognizes another important role, the role of the expert. In this research, the expert is not always the same as a manager. One marginal note that needs to be made is that this research has been executed in a Dutch train maintenance company and that the importance of the role of the expert not automatically can be applied for all organizations that integrated idea management.

The empirical research and the executed analysis resulted in six conclusions about the idea management process of NedTrain, these conclusions are extracted from two studies, the content analysis and the case studies.

The content analysis showed that over 91 percent of all the generated ideas are process ideas. This largely supports the existing theory of Brem & Voigt (2007) of classical idea management. Idea management in its classical form, mostly introduces ideas with the objective of process innovations and improvements within the company. This form of idea management rarely triggers radical innovations for new products and processes.

Second conclusion that can be drawn from the content analysis is that different types of ideas move through NedTrain's idea management process in the same way. There are no significant differences between the types of ideas, the scope of ideas and their mean lead time in the idea management process. Next, for all type of ideas counts that the most ideas are sticking in the process steps 'sharing with a colleague' and 'sharing with the expert'. These two steps in the process of NedTrain have the most currently running ideas. Only the tertiary ideas, the ideas that have nothing to do with the core business of NedTrain, have a significant lower lead time than the primary and secondary ideas.

Third, the case study shows that the coach is essential for the involvement of the expert and decision maker in the idea project. In cases of successfully implemented ideas the coach involves the expert and decision maker at the start of the process. A large number of ideas that petitioners register depend on the knowledge and approval of experts within NedTrain. In the implemented idea cases it was the coach who got the expert and decision maker involved in the idea project, in contrast to the coaches of the currently running and rejected idea cases.

Though the coach is essential for the involvement of the expert and decision maker in the project, coaches often have problems with approaching and involving experts and decision makers in the idea case. Within NedTrain knowledge, expertise and decision making is highly divided, this results in the fact that coaches experience the process of getting experts and decision makers involved in the idea project as a barrier for petitioner and coach. The success factor described in the literature as 'high level of inter-functional coordination and integration

often misses. When coaches experience this barrier, the idea will be returned to the petitioner. This results in closure of the idea project and a frustrated petitioner.

Following on the previous drawn conclusion, experts and decision makers are scarcely involved in the idea management process of NedTrain. The highly divided knowledge, expertise and decision making within NedTrain makes it difficult to approach the right expert or decision maker and in practice it turns out that different departments that act as expert or decision maker (e.g. engineering or technical service) are not pro-active in the idea management process and don't give priority to these ideas.

Last conclusion is that the different responsibilities of the different parties involved in idea cases (e.g. petitioner, idea manager, coach, expert) are not clear. As became clear in the case studies, different coaches and idea managers approach their profession in different ways and allocate themselves and others different responsibilities, which leads to an unclear process.

5.2 Recommendations

The practice of NedTrain's idea management have been used to execute this empirical research. Based on theoretical research, the analysis and the above formulated conclusions different recommendations towards NedTrain can be framed. An overview of the recommendations that flow from this research can be found in table 21.

Table 21 overview of the recommendations

Recommendations
1: Define responsibilities of all involved parties and make these responsibilities known
2: Appoint coaches in all levels of the organization, also higher in the organization.
3: Approach experts and decision makers earlier in the process
4: Make all departments that can act as expert or decision maker aware of their role in the idea management process

The first recommendation is that for all parties involved in the idea management process (e.g. petitioner, idea manager, coach, expert) the responsibilities need to be defined. And all parties have to commit to these defined responsibilities. In the current process it often occurred that different parties are waiting for each other to take the next step in the process. Coaches and experts expect the petitioner to undertake action, because of NedTrain's vision, the petitioner is always end-responsible. But because some ideas are very complex and NedTrain has strict rules about adapting constructions, the petitioner is not always capable of taking the next step. Making clear before starting an idea project who is responsible for involving the expert and decision maker will speed up the process. Therefore defining responsibilities of all involved parties in the process would be an improvement of the idea management process of NedTrain.

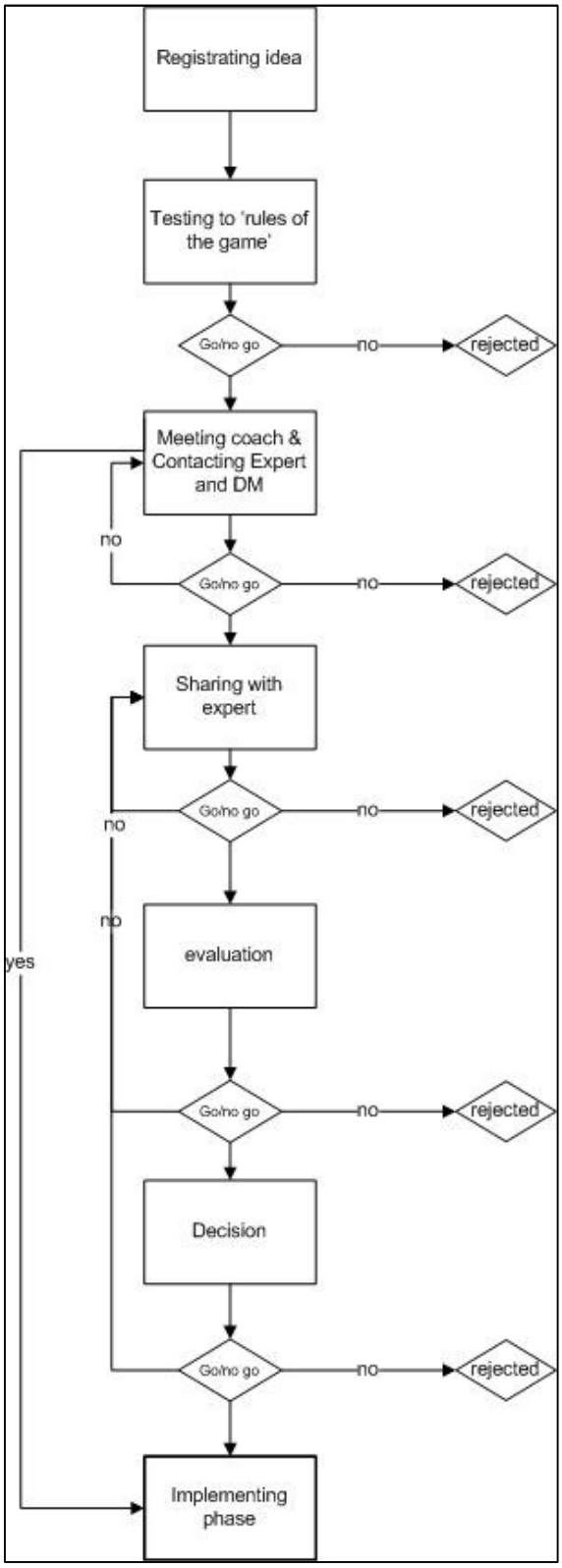
Second recommendation is to appoint coaches in all levels of the organization, not only first line managers. During different idea cases the coach was not able to get the expert and decision maker involved in his idea project. Coaches frequently stated they were not able to arrange an appointment with the expert or decision maker. When they knew the experts superior and arranged an appointment through this person, making appointments with this experts suddenly became possible. The literature describes that the coach needs a high level of inter-functional coordination and integration. In other words, when the experts and decision makers for a certain idea are high up in the organization, the coach must be able to approach these individual and get the idea on their agenda.

In the cases that were implemented with success, the coaches involved the expert and decision maker from the start. The third recommendation is to involve the expert and decision maker from the beginning of the idea project. This doesn't mean that the decision maker already has to make a decision, but he or she knows the idea and is involved in the project. By involving them from the start, they will be informed about the idea the moment they have to undertake actions or have to make decisions in order to get the idea implemented. Figure 4 shows the adapted process flow.

One other recommendation that influences the process is removing the step 'sharing with colleagues'. The within-case studies showed that almost all petitioners shared their ideas with their colleagues even before they registered it in the system 'MijnIdee'. And at every go/no go

point the idea can be rejected, or send back to the previous step in the process. As described in the literature, an idea moves back and forward, and has to be able to skip steps.

Figure 4 Future process layout NedTrain



Last recommendation is to create awareness about the idea management process, the involved parties and their responsibilities, in all departments that can act as an expert or decision maker. Based on the case studies it often occurs that experts and decision makers are not aware of their role in the idea management process. This creates situations in which coaches and petitioners are fully dependent on these experts and decision makers, while these are not giving priority to these ideas.

5.3 Limitations

Four marginal notes can be made with regard to choices that are made for this research. The research has a certain scope as a result of which some elements are left out of consideration. Furthermore some theoretical assumptions are taken. The four limitations are starting points for further research, discussed in the next paragraph.

First, this research focuses on creating an in-depth assessment of the idea management process. The practice of NedTrain's idea management have been used for this empirical research. One issue that have been left out of consideration, based on the scope of this research, is the willingness of the NedTrain employees to participate in the idea management process. NedTrain generates shop floor ideas in order to improve process or product. Their process is dependent of the willingness of the employee to participate.

Second, the literature discusses two different roles in the idea management process, the petitioner and management. In practice besides these two parties other were involved, e.g. the expert and coach. The coach isn't automatically a manager, the same applies for the expert. Though they aren't always managers, the theoretical assumption have been made that the success factors for management also apply for NedTrain's coaches and experts.

Third limitation is the choice for the qualitative research method. A quantitative research method could provide more evidence for causal relationships between the presence of success factors in the process and a lower lead time. This research was an in-depth assessment of the idea management process and its success factors in a railroad maintenance company. Because of the type of organization used for this empirical research, it is hard to use the results and

conclusions and apply them on other idea management processes of other type of organizations.

Last limitation is about the influencing factor of creative archetypes for managers and petitioners. The theory describes different types of managers and petitioners. Some types of managers have a negative influence on the process. For the different type of petitioners, different types of management is required. This success factor was mentioned in the theoretical framework but left outside in the analysis. Though the creative archetypes can form an influence on the idea management process, this has been left out of consideration.

5.4 Future research

From the mentioned limitations in the previous paragraph, different opportunities for future research can be extracted . This paragraph discusses three different approaches for future research.

One of the formulated limitations was that this research focuses on assessing the idea management process and its success factors and not on the willingness of the employee to intrapreneur. Though the petitioner only a part forms of the content of this research, the willingness of the petitioner to intrapreneur could be a research on its own.

Second, the method of this research is a case study, containing eight cases. These eight cases have been analyzed in a qualitative research. A future research that can be designed is a quantitative research in which hundreds of ideas are analyzed. In this way, possible causal relationships between the idea management process and the presence of success factors can be found.

Last, according to different articles different types of petitioners and different types of managers have its effect on the idea management process. These types can be measured by taking psychological tests. These creative archetypes and their influence on the idea management process can be subject of future research. The different psychological tests are possible tools that can be used.

References

Amabile, T.M. (1983) *The Social Psychology of Creativity.* New York: Springler-Verlag.

Amabile, T.M., Gryskiewicz, S.S. (1989). The creative environment scales: Work environment inventory. *Creative Research Journal,* 2, 231-253.

Amabile, T.M. (1996). *Creativity in Context.* Boulder, CO: Westview.

Axtell, C.M., Holman, D.J., Unsworth, K.L., Wall, T.D., Waterson, P.E., Harrington, E. (2000). Shopfloor innovation: Facilitating the suggestion and implementation of ideas. *Journal of occupational and Organizational Psychology,* 73, 265-285.

Babbie, E. (2004). *The practice of Social Research.* Belmont: Wadsworth/ Thomson Learning.

Berelson, B.R. (1952). *Content Analysis in Communication Research.* New York: Hafner.

Boeddrich, H.J. (2004). Ideas in the Workplace: A New Approach Towards Organizing the Fuzzy Front End of the Innovation Process. *Creativity and Innovation Management,* 13(4), 274-285.

Brem, A., Voigt, K.I., (2007). Innovation management in emerging technology ventures – the concept of an integrated idea management. *International Journal Technology, Policy and Management,* 7(3), 304-321.

Bunce, D., West, M.A. (1994) Changing work environments: Innovative coping responses to occupational stress. *Work and Stress,* 8, 319-313.

Cooper, R.G., Edgett, S.J., Kleinschmidt, E.J. (2002). Optimizing the Stage-Gate process: what best-practice companies do – I. *Research –Technology Management, September-October,*21-27.

Cooper, R.G., Edgett, S.J., Kleinschmidt, E.J. (2002). Optimizing the Stage-Gate process: what best-practice companies do – II. *Research –Technology Management, November-December,43-49.*

Cooper, R.G. (2008). The Stage-Gate Idea-to-Launch Process-Update, What's New and NexGen Systems. *Journal Product Innovation Management,* 25(3), 213-232.

Damanpour, F. (1991). Organizational innovation: A meta-analysis of effects of determinants and moderators. *Academy of Management Journal,* 34, 555-590.

Davis, G.A. (1989) Testing for creative potential. *Contemporary Educational Psychology,* 14, 257-274

Desouza, K.C., Awazu, Y., Jha, S., Dombrowski, C., Papagari, S., Baloh, P., Kim, J.Y. (2008). Customer driven innovation: to be a marketplace leader, let your customers drive. *Research-Technology Management,* May-June, 35-44.

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

Flynn, M., Dooley, L., O'Sullivan, D., Cormican, K. (2003). Idea management for organizational innovation. *International Journal of Innovation Management,* (7)4, 417-442.

Gaspersz, J. (2002). *Concurreren met creativiteit. De kern van innovatiemanagement.* Amsterdam: Pearson Education.

Khurana, A., Rosenthal, S.R. (1998). 'Towards holistic "front ends" in new product development'. *Journal of Product Innovation Management,* 15, 57-74.

Kijkuit, B., van den Ende, J. (2007) The organizational life of an idea: integrating social network, creativity and decision-making perspectives. *Journal of Management Studies,* 44(6), 863-882.

King, N., Anderson, N. (1995). *Innovation and change in organizations,* London: Routledge.

Koen, P.A., Ajamian, G.M., Boyce, S., Clamden, A., Fisher, E., Fountoulakis, S., Johnson, A., Puri, P., Seibert, R. (2002). Fuzzy Front End: effective methods, tools and techniques. In P. Belliveau, Griffin, A., Somermeyer, S. (Ed.). *The PDMA toolbook for new product development.* (pp. 5-36). New York: John Wiley & Sons.

Martindale, C. (1989). Personality, situation and creativity. In Glover, J.A., Ronnings, R.R., Reynolds, C.R. (Eds.), *Handbook of Creativity* (pp. 211-232). New York: Plenum.

Maslow, A.H. (2000). *The Maslow Business Reader*. New York: John Wiley & Sons.

Oei, P., Kraan, K., Vaas, F. (2010). Naar een Wetenschappelijke onderbouwing van Sociale Innovatie. *Tijdschrift voor HRM,* 1, 74-100.

Oldham, G.R., Cummings, A. (1996). Employee creativity: Personal and contextual factors at work. *Academy of Management Journal,* 42, 403-419.

Tidd, J., Bessant, J., Pavitt, K. (2005) *Managing Innovation. Integrating technological, market and organizational change.* Chichester: John Wiley & Sons.

Twiss, B. (1992) *Managing Technological Innovation.* London: Pitman.

Van Dijk, C., Van den Ende, J. (2002). Suggestion systems: transferring employee creativity into practicable ideas. *R&D Management,* 32(5), 387-395.

Vandenbosch, Saatcioglu, A., Fay, S. (2006). Idea management: a systematic view. *Journal of Management Studies,* 43(2), 259-288.

Verschuren, P., Doorewaard, H. (1995). *Ontwerpen van een onderzoek.* Utrecht: Uitgeverij LEMMA BV.

Von Stamm, B. (2001). *Managing Innovation, Design & Creativity.* Chichester: John Wiley & Sons.

Voorendonk, R. (1998) *Creativiteit en Management.* Schoonhoven: Academic Service.

West, M.A., Farr, J.L. (1990). Innovation at work. In West, M.A., Farr, J.L. (Ed.), *Innovation and creativity at work* (pp. 3-13). Chichester: John Wiley & Sons.

Yin, R. K. (2003) *Case study research: design and methods (Third ed.).* Thousand Oaks: Sage Publications.

Appendix A - Management samenvatting (in Dutch)

Ideeën management gaat om het genereren van ideeën, blijven volgen van deze ideeën en uiteindelijk selecteren of afwijzen, om zo een helder overzicht te creëren van alle innovatieprojecten van de organisatie. NedTrain heeft een ideeën management systeem ontwikkeld, 'MijnIdee', waar alle medewerkers op de werkvloer ideeën kunnen registreren die de producten of processen van NedTrain kunnen verbeteren. Het ideeën management proces van NedTrain bestaat uit zeven stappen, deze focussen zich op registreren, ontwikkelen en selecteren van ideeën. NedTrain heeft de overtuiging dat om 'best in class' te worden, de beste ideeën van de werkvloer in praktijk moeten worden gebracht.

Introductie

Vanaf het moment dat NedTrain 'MijnIdee' lanceerde, mei 2007, tot het begin van dit onderzoek, oktober 2009, zijn er 2569 ideeën geregistreerd, waarvan er 506 zijn geimplementeerd, 827 afgewezen en 1236 nog liepen. De gemiddelde doorlooptijd was 15 weken. De afdeling ideeënmanagement merkte op dat het aantal lopende ideeën in het systeem toenam en dat een groot deel van deze ideeën inactief waren. De afdeling ideeënmanagement heeft de ambitie om een ideeënmanagement proces te creëren dat een continue doorstroom van ideeën kan verwerken. Doelstelling van dit onderzoek is als volgt geformuleerd: 'het creëren van een uitvoerige waardering van het ideeën management proces, van het moment van genereren tot het moment van implementeren of afwijzen. Doel hiervan is om NedTrain te voorzien van aanbevelingen die leiden tot het verbeteren van het proces.

Theoretisch kader

Om een uitvoerige waardering te kunnen geven aan het ideeën management proces van NedTrain is het belangrijk om inzicht te verkrijgen in het concept 'ideeënmanagement', de betrokken spelers én verschillende elementen of omstandigheden die bijdragen aan een functionerend proces. De literatuur van verschillende wetenschappers zijn gebruikt om een model te ontwikkelen. Dit model onderscheidt het proces in drie fasen, genereren, ontwikkelen en selecteren. De twee grote spelers in het proces zijn management en de indiener van het idee. Er zijn verschillende succes factoren die gerelateerd zijn aan het ideeën management proces, het management of de indiener. De tien succes factoren voor het proces zijn: strategische

richtlijnen, systematische structuur, verschil in type ideeën, voldoende resources, de plek van verzameling, aanmoediging, duidelijke voorkeur, mogelijkheid om verschillende functies te benaderen, ruimte om fouten te maken en verbintenis met regels. De drie succes factoren die gerelateerd zijn aan het management zijn, betrokkenheid van hoger en midden management, een hoog niveau van integratie en coördinatie tussen verschillende functies en management archetypes. Ook de indiener heeft drie succes factoren die aan hem gerelateerd zijn, terugkoppeling, transparantie en indiener archetypes.

Methodologie

Om het ideeënmanagement proces van NedTrain te kunnen waarderen, zijn er twee verschillende methodes gebruikt, de content analyse en de case study. De content analyse is een methode dat informatie genereert uit documenten, media en realiteit. De project beschrijvingen en de status van 971 ideeën zijn verzameld uit het systeem 'MijnIdee' om deze analyse uit te voeren. Alle ideeën zijn gecodeerd aan de hand van een codeerschema, om zo inzicht te verkrijgen in de manier waarop verschillende ideeën door het proces bewegen. Acht ideeën zijn gebruikt voor de case studies. Drie verschillende analyses zijn uitgevoerd, de within-case analyse, de cross-case search for patterns en de between-group analyse (Eisenhardt, 1989). De within-case analyse betreft een uitgebreide uiteenzetting van elke case. De cross-case search for patterns gaat om het selecteren van groepen of dimensies, om vervolgens te zoeken naar overeenkomsten binnen de groepen. De verschillende dimensies in dit onderzoek zijn: geimplementeerde ideeën, lopende ideeën en afgewezen ideeën. De laatste analyse die is uitgevoerd is de between-group analysis en gaat om het vergelijken van patronen, gevonden in de voorgaande analyse, met de andere dimensies. Deze analyses leiden tot een waardering van het ideeeën management proces van NedTrain.

Resultaten

De conceptual analyse geeft inzicht in de manier waarop verschillende ideeën door het proces bewegen. De ideeën zijn opgesplitst in idee categorie (primair, secundair en tertiair), type idee (product, proces en sociaal) en de scope (lokaal of NedTrain breed). De resultaten van deze conceptual analyse laten zien dat er geen significante verschillen zitten tussen het type en scope van ideeën en hun doorlooptijd. In de categorieën van de ideeën zit wel een significant verschil.

De tertiare ideeën hebben een significant lagere doorlooptijd dan de primaire en secundaire ideeën. De alle ideeën geldt dat in de stappen ‘delen met collega’s’ en ‘delen met expert’ de meeste openstaande ideeën staan.

Verschillende patronen verschenen in de drie dimensies waar de acht cases in waren verdeeld (geimplementeerde ideeën, lopende ideeën en afgewezen ideeën). Tussen de dimensies waren verschillen op basis van de rol van de coach, de rol van de expert en van de beslisser. In de dimensie van de geimplementeerde ideeën was de coach in staat om de expert en de beslisser benaderen en hen vanaf het begin te betrekken in het project. Dit patroon was niet aanwezig in de andere twee dimensies. Er bestonden ook verschillen in de complexiteit van het idee en de ontwikkeling van het idee op het moment dat het geregistreerd werd.

Conclusies en aanbevelingen

De zojuist beschreven methoden en resultaten leiden tot zeven conclusies en vier aanbevelingen. De eerste conclusie is dat NedTrain’s klassieke vorm van ideeën management voornamelijk ideeën aantrekt die procesinnovaties en verbeteringen binnen de organisatie als doel hebben. Deze vorm van ideeënmanagement leidt zelden tot radicale innovaties voor nieuwe producten of processen. Een tweede conclusie die getrokken kan worden is dat verschillende typen ideeën op eenzelfde manier door het proces bewegen. Er zijn geen significante verschillen tussen de typen ideeën, de scope van ideeën en hun doorlooptijd in het proces. Derde conclusie is dat de coach essentieel is voor het betrekken van de expert en de beslisser in het ideeënproject. De vierde conclusie vormt een aanvulling de derde conclusie, de coaches ervaren het vaak als een probleem om de expert en de beslisser te benaderen. Twee aanbevelingen, die voortkomen uit deze twee conclusies, zijn om coaches aan te wijzen in ook de hogere lagen van de organisatie en om de expert en beslisser eerder in het process te betrekken. Een vijfde conclusie is dat experts en beslissers nauwelijks betrokken zijn in het ideeën management proces van NedTrain. Een aanbeveling die daarom gedaan wordt is om alle afdelingen die kunnen optreden als experts of beslissers bewust te maken van hun rol in het ideeën management proces. Laatste conclusie is dat de verschillende verantwoordelijkheden van de verschillende partijen die betrokken zijn in de verschillende cases vaak onduidelijk waren. Een belangrijke aanbeveling is dan ook om alle verantwoordelijkheden van alle

betrokken partijen in het ideeën management proces, uit te schrijven en deze door te communiceren daar de betreffende partijen.

Limitaties en vervolgonderzoek

De eerste limitatie is dat de bereidheid van de medewerkers van NedTrain om te participeren in het ideeën management proces buiten beschouwing is gelaten. Dit hoewel het proces afhankelijk is van de bereidheid van de medewerker om deel te nemen. Een tweede limitatie is dat de literature enkel spreekt van twee spelers in het proces, het management en de indiener. Maar de coach, zoals beschreven in dit onderzoek, is niet automatisch ook manager. Dit zelfde geldt ook voor de expert. Derde beperking is de keuze voor een kwalitatief onderzoeksmethode. Een kwantitatief onderzoekmethode zou meer bewijs kunnen leveren voor een causale relatie tussen de aanwezigheid van succes factoren in het proces en een lagere doorlooptijd. De laatste limitatie het betrekking op de verschillende archetypes. Deze succes factoren werden genoemd in het theoretisch kader maar zijn verder buiten beschouwing gelaten. Naast de limitaties zijn er drie onderwerpen voor eventueel vervolgonderzoek. Ten eerste, hoewel de indiener slechts een onderdeel vormt van dit onderzoek, de bereidheid van de indiener om een intrapeneur te zijn zou een onderzoek op zich kunnen zijn. Daarnaast zou een toekomstig onderzoek ontworpen kunnen worden als een kwantitatief onderzoek waarin honderden ideeën geanalyseerd zouden kunnen worden. Causale verbanden tussen het ideeën management proces en de aanwezigheid van succes factoren zouden mogelijk aangetoond kunnen worden. Laatste onderwerp voor eventueel toekomstig onderzoek is de verschillende types indieners en managers en hun invloed op het proces. Deze types kunnen gemeten worden door het afnemen van psychologische testen.

Appendix B – Table of responsibilities

Process	Involved									
	Head Ideamanagment									
		Ideamanager local								
			Ideamanager central							
				Ideacoach						
					Executive employee					
						employee				
							Assesor			
								Decisionmaker		
									Backoffice	
										Employee P&O
Hand in new idea					I	E				
Testing the idea to rules		R	E			I				
Decission about local/central handeling		E				I				
Assigning a coach (local)		E				I				
Assigning a coach national netwerk			E			I				
Share idea with Collegues		I	I	E	I	R				
Decission about continuing		C	C	E		R				
Share idea with expert		I	I	E		R				
Decission about continuing		C	C	E		R				
identify assesor en desicionmaker		C	C	E		C				
Critisize the idea				I		I	E	I		
Decission about continuing				E		R	C			
Decide about the idea		I		I	I	I	C	E		
Decide about who will implement					I	I		E		
adressing standard reward of 75 euro				E	C	I				
process reward in SAP										R/E
adressing extra reward		C	C	C	E	I				
Implement the new idea				I		I		E		
Assign 'MijnIdee' authorization	E		R						R	

R – Responsible – takes care of execution
E – End responsible for the results
C – Consult – Must be consulted
I – Inform- Must be informed

Appendix C - Interview protocol (in Dutch)

Introductie:

- Wanneer nodig voorstellen J.J. Elskamp
- Onderzoek naar ideeenmanagement voor afstuderen Universiteit Twente
- Focus op 'MijnIdee'
- Interviews focussen op process en omstandigheden rond ingediende processideeen die zijn ingediend na 1 januari 2009 en voor 1 juli 2009.
- Quotes kunnen worden gebruikt in het onderzoek, zonder naam en toenaam.
- Achteraf uitgewerkt interview wordt opgestuurd ter goedkeuring.
- Duur is maximaal 60 minuten en wordt opgenomen op voicerecorder.
- Vragen vooraf?

Verifieren rol:

- Volgens de gegevens in 'MijnIdee' was u betrokken bij idee X in de rol van Y, is dit juist?

Beschrijving idee:

- Kunt u kort het idee beschrijven?

Procesverloop van idee X per stap:

- wie waren er betrokken?
- welke keuzes zijn er gemaakt en waarom?
- wat waren gemaakte afspraken?
- Hoe vond u deze stap gaan? (plus- en minpunten)

Algemene evaluatie:

- Hoe heeft u het hele proces ervaren?
- Zijn er volgens u aspecten in het proces die verbeterd kunnen worden? (de verschillende stappen, invulling van de verschillende rollen)
- **Indien afgesloten:** Wat zijn de belangrijkste oorzaken geweest waarom dit idee succesvol/niet succesvol is afgerond?
- **Indiener:** Zou u in de toekomst opnieuw een idee indienen?

opmerkingen:

- Zijn er nog vragen of opmerkingen die u zelf nog wilt maken?

Afsluiting

Hartelijk dank voor uw tijd en medewerking aan dit onderzoek! Binnen enkele dagen ontvangt u de uitwerking van dit interview in uw e-mail, wilt u deze aandachtig doorlezen en eventuele op- of aanmerkingen terug e-mailen? **(vraag e-mailadres)**

Appendix D - E-mail send to all the interviewees (in Dutch)

Datum: 26-04-2010

Onderwerp: Uitwerking interview onderzoek 'MijnIdee'

Beste …,

In de afgelopen periode heb ik verschillende mensen geinterviewd voor mijn onderzoek naar 'MijnIdee'. Ook met jou heb ik een prettig gesprek gehad en zoals beloofd zou ik het gesprek uitwerken en naar je opsturen. De uitwerking van ons gesprek vind je in de bijlage. Mijn vraag is of je het document rustig wilt doorlezen en wanneer er fouten in staan deze fouten terug e-mailen naar mij. Uiteraard zal ik je op de hoogte houden van de uiteindelijke uitkomsten van het onderzoek. Mocht ik geen e-mail terug ontvangen van je, dan ga ik er vanuit dat het gesprek goed is uitgewerkt!

Met vriendelijke groet,

Jan Jaap Elskamp

Stagiair

Afdeling Creatieve Bedrijfsvoering

Gebouw LKT 3 06-41009709

Postbus 2167 2

3500 GD Utrecht http:/www.nedtrain.nl

Appendix E - Table with lead time per workflow step for different idea types

Idea type (product/process/social)	Workflow step	Open/ Closed idea	Mean	N	Std. Deviation
process	Register	closed	122,3	4	122,356
	Checking	open	255,1	14	63,908
		closed	95,61	141	86,406
	Sharing	open	259,7	198	48,839
		closed	150,7	57	89,321
	Expert	open	255,4	100	48,000
		closed	100,7	54	72,154
	Criticizing	open	239,6	49	71,013
		closed	131,7	27	80,034
	Decision	open	238,3	18	45,138
		closed	120,8	8	33,303
	Implementation	open	249,4	37	58,292
		closed	92,79	179	72,718
product	Checking	open	242,0	3	86,000
		closed	71,69	13	66,422
	Sharing	open	226,3	7	48,777
		closed	56,33	3	57,073
	Expert	open	276,8	9	37,818
		closed	39,00	5	31,812
	Criticizing	open	278,2	6	40,892
		closed	110,8	8	66,919
	Decision	closed	15,50	2	2,121
	Implementation	open	283,0	1	.
		closed	116,3	8	66,523
social	Checking	open	310,0	1	.
		closed	114,8	4	114,156
	Sharing	open	252,8	4	34,413
		closed	136,0	1	.
	Expert	open	214,0	1	.
		closed	113,5	2	91,217
	Criticizing	closed	159,0	2	69,296
	Implementation	open	328,0	1	.
		closed	114,0	2	159,806

Appendix F - Table with lead time per workflow step for different idea categories

Idea category (primary/secondary/tertiary)	Workflow step	Open/ Closed idea	Mean	N	Std. Deviation
primary	Register	closed	7,00	1	.
	Checking	open	244,1	7	56,375
		closed	111,9	42	95,090
	Sharing	open	274,1	90	51,541
		closed	131,7	29	98,886
	Expert	open	262,5	59	50,698
		closed	101,8	33	77,987
	Criticizing	open	239,5	27	83,750
		closed	134,4	13	76,443
	Decision	open	257,0	6	46,588
		closed	114,0	1	.
	Implementation	open	250,1	11	68,145
		closed	100,0	70	71,689
secondary	Register	closed	160,7	3	116,625
	Checking	open	286,4	7	67,764
		closed	94,98	62	81,880
	Sharing	open	250,8	86	43,871
		closed	182,9	20	78,460
	Expert	open	249,5	35	41,395
		closed	97,33	12	60,985
	Criticizing	open	246,7	21	52,555
		closed	138,6	13	86,200
	Decision	open	216,2	9	35,773
		closed	121,7	7	35,850
	Implementation	open	256,2	21	55,961
		closed	88,73	96	72,586
tertiary	Checking	open	223,3	4	65,896
		closed	79,30	54	80,200
	Sharing	open	234,7	32	40,097
		closed	118,3	12	64,442
	Expert	open	251,8	16	47,343
		closed	83,44	16	66,926

	Criticizing	open	251,7	7	57,218
		closed	110,0	11	65,198
	Decision	open	267,3	3	47,606
		closed	15,50	2	2,121
	Implementation	open	244,1	7	56,855
		closed	97,74	23	80,374