

MASTER

Corporate entrepreneurship and innovation at Royal IHC

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Award date:
2016

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**Corporate entrepreneurship and innovation
at Royal IHC**

Date: 26-06-2016

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In partial fulfilment of the requirements for the degree of

**Master of Science
in Innovation Management**

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Management summary

This document describes the master thesis research project that is conducted in cooperation with Royal IHC. IHC is an international operating cooperation with over 3000 employees worldwide. The core business is to develop and build equipment for the dredging, mining and offshore industry. The product range includes fully integrated systems such as high tech vessels for dredging, cable laying, deep sea mining and wind farm installation, and advanced components such as dredging pumps, winches, pile driving equipment and pipe lay equipment. The products delivered by IHC form the heart of operations of their clients, coming up with continuous product innovation is therefore crucial for the survival of the company.

The focus of this research project is on solving a practical problem that is expressed in the management question. The problem relates to the perceived low innovation performance and the lack of entrepreneurial activity in the organization. This problem is expressed in the management question that forms the start point of this research:

MQ: What should be done to stimulate entrepreneurial behavior of employees in order to increase innovation performance?

In addition to the management question a series of research questions is formulated. These questions are specifically aimed at guiding the quantitative survey research. Answering these question could provide the needed insights that help formulate a proper answer to the management question. The research questions are formulated as follows:

RQ 1: Do the organizational antecedents of corporate entrepreneurship contribute to innovation performance?

RQ 2: Does external orientation contribute to innovation performance?

RQ 3: Are there interaction effects between the independent variables 'management support', 'work discretion', 'time availability', 'rewards & reinforcement', 'risk taking' and external collaboration?

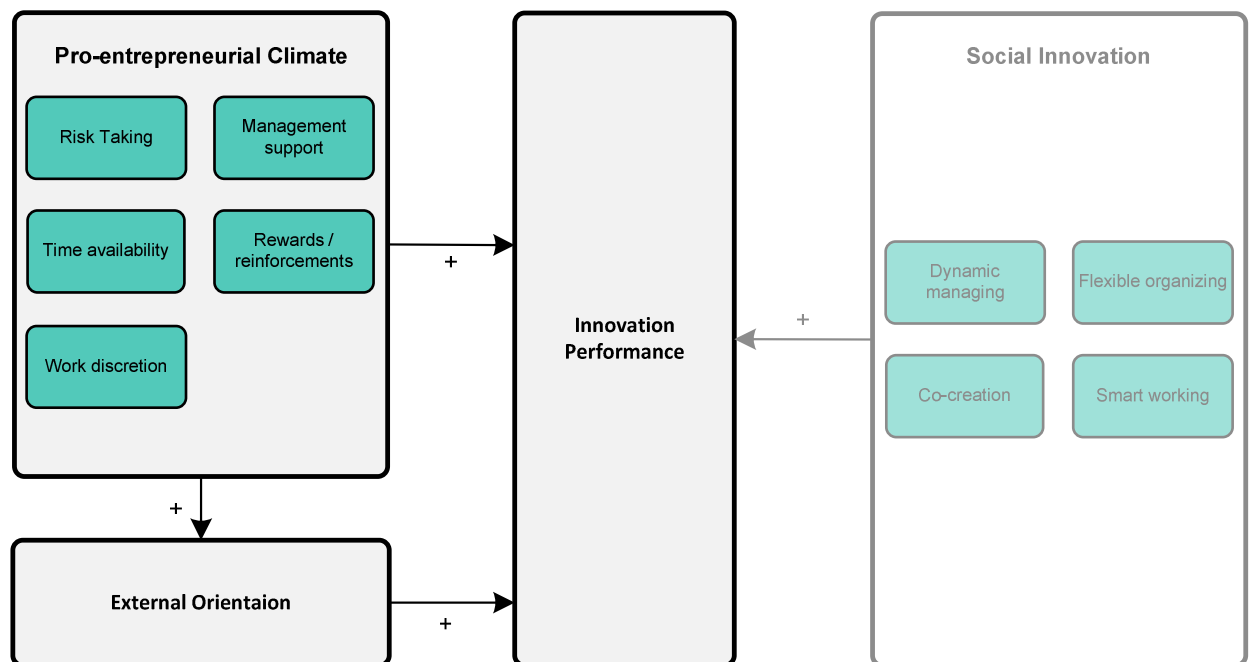
Theoretical background

The main subject is corporate entrepreneurship and how its organizational antecedents relate to innovation performance. Besides the organizational antecedents of corporate entrepreneurship also external collaboration is included as a determinant of innovation performance because at IHC this is seen as a major contributor to innovation performance and it is widely supported in existing literature that innovation can benefit from an open approach towards clients and suppliers.

Based on existing literature a set of variables are defined that represent a pro-entrepreneurial culture. These variables are;

- Management support: The extent to which management supports entrepreneurial activities.
- Time availability: The amount of slack time available to employees to spent on developing creative initiatives.
- Rewards & reinforcements: The extent to which rewards are used to stimulate entrepreneurial behavior.
- Risk taking: The extent to which risk taking is tolerated within the organization.
- Work discretion: The level of autonomy that employees have to decide how they perform their work.

Scoring high on these variables would mean that the organization has a pro-entrepreneurial culture, and having a pro-entrepreneurial culture is proposed to lead to higher innovation performance. The theoretical framework that is developed for this study is presented in the figure below.



Survey

To answer the research questions an electronic survey was sent to a total of 900 employees. 222 respondents submitted a complete response. The survey is aimed at the organization members who are actively involved in the execution of innovation projects, or the management of innovation projects. This includes middle management, higher management, and a part of the operational employees such as business developers, research and development engineers, project engineers, account managers, internal business consultants, market analysts etc.

The survey included multiple item measures for all variables. The raw data was computed to make it suitable for regression analysis. The innovation performance and external collaboration measures were computed to calculate the weighted average. The other

independent variables were loaded in a principal component analysis of which the extracted factors were exported for further analysis. Next a hierarchical multiple regression analysis was conducted that also included interaction terms of the independent variables. The results showed that management support, rewards & reinforcements and external collaboration have a significant effect on innovation performance. Out of the total of 15 interaction terms, 5 were found to be significant.

Interviews

The survey results on its own are difficult to interpret in a generic theoretical framework as this is a case study research. To understand how the quantitative data should be interpreted a series of semi-structured interviews were held, in order to get context to a case. The interview questions were based on the theoretical framework that was developed in the preparation of the research project. The interviews were transcribed and coded using descriptive and interpretative coding. Thereafter, qualitative data processing was used to extract meaningful information.

From the interviews it clear that many innovations at IHC are technology driven, and sometimes do not have a proper connection to the market. Further, the innovation strategy is mostly driven by risk control which does not sufficiently stimulate creativity according to some of the respondents. Although at IHC it is recognized that entrepreneurial behavior can increase innovation performance, the overall consensus is that at this moment it is not sufficiently implemented in the organization.

Conclusion & recommendations

To provide an answer to the management question, a set of practical recommendations was developed. Design principles following the CIMO logic (Denyer, Tranfield, & van Aken, 2008) were used to merge the information from the research findings, case study exploration and theoretical background into useful recommendations.

For IHC it is recommended to stimulate corporate entrepreneurship by the following interventions:

- Reinforcing management support towards entrepreneurial behavior.
- Facilitate high work discretion.
- Be receptive to risk taking.
- Stimulate external collaboration early in the innovation process.
- Align rewards & reinforcement systems with corporate entrepreneurship objectives.

These proposed interventions and their outcome are dependent on contextual factors of the organizational environment. It is therefore recommended that for each business unit a corporate entrepreneurship strategy is developed that meets the specific needs for that business unit.

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1. Introduction

This document describes the master thesis research project that was conducted in cooperation with Royal IHC. The main subject is corporate entrepreneurship and how it relates to innovation performance. The main objective of this research project is to develop knowledge that can be applied to improve innovation performance through stimulation of corporate entrepreneurship at IHC. For this study, corporate entrepreneurship is seen as a major driver of innovation in a corporate setting that incorporates all levels of the organization from top management to operational.

Literature research has shown that organizations are transformed from being bureaucratic institutions with rigid structures, to more dynamic systems with open boundaries (Chesbrough, 2003a; Schneider & Somers, 2006). These changes do not only influence the way of doing business, also the perspective of science on management practice is shifting (Chesbrough & Schwartz, 2007; Eisenhardt & Sull, 2001). The essence of this shift and the implications for management sciences is nicely captured by the following phrase: “*When the business landscape was simple, companies could afford to have complex strategies. But now that business is so complex, they need to simplify*” (Eisenhardt & Sull, 2001, p. 107).

In the pursuit of competitive advantage, innovation is believed to be a key contributor (O’Connor & Rice, 2001; Quintas, 2002). Innovation can be seen as a complex, non-linear process that connects technological knowhow, market opportunities and the abilities of the organization, with the goal of increasing their competitive advantage (Mothe & Link, 2002). In the modern business environment, increasingly more companies see the advantage of collaborating with external parties during the innovation process (Chesbrough, 2003b). As a result, it is the network of partners where the innovation is shaped instead of a single organization (Powell, Koput, & Smith-Doerr, 1996). Such a network is called an innovation network, and can be defined as a cooperation between two or more parties with the aim of improving the effectiveness of innovation (Ahuja, 2000; Chesbrough & Schwartz, 2007; Jenssen & Nybakk, 2013).

In this modern business environment, where innovation is driving competitive advantage more and more, the concept of corporate entrepreneurship is recognized as a successful strategy to facilitate innovation (Kuratko & Audretsch, 2013; Zahra, 1991). Corporate entrepreneurship is a broad field of research that ranges from corporate strategy (Kuratko, Ireland, & Hornsby, 2001) to individual behavior (Kuratko, Ireland, Covin, & Hornsby, 2005). This makes it a versatile source of information for managers who want to strengthen the innovation performance of their organization. It not only provides guidance on business strategy, it also provides useful insights for shaping an organization in which organizational members such as departments, teams and individuals can develop innovations.

Interaction between organization members that are part of the innovation network are most often human centered. Employees or managers represent their organization and interact with employees or managers of a different organization. At the moment of interaction human behavior will have a major influence on the transaction between two or more organizations. However, this single interaction is only a tiny part of the whole system; the effect of a single interaction cannot be regarded as insignificant. Because of the non-linear behavior, a small cause can have a large effect (*e.g.* the well-known butterfly effect). Each interaction between

two or more network members has the potential to trigger the emergence of a successful innovation. Therefore, human behavior that influences the interaction between network members may play a key role in the emergence of an innovation, and must be considered as an important aspect of the complex innovation process. The social aspects that are associated with the interaction of employees therefore plays a crucial role in the development of innovations (Van Doorn, Jansen, Van den Bosch, & Volberda, 2013; Volberda & van den Bosch, 2013, 2005). Recent research has shown that social aspects account for 50%-75% of the innovation success (Volberda & van den Bosch, 2013).

1.1 Company description

This research project is focused on solving a practical problem, the organization that is subject of this project is IHC. The project is guided by MTI Holland (MTI) which is part of IHC. MTI fulfilled an important role in the design of this research by providing a practical problem and allow this research to be completed in their organization.

IHC, as we know it today, finds its origin in the early 1940's when three independent shipyards decided to establish a partnership, some of these shipyards even have a history that goes back to the 16th century. Although each company remained independent, the partnership proved to be so successful that it led to the founding of IHC Holland NV. In the late 1980's IHC Holland acquired a shipyard called 'De Merwede', this formed the combination of IHC as it still exists today. During the period from 1990 till 2010, IHC further expanded due to several acquisitions and internal growth of the existing business units. Today IHC is an international operating cooperation with over 3000 employees worldwide. The core business is to develop and manufacture equipment for the dredging, mining and offshore industry. The product range includes fully integrated systems such as high tech vessels for dredging, cable laying, deep sea mining and wind farm installation, and advanced components such as dredging pumps, winches, pile driving equipment and pipe lay equipment. The products delivered by IHC form the heart of operations of their clients, therefore being a reliable partner and coming up with continuous product innovation is crucial for the survival of the company.

At this moment IHC has four strategic priorities: internationalization, growth, product and process development and internal and external cooperation. Annual investments in R&D of 2% of the revenue will safe guard the new product and process developments. Attraction of national and European funding from governments must further stimulate the innovative activities. Internal and external cooperation is stimulated by different programs, the different Product Market Combinations (PMCs) aim at strengthening the relationship with customers, and is reported to provide a better connection between solutions and customer needs.

Another program called "One IHC" is aimed at the internal cooperation of business units and employees. The program must ensure that processes and procedures are aligned so that internal communication between business units becomes more effective and efficient. The backbone of the program will be a companywide enterprise resource planning (ERP) system with central databases which will be operational in 2016 (IHC Merwede, 2012, p. 6).

As part of IHC Merwede, MTI is a knowledge center that provides services such as R&D, training and consultancy. With over 50 years of experience and approximately 60 staff

members MTI translates fundamental knowledge of dredging and mining into practical applications and equipment. Within IHC, MTI takes a leading position when it comes to innovation. Not only by providing fundamental knowledge, but also by providing innovation process management support; the innovative capacity of IHC is driven by MTI. The R&D activities supported by MTI cover a wide range including soil investigation, materials research, computational fluid dynamics, dynamic operations and corporate social responsibility. The majority of R&D activities are provided to the mother company IHC, but also third parties are served.

In the past years, IHC has been transforming from a network of cooperating business units towards a more integrated whole. In the old situation, tactical business units that have different specialties taking account for different markets. Each business unit was responsible for its own operations, and the whole was coordinated by an overarching hierarchical body. This structure can best be described as decentralized with a small central coordinating body (IHC Merwede, 2007, p. 9). The central body was mainly concerned with strategy formulation and dissipating of the strategy downwards through the hierarchy, while the business units were more focused on the execution of daily operations within the boundaries of the corporate strategy. By the introduction of the program “One IHC”, not only internal processes are aligned, also a new organizational structure is created that must represent a more integrated whole.

1.2 Research objective

This study has both an academic and practical contribution. First, this study attempts to provide applicable knowledge to solve a practical problem. By applying an integrated view on innovation performance, external collaboration and corporate entrepreneurship this research aims to identify organizational roadblocks and opportunities that will help to improve innovation performance through stimulation of corporate entrepreneurship at IHC.

From an academic perspective this study contributes to the existing body of literature by combining the theories of corporate entrepreneurship and external orientation and investigate how these constructs jointly contribute towards innovation performance in a technology driven industry. It appears that in the current literature the two concepts have followed their own path and although they have a common objective of stimulating innovation performance there has been limited attention given to the development of an integrated theory. This study attempts to explore how the constructs of corporate entrepreneurship and external orientation jointly influence the innovation performance in a technology driven industry.

1.3 Problem definition and research questions

The central problem definition of this research is an outcome of the interplay between theoretical background and the practical background of this case study at IHC. The management problem that this research will address is focused on enhancing the innovation performance by stimulating entrepreneurial behavior among organizational members. An in depth problem analysis has been performed that concluded with the formulation of a management problem and an associated management question. This question represents the main focus of the research, the management question reads as follows:

MQ: What should be done to stimulate entrepreneurial behavior of employees in order to increase innovation performance?

To provide an answer on the management question a theoretical framework is developed based on the corporate entrepreneurship assessment instrument (CEAI) as developed by Hornsby, Kuratko, & Zahra (2002). Five factors were found which describe internal aspects that can stimulate entrepreneurial behavior within the organization, these factors are management support, work discretion/autonomy, rewards/reinforcement and time availability and organizational boundaries (Hornsby et al., 2002). In addition to the CEAI, external collaboration is added to the theoretical framework as it is believed that this variable is an important contributor to innovation performance. Based on the theoretical framework a number of research questions is formulated. The first research question is:

RQ 1: Do the organizational antecedents of corporate entrepreneurship contribute to innovation performance?

To answer this question, the following sub questions are formulated:

RQ 1a: Does the organizational antecedent of corporate entrepreneurship 'work discretion' contribute to innovation performance?

RQ 1b: Does the organizational antecedent of corporate entrepreneurship 'management support' contribute to innovation performance?

RQ 1c: Does the organizational antecedent of corporate entrepreneurship 'time availability' contribute to innovation performance?

RQ 1d: Does the organizational antecedent of corporate entrepreneurship 'risk taking' contribute to innovation performance?

RQ 1e: Does the organizational antecedent of corporate entrepreneurship 'rewards and reinforcement' contribute to innovation performance?

The importance of the innovation network and external collaboration to the innovation process is described in the management dilemma, which is further elaborated on in the theoretical background section. The innovation network represents different external parties that influence the innovation process. These can be customers that articulate a certain need, suppliers who provide a new technology or partners who contribute to the development of innovations. Because of the important role of external parties in the innovation process, an external orientation is thought to have a positive effect on innovation performance. In addition, existing literature indicates that corporate entrepreneurship can have a positive influence on opportunity recognition. This leads to the following research question:

RQ 2: Does external collaboration contribute to innovation performance?

Having a high or low external orientation may also introduce moderating effects in the relationship of the organizational antecedents of corporate entrepreneurship and innovation performance. In addition, the organizational antecedents of corporate entrepreneurship may have interaction effects among them. To explore this potential interaction effect the following research question is formulated:

RQ 3: Are there interaction effects between the independent variables 'management support', 'work discretion', 'time availability', 'rewards & reinforcement', 'risk taking' and external collaboration?

1.4 Initial state of the research

The initial state of the research is defined by the outcome of the first step in which the research context and theoretical foundation were formulated. This was done by conducting a literature study, and selecting a practical case for investigation. During the literature study, a series of meetings were held with ICH that was selected to be the 'practical partner'. In these meetings, the theoretical findings were discussed in the practical context of the organization. The result of this approach was a true iterative process that enabled the development of both the theoretical framework, and to discover the practical management dilemma at the same time. Theoretical findings provided input for the practical discussion, which led to identification of certain managerial problems. These problems were then used to form the new direction for further literature research. This cycle has been repeated several times until the theoretical framework and practical framework converged to a satisfactory state in which proper aligned was achieved. The results of this first step of the research design were reported in the research proposal, which provided the rationale and direction to start the field research (Yin, 2009).

1.5 General research approach

The research project includes different phases, the first phase consisted of an exploration of relevant literature and the formulation of a practical problem statement. During the preparation phase of the research project an initial theoretical framework was developed to guide the problem analysis and the data collection. The central body of the research project is divided into a qualitative problem analysis and a quantitative survey research, both parts are complementary to each other. The results of these two research methods together will form the basis on which practical recommendations will be formulated. Reflecting the outcome of the quantitative survey against the findings of the literature study provides more insight into the antecedents of corporate entrepreneurship and the relation it has with innovation performance at IHC. Proof of this relationship is already found in existing literature, but there was no evidence of this in the practical context of the current case. The overall problem that will be addressed by this research is to investigate to what extent corporate entrepreneurship and external orientation contribute to innovation performance at IHC.

A series of interviews were held with managers of IHC to gain a thorough understanding of the management problem and the context in which the solution is to be designed. Since the research is concerned with soft aspects of the organization such as culture, employee behavior and social interaction, it is important to develop a proper understanding of the context in which the results are to be interpreted. Next a qualitative survey was conducted to gather data that will increase the level of detail on which the management problem is analyzed.

Both the interviews and the survey are based on the theoretical framework that is presented in the theoretical background section. Using the same theoretical framework for both the interviews and survey ensures that the results of both research methods are complementary. The data will be used to get a better focus on the problem, and off course a better focus on the solution. The research concludes with the formulation of recommendations that are derived from the findings and reflected against scientific literature.

1.5.1 Research strategy

During the solution design phase a process inspired by Brown (2008) was used. This process has a strong focus on iterative cycles, constantly evaluating possible solutions and coming up with improved alternatives. This strategy is helpful for explorative research that requires continuous learning and development of new insights along the way. A design project usually has three phases; inspiration, which provides the motivation for the search of a solution, ideation, which is the development and testing of ideas that might lead to a solution, and implementation, where the idea is translated to a feasible application (Brown, 2008). The three phases are interconnected by feedback loops, and overlap between the phases exist, see Figure 1.

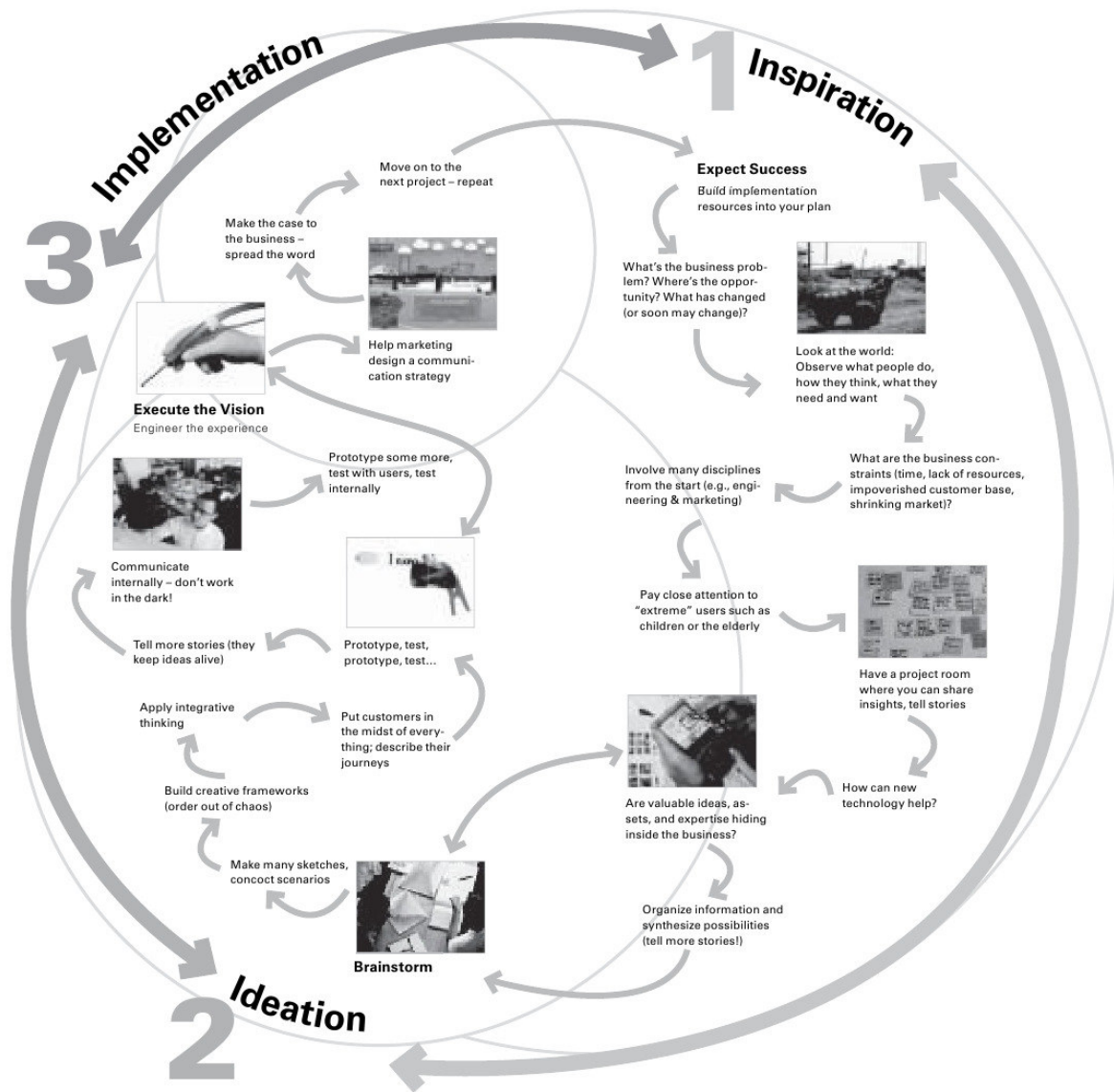


Figure 1 Design process after Brown (2008)

An integrated view and iterative approach was needed to guide the project through the design process, finding an overall solution is not a onetime effort. Once a feasible solution was selected, it was reflected upon and then be recycled or accepted.

The design process in this research project started by first focusing on a practical issue in the company. A qualitative case study exploration was conducted that provided all details of the management problem, which further guided the in depth investigation. The design process evolved when more data became available, the solution started taking shape as available and newly gathered knowledge from a theoretical perspective were applied to the practical problem, and new insights were developed. These new insights served as boundaries in which the design process towards a well-defined outcome will take place.

1.5.2 Research quality

Before validity and reliability can be evaluated, the research must be controllable; controllability can be achieved when all details on how the research is conducted are

described in such a way that it is replicable, and when the presented results are precise (van Aken, Berends, & van der Bij, 2007). To enhance the controllability of this research, all relevant documents such as transcriptions, coding schemes, notes and other documentation are archived. However, due to confidentiality some of these documents are only available for a limited group of people. Not only the controllability will be enhanced by these implications, it also provides the means to build reliability into the research.

Validity

In order to secure construct validity, data was gathered from multiple sources. The primary source is a series of interviews and a survey. In addition, two internal research reports provided by employees who participated in the research project were used as secondary data source. In Table 1 an overview of all information sources that were used in this research project is presented.

Table 1 Overview of data sources used in the research project

Information source	Application in research
Semi structured interviews	Define context of the research, explore how employees and managers stand towards the subjects that are under investigation.
Open interviews	Further definition of research context.
Electronic survey	Gather quantitative data.
Scientific literature	Source for theoretical constructs, measurement instrument and scientific evidence.
Observations	Developing a proper understanding of the organizational culture.
Expert session	Developing insights from experience of practitioners.
Internal research reports	Gain insight about managerial practices related to the subject of this research project.
Company website	General information.
Annual reports	Contextual information about company objectives, organizational structure and strategy.

1.6 Outline of report

After the introduction this reports continues with the theoretical background in chapter 2, the theoretical framework on which the field study is based is presented at the end of the chapter. The first part of the field study, survey research, is presented in chapter 3, followed by the interviews in chapter 4. The discussion of the results and the formulation of practical recommendations is presented in chapter 5. And the report finishes with the conclusion and reflection in chapter 6.

2. Theoretical background

The problem that is central in this research project is composed of three main themes. First theme is innovation. Increasing innovation performance is the objective of the management question.

The second theme is corporate entrepreneurship, which resembles a way of organizing that is expected to lead to more innovative output of the organization. Corporate entrepreneurship and innovation can be seen as two interconnected subjects. Corporate entrepreneurship is a very broad and diverse concept that is related to other domains of management science such as organizational learning, innovation processes, human behavior etc. Many scholars agree that the central theme of entrepreneurship is innovation. This may be present in different forms, such as renewal of existing products, markets, processes or services; or in the form of the creation of new products, markets, processes or services.

The third theme is external collaboration. Innovations that are developed from a technology push perspective are becoming less effective as it seems that there is a reasonable risk for a mismatch between a new product and the actual market demand. As presented in the problem diagnosis, for IHC it becomes more and more important to include external parties such as customers and suppliers in the innovation process. Enhancing the external collaboration during the innovation process is expected to increase the innovation performance.

2.1 Corporate entrepreneurship

Competitive advantage in the form of innovation can be a result of entrepreneurial behavior of employees that is stimulated when a pro-entrepreneurial climate is in place (Hornsby et al., 2002; Kuratko et al., 2005). Managers must engage in coordination and support of such an pro-entrepreneurial culture to ensure that entrepreneurial efforts result in successful innovations (Barringer & Bluedorn, 1999; Hornsby et al., 2002; Thornberry, 2003; Zahra, 1991). It is not just the entrepreneurial behavior of the employees that lead to innovation; organizational environment that shapes an appropriate climate is even more important (Zahra, 1991).

Corporate entrepreneurship can be initiated on the firm's strategic level. Organizing people and tasks in such a way that entrepreneurial behavior is enabled, requires the formulation of a corporate entrepreneurship strategy (Kuratko et al., 2001). A corporate entrepreneurship strategy is characterized by three main elements: entrepreneurial vision, pro-entrepreneurship organizational structure, entrepreneurial processes and behavior across the organizational hierarchy (Ireland, Covin, & Kuratko, 2009). Antecedents of entrepreneurial cognitions such as individuals' beliefs, values, and attitude towards entrepreneurship play an important role in shaping pro-entrepreneurial behavior (Ireland et al., 2009), on an individual level, corporate entrepreneurship is based on innovativeness, pro-activeness and risk taking behavior (Covin & Slevin, 1989). A corporate entrepreneurship strategy must therefore support entrepreneurial actions, reinforce those entrepreneurial actions with appropriate reward systems, encourage risk taking and tolerate failure (Kuratko et al., 2001).

Despite the individual attributes being important for corporate entrepreneurship, it is not the only thing that defines the entrepreneurial behavior in a corporate setting. A pro-entrepreneurial organizational structure forms the context in which entrepreneurial behavior is enabled. Such a structure can be described as organic and is characterized by decentralized decision making, low formality, wide span of control, process flexibility, free-flowing information networks, loose adherence to policy and rules, and expertise-based power distribution (Ireland et al., 2009). Therefore, stimulation of corporate entrepreneurship requires a redefinition of the organizations' strategy.

Different scholars agree that innovation is the most important determinant for 'entrepreneurial' organizations; innovation is at the heart of entrepreneurship and always present as driver of entrepreneurship (Covin & Miles, 1999). Lumpkin & Dess (1996) emphasize that the essential act of entrepreneurship is a new entry, which may be established in different forms such as; entering new markets with new or existing products; launch of a new firm as a startup or through corporate venturing (Lumpkin & Dess, 1996). Similar to the act of new entry, Covin & Miles (1999) have defined "rejuvenation and redefinition" as the core element of corporate entrepreneurship. This element is explained as renewal or redefinition of organizations, markets and/or industries. Covin & Miles (1999) present an integrated view on corporate entrepreneurship, which not only describes the entrepreneurial behavior of employees, but also the entrepreneurial behavior of the organization as a whole. They argue that corporate entrepreneurship allows an organization to respond properly to unanticipated developments in the business environment, and eventually leads to superior firm performance. In accordance with this, Ireland et al. (2009) provide the following definition: "We define CE [corporate entrepreneurship] strategy as a vision-directed, organization-wide reliance on entrepreneurial behavior that purposefully and continuously rejuvenates the organization and shapes the scope of its operations through the recognition and exploitation of entrepreneurial opportunity" (Ireland et al., 2009, p. 21). Other researchers elaborate on the positive influence of corporate entrepreneurship on company performance (Barringer & Bluedorn, 1999; Goodale, Kuratko, Hornsby, & Covin, 2011; Hornsby et al., 2002; Kuratko et al., 2001; Zahra, 1991).

The relationship between corporate entrepreneurship and firm performance has received significant attention in the scientific literature. Corporate entrepreneurship is found to result in increased diversity of products and markets, and ultimately leads to higher firm performance (Kuratko et al., 2001). This claim is supported by other researchers such as; Zahra & Covin (1995) who linked corporate entrepreneurship to increased profit and growth; Ahuja & Morris Lampert (2001) who state that corporate entrepreneurship leads to the creation of breakthrough inventions and wealth; and Zahra (1991) who state the corporate entrepreneurship is associated with financial performance and reduced systematic risk. While this research uses a broad concept of firm performance, the impact of corporate entrepreneurship on innovation performance is not always easy to derive.

2.1.1 Corporate entrepreneurship and external orientation

Covin & Miles (1999) present an integrated view on corporate entrepreneurship, which not only describes the entrepreneurial behavior of employees, but also the entrepreneurial

behavior of the organization as a whole. They argue that corporate entrepreneurship allows an organization to respond properly to unanticipated developments in the business environment, and eventually leads to superior firm performance. They identify a missing element in the corporate entrepreneurship theory as “rejuvenation and redefinition”. Based on the definition of corporate entrepreneurship Covin & Miles conceptualize four forms of rejuvenation and redefinition; sustained regeneration, organizational rejuvenation, strategic renewal and domain redefinition;

- *Sustained regeneration* is defined by continuously rejuvenation of new products, or continuously entering of new markets. It has a focus on the environment of the organization and it provides a basis for competitive advantage in the form of differentiation.
- *Organizational rejuvenation* is more focused on the altering of internal processes, structures and capabilities of the organization. The typical basis for competitive advantage provided by this form of corporate entrepreneurship is cost leadership (Covin & Miles, 1999).
- *Strategic renewal* translates into redefinition of the relationship of the organization and its environment; the industry, market and competitors.
- *Domain redefinition* stands for pro-active creation of a new product-market arena that others have not yet recognized, the typical competitive advantage is most associated by quick response.

Three out of the four forms of rejuvenation and redefinition as proposed by Covin & Miles (1999) have a strong emphasis on the environment of the organization. Further, the perspective of Covin & Miles (1999) also incorporates both the exploration and exploitation functions of an organization. Sustained regeneration and organizational rejuvenation may be associated with exploitative behavior and an emphasis on short term profits, while strategic renewal and domain redefinition are more associated with long term survival and explorative behavior.

With respect to explorative activities, increasingly more companies see the advantages of collaboration with external parties. This has led to a different way of how companies achieve successful innovations (Chesbrough, 2003b). In the past there was a strong believe described by Chesbrough (2003b) as: “If you want something done right, you’ve got to do it yourself”. This believe represents the traditional form of innovation, which is called the ‘closed model’. According to this model companies only utilized internal resources to generate ideas, develop new technologies, and commercialize new products or services (Chesbrough, 2003b). In the late 20th century, the effectiveness of the closed model proved to be limited (Chesbrough, 2003a). Due to the increase in knowledge workers and the higher mobility of those, it became more difficult for companies to control their internal knowledge base. In addition, the introduction of venture capital has created a completely new opportunity for doing business; ideas that were not picked up within the corporate boundaries could now be commercialized externally with the help of venture capital (Chesbrough, 2003b).

External collaboration is not only focused on a single transaction between two parties, rather it helps to strengthen the internal competences of the organization (Powell et al., 1996).

From the definition of open innovation, it becomes clear that the exchange of knowledge with external parties is the base for successful implementation of open innovation. Being dependent on external sources for innovative ideas or external parties for successful commercialization of your own ideas means that inter-firm collaboration becomes more and more important. In a rapid expanding and knowledge intensive industry, the locus of innovation lies within the network of incumbents, organizations and research institutions (Powell et al., 1996), e.g. the network of partners is shaping the innovation instead of a single organization. External collaboration increases the knowledge base that is available to the organization (Jenssen & Nybakk, 2013).

2.2 Management innovation / social innovation

Developing a pro-entrepreneurial climate requires a change in how organizations are managed. Management innovation is the invention and implementation of management practices, processes and structures (Birkinshaw, Hamel, & Mol, 2008). It is also known as social innovation that refers to the management change processes which include a variety of human centered interventions such as organization restructuring, smart working, stimulation of coworkership and creation of new management skills (dynamic managing) (Volberda & van den Bosch, 2013). The success determinants of innovation depends for 50%-75% on social innovation (Volberda & van den Bosch, 2013), meaning that a big gain is to be achieved when the social capital of the organization is increased.

Although management innovation and social innovation are relative new streams in today's literature, they show resemblance with literature on socio-technical systems which goes back to the 1950's (Trist, 1981). During a study in the English coal mining industry, researchers found that a social structure build around small autonomous workgroups had a strong impact on productivity (Jaques, 1951). At that time, viewing an organization as a social system was a first, and led to the emergence of the socio-technical systems theory (Cummings, 1978). While the original theory is mainly concerned with the 'design of work', over time, it has evolved in a broader research field that includes socio-technical systems theory, socio-technical systems design, socio-technical systems change and development processes (van Eijnatten, Shani, & Leary, 2008). Central to this field of research is the development and transformation of organizations that are focused on the interplay between technical and social systems (Cummings, 1978; Shani, Eijnatten, & Leary, 2005; Shull, 1977). With respect to the literature on management innovation and social innovation, the overlap with the socio-technical systems theory lies in the focus on the social aspects.

While the current study is aimed at corporate entrepreneurship, it also addresses the implications of social innovation literature. Focus of this research project is on the soft aspects of innovation (organizational design, human behavior, culture etc.) instead of the hard aspects (processes, technology etc.). Designing suitable organizational structures and applying management practices that allow employees to behave more like entrepreneurs with the ultimate goal of increasing the innovation performance does require a proper implementation of management innovation. Understanding the theory of socio-technical systems may be helpful to implement findings of the current research in the bigger whole of the organization. Ultimately, it is the tasks of the management team to shape an organization

in which social capital is enhanced so that technology, knowledge and processes are optimally utilized (Volberda & van den Bosch, 2005). Boosting the entrepreneurial culture within an organization may therefore be seen as a practical implication of management innovation, while the socio-technical theory may provide useful guidance for implementation of management innovation on a higher level of abstractness.

2.3 Innovation

Looking with a broad perspective, innovation can be seen as a complex, nonlinear process that connects technological knowhow, market opportunities and the abilities of the organization with the goal of increasing their competitive advantage (Leifer, O'Connor, & Rice, 2001; Mothe & Link, 2002). The process is associated with technology discontinuities; it is oscillating between periods of dynamic events with radical change, and periods of incremental innovation that extends or complements an existing product line (Dunlap-Hinkler, Kotabe, & Mudambi, 2010), the time scale on which this process evolves may be dependent on contextual factors such as product lifecycle time.

In order to secure a certain level of innovative output an organization must be involved in explorative behavior, which is contrasted by exploitative behavior (March, 1991). These two orientations represent two primary functions of an organization. March has defined that exploitation is represented by “refinement, choice, production, efficiency, selection, implementation, execution” (March, 1991, p. 72); and exploration by “search, variation, risk taking, experimentation, play, flexibility, discovery, innovation” (March, 1991, p. 72). In other words, exploration is concerned with the ‘pursuit of new knowledge’, and exploitation is ‘the use and development of things already known’ (Gilsing, Nooteboom, Vanhaverbeke, Duysters, & van den Oord, 2008; Lavie, Stettner, & Tushman, 2010). Balancing the two activities is crucial for a firm’s survival in a dynamic environment (March, 1991), but this introduces some challenges for strategic management. First of all, resources are most often constraint, thus companies have to decide to allocate their resources to exploring activities or exploiting activities. Second, exploitation is associated with inertia and stability while flexibility and change are associated with exploration. Third, exploitation results in short term financial returns with low risk, whereas exploration is needed to discover new knowledge, new markets and opportunities to secure ground for future economic gains (Lavie et al., 2010).

According to Garud, Tuertscher, & Van de Ven (2013) the innovation process roughly covers three main phases; 1) invention, the emergence of an idea; 2) development, the elaboration of the idea; 3) implementation, acceptance of the idea by the end users. First, a novel idea must emerge; a long and unclear period of conception precedes the emergence of the initial idea or break through invention (Ahuja & Morris Lampert, 2001). Next this idea must be developed, covering all activities needed to transform the idea to the market place including engineering, manufacturing, marketing and setting up distribution networks. This process requires the exploration of a large number of different paths, often leading to set backs before a successful result is reached. It involves a large number of different stakeholders, and true progress is difficult to measure. Finally, the developed idea must receive wide acceptance to become implemented as a value added novelty on the market

place. This process is not simply described by the diffusion of the idea, but rather is an iterative process of integrating the novel idea with what is already known (Garud et al., 2013). It can be recognized as the opportunity identification, which is defined as making the match between an unfulfilled market need and a solution that satisfies that need (O'Connor & McDermott, 2004; O'Connor & Rice, 2001).

For all phases as described by Garud et al. (2013) it is found that they do not unfold in an orderly manner, nor can they be described as chaotic. Instead, the whole innovation process is dominated by patterns of divergent and convergent behavior (Dunlap-Hinkler et al., 2010). This is supported by O'Connor & McDermott (2004) who stated that opportunity recognition may be preceded by idea generation, or it can be a trigger for idea generation. For example when an unfulfilled market need is identified, the idea generation phase may provide a technological solution. This behavior makes that innovation processes are dynamic, non-linear and unpredictable by nature (Leifer et al., 2001). In the innovation process, opportunity recognition is not a onetime effort, rather it is a chain of opportunity recognitions throughout the innovation process. Since the uncertainty is high, the initial opportunity can change during the process, reoccurrence of opportunity recognition may be a result of discontinuities in the development of an innovation (O'Connor & Rice, 2001).

2.3.1 The role of individuals in the innovation process

Individuals play an important role in the innovation process, O'Connor & McDermott (2004) have identified a set of different human roles that are involved in the innovation process. Prior literature indicated five different roles in the innovation process; idea generation, championing, project leading, gate keeping and sponsoring or coaching. In addition the authors identified two other important roles; opportunity recognition and project alumni. Opportunity recognition is a creative act, which lies within the individual (O'Connor & Rice, 2001), it is therefore more dependent on individual capacity instead of organizational routines and procedures. However, only relying on individuals would be inefficient from an organizational perspective. Management can perform different actions that stimulate and facilitate desirable human behavior (O'Connor & Rice, 2001).

The second additional role, project alumni, describes project members who leave the project before it is completed. Loosing key team members may have a negative impact on the progress, but project alumni take a key position of the project's informal network within the organization. They can facilitate wider organizational support for the project by educating other parts of the organization about the innovation project (O'Connor & McDermott, 2004).

The informal network of an individual is an important source of information during the innovation process. O'Connor & McDermott (2004) found that in most cases the informal network within the organization was crucial in bringing together the right people, competences and needed information to come to a successful innovation. For a radical innovation project, it is important that the project can move through the organization without being hindered by hierarchy, formal processes and functional structures; informal networks can accomplish this (O'Connor & McDermott, 2004).

2.4 Organizational antecedents of a pro-entrepreneurial climate

An essential part of a corporate entrepreneurship strategy is shaping an organizational culture in which entrepreneurial behavior can take place, that in turn will lead to an higher innovation performance (Barringer & Bluedorn, 1999; Hornsby et al., 2002; Thornberry, 2003; Zahra, 1991). Prior research has addressed a variety of organizational factors that describe a pro-entrepreneurial climate (see Table 2). Based on a large body of corporate entrepreneurship literature Hornsby et al. (2002) found five organizational factors that stimulate entrepreneurial behavior among middle managers. In addition to the existing measures of corporate entrepreneurship (Covin & Slevin, 1989; Knight, 1997; Zahra, 1993), Hornsby et al focus on a specific set of organizational factors that influences middle managers behavior. These factors are: management support, work discretion/autonomy, rewards/reinforcement, time availability and organizational boundaries. These were found to stimulate entrepreneurial behavior within the organization (Hornsby et al., 2002).

Table 2 organizational antecedents of a pro-entrepreneurial climate

Factor	Author(s)
Risk taking	Lumpkin & Dess (1996) Covin & Slevin (1989) O'Connor & McDermott (2004)
Management support	Hornsby et al. (2002) Kuratko et al. (2005)
Appropriate reward system	Hornsby et al. (2002) Kuratko et al. (2005)
Time availability	Hornsby et al. (2002) Damanpour (1991)
Work discretion / autonomy	Hornsby et al. (2002) Lumpkin & Dess (1996)

Willingness to take risk

Risk itself is a broad concept that may have different meanings depending on the context in which it is considered (Lumpkin & Dess, 1996). Risk taking in relation with entrepreneurial actions involves the investment of resources in activities of which the outcomes and financial returns are unknown. It is considered to be a fundamental element of entrepreneurship that has been associated with solo entrepreneurship, corporate entrepreneurship and intrapreneurship (Antoncic & Hisrich, 2004; Miller, 1983; Mintzberg, 1973).

Work discretion / autonomy

Decentralization of authority will stimulate openness and will facilitate a culture that can adopt new ideas and behaviors (Damanpour, 1991). Dispersion of power will facilitate a participative culture that increases the commitment, awareness and involvement of employees (Damanpour, 1991). Work discretion stands for the freedom to operate and dispersion of authority to lower level managers and employees (Hornsby et al., 2002). In

addition, the absence of multiple hierarchical levels will allow direct communication so that ideas can flow freely through the organization (Damanpour, 1991).

Management support

Successful innovation depends on support, coordination and leadership that managers provide in order to facilitate a favorable culture (Damanpour, 1991). The extent to which employees feel like managers encourage and facilitate entrepreneurial behavior, and to provide resources to entrepreneurial activities is expressed as management support (Hornsby, Kuratko, Holt, & Wales, 2013). Without sufficient and sustainable management support, corporate entrepreneurship activities are likely to fail before they can deliver added value to the organization (Zahra & Covin, 1995).

Rewards and reinforcement

Performance based rewards and appraisal may encourage employees to commit themselves to reach certain achievements. Having the right reward system in place can trigger employees to engage in entrepreneurial activities (Hornsby, Kuratko, et al., 2013). From the perspective of the employee, taking responsibility in a (radical) innovation project often introduces career risks. Bonuses and further career opportunities often are based on success. Given the low success rate of radical innovation projects the balance between risk taking and rewards is often not there in a corporate environment (O'Connor & McDermott, 2004). Key employees are not likely to bear the large risk of failing in an innovation project when there is no potential reward in return.

Time availability

The availability of free time (slack resources) allow an organization to explore new ideas that feed the innovation process, and absorb failure of those ideas that cannot be developed into a successful innovation (Damanpour, 1991). Having a system in place that allows employees to proper balance their efforts between long term and short term goals is found to contribute to innovation performance (Hornsby, Bloodgood, Hayton, & Kuratko, 2013).

2.5 Theoretical framework

In Figure 2 the theoretical framework on which this research is based is presented. The center of the framework consists of the dependent variable Innovation Performance which represents the success at which the process of combining technological knowhow, market opportunities and the abilities of the organization with the goal of increasing the competitive advantage is established in the organization's activities.

Corporate entrepreneurship has often been argued to contribute to organizational performance in general (Barringer & Bluedorn, 1999; Goodale et al., 2011; Hornsby et al., 2002; Kuratko et al., 2001; Zahra, 1991), and more specifically, corporate entrepreneurship has been directly related to innovation (Covin & Miles, 1999). Therefore, having a pro-entrepreneurial climate which is an essential part of corporate entrepreneurship (Hornsby et al., 2002) is proposed to have a positive effect on innovation performance.

Innovation itself is not only a result of the internal organizational efforts, but rely more and more on input from external parties (Chesbrough, 2003a). To represent this, external orientation is included in the theoretical framework.

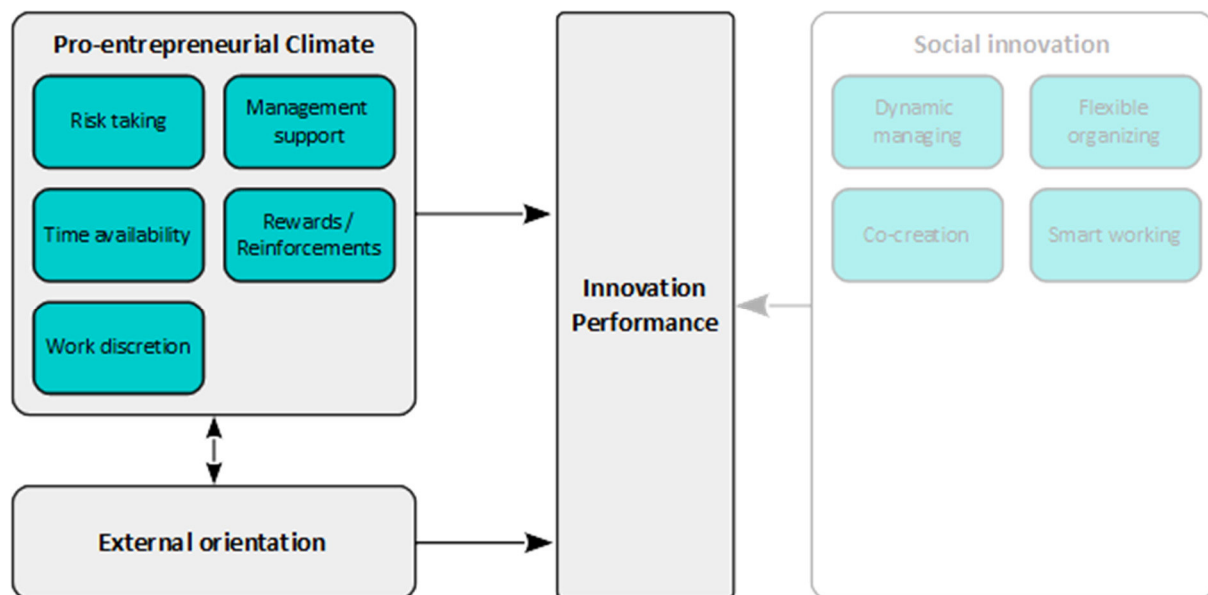


Figure 2 Theoretical framework

The theoretical framework, shown in Figure 2, used for this research proposes that a pro-entrepreneurial climate and external orientation leads to a higher innovation performance. Further it is proposed that external orientation and pro-entrepreneurial climate interact with each other with respect to innovation performance (left part on the frame work). The pro-entrepreneurial climate is composed of five items; Risk taking, management support, time availability, rewards/reinforcements and work discretion, and is proposed to have a direct effect on innovation performance.

At the right side of the framework social innovation is included, forming the context in which an innovation is developed. These factors are considered to have a positive influence on innovation performance, but are not included in this study.

The following sections of this report present the field research consisting of a series of interviews and a survey, which are both based on this theoretical framework. As this research works towards an answer on the management question, this theoretical framework will be used to make the relationships of corporate entrepreneurship and external orientation with innovation performance explicit in the context of IHC.

3. Survey

To answer the research questions a survey was sent out to a large group of employees of IHC divided over several business units. The collected data were analyzed using a multiple linear regression. Objective of the analysis is to identify main effects of the corporate entrepreneurship and external collaboration variables on innovation performance, and to investigate interaction effects of external orientation and the corporate entrepreneurship variables. Knowing the relationship between the variables at IHC provides information that can be used to optimize the current organization. This research will provide a detailed representation of the current situation that can be used to identify specific areas in which organizational optimization will be most effective.

3.1 Method

3.1.1 Data collection

Data for this study were collected using an electronic survey that was hosted on an IHC internal web server. A group of potential respondents received a personalized e-mail invitation to participate in this study. In addition, some key respondents such as business unit directors and managers were engaged in person, and asked to respond in a short, open interview.

Target population

The survey is aimed at the organizational members who are actively involved in execution of innovation projects, or the management of innovation projects. This includes middle management, higher management, and a part of the operational employees such as business developers, research and development engineers, project engineers, account managers, internal business consultants, market analysts etc.

Sample size and response rate

The survey was sent to 901 employees divided over 20 business units. A total of 462 responses were collected of which 222 were complete and useful for further analysis. Business units that had less than 10 responses were grouped, this resulted in four groups that represent more than one business unit. See Table 3 for an overview of sample size and useful responses per business unit. Due to confidentiality the business unit names are not mentioned in this report.

Table 3 Sample size and response rate

Business unit	Employees	Invited for survey	Responses	response rate	Sample size
BU 1	235	53	14	26%	6%
BU 2	105	59	17	29%	16%
BU 3	442	78	11	14%	2%
BU 4	287	98	20	20%	7%
BU 5	432	132	39	30%	9%
BU 6	131	44	10	23%	8%
BU 7	182	78	23	29%	13%
BU 8	75	50	15	30%	20%
BU 9	108	56	13	23%	12%

BU 10	86	65	14	22%	16%
BU 11	470	188	46	24%	10%
Total	2553	901	222	25%	9%

3.1.2 Measurement instrument

Innovation performance

To measure the innovation performance a subjective measure is used due to several reasons. First, IHC Merwede has over 20 business units that carry a variety of products and services and serve different markets. Because of the large variation in contextual factors and the lack of a central administration, objective innovation performance data is not readily available. Second, respondents probably lack detailed information about objective performance data such as ROI, market share per product group etc. In such cases, using a subjective measure is common practice (Blindenbach-Driessen, Van Dalen, & Van Den Ende, 2010). And third, subjective performance measures are found to be consistent with objective performance measures, there is no significant difference found between subjective company performance measurements and objective company performance measurements (Wall et al., 2004).

Because of the difficulty to collect consistent objective innovation performance data of the different business units of Royal IHC, a subjective measure is expected to be the most appropriate tool for this case. It is also expected that such a measurement allows for direct comparison of different business units on their level of innovation performance opposed to objective data that must be processed to make it suitable for direct comparison.

Based on Goodale et al. (2011) the dependent variable ‘innovation performance’ is measured using a subjective method that relies heavily on the perception of the respondents (Goodale et al., 2011). In their research, key respondents were targeted who were the most knowledgeable about innovation performance of the organizations that were under investigation. However, for the current research a broader target group is used. This may result in a bias due to misperception of the innovation performance by the respondents. To reduce this bias, the measurement instrument as proposed by Goodale et al. (2011) is adjusted to included questions that are explicitly aimed at organizational objectives instead of only relying on personal perception.

To measure the innovation performance, the respondents are asked to rate the importance of eight innovation performance objectives for the organization on a seven point Likert type scale, ranging from “not important at all” to “extremely important”. Next, the respondent is asked to rate how satisfied he/she is with business unit performance compared to companies in the same industry on a seven point Likert type scale, ranging from “not at all satisfied” to “extremely satisfied”. See Table 4 for the survey items.

Table 4 Innovation performance

Importance	
How important are the following innovation performance objectives for your business unit?	
Item 1	Number of new products or services developed.
Item 2	Number of new products or services brought to market.
Item 3	Speed with which new products or services are developed.
Item 4	Speed with which new products or services are brought to market.
Item 5	Ability to respond quickly to market or technological developments.
Item 6	Ability to respond to market or technological developments faster than competitors.
Item 7	Incorporation of technological innovations into product/service offerings.
Item 8	Incorporation of technological innovations into internal operations.
Satisfaction	
How satisfied are you with the performance of your business unit on the following innovation performance objectives, compared to similar companies?	
Item 1	Number of new products or services developed.
Item 2	Number of new products or services brought to market.
Item 3	Speed with which new products or services are developed.
Item 4	Speed with which new products or services are brought to market.
Item 5	Ability to respond quickly to market or technological developments.
Item 6	Ability to respond to market or technological developments faster than competitors.
Item 7	Incorporation of technological innovations into product/service offerings.
Item 8	Incorporation of technological innovations into internal operations.

The level of innovation performance is calculated as the weighted average of the satisfaction scores with importance as weight:

$$\frac{\sum(\text{Item satisfaction} \times \text{Item importance})}{\sum(\text{All items importance})}$$

To measure the dependent variable innovation performance a set of self-reported items is used in the survey. Using such a measure may introduce common method bias, meaning that variance in the data is attributed by the measurement instrument itself instead of the construct it is intended to measure (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003). This can result in systematic error in the estimations of the relationships between dependent and independent variables.

To test whether or not the innovation performance measure is affected by a common method variance Harman's single factor test is conducted. All variables that are related to the innovation performance measure are loaded on one factor using principal component factor analysis. Harman's single factor test assumes that when common method bias is an issue, all variables should load on one factor that explains the majority of variance of the data. Results of this analysis shows that a single extracted factor explains less than 50% of the variance of

all items. The amount of variance explained by a single factor is not considerable high, and thus it is expected that common method bias is not a big issue.

However, because there is no statistical valid measure of the Harman’s single test the existence of common method bias cannot be ruled out based on this single test (Podsakoff et al., 2003). To get a better understanding of the presence of common method bias a second test, conformity factor analysis, is conducted. When common method bias is present, a single factor will emerge or one factor will account for the majority of explained variance in the data. Following the recommendations of Podsakoff et al. (2003) all items are loaded in a principal component analysis with varimax rotation to determine the number of dimensions that are present in the data. The results show that 4 dimensions are present with an eigenvalue >1, that together explain 75% of the variance. 27% of the variance is accounted for by the first factor. Based on these results, and in accordance with the recommendations of Podsakoff et al. (2003) it is therefore expected that common method bias will not have a negative influence on the data.

Organizational antecedents of corporate entrepreneurship

The independent variables that resemble the organizational antecedents of corporate entrepreneurship are deducted from Hornsby, Kuratko, et al. (2013). The variables are: ‘management support’, ‘time availability’, ‘work discretion’, and ‘rewards/reinforcement’. Each variable consists of multiple items (see Table 5 till Table 9 for all items) that are measured on a seven point Likert type scale ranging from “strongly disagree” to “strongly agree”.

Table 5 Management support measurement items (Hornsby, Kuratko, et al., 2013)

Management support	
Item 1	Upper management is aware and very receptive to my ideas and suggestions.
Item 2	This organization supports many small and experimental projects realizing that some will undoubtedly fail.
Item 3	Budget is often available to get new project ideas off the ground.
Item 4	People are often encouraged to take calculated risks with new ideas around here.
Item 5	Senior managers encourage innovators to bend rules and rigid procedures in order to keep promising ideas on track.
Item 6	Those employees who come up with innovative ideas on their own often receive management encouragement for their activities.
Item 7	My manager helps me get my work done by removing obstacles.

Table 6 Work discretion measurement items (Hornsby, Kuratko, et al., 2013)

Work discretion	
Item 1	I have much autonomy on my job and I am left on my own to do my own work.
Item 2	It is basically my own responsibility to decide how my job gets done.
Item 3	I seldom have to follow the same work methods or steps for doing my major tasks from day to day.
Item 4	I feel that I am my own boss and do not have to double-check all of my decisions.
Item 5	This organization provides freedom to use my own judgment.
Item 6	I have the freedom to decide what I do on my job.

Table 7 Rewards & reinforcements measurement items (Hornsby, Kuratko, et al., 2013)

Rewards & reinforcements	
Item 1	The rewards I receive are dependent upon my work performance.
Item 2	My supervisor will give me special recognition if my work performance is exceptionally good.
Item 3	My manager would tell his boss if my work was outstanding.
Item 4	Individuals with successful innovative projects receive additional rewards and compensation for their ideas and efforts beyond the standard reward system.
Item 5	Promotion usually follows the development of new and innovative ideas.

Table 8 Time availability measurement items (Hornsby, Kuratko, et al., 2013)

Time availability	
Item 1	I always seem to have plenty of time to get everything done.
Item 2	During the past 3 months, my workload was too heavy to spend time on developing new ideas.
Item 3	I have just the right amount of time and workload to do everything well.
Item 4	I feel that I am always working with time constraints on my job.
Item 5	My coworkers and I always find time for long-term problem solving.

Risk taking

In addition to the CEAI a factor called ‘uncertainty / risk taking’ is added to the conceptual framework. The variable ‘uncertainty and risk taking’ is also measured by multiple items that were developed for this study, and added to the theoretical framework.

Following the interviews that preceded this survey, risk taking and dealing with uncertainty seems to be a topic of interest at IHC. Also in the literature of corporate entrepreneurship, risk taking is found to be an important determinant of entrepreneurial behavior (Covin & Slevin, 1989). Lumpkin & Dess (1996) argue on the difference in individual and organizational behavior; risk taking of the organization as result of a corporate entrepreneurial strategy does not directly relate to the risk taking behavior of organizational members (Lumpkin & Dess, 1996). Individual risk takers are often recognized for their willingness to champion new projects, whether eventually successful or not. Details on the measurement items for risk taking can be found in Table 9 .

Table 9 Risk taking measurement items (Alpkan, Bulut, Gunday, Ulusoy, & Kilic, 2010)

Risk taking	
Item 1	In general top management has a preference for high risk innovation projects, with high potential returns.
Item 2	Risk management is a central role in our organization.
Item 3	When decisions involve high uncertainties, the potential opportunity is more important than the reduction of the perceived risk.
Item 4	The term risk taker is considered a positive attribute for people in our organization.
Item 5	Individual risk takers are often recognized for their willingness to champion new projects, whether eventually successful or not.

External collaboration

Next to management support', 'time availability', 'work discretion', 'uncertainty and risk taking', and 'rewards/reinforcement' the degree of external orientation of the innovation process is included in this study. This measure is adapted from the innovation performance index as developed by Goodale et al. (2011). The respondents were asked to rate the importance of four external orientation items for their business unit on a seven point Likert type scale ranging from "not important at all" to "extremely important". Next the respondents were asked to rate how satisfied he/she is with respect to the same items on a seven point Likert type scale ranging from "not at all satisfied" to "extremely satisfied". A weighted index is processed in the same way as the innovation performance index:

$$\frac{\sum(\text{Item satisfaction} \times \text{Item importance})}{\sum(\text{All importance items})}$$

3.1.3 Principal component analysis

All items were loaded in a principal component analysis with varimax rotation to reduce the number of factors. A fixed number of five factors were extracted from the data, these five factors explain together 58% of the variance. All items loaded on the factors as expected from the theoretical model and no cross loadings occur. The five factor scores are exported to be used in further analysis. See Table 10 and Table 11 for the results of the factor analysis.

Table 10 Factor analysis, total variance explained

Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
1 Management support	7,090	25,321	25,321	7,090	25,321	25,321	3,985	14,232	14,232
2 Work discretion	3,393	12,119	37,440	3,393	12,119	37,440	3,803	13,582	27,814
3 Rewards Reinforcements	2,276	8,130	45,571	2,276	8,130	45,571	3,420	12,213	40,028
4 Risk taking	2,036	7,271	52,842	2,036	7,271	52,842	2,861	10,218	50,246
5 Time availability	1,527	5,454	58,296	1,527	5,454	58,296	2,254	8,050	58,296

Extraction Method: Principal Component Analysis.

Table 11 Rotated Component Matrix

Item	Component				
	1	2	3	4	5
Management support 1	,708	,227	,228	,029	,075
Management support 2	,668	,154	,044	,304	,043
Management support 3	,750	,181	,006	,174	,198
Management support 4	,734	,067	,131	,313	,055
Management support 5	,670	,035	,251	,254	,048
Management support 6	,768	,095	,262	,088	-,010
Management support 7	,591	,048	,370	,063	,059
Work discretion 1	,111	,790	-,073	-,101	-,005
Work discretion 2	,181	,769	-,004	-,117	-,011
Work discretion 3	-,056	,658	-,009	,221	,114
Work discretion 4	,143	,817	,095	,101	-,130
Work discretion 5	,212	,744	,163	,014	,049
Work discretion 6	,071	,799	,155	-,005	,068
Rewards & reinforcement 1	,132	,042	,653	,180	-,110
Rewards & reinforcement 2	,224	,153	,781	-,035	,058
Rewards & reinforcement 3	,234	,218	,718	-,024	,048
Rewards & reinforcement 4	,127	-,038	,783	,200	,030
Rewards & reinforcement 5	,221	-,058	,736	,289	,063
Risk taking 1	,196	-,092	,200	,697	-,008
Risk taking 2	,022	-,007	,157	,355	,252
Risk taking 3	,266	-,028	,027	,645	-,136
Risk taking 4	,225	,004	,087	,826	,084
Risk taking 5	,184	,210	,078	,779	,067
Tine availability 1	,064	,055	,092	,051	,734
Tine availability 2*	,032	,001	-,199	,003	,752
Tine availability 3	,122	-,109	,213	,057	,563
Tine availability 4*	-,028	,021	-,231	-,005	,617
Tine availability 5	,167	,153	,287	,010	,495

Extraction Method: Principal Component Analysis.

Rotation Method: Varimax with Kaiser Normalization.

*Items were inverse recoded

Rotation converged in 6 iterations.

Based on the principal components analysis five factors were found in the data. These factors were expected to be found based on the corporate entrepreneurship assessment instrument (CEAI) as developed by Hornsby et al. (2002).

3.1.4 Regression analysis

To investigate the relationship between the antecedents of corporate entrepreneurship and external collaboration in the dependent variable innovation performance a multiple regression analysis is performed. The variables that are entered into the regression are the exported factors from the principal component analysis. In addition three control variables were entered; experience at current employer, experience at current function and job level. The regression analysis is also used to investigate interaction effects between the corporate entrepreneurship variables and external collaboration. To do this a set of new variables are processed as the product of two existing variables to represent the interaction effect between two variables.

A step wise approach was used to load the independent variables in the regression analysis. First the control variables are loaded, then the corporate entrepreneurship variables are loaded, followed by the external collaboration variable and finally the interaction variables are loaded.

3.2 Results

Table 12 shows the descriptive statistics and correlations of the ten variables that are included in the multiple regression analysis. The corporate entrepreneurship variables used in this analysis are the exported factors from a factor analysis, external collaboration and innovation performance are weighted averages of multiple items and the control variables are single item measures. Prior to loading the variables into a regression analysis, the independent variables are mean centered to allow an easy interpretation of the interaction effects (Hair, Tatham, Anderson, & Black, 2009).

Table 12 descriptive statistics and correlations

	N	Mean ¹	SD	Correlations									
				1	2	3	4	5	6	7	8	9	
Control variables													
1	Experience at current employer	222	3,532	1,539									
2	Experience at current function	222	3,486	1,445	,520**								
3	Job level	219	2,767	0,956	,314**	,201**							
CE variables													
4	Management support (MS)	208	-0,002	1,002	-,091	-,102	,083						
5	Work discretion (WD)	208	0,004	1,001	,017	,039	,113	,002					
6	Rewards & reinforcement (RR)	208	-0,002	1,002	-,098	-,145*	-,132	-,001	,002				
7	Risk taking (RT)	208	-0,006	0,999	-,091	,008	-,041	-,003	,004	-,003			
8	Time availability (TA)	208	-0,002	1,002	-,203**	-,137*	-,192**	-,001	,002	-,001	-,002		
External collaboration variable													
9	External collaboration (EC)	211	4,029	1,067	-,081	,044	-,017	,277**	-,066	,194**	,111	,045	
Dependent variable													
10	Innovation performance (IP)	211	3,858	1,119	-,133	-,011	-,011	,529**	,057	,260**	,115	,118	,513**

Notes:

1) The non-centered means are reported.

** Correlation is significant at the 0.01 level (2-tailed).

* Correlation is significant at the 0.05 level (2-tailed).

Table 13 presents the results of three regression models. Model 1 shows that there is no relationship between the control variables and innovation performance since the model is not significant.

In model 2 the corporate entrepreneurship variables are added. The model shows that three of the five variables have a significant relationship with innovation performance; time availability ($P < 0,05$), management support ($P < 0,01$) and rewards & reinforcement ($P < 0,01$).

In model 3 the variable external collaboration is added. In this model, none of the control variables has a significant effect on innovation performance. Of the corporate entrepreneurship variables management support and rewards & reinforcement have a significant ($P < 0,01$) positive effect on innovation performance, which confirms research questions 1b, 1d and 1e. The external collaboration variable has also a significant ($P < 0,01$) positive effect on innovation performance, which confirms research question 2.

Model 4 introduces the interaction effects between the corporate entrepreneurship variables and external orientation. Of the fourteen possible two way interactions five are significant. This partly confirms research question 3 as not all independent variables are involved in interaction effects.

Table 13 Regression results

	Model 1	Model 2	Model 3	Model 4	
Dependent variable: Innovation performance					
Step 1: Control variables					
1	Experience at current employer	-0,164*	-0,008	-0,23	-0,103
2	Experience at current function	0,069	0,08	0,051	0,088
3	Job level	0,042	-0,009	0,002	-0,009
Step 2: CE variables					
4	Management support (MS)		0,53**	0,448**	0,475**
5	Work discretion (WD)		0,055	0,076	0,071
6	Rewards & reinforcement (RR)		0,3**	0,238**	0,175**
7	Risk taking (RT)		0,107	0,069	-0,002
8	Time availability (TA)		0,128*	0,097	0,071
Step 3: External collaboration variable					
9	External collaboration (EC)			0,274**	0,318**
Step 4: Interaction effects					
10	EC x MS				0,026
11	EC x WD				0,137*
12	EC x RR				0,093
13	EC x RT				-0,123*
14	EC x TA				0,033
15	MS x WD				-0,118*
16	MS x RR				-0,041
17	MS x TA				-0,015
18	MS x RT				-0,057
19	WD x RR				-0,142*
20	WD x TA				-0,089
21	WD x RT				0,014
22	RR x TA				0,020
23	RR x RT				0,201**
24	TA x RT				-0,040
Model R ²		0,005	0,398	0,462	0,516
Change in R ²		0,005	0,393	0,064	0,054
Model F		1,387	15,219**	16,975**	9,436**
Notes:					
Standardized regression coefficients are reported.					
* Significant at the 0.05 level (2-tailed).					
** Significant at the 0.01 level (2-tailed).					

The five interaction effects, which are significant, include one of the corporate entrepreneurship variables that have no direct effect on innovation performance. Only the variable time availability has no significant main effect or interaction effect, and seems to have no contribution towards innovation performance.

Figure 3 shows the interaction between external collaboration and work discretion. Although work discretion does not have a direct effect on the innovation performance, it does have a significant ($P < 0,05$) interaction effect on the relation between external collaboration and innovation performance. When the level of work discretion is high, the positive effect of a high level of external collaboration on innovation performance is increased.

Figure 4 shows the interaction between external collaboration and risk taking. Although risk taking does not have a direct effect on the innovation performance, it does have a significant ($P < 0,05$) moderating effect on the relation between external collaboration and innovation performance. When the level of risk taking is high, the positive effect of a high level of external collaboration on innovation performance is weakened.

Figure 5 shows the interaction between management support and work discretion. Although work discretion does not have a direct effect on the innovation performance, it does have a significant ($P < 0,05$) interaction effect on the relation between management support and innovation performance. When the level of work discretion is high, the negative effect of a low level of management support on innovation performance is weakened.

Figure 6 shows the interaction between rewards & reinforcements and work discretion. Although work discretion does not have a direct effect on the innovation performance, it does have a significant ($P < 0,05$) moderating effect on the relation between rewards and reinforcements and innovation performance. When the level of work discretion is high, the positive effect of a high level of external collaboration on innovation performance is weakened.

Figure 7 shows the interaction between rewards & reinforcements and risk taking. Although risk taking does not have a direct effect on the innovation performance, it does have a significant ($P < 0,01$) moderating effect on the relation between rewards & reinforcements and innovation performance. When the level of risk taking is high, external collaboration has a moderate to strong positive effect on innovation performance. When the level of risk taking is low, external collaboration has a weak negative effect on innovation performance.

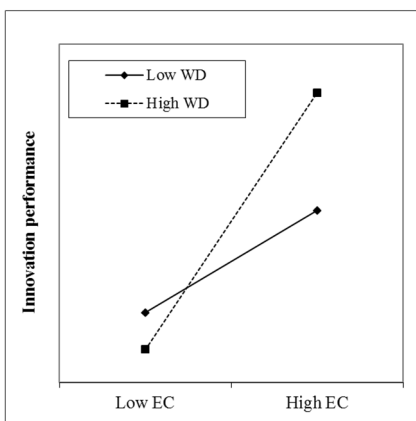


Figure 3 Interaction External Collaboration (EC) and Work Discretion (WD)

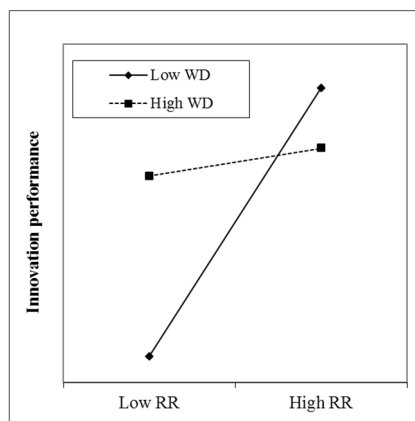


Figure 4 Interaction Rewards & Reinforcements (RR) and Work Discretion (WD)

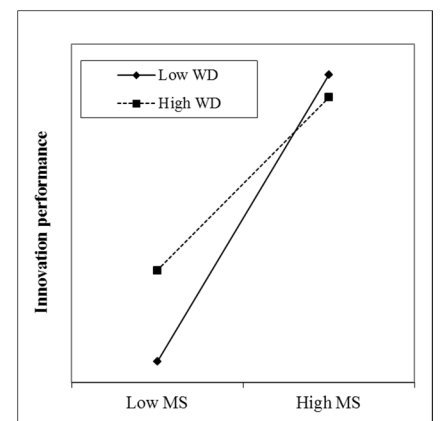


Figure 5 Interaction Management Support (MS) and Work Discretion (WD)

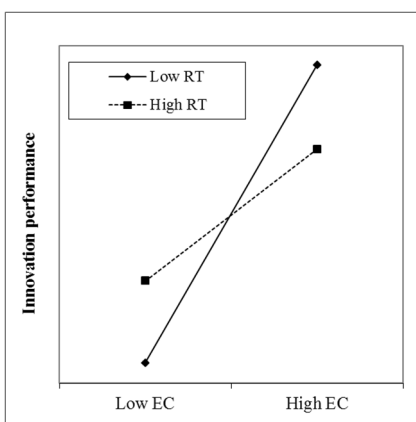


Figure 6 Interaction External Collaboration (EC) and Risk Taking (RT)

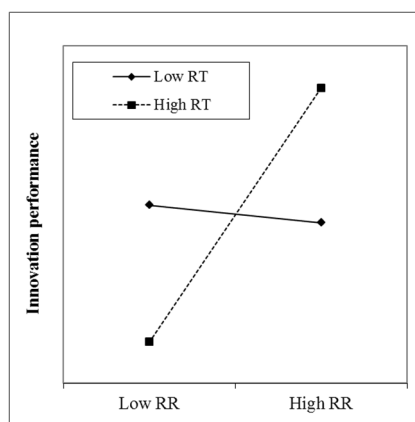


Figure 7 Interaction Rewards & Reinforcements (RR) and Risk Taking (RT)

3.3 Conclusion

The results of the regression analysis show that the variables management support, rewards & reinforcements and external collaboration have a positive effect on innovation performance. Based on the theoretical background, these relationships were expected to be found. Of all variables, management support is found to be the most influential determinant of innovation performance.

In Figure 8 an overview of the variables and their relationships based on the regression analysis is presented, for each effect the standardized regression coefficient is reported. In the overview a distinction is made between dependent, independent and moderating variables. The main and interaction effects connect the variables according to their relationship that was found with the regression analysis. The diagram clearly shows that multiple effects exist between the dependent and independent variables.

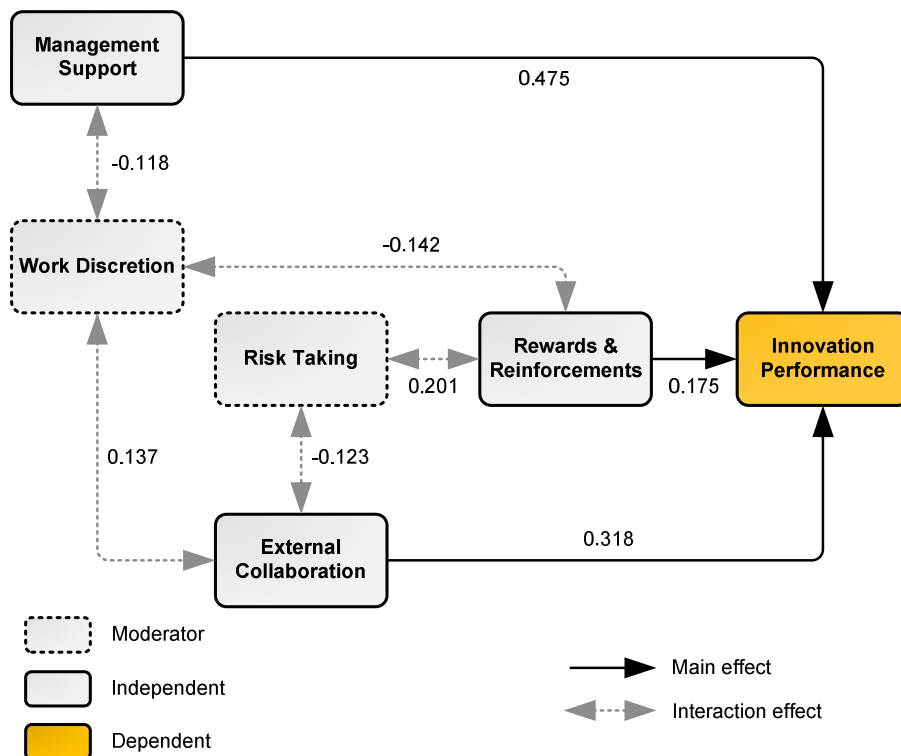


Figure 8 Main effects and interaction effects between variables.

4. Interviews

This study is conducted within one company which makes it difficult to generalize the findings of the survey research. To supplement the findings of the survey research a series of interviews is conducted, and followed by qualitative data analysis. The interview results will provide an in-depth understanding of the context in which the survey results should be interpreted.

4.1 Method

The chosen research method is a semi-structured interview, this type of interview is useful to identify issues in a wide ranging research problem and it is suitable for exploratory purposes (Blumberg, Cooper, & Schindler, 2008, p. 386). A semi-structured interview allows the interviewee to bring up the most critical subjects within the themes of the research. A small number of interviewees is sufficient since no quantification of the results is needed at this stage of the research.

4.1.1 Data collection

The interview is based on findings that are reported in the literature study and research proposal that preceded this research project. Three main themes, organizational antecedents of corporate entrepreneurship, innovation and external collaboration were derived from the theoretical framework. For each theme, a number of questions were formulated, for the complete interview script (in Dutch) see appendix 1. All interviewees were asked the same structured main questions. Follow up questions were formulated during the interview following an open approach. Depending on the answer of the interviewee, the researcher formulated follow up questions. A list of probing topics per question was used to guide the formulations of follow up questions. This semi-structured set up of the interview allows for proper comparison of the responses of different interviewees, while each interviewee still has the ability to speak freely about his/her opinion and add context to his/her response.

Pilot interview

Prior to the data collection, a pilot interview was held to test the initial interview. The pilot interviewee was selected to be representative for the target group, and does not receive any additional information prior to the pilot interview. The only difference with the final interview is that the interviewee was asked to provide detailed feedback on the interview content, structure, presentation and timing.

Target group

The target group consisted out of employees and mid-level managers who are known to be involved in –either personal, or as manager- in corporate entrepreneurial activities, and are expected to have a clear opinion about how these themes are present in the organization.

Confidentiality

All data are treated confidentially and kept anonymous. The recordings and transcriptions will not be published in this report, and no quotes will be published without permission of the interviewee.

4.1.2 Qualitative data analysis

The interviews are recorded and transcribed, the transcriptions are analyzed using qualitative data coding. Three types of data coding were used following the recommendations of Miles & Huberman (1994). The coding process was iterative, first descriptive coding was used to describe chunks of data. Next interpretive coding was used to analyze the meaning of a particular chunk of data. Finally, when all data was available, pattern coding was used to find patterns in the collected data. The initial coding scheme is developed based on existing literature on the subjects that were included in the interview.

The first step in analysis of the interviews was qualitative processing of the coded texts, this was done with the help of a computer program called QDA miner lite. Chunks of coded text of different cases were filtered and presented in clusters that resemble a certain topic. These clusters of texts were processed into an integrated text that captures the similarities and difference between the cases.

A second step in the qualitative data processing is identifying recurring themes in processed data per topic. These recurring themes are concepts, or bundles of concepts that relate one topic to another, and are helpful to identify common ground between topics that seem to be separated when regarded on their own.

4.2 Results

The series of interviews including the pilot interview has led to a total of four transcriptions. The resulting data set that was analyzed contained a total of approximately 40.000 words divided over the four transcriptions. During the interviews, the context in which IHC operates has been elaborated by the interviewees. First a summary of the business context is provided and following that the results of the interviews are presented per topic.

4.2.1 Business context

Markets

IHC is active in three main markets; dredging, (wet) mining and offshore. Each of these markets has their own characteristics that influence the way that IHC behaves as an organization. The dredging market is a worldwide, well established market in which IHC has been involved over 70 years. Over the years IHC has been able to take a leading position in this market with a market share of over 50% in 2007 (IHC Merwede, 2007) and hold this leading position over the past years (IHC Merwede, 2012). The dredging market is in a state of consolidation and no worldwide growth is foreseen for the near future. Therefore, the offshore market is chosen as a new growth market for IHC. The offshore market is a well-established worldwide market. In contrast to the dredging market, IHC is a new player in this field. The mining market is related to dredging in the form that similar technologies can be used for both markets. The worldwide mining market is still developing, and especially niches such as deep sea mining are seen as new to the world. Because of the increasing

scarcity of onshore and near-shore minerals, deep sea mining provides a huge opportunity for the mining industry to keep up a steady supply of minerals. In recent years, many companies are actively involved in the development of new and creative concepts for deep sea mining. However, most of the technology still is not commercially operational. Until today, the market is still open for innovative solutions that can extend the current working range of wet mining.

Having a rich history in the dredging industry as market leader, while at the same time being a new entrant on the offshore market has several implications for IHC. Due to the long running success in the dredging market, the market expects to receive high quality and advanced equipment. Even in the offshore market, where IHC is a new player, the expectations are still high due to their reputation in the dredging market. To meet those expectations, a lot of learning, knowledge development and changing of old habits is needed.

Products

The product range of IHC includes fully integrated vessels for the offshore and dredging markets. These products are capital intensive goods and form the core of the client's operations. Most often, these vessels are one offs, meaning that each new vessel is substantial different. For IHC this implies that there is little room for error. Extensive testing of each product is time consuming and too expensive, for these products it comes down to 'do it right the first time'.

Organizational structure

IHC has a decentralized structure where each business unit is responsible for its own operations. It can be described as a network of independent business units with a small central coordinating body. The cooperation between business units is low, even a form of competition may take place between them.

4.2.2 Innovation at IHC

For IHC innovation is important to stay ahead of the competition, the company is well known to provide high quality and advanced products. Having a high innovation output is therefore needed to meet the expectations of the market, "being innovative is a license to operate" as one of the respondents said.

The overall observation of the respondents is that IHC performs well with innovative products and services. Nevertheless, it is noted that most of the innovation is incremental, and that there is a growing need for more (radical) innovation output. This need finds its origin in the market developments, says one respondent. For example the dredging market is a mature market where no big steps can be made in terms of product innovations. For years this market has been the prime source of revenue for IHC, but because the limited growth potential it is needed to target new markets. The new markets that are currently targeted are deep sea mining and offshore. Both these markets are related to dredging, but IHC still needs to learn how to apply their dredging based knowledge in this new environment. To successfully enter these markets, IHC must create more innovations in both products and services.

Innovation strategy

Despite that innovation is a main corporate objective, all respondents observe that there is no clear innovation strategy. As one of the respondents explain, this is partially a result of the decentralized structure where each business unit is responsible for its own operations and for its own innovation program. In addition, another respondent points out that another factor that makes it difficult to formulate a corporate innovation strategy is the large variety of products that are delivered and markets that are served by different business units. The innovation strategy on business unit level is mainly formed by the local culture and leaders of that specific unit. Especially in the past, the informal network has been more influential towards innovation strategy formulation than the central coordinating body of IHC.

All respondents agree that the decentralized innovation strategy is not considered as negative when looking on a product or market segment level. Each specific product-market mix needs a tailor made innovation strategy. However, on a corporate level, some of the respondents expect to see a positive influence from more centralized innovation approach. Centralization can result in a situation where the way of creating an innovation can be aligned between different business units. This increases the inter-business unit communication and may enhance the capacity to learn from each other.

One respondent elaborates on the fact that the innovation strategy is cost driven, meaning that 2% of the revenue is invested in innovation projects (IHC Merwede, 2012). It was also noted that the investment per market share is derived from the revenue of that market. This approach does not sufficiently account for future prospects, resulting in a situation where promising new markets which do not have a large growth potential do not get the same investment as the current markets which have shown little growth over the last years. This strategy may force innovation projects to be focused on exploitative results rather than explorative results.

Innovation processes

All respondents agree that there is no formalized approach to execute an innovation processes within IHC. However, over the years some structures have evolved as the respondents observe. The most common innovation process at IHC starts with an idea from an engineer. This idea then takes some time to develop before the initiator brings out his idea into his direct informal network of colleagues and direct manager. Once the idea is broadcasted into the network a more shared development between multiple employees can take place, this is all still informal. After the initial idea is developed to a preliminary concept, it is ready to be picked up in a more formal circuit. Most often, the direct manager of the idea initiator, or a R&D manager of the associated product line may decide to assign resources to further development of the concept. Most often, the first formal steps are to assign a student intern to do first conceptual developments. Depending on how far away the concept is from a practical application, this phase of the process can take up to several years. As the concept is developed into more detail, and the concept is believed to have potential, more resources are assigned to the project. After completion of the conceptual design phase engineering picks up the idea, delivers detailed engineering, and plans for prototyping. After the prototype is fully developed and tested, the new product is launched on the market. As

one of the respondents explains, this kind of process is typical for IHC. Because of the broad knowledge base of the organization, IHC is capable of developing a strong technology push for their innovation processes. But as the respondent further elaborates, relying solely on a technology push can lead to the development of products that do not meet the customer demands. In the past it has happened more than once that a newly developed product was not positively received on the market.

Despite the strong focus on technology push, all respondents observe that there is a second type of innovation process that is more driven by customer demand. One of the respondents tells that these demands are related to existing products or processes and have a strong focus on technological aspects. IHC then acts responsive on a customer need to solve a particular problem. If the solution to that problem is regarded to be a successful improvement on an existing product or product line, than it is adopted. A kind of market pull is generated to counter balance the technology push as one respondent says. According to this respondent this is necessary to improve the innovation performance. IHC should be more proactive in establishing collaboration with customers during the innovation process. It is already happening for some projects, but it must get wider attention within IHC.

Another respondent indicates that customer initiated innovation processes provide a good opportunity for IHC to exploit their in-house knowledge and resources. As a result, new leads for further knowledge development can arise that will ultimately lead to new innovation projects.

4.2.3 Entrepreneurial behavior

The respondents indicate that entrepreneurial behavior at IHC is understood as doing more than what is expected, to take a proactive role, take responsibility and initiative, and when needed 'to bend the rules'. Most of the respondents think that entrepreneurial behavior is partly dependent on personal attributes and can be stimulated by the direct environment. One respondent believes that culture and informal interaction between an employee and his/her direct environment is an important factor that can stimulate entrepreneurial behavior. organizational structure and procedures are not recognized as determinants for entrepreneurial behavior.

Risk taking

At IHC, risk taking is not always received as something positive. However, it is associated with entrepreneurial behavior according to the respondents. In general, support for risk taking behavior is limited from both colleagues and managers. Some respondents, describe the corporate strategy as risk averse. One respondent further elaborates that this risk averse behavior may be related to the cost driven innovation strategy. Another respondents further explains the relation between risk and costs, taking a 10% risk in an order for a custom build dredging vessel translates to a huge financial impact. On the other hand, taking 100% risk in the early phase of a R&D project that only requires the assignment of one employee for a full year resembles a fraction of the cost compared to a 10% risk in an order for a dredging vessel.

Work discretion / autonomy

Employees at IHC may have a large amount of freedom to act depending on their function. Higher level engineers and mid-high level managers are to a large extent free to decide how they do their daily job. One respondent emphasizes that there are large differences due to the fragmented structure of the corporation. Autonomy may not only differ with respect to function, but also between different business units there can be a significant difference in the amount of freedom that employees have. One respondent emphasizes that the division of autonomy at IHC is complex, how much autonomy an employee receives may depend on his/her personal attributes, direct manager and the business unit where he/she is employed. Employees who can handle the freedom and take their responsibility are likely to receive more autonomy than others. Another respondent states that autonomy is sometimes used as a reward for personal performance on the job, if an employee does his job better than average he is likely to receive more autonomy.

Rewards and reinforcements

No personal financial rewards are provided for good performance except for top management. The only form of rewards that is given is informal and sometimes aimed at personal development such as additional opportunities for training and education. Employees who perform well may receive recognition from their colleagues and managers, and may be rewarded by getting more responsibility and more autonomy in their daily work.

Stimulating entrepreneurial behavior

All respondents agree that employees must be challenged to trigger entrepreneurial behavior. This challenge must consist of a combination of responsibilities and autonomy. In the current situation, both the formal and informal systems contribute to the formulation of challenging tasks. One respondent remarks that challenging employees does not only have to be done by the direct manager. Instead, IHC as a corporation should formulate more clear and concrete strategic goals that are easily translated into workable challenges.

The respondents agree that employees have a high level of autonomy in the current situation. However, there still is a lack of incentives for employees to really act as entrepreneurs within the organization. Most respondents think that employees are lacking initiative, or that the organization fails in stimulation of the initiative. This reactive behavior is believed to be very difficult to understand since it is almost fully dependent on case specific factors in combination with informal culture as one respondent explains.

According to one respondent, another limiting factor for entrepreneurial behavior is the lack of a transparent structure; employees may not have a clear view on where and how they must articulate a potential innovative idea. The respondent further elaborates that one may argue that it is the essence of entrepreneurial behavior to take a proactive approach in creating support for an innovative idea, and it is the responsibility of the entrepreneurial employee to do so. On the other hand, within an organization it is possible to shape a certain environment in which creative ideas receive a certain amount of unconditional support. As organization, a strong signal can be sent towards entrepreneurial employees when creative

ideas are really taken serious instead of only listening to the ideas. Executing a proper follow-up action that is visible for the idea initiator is believed to be key for the motivation of entrepreneurial employees. The respondent expects that such an approach would minimize the obstacles that withhold employees to launch promising ideas.

4.2.4 External collaboration

All respondents observe that during the innovation process external collaboration can take place at IHC. It depends to a large extent on the specific situation if external collaboration will take place, which parties will be involved and what the nature of the collaboration is. All options between a fully closed innovation process and collaboration with multiple suppliers and customers within one project are possible says one of the respondents. There is no formal set of rules defined with respect to engaging in external collaboration, instead an informal system has evolved that controls when collaboration will take place and which parties are involved.

The most common parties with whom IHC will collaborate are customers, suppliers and knowledge institutions such as universities. In the field of knowledge development, where knowledge and technology have a relatively large distance from a practical application, the willingness to collaborate is reasonable high. As soon as the development moves towards a specific application, the general consensus is to not engage in external collaboration if it is not necessary as one respondent elaborates. Other respondents support this, and describe that there is a certain fear among managers to expose knowledge to the outer world.

In those cases where external collaboration takes place, all respondents observe that IHC has a reactive strategy. Most often, it is a customer who triggers a collaboration to solve a specific problem, or a supplier trying to introduce a new technology. However, all respondents observe that recent developments show that IHC is becoming more focused on external collaborations. One respondent says that not only suppliers, customers and knowledge institutions are subject of collaboration, also contacts are made with companies that are not related to the shipbuilding industry to learn about innovation management and process control.

With respect to the innovation process, most of the respondents think that a more open approach will be beneficial. Especially to build a better connection to the market, and gather accurate market information early in the innovation process is expected to contribute towards the innovative output. In the current situation, external collaboration is limited in early stage of the innovation process, while these phases are expected to be most often critical in the success of the innovation.

4.3 Conclusion

Based on the interview results an in-depth understanding of the situation regarding innovation, corporate entrepreneurship and external collaboration at IHC is reached. In short, the interviews provided the following main findings:

- Due to the decentralized structure there is no clear innovation strategy formulated.
- The innovation process is mostly closed; market orientation during the first phases of the innovation is in general low.

- Risk averse, reactive behavior and the informal culture seem to fail to stimulate entrepreneurial behavior.
- In a changing business environment, the collaboration between different business units must be stimulated in order to keep developing successful innovations.

5. Discussion & Recommendations

In this section the results of both the interviews and survey research will be discussed. Based in these results, a set of practical recommendations will be developed using the CIMO logic method.

5.1 Discussion survey results

Following the results of the survey, management support, rewards & reinforcements and external collaboration have a positive effect on innovation performance. The variables work discretion and risk taking do not have a direct effect on innovation performance, but they do have interaction effects with the other independent variables.

In existing literature, management support is defined as a broad concept. In general it is recognized as to facilitate an organizational culture (Damanpour, 1991), and more particular it includes the effort of top management to facilitate entrepreneurial behavior, for example by championing of innovative ideas and institutionalizing of entrepreneurial activities in corporate processes (Hornsby et al., 2002). It is therefore not surprising that the current research found that management support, as an antecedent of pro-entrepreneurial climate has a positive effect on innovation performance.

For rewards & reinforcements it is also acknowledged that it can stimulate a pro-entrepreneurial climate; having the right reward system in place can trigger employees to engage in entrepreneurial activities (Hornsby, Kuratko, et al., 2013). Based on the survey results it is found that rewards & reinforcements does not only facilitates a pro-entrepreneurial climate, but also leads to a higher innovation performance.

According to the survey results risk taking and work discretion do not have an effect on innovation performance which is in contrast with the expectations. Both variables are considered to be a fundamental element of a pro-entrepreneurial climate (Antoncic & Hisrich, 2004; Miller, 1983; Mintzberg, 1973), and a pro-entrepreneurial climate is associated with a higher innovation performance (Barringer & Bluedorn, 1999; Hornsby et al., 2002; Thornberry, 2003; Zahra, 1991). It is therefore surprising that a direct relationship between risk taking and work discretion, and innovation performance is not found.

However, despite that no direct effects were found the variables risk taking and work discretion do have interaction effects with the other variables. Between five independent variables a total of five interaction effects are found, some effects are modest while others are stronger. Looking at the interaction pattern of the independent variables, it seems that all of the variables, except for the variable time availability have an effect on innovation performance via different 'routes'. This implies that influencing one of the moderating variables does have multiple effects on innovation performance. For example, an increase in risk taking may reduce innovation performance when the level of external collaboration is high (negative interaction effect) while at the same time it may increase the innovation performance when a performance based reward system is in place (positive interaction effect). The relationships are therefore difficult to interpret, especially the interaction effects contribute to the complexity of the relation between independent and dependent variables.

According to the survey results the variable external orientation has a direct relationship with innovation performance. In existing literature this is a well-established idea; Powell et

al. (1996) and Jenssen & Nybakk (2013) argues that external collaboration helps to strengthen the internal competences and Chesbrough (2003a) how an open innovation model contributes to firm performance. On itself this finding is not new, but the current research proposes that external orientation is part of an integrated framework together with the antecedents of corporate entrepreneurship. Looking at the results it is found that external collaboration has interaction with two of the corporate entrepreneurship antecedents: Work discretion and risk taking. The results suggest that when external orientation is high, having high work discretion would lead to higher innovation performance than when work discretion is low and when external orientation is high, having low risk taking would lead to higher innovation performance. Due to the setup of the data analysis it is not possible to further investigate the causal relationships between the variables, but it can be concluded that there is an interplay between corporate entrepreneurship and external orientation when it comes to enhancing the innovation performance.

5.2 Discussion interview results

The current innovation strategy has two main ingredients: knowledge development and continuous innovation. First, IHC is always involved in knowledge development related to their core business. The current vision is that knowledge development is necessary to keep a leading position in the field. This continuous knowledge development must ensure a proper balance between short term and long term objectives. Second, IHC strives to generate a continuous stream of product and process innovations. The two strategic objectives are interdependent; it is believed that existing knowledge forms a fundamental base for the generation of successful product and process innovation in the future, and that exploring new innovative ideas fuels the knowledge generation process.

The two strategic objectives result in a situation in which a variety of innovation projects are conducted. Because the development of capital goods such as high tech, special purpose vessels are key for IHC, innovation projects often take a long time to develop and have high associated costs. Therefore, the applied innovation management tools at IHC have a strong focus on risk and process control, and are built to reduce uncertainty during development of the innovation projects. Incremental innovations are assumed to be highly manageable and are mostly triggered on customer request. More radical innovation projects start often with a specified goal, but during development of such a project the focus on this goal may loosen. It might be the case that the outcome of a radical innovation process is different from what was expected at the start. This unpredictable nature makes it more difficult to control radical innovation projects. The tools that prove to be effective to manage an incremental innovation, may not suit the context of more radical innovation that requires the involvement of external parties.

With respect to external collaboration, the current situation is that IHC is actively involved different formal initiatives, and IHC has a large informal network of customers, suppliers, universities and governmental agencies. In the program ‘Integraal samenwerken’ (Integraal samenwerken, 2013), which ran from 2008 until 2013, IHC was one of the major contributors. This program resulted in a huge improvement of the supply chain integration in the Dutch maritime industry. Over the lifetime of the program, various technological tools

were developed and implemented to improve the communication between shipyards and various suppliers. This resulted in an efficiency improvement of the exploitative activities (Integraal samenwerken, 2013).

Within the setting of explorative activities IHC aims to take a leading role in the network based innovation process. It is not always the case that IHC takes the initiative in developing innovations. For example, incremental innovations are most often initiated by customers and the organization behaves responsive. At IHC there is the desire to take a more active role in scanning the environment, and better target potential innovation opportunities rather than being reactive. It seems that in the past the exploitative activities received the most attention, while there is a growing demand for more emphasis on explorative behavior. For example, one recent initiative is focused on improving the explorative activities. With the introduction of the IHC innovation lab at the site of the RDM campus in Rotterdam, a more proactive approach is used to reach out to educational institutions. The RDM campus offers housing and a variety of facilities to existing companies, startups and educational institutions to work jointly on innovative projects. IHC uses the innovation lab to establish a better connection with external parties such as educational institutions and other ship building companies. Students are allowed to work on the development of new technological concepts provided by IHC and partners. Not only innovative concepts are being developed in the innovation lab, but it is also used to scan for high potential human resources.

The role of entrepreneurial behavior in the innovation process is already known to be important, but practice proved that simply selecting employees with entrepreneurial qualifications turns out to be insufficient to stimulate the success of innovation. There is however a strong belief that motivation, commitment and dedication of employees are key factors for success of an innovation project. These characteristics resemble a strong relation to the success factors of experienced entrepreneurs. This leads to the expectation that entrepreneurial behavior of employees may improve the innovation performance of the company.

In the current situation it seems that entrepreneurial behavior is not enough stimulated. This might be caused by the presence of a strong hierarchical division of responsibilities, which reduces the freedom to act for employees who are lower in the hierarchy. Secondly the closed innovation model, forming a barrier for multidisciplinary problem solving, may have a negative effect on innovation performance. This later one is recognized by the company, and in response to this the program “One IHC” was launched. This program is expected to facilitate more openness and more effective interaction between business units to eventually form a more integrated whole. In this environment, entrepreneurial behavior is believed to be important in finding and developing new creative ideas and turn them into an innovation success.

5.3 Recommendations

Looking at the results of the survey research, it can be concluded that a part of the antecedents of corporate entrepreneurship, management support and rewards & reinforcement, are related with innovation performance. This indicates that at IHC certain aspects of the organization are in place to stimulate corporate entrepreneurship, but other

aspects do not contribute to innovation performance. When the findings on the survey research are combined with the information that came out of the interview sessions it possible to formulate some specific recommendations.

5.3.1 Method

During the formulation of recommendations, the well-established method called CIMO logic was used. Denyer et al. (2008) present a set of rules they call design propositions that follow the CIMO logic. Using these is helpful as a tool that makes research based knowledge in management and organizational studies better accessible. In other words, the effectiveness of research synthesis will be higher using this systematic review methodology. The core of these design propositions is that they follow the so-called 'CIMO-logic', which consists of an intervention (I) that triggers a certain mechanism (M) and lead to a desired outcome (O) within a certain context (C) (Denyer et al., 2008). The context for the design principles as presented here follows from the organizational environment of IHC. Since all the design principles are aimed at improving innovation performance through stimulation of corporate entrepreneurship at IHC, the context is the same for all design principles, and is therefore not repeatedly formulated in each design principle. Instead, a general description of the context will be given prior to the presentation of the design principles.

5.3.2 Business context of IHC

IHC has a decentralized structure where each business unit is responsible for its own operations. It can be described as a network of independent business units with a small central coordinating body. The cooperation between business units is perceived as being low, even a form of competition may take place between different business units within IHC. Although, at the moment an organizational change is going on that is intended to centralize certain aspects. For example, a corporate ERP system will be developed to stream line communication and collaboration between business units, and procedures and organizational structures are being aligned with the same purpose.

For IHC, innovation is important to stay ahead of the competition. They are well known as a company that provides high quality and advanced products, having a high innovation output is therefore needed to meet the expectations of the market. "Being innovative is a license to operate" as one of the respondents said, innovation is therefore a main ingredient for the corporate strategy. However, due to the decentralized structure there is no clear innovation strategy formulated.

Within IHC the innovation process is mostly technology driven. Being active in the design and fabrication of capital intensive goods makes the overall attitude to be risk averse. As a result, the innovations that are developed are often incremental of nature as this kind of innovation is controllable and incorporates relatively low uncertainty.

Entrepreneurial behavior is believed to be a key aspect in the innovation process, however, it is not fully clear how entrepreneurial behavior contributes to innovation performance, and how entrepreneurial within a corporate environment must be stimulated. There are several organizational members who have ideas about how this should be handled, but this has not yet been translated in an effective strategy.

5.3.3 Practical implications

The problem exploration that is central in this case study research provided a clear management question, this question resembles the practical problem that will be addressed by this research. The management question reads as follows:

MQ: What should be done to stimulate entrepreneurial behavior of employees in order to increase innovation performance?

The answer to this question is not straight forward, as the results of this research shows there are multiple aspects to be considered. It is therefore needed to develop a series of practical implications that address the answer on the management questions over the full width of the problem.

Management support

It might be too easy to just recommend that management should be supportive towards entrepreneurial activities among employees in the broadest sense. Providing effective management support depends on large number of factors. Formulating universal rules is simply not possible due to the dynamics that are involved in the daily management of innovation processes. Contradicting forces are continuously shifting the balance that forms the most favorable setting (Quinn, 1985). The recommendations of this research is to provide more concrete implications that relate to how management support should be implemented at IHC. All of these recommendations are designed to work in a specific context; the context of IHC.

The first general design principle relates to management support, and reads as follows:

Design principle 1: Management support

IHC (C) should stimulate a culture where employees receive a high level of support from their direct managers and top management (I) as this will facilitate a pro entrepreneurial climate (M) that will lead to a higher level of innovation performance (O).

Management support may be expressed in multiple ways, for example, senior managers can encourage employees to bend rigid rules and procedures (Hornsby, Kuratko, et al., 2013). Although it may sound contradicting when senior managers encourage employees to bend the rules they have implemented themselves, it is just that what is needed to keep up with the continuous changing business environment (Eisenhardt & Sull, 2001).

A second recommendation to enhance management support is to provide support for small and experimental projects, even though it is known that many will fail (Hornsby, Kuratko, et al., 2013). For radical innovation, it is often not clear what the solution will be, or even the problem itself may not be explicit in the early stages. As a result, it can take a while before the most appropriate method and which technology is to be applied can be selected. Keeping as much options open until one of them is sure to be successful is therefore the most effective approach to come to a successful innovation (Quinn, 1985). A supportive manager

allows his employees to follow different paths and helps them to find the most valuable solution.

In addition, the support for experimental projects, and providing budget to develop promising ideas that are not yet proven contributes to perceived management support (Hornsby, Kuratko, et al., 2013). Budget is needed to develop a promising idea into a sound project proposal. Before deciding to proceed or kill a project there must be more evidence than only the idea itself. Providing time to employees to develop their ideas signals that they are supported in their actions. Further recommendations regarding management support are that risk taking, work discretion and rewards & reinforcement have a positive effect on management support. Increasing those three aspect will lead to a high perceived management support.

External collaboration

As prior literature has often emphasized the importance of external collaboration during the innovation process (Chesbrough, 2003b). This research shows that for IHC external collaboration and a pro entrepreneurial culture are both important determinants for innovation performance.

Design principle 2: External collaboration

IHC (C) should establish a strong focus on external collaboration (I) as this will enhance the connection with the market (M) that will lead to a higher level of innovation performance (O).

External collaboration is not limited to just having interaction with customers or suppliers as an organization. Also the extent to which the information that is extracted from the environment is dispersed throughout the organization must be taken into account. External collaboration is needed to extract information from the outside, process that information to meaningful knowledge, and ultimately to apply this knowledge in the innovation process. Han, Kim, & Srivastava (1998) explain this mechanism as inter-functional coordination. Having horizontal communication lines and openness between functional departments allows information to flow from sales and marketing departments into research & development departments. This connection is crucial since most of knowledge lies outside of the organization (Quintas, 2002). Even the largest organizations on their own are not able to develop the needed knowledge to keep up with the rapidly changing business environment. For IHC it is recommended to shape internal information flows in such way that information from external parties can easily flow towards product development departments

Being able to extract knowledge from the external environment through external collaboration does not mean the internal assets are less important. The added value of engaging in external collaboration is largely dependent on the internal assets of the organization, while the internal assets are in turn developed because of external collaboration. Or as Powell states: “*What can be learned is crucially affected by what is already known.*” (Powell et al., 1996, p. 120). With respect to external collaboration at IHC, it is crucial that this is implemented as a multidisciplinary practice. Contacts with external parties like customers and suppliers should not

be restricted to sales and marketing staff or to higher management staff. The recommendation of having a high level of work discretion does also apply to external collaboration. Lower level managers and employees who are active in the development of innovations should have the authority to engage in external collaboration, and they should have the authority to make decisions during this process with regard to external collaboration.

Risk taking

A pro entrepreneurial climate is partially determined by tolerance for risk taking. Therefore, the following design principles are formulated that take the relationship with management support into account.

Design principle 3: Risk taking

IHC (C) should be more tolerant for risk taking behavior (I) as this will facilitate a pro entrepreneurial climate (M) that will lead to a higher level of innovation performance (O).

Risk taking is a core concept in entrepreneurship literature, and can be expressed in many different forms. From a perspective of corporate entrepreneurship it is most often considered as the extent to which an organization assigns resources while there is a reasonable chance that no returns can be generated (Lumpkin & Dess, 1996). This kind of risk taking is an example of financial risk and is mostly recognized as organizational level risk taking. This type of risk taking is directly related to management support in the form of supporting the development of creative ideas by providing budget to develop projects that do not have a high change on success (Hornsby, Kuratko, et al., 2013).

In addition, when speaking about corporate entrepreneurship and innovation, there is a different kind of risk taking that is conceptualized on the individual level. Individuals that take a leading role in radical invocation projects may be confronted with enormous career risks. While they have the chance of receiving recognition when the project turns out to be successful, they also bear the risk of being held personally responsible for the failure of the project (O'Connor & McDermott, 2004). As a result, these employees can lose support from their superiors and colleagues that can ultimately lead to a large reduction in their motivation.

When speaking about a favorable risk taking culture within an organization it is not only about the organizational aspects like assigning resources to more risky projects. The individual risks exposed to the employee are of crucial importance for the innovation performance of the organization. Having a high tolerance for failure from both management and colleagues will stimulate employees to commit themselves to innovative projects (Hornsby, Kuratko, et al., 2013).

In practice a more tolerant attitude from the organization towards risk taking can be achieved in multiple ways. One idea is to reward failure; reward potential innovative projects that did not deliver the expected result. Out of all projects that were not successful the most promising can be selected to be presented towards management and employees as a case study. During this presentation the focus should be on the idea and the methods that were used to develop this idea into a success innovation, and a brief analysis of what went wrong

can be shared with employees out side of the project team. By rewarding the effort despites a disappointing outcome will send a clear message towards employees that failure is not something to be afraid for, instead it should be perceived as an opportunity to learn.

Rewards & reinforcement

Following the results of this research, rewards & reinforcement contribute to a pro entrepreneurial climate that enhances innovation performance. As rewards & reinforcement have an interacting effect with risk taking and work discretion, the exact contribution it has to innovation performance may be difficult to understand. Therefore, the following design principles are formulated that take the relationship with management support into account.

Design principle 4a: Rewards & reinforcement

At IHC (C) a proper performance based reward system should be established (I) as this will facilitate a pro entrepreneurial climate (M) that will lead to a higher level of innovation performance (O).

Having found interaction effects between rewards & reinforcements and some other variables, the following recommendations can be formulated:

Design principle 4b: Rewards & reinforcement

A business unit of IHC where employees have low work discretion (C) should establish a proper performance based reward system (I) as this will facilitate a pro entrepreneurial climate (M) that will lead to a higher level of innovation performance (O).

Design principle 4c: Rewards & reinforcement

A business unit of IHC where the level of risk taking is high (C) should establish a proper performance based reward system (I) as this will facilitate a pro entrepreneurial climate (M) that will lead to a higher level of innovation performance (O).

Rewards & reinforcement does not only influence the level of perceived management support, it also has an interaction effect with risk taking and external collaboration. It is an important aspect but at the same time, it is a very difficult subject due to its multiple relationships as the results of this research indicate. For a proper rewards & reinforcement system it is extremely important that the rewards system has a good fit with the organization's strategy (Kuratko et al., 2001), when reward & reinforcement system is not implemented correctly it can easily lead to negative effects (Kelley, O'Connor, Neck, & Peters, 2011). Especially for innovation team members there is a high likelihood of a mismatch between the rewards system and the individual or organizational risks (O'Connor & McDermott, 2004).

As this research shows, there is a significant interaction effect between risk taking and rewards & reinforcement. It seems that in a high risk taking culture, having a performance

based rewards & reinforcement in place does contribute to innovation performance. However, when there is a low risk taking culture, performance based rewards & reinforcement will not enhance the innovation performance. In addition, reward & reinforcements also have an interaction effect with work discretion. When the work discretion is high, rewards & reinforcements do not have a strong effect on innovation performance, and when work discretion is low, it does have a strong effect. Thus, it seems that in an organizational environment where work discretion and risk taking are both low, rewards & reinforcements seem to be very effective. Such an organization however is in general not characterized as being entrepreneurial (Lumpkin & Dess, 1996). Thus, despite a positive relationship between rewards & reinforcements and management support, there also seems to be a negative interaction effect with risk taking and work discretion. In accordance with this observation, Alpkhan et al. (2010) found that there was no relationship between rewards and innovation performance. These ambiguous findings indicate that rewards & reinforcement is a difficult subject, of which the effectivity is very much dependent on several contextual conditions.

For IHC specific it will be a difficult task to develop a suitable rewards systems since the organization has a large variety in the contextual factors among business units. Therefore it is not recommended to implement a central rewards & reinforcement system. Instead, the rewards and reinforcement system must be carefully tuned to the specific requirements of a small part of the organization. For example, a division can be made based on function. Employees who are expected to make decisions that involve large risk can be stimulated by having a performance based reward system. And on the other hand, employees who are involved in creative problem solving may benefit more from a supportive reward system, were good performance is rewarded with autonomy and credibility.

Since effective rewards & reinforcement systems differ from case to case it can be recommended to implement contingent rewards as part transactional leadership. According to the theory of transactional leadership, managers actively set clear goals of what is expected from individuals and continuously assess the related performance (Vaccaro, Jansen, Van Den Bosch, & Volberda, 2012). Future goals are to be continuous adjusted to maintain the best possible fit for the individual case.

Work discretion

Management support is partially determined by work discretion. Therefore, the following design principle is formulated that take the relationship with management support into account.

Design principle 5a: Work discretion → management support

IHC (C) should facilitate its employees with high work discretion (I) as this will increase the perceived management support and a pro entrepreneurial climate (M) that will lead to a higher level of innovation performance (O).

Work discretion or autonomy has often been associated with entrepreneurial behavior (Lumpkin & Dess, 1996). Moving authority down to lower levels in the organization will stimulate self-organization and the formation of autonomous teams. Such an approach demands a high confidence of the manager in his employees and a different management style. Instead of being directive the manager should act more as a coach (Volberda & van den Bosch, 2013). In addition, it is found that the performance of autonomous new product development teams is dependent on the contextual factors. Especially in environments with high technological novelty and uncertainty autonomous teams are effective (Patanakul, Chen, & Lynn, 2008).

The results of this research show that having high work discretion has a positive effect on management support and innovation performance. It also has an interaction effect with several of the other variables. Knowing that the overall level of work discretion at IHC is reasonable high, a further increase in work discretion may not be the most important recommendation. Instead, it is much more effective to concentrate work discretion in those parts of the organization where it can still have added value. For example when the level of external collaboration is high, work discretion can further increase innovation performance. Thus, it is preferred to further stimulate the work discretion for employees who participate in the innovation process and are involved in external collaboration.

5.4 Overall recommendations

The recommendations as formulated in the preceding text are all focused on a specific aspect. Since this research found that complex relationships are present between the variables it is recommended to implement an integral intervention. For example, an intervention strategy that only addresses the performance based rewards with the objective of increasing innovation performance may lead to unexpected results when the interaction of risk taking and external collaboration are not taken into account.

Although the independent variables that are included in this study represent aspects that can be influenced by management intervention, it must be recognized that this influence is limited. The added value of this research lies not so much in prescribing a desired value for some variables that automatically lead to the most optimal innovation performance. Instead, the added value of this research must be found in the enhanced insight into the relationship between organizational antecedents of a pro entrepreneurial culture and innovation performance.

Although the data from which these recommendations are derived are gathered within IHC, this does not imply that findings can be generalized over the whole organization. Regarding the large variety of context in which the different business units of IHC operate, it may very well be the case that a certain intervention strategy works well in business unit A and fails in business unit B. For example a business unit that has a main focus on research and development contributes to the innovation process by developing knowledge. This business unit has a different task in the innovation process compared to a business unit which is mainly concerned with design, fabrication and sales of pieces of equipment. The first one delivers the knowledge that the latter one applies. Both business units operate within a different part of the innovation process, and therefore must operate according to different

principles. To deal with this large variation within the organization, IHC must carefully develop a set of intervention strategies that comply with each other, but serve different objectives.

In conclusion, the recommendation must be considered as a whole, and an intervention strategy is to be implemented taking all contextual aspects into account. Looking at the current situation at IHC it can be concluded that the overall score on organizational antecedents of corporate entrepreneurship is high, so there is no urgent need to implement organizational wide structural changes. Instead, it would be more valuable to implement these recommendations in isolated parts of the organization where innovation is the most important factor to gain competitive advantage. These isolated parts can be existing business units, product groups and departments, or a new organizational environment can be created in which an optimal climate for innovation and entrepreneurship is shaped.

6. Conclusion

To conclude this thesis, first a reflection on the main findings will be given from a practical perspective, and second a reflection on the theoretical framework from an academic perspective will be provided. In addition, the limitations and future research will be addressed.

6.1 Main findings

A theoretical framework has been developed and a set of research questions have been formulated. The main findings of the quantitative survey research can be presented as answers on these research questions, based on the linear multiple regression analysis the following findings can be presented:

RQ 1: Do the organizational antecedents of corporate entrepreneurship contribute to innovation performance?

Some of the antecedents have an effect on innovation performance, see RQ 1a – RQ 1e for details.

RQ 1a: Does the factor ‘work discretion’ contribute to innovation performance?

Work discretion does not have a direct effect on innovation performance, but it does have interaction effects with external orientation, rewards & reinforcements and management support.

RQ 1b: Does the factor ‘management support’ contribute to innovation performance?

Management support does have a significant effect on innovation performance.

RQ 1c: Does the factor ‘time availability’ contribute to innovation performance?

Time availability does not have an effect on innovation performance.

RQ 1d: Does the factor ‘risk taking’ contribute to innovation performance?

Risk taking has an indirect effect on innovation performance as it partially determines management, which in turn has a direct effect on innovation performance.

RQ 1e: Does the factor ‘rewards and reinforcement’ contribute to innovation performance?

Rewards & reinforcement has an indirect effect on innovation performance as it partially determines management, which in turn has a direct effect on innovation performance.

RQ 2: Does an external orientation contribute to innovation performance?

External collaboration does have a significant effect on innovation performance, and it has interaction effects with some of the antecedents of corporate entrepreneurship.

RQ 3: Are there interaction effects between the independent variables 'management support', 'work discretion', 'time availability', 'rewards & reinforcement', 'risk taking' and external collaboration?

Multiple interaction effects were found:

- Work discretion has an interaction effect on: 1) the relationship between management support and innovation performance; 2) the relationship between rewards & reinforcement and innovation performance; 3) the relationship between external collaboration and innovation performance.
- Risk taking has an interaction effect on: 1) the relationship between external collaboration and innovation performance; 2) the relationship between rewards & reinforcement and innovation performance.

These findings are used to formulate a comprehensive answer to the management question that followed from the qualitative case study exploration. The management question reads as follows:

MQ: What should be done to stimulate entrepreneurial behavior of employees in order to increase innovation performance?

The answer on this question is provided as a set of design propositions and recommendations. The overall message was that the variables that are found to have a positive effect on innovation performance should be enhanced in order to stimulate a more pro entrepreneurial climate, that in turn will lead to a higher innovation performance. Having found interaction effects between the variables this general recommendation cannot be implemented as straightforward management rule. Instead it is needed to account for specific characteristics of business units before a proper intervention strategy can be implemented, the business context of the organization interacts with a given invention strategy.

It was found that not all antecedents of corporate entrepreneurship have a direct effect on innovation performance. The variable time availability did not have an effect on innovation performance. Work discretion, risk taking and rewards & reinforcement were found to have an indirect effect on innovation performance. Of the organizational antecedents of corporate entrepreneurship, the variables management support and rewards & reinforcements were found to have a direct effect on innovation performance. The variables work discretion and

risk taking were found to have interactions effects only. This finding was not reported in the original source of the applied measurement instrument (Hornsby, Kuratko, et al., 2013; Hornsby et al., 2002), and thus this research can complement the existing construct by showing how the organizational antecedents relate to each other.

6.2 Reflection

This research intends to investigate the how a pro-entrepreneurial climate and external orientation influence innovation performance. In existing literature these two subjects represent different fields of research, although there is overlap between the two little research exist that addresses both subjects with an integrated approach. Having identified interaction effects between external orientation and the antecedents of corporate entrepreneurship combined with the finding that both external orientation and some of the antecedents of corporate entrepreneurship have a direct effect on innovation performance suggest that the two should not be treated as separate subjects. Unfortunately the regression method used for the quantitative data is not capable of investigating underlying causal relationships, therefore it is not possible to provide strong and convincing evidence for the soundness of an integrated theoretical framework for corporate entrepreneurship and external orientation.

Looking at the practical contribution of this research the objective was to identify roadblocks and opportunities for enhancing the innovation performance at Royal IHC. The survey results are supplemented by quantitative data gathered by a series of interviews, this makes the research practical relevant for the day to day activities that contribute to development of innovations at Royal IHC. The survey results show certain relationships as defined in the theoretical framework do exist, and others not. This information is in particular useful to understand how the organizational structure relates to the conceptualized knowledge that is found in existing literature. The information gathered by the interviews provides a thorough understanding on the context in which innovation is developed at Royal IHC; it gives information about the how and why behind processes that are in place. In the end it can be concluded that this research has stronger focus on the practical contribution then on the theoretical contribution.

6.3 Limitations and further research

All data used in this research has been collected from this single organization. Therefore, the generalization of the results and recommendations is limited. The main focus of this research was on the relationship of organizational antecedents of corporate entrepreneurship, external collaboration and innovation performance. Prior research has shown that the social aspects of innovation contribute more to success then technological factors do (Volberda & van den Bosch, 2013).

The findings of this research show that organizational antecedents such as management support, risk taking behavior, rewards & reinforcements shape a pro-entrepreneurial culture that eventually leads to innovation performance. Looking back at the relevance of this research in relation to existing literature the results support that a pro-entrepreneurial climate leads to a higher innovation performance. Having found evidence of this relationship in a technology driven industry adds to the evidence supporting the theory that corporate entrepreneurship leads to competitive advantage. The influence of corporate entrepreneurship

and external orientation as individual constructs on innovation performance is already extensively elaborated in existing literature, this research contributes to that by providing an integrated view on how the two constructs jointly influence innovation performance. A first suggestion for future research is to conduct a similar research in more organizations so that the findings can be generalized. By doing so, this research can be better integrated in existing theory, what will lead to a better interpretation of the findings.

Furthermore this research shows that there is an interaction between the organizational antecedents of corporate entrepreneurship and external orientation, this interaction shows that underlying patterns exist. Based on the current research a proper understanding of these interaction patterns cannot be given as the analysis method used can only show that there are interaction effects present. A suggestion for further research is therefore to investigate whether or not there are causal relationships present between the antecedents of corporate entrepreneurship and external orientation.

In addition to the above suggestions for further research, this research can be extended to include known concepts such as social innovation (Volberda & van den Bosch, 2013) into an integrated framework that explains innovation performance as a multifunctional construct. In such a construct several aspects should be included that represent both the organizational aspects and the social aspects. Having such a construct in combination with a view on the underlying causal relations is expected to deliver a more precise foundation on which an effective innovation strategy can be build. Specific for IHC, further research within the organization can investigate to what extend the organizational antecedents interact with social aspects such as organizational culture, and how that contributes to a higher innovation performance.

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Appendix 1: Interview script

Interview Script, versie 1.0

Datum: 14-01-2014

Doelstelling (for info only)

Wat is de aanleiding van het onderzoek?

Ondernemend gedrag speelt een belangrijke rol bij het creëren van een (radicale) innovatie, echter binnen een groot bedrijf als IHC is het lastig om ondernemend gedrag te implementeren zonder de grenzen van de organisatie te overschrijden. De aanleiding van dit onderzoek is om meer inzicht te krijgen in de kansen en uitdagingen van ondernemend gedrag binnen IHC.

Wat is het probleem dat dit onderzoek aanspreekt?

Ondernemend gedrag en het bewerkstelligen van radicale innovatie lijkt zich lastig te ontplooien in de huidige situatie. Het onderzoek moet uitwijzen waarom dit zo is, en wat er in de toekomst verbeterd kan worden.

Wat moet er bereikt worden met het onderzoek?

Het interview moet leiden tot een gedetailleerd beeld van de organisatorische factoren die ondernemend gedrag stimuleren of juist blokkeren, en de manier waarop ondernemend gedrag kan bijdragen aan het succes van innovatie projecten.

Wat gaat er met de informatie gebeuren?

De uitkomsten van dit onderzoek zullen verwerkt worden in een projectvoorstel dat in de toekomst moet dienen om actief op ondernemend gedrag te gaan sturen.

Wat is de toegevoegde waarde van het interview / onderzoek?

Het onderzoek zal duidelijkheid verschaffen over de huidige status van ondernemend gedrag binnen IHC. Niet alleen de vraag of er ondernemend gedrag vertoont wordt zal beantwoord worden, maar vooral vragen over waarom ondernemend gedrag wel of niet vertoont wordt zullen uiteindelijk aan kunnen geven wat eventuele verbeterpunten zijn.

Doelgroep

De doelgroep van het interview bestaat uit individuen die nauw betrokken zijn (of zijn geweest) bij uitvoerende taken die onderdeel uitmaken van het innovatie proces, zoals product ontwikkeling, marketing, project management etc.

De doelgroep is met opzet vrij breed gekozen, zo wordt er geprobeerd om een brede focus te houden. De gedachte achter de interviews is juist de diversiteit zichtbaar moet worden. Een focus op individuen is belangrijk omdat creativiteit, leren en delen van informatie in essentie starten bij één persoon.

---Interview---

Introductie

Mijn naam is Michiel Rijckaert, ik ben een master student van de Technische Universiteit Eindhoven. Dit interview is een onderdeel van mijn afstudeer project. Met dit project wil ik de rol van ondernemend gedrag in het innovatie proces, en de manier waarop externe partijen betrokken zijn bij het innovatie proces gaan onderzoeken.

Het interview wordt opgenomen en getranscribeerd, en vervolgens geanalyseerd. De inhoud van dit interview wordt vertrouwelijk behandeld, en is anoniem. Uw naam wordt niet gebruikt in de data analyse, en zal ook niet in het uiteindelijke rapport vermeld worden.

Het interview duurt ongeveer 60 to 90 minuten, afhankelijk van de lengte van uw antwoorden.

Heeft u nog vragen of opmerkingen voordat het interview start?

<Start opname>

I. Individuele vragen		
Hoofdvragen	Probes	Tijd
1. Hoe lang werkt u al bij IHC?		0
2. Bij welke business unit werkt u?		
3. Wat is u huidige functie?		
4. Hoe lang werkt u al in deze functie?		
5. Kunt u uw rol in de organisatie beschrijven?	<i>Persoonlijke rol Functie omschrijving Verantwoordelijkheden Geschiedenis</i>	5

II. Thema: Innovatie		
Hoofdvragen	Probes	Tijd
6. Heeft IHC een duidelijke innovatie strategie? Motivatie?	<i>Persoonlijke mening</i>	7
7. A. Hoe belangrijk is het voor IHC om te innoveren? B. Wat voor soort innovatie zal voor IHC het meeste waarde creëren?	<i>Incrementeel Radicaal Technologie / Business model</i>	
8. Denkt u dat IHC op dit moment goed presteert met innovatieve producten of diensten?	<i>Motivatie</i>	
9. Kunt u omschrijven hoe een typisch innovatie project verloopt?	<i>Discontinuous development Specifiek doel Evoluerend</i>	
10. Tijdens een innovatie project kunnen er grote onzekerheden in het spel zijn, hoe gaat men hier in het algemeen mee om?	<i>Risico management Bewust / onbewust</i>	
11. Wat zijn naar uw mening de belangrijkste factoren die bijdragen aan een succesvolle innovatie?	<i>Creativiteit Management support Financial support</i>	
12. Kunt u een paar voorbeelden noemen van succesvolle innovatie projecten?		35

III. Thema: ondernemend gedrag		
Hoofdvragen	Probes	Tijd
13. Wat is de algemene houding tegenover het nemen van risico, en individuele initiatieven om creatieve projecten op te starten?	<i>Management support Support van collega's</i>	40
14. In hoeverre zijn werknemers vrij om zelf te beslissen hoe zij hun dagelijks werk uitvoeren?	<i>Routines Toestemming van manager</i>	
15. Wat voor een soort beloningen worden er gegeven aan werknemers die goed presteren? En welke prestaties worden er vaak beloond?	<i>Financieel Promotie Erkenning</i>	
16. Welke factoren kunnen werknemers er van weerhouden om zich ondernemend te gedragen?	<i>Hiërarchie Ondersteuning van manager Ondersteuning van collega's</i>	
17. Welke factoren kunnen werknemers stimuleren om zich ondernemend te gedragen?	<i>Organisatorische aspecten</i>	

	<i>Persoonlijke aspecten</i>	
18. A. Wat is voor uw dagelijkse werkzaamheden een korte termijn? B. Wat is voor uw dagelijkse werkzaamheden een lange termijn? C. Hoe is de verhouding tussen de tijd die gespendeerd wordt aan het oplossen van lange termijn problemen, en korte termijn problemen?	<i>Project duur</i> <i>Prioriteit</i>	60

IV. Thema: Externe samenwerking		
Hoofdvragen	Probes	Tijd
19. Gaat IHC vaak samenwerking aan met externe partijen tijdens het innovatie proces? Zo ja, wat voor een soort partijen zijn dit over het algemeen?	<i>Universiteiten</i> <i>Klanten / Leveranciers</i> <i>Peers</i>	65
20. Welke rol speelt samenwerken met externe partijen in het innovatie proces?	<i>Bron van kennis</i> <i>Markt informatie</i> <i>Gevaar / kans</i>	
21. Wie neemt over het algemeen het initiatief om een externe samenwerking aan te gaan?	<i>Werknemer</i> <i>Manager</i> <i>Meerdere personen</i> <i>(democratisch?)</i>	75

Appendix 2: Survey

--See PDF file--

Corporate Entrepreneurship & Innovation at IHC Merwede (v 0.4)

Welcome to the survey Corporate Entrepreneurship & Innovation at IHC Merwede. Press the button "next" at the bottom of this page to start the survey. Completing this survey takes about 10-15 minutes.

Your response will be kept completely confidential. Your name will not be attached to any results, unless you choose to fill in your e-mail address to get feedback of the results. When you choose to receive feedback of the survey results, you can compare how your business unit scores on the items compared to other business units.

For questions, you can contact Michiel Rijckaert by e-mail at mm.rijckaert@ihcmerwede.com.

There are 16 questions in this survey

Individual questions

How long do you work for IHC Merwede?

Please choose **only one** of the following:

- Less than 1 year
- 1 - 2 years
- 2 - 5 years
- 5 - 10 years
- 10 - 20 years
- 20 - 30 years
- More than 30 years

How long do you work in your current function?

Please choose **only one** of the following:

- Less than 6 months
- 6 months to 1 year
- 1 - 2 years
- 2 - 5 years
- 5 - 10 years
- More than 10 years

At which business unit are you employed?

Please choose **only one** of the following:

- Head Office
- IHC Dredgers
- IHC Beaver Dredgers
- IHC Hytech
- IHC Hytop
- IHC Sealing Solutions
- IHC Parts & Services
- MTI Holland
- IHC Systems
- IHC Global Production
- IHC Fabrication
- IHC Metalix
- IHC Fundex Equipment
- IHC Offshore & Marine
- IHC Hytop
- IHC Vremac Cylinders
- IHC Handling Systems
- IHC Piping
- Vuyk Engineering Rotterdam
- IHC Offshore Systems
- IHC Deep Sea Mining
- IHC Sea Steel
- IHC Engineering Business
- IHC Tidal Energy
- IHC Interior
- IHC Marine & Mineral Projects
- Oceanflore
- Other

Please choose which job level best describes your situation.

Please choose **only one** of the following:

- Junior
- Medior
- Senior
- Management
- Executive

Please choose which function(s) best describes your daily work.

Please choose **all** that apply:

- Research & Development
- Sales
- General management
- Project management
- Purchasing
- Administrative
- Engineering
- Production
- Planning & Control
- Product development
- Business development
- After sales services
- Human resource management
- ICT
- Other:

Innovation Objectives

Innovation is about generating a new idea, developing the idea, and bring the idea to the market. For an innovation to be successful, it is essential that it generates added value.

How important are the following innovation performance objectives for your business unit?

Please choose the appropriate response for each item:

	1 (Not important at all)	2	3	4	5	6	7 (Extremely important)
Number of new products or services developed .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of new products or services brought to market .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speed with which new products or services are developed .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speed with which new products or services are brought to market .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to respond quickly to market or technological developments.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to respond to market or technological developments faster than competitors.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incorporation of technological innovations into product/service offerings .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incorporation of technological innovations into internal operations .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Innovation Performance

Innovation is about generating a new idea, developing the idea, and bring the idea to the market. For an innovation to be successful, it is essential that it generates added value.

To what extent does your business unit meet the following innovation performance objectives?

Please choose the appropriate response for each item:

	1 (not at all)	2	3	4	5	6	7 (above target)
Number of new products or services developed .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of new products or services brought to market .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speed with which new products or services are developed .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speed with which new products or services are brought to market .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to respond quickly to market or technological developments.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to respond to market or technological developments faster than competitors.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incorporation of technological innovations into product/service offerings .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incorporation of technological innovations into internal operations .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Innovation Performance Satisfaction

Innovation is about generating a new idea, developing the idea, and bring the idea to the market. For an innovation to be successful, it is essential that it generates added value.

How satisfied are you with the performance of your business unit on the following innovation performance objectives, compared to similar companies?

Please choose the appropriate response for each item:

	1 (Not satisfied at all)	2	3	4	5	6	7 (Extremely satisfied)
Number of new products or services developed .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Number of new products or services brought to market .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speed with which new products or services are developed .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Speed with which new products or services are brought to market .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to respond quickly to market or technological developments.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Ability to respond to market or technological developments faster than competitors.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incorporation of technological innovations into product/service offerings .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Incorporation of technological innovations into internal operations .	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

External Collaboration Importance

Collaboration with external parties may take place during different phases of the innovation process:

- Idea generation: The initial idea is formulated and transformed to a concept.
- Development: The concept is developed in more detail, tested, and prepared for production.
- Market entry: The new product/service is launched on the market.
- Exploitation: The product/service is being sold to various customers and sustainable revenues are made without further development taking place.

How important is collaboration with an external party during the different phases of the innovation process for your business unit? (An external party may also include another business unit of IHC Merwede.)

Please choose the appropriate response for each item:

	1 (Not important at all)	2	3	4	5	6	7 (Extremely important)
External collaboration during idea generation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
External collaboration during development.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
External collaboration during market entry.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
External collaboration during exploitation phase.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

External Collaboration Satisfaction

Collaboration with external parties may take place during different phases of the innovation process:

- Idea generation: The initial idea is formulated and transformed to a concept.
- Development: The concept is developed in more detail, tested, and prepared for production.
- Market entry: The new product/service is launched on the market.
- Exploitation: The product/service is being sold to various customers and sustainable revenues are made without further development taking place.

How satisfied are you with the involvement of external parties during the different phases of the innovation process at your business unit? (An external party may also include another business unit of IHC Merwede.)

Please choose the appropriate response for each item:

	1 (Not satisfied at all)	2	3	4	5	6	7 (Extremely satisfied)
External collaboration during idea generation.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
External collaboration during development.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
External collaboration during market entry.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
External collaboration during exploitation phase.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Management support

Management support refers to the extent to which top managers are willing to facilitate and promote entrepreneurial behavior, including the championing of innovative ideas and providing the resources people require to take entrepreneurial actions.

Please indicate to which extent you agree with the following items:

Please choose the appropriate response for each item:

	1 (strongly disagree)	2	3	4	5	6	7 (strongly agree)
Upper management is aware and very receptive to my ideas and suggestions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This organization supports many small and experimental projects realizing that some will undoubtedly fail.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Budget is often available to get new project ideas off the ground.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
People are often encouraged to take calculated risks with new ideas around here.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Senior managers encourage innovators to bend rules and rigid procedures in order to keep promising ideas on track.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Those employees who come up with innovative ideas on their own often receive management encouragement for their activities.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My manager helps me get my work done by removing obstacles.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Work discretion and autonomy

Work discretion refers to the extent to which top managers tolerate failure, provide decision-making latitude and freedom from excessive oversight, and delegate authority and responsibility to lower level managers and workers.

Please indicate to which extent you agree with the following items:

Please choose the appropriate response for each item:

	1 (strongly disagree)	2	3	4	5	6	7 (strongly agree)
I have much autonomy on my job and am left on my own to do my own work.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
It is basically my own responsibility to decide how my job gets done.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I seldom have to follow the same work methods or steps for doing my major tasks from day to day.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel that I am my own boss and do not have to double-check all of my decisions.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
This organization provides freedom to use my own judgment.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have the freedom to decide what I do on my job.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Rewards and reinforcement

Rewards and reinforcement refers to the extent to which top managers develop and use systems that reward based on performance, highlight significant achievements, and encourage pursuit of challenging work.

Please indicate to which extent you agree with the following items:

Please choose the appropriate response for each item:

	1 (strongly disagree)	2	3	4	5	6	7 (strongly agree)
The rewards I receive are dependent upon my work performance.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My supervisor will give me special recognition if my work performance is exceptional good.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My manager would tell his boss if my work was outstanding.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Individuals with successful innovative projects receive additional reward and compensation for their ideas and efforts beyond the standard reward system.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Promotion usually follows the development of new and innovative ideas.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Time availability

Time availability refers to the extent to which individuals and groups have the time needed to pursue innovations and that their jobs are structured in ways that support efforts to achieve short- and long-term organizational goals.

Please indicate to which extent you agree with the following items:

Please choose the appropriate response for each item:

	1 (strongly disagree)	2	3	4	5	6	7 (strongly agree)
I always seem to have plenty of time to get everything done.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
During the past 3 months, my workload was too heavy to spend time on developing new ideas.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I have just the right amount of time and workload to do everything well.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
I feel that I am always working with time constraints on my job.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
My coworkers and I always find time for long-term problem solving.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Risk taking and uncertainty

Risk taking refers to the extend to which the organization is willing to take risk in the process of bringing an innovation to the market.

Please indicate to which extent you agree with the following items:

Please choose the appropriate response for each item:

	1 (Strongly disagree)	2	3	4	5	6	7 (Strongly agree)
In general top management has a preference for high risk innovation projects, with high potential returns.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Risk management is a central role in our organization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
When decisions involve high uncertainties, the potential opportunity is more important than the reduction of the perceived risk.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
The term risk taker is considered a positive attribute for people in our organization.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>
Individual risk takers are often recognized for their willingness to champion new projects, whether eventually successful or not.	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Results feedback

If you are interested in the results of this survey, please fill in your e-mail address.

Please write your answer here:

Thank you for your participation in this survey, your opinion is appreciated!

Submit your survey.

Thank you for completing this survey.