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Critical Success Factors
for
Innovative Performance of Individuals

A Case Study of Scania

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“There is a way to do it better – find it!”

- Thomas Edison

Abstract

Title: Critical Success Factors for Innovative Performance of Individuals - *A Case Study of Scania*

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Background: The competitive corporate environment of today, as marked by continuous changes and enhanced global competition, forces companies to constantly adapt their current business activities and increasingly excel. Innovation is considered a critical imperative in order to respond to these increased competitive threats. Hence, innovation ought to permeate corporate environments and their inherent business activities. Recent global studies indicate that innovation is considered particularly vital within the highly competitive automotive industry; 93 percent of its senior executives rank innovation as critical to long-term corporate success. Companies thus must embrace innovation through the consequent incorporation of levers for enhanced innovative performance throughout organisational settings and adherent contexts. The critical importance of particularly innovative individuals has been elucidated in recent studies. Therein, particularly innovative individuals have been identified as the single most critical element of innovative success of companies. To scrutinise the underlying critical success factors for the significant innovative performance of these particularly innovative individuals can thus be considered a key to long-term corporate innovative success and according also to corporate survival.

Purpose: The purpose of this master thesis project was to identify critical success factors for innovative performance of individuals within Scania specifically. Hence, this master thesis project aimed at increasing the corporate understanding therein.

Method: Throughout this master thesis project, a system approach with a qualitative grip was applied, in order to capture complex interlinks and interdependencies. An explorative case study with focus on internal top innovators was conducted at Scania. It was preceded by exhaustive desk studies along with a quantitative survey of Scania's internal patent

database, which selected the survey units to include in the case study. As a key performance indicator of innovative performance, the number of registered invention submissions during the years of 2009, 2010 and 2011 was applied. Interviews, previous research and literature studies were the main data gathering techniques used. Semi-structured interviews with the selected top innovators provided qualitative primary data and constituted the major source of empirical data. Previous research provided exhaustive quantitative secondary data through register data from Scania's internal patent database, along with company-specific information. Literature studies provided foremost qualitative secondary data to the initial desk studies.

Conclusions:

The authors present six different critical success factors for innovative performance of individuals within Scania; motivation, creativity, innovative features, assignment, time for innovation and collaboration. *Motivation* must be in place through the presence of foremost intrinsic motivation but also extrinsic motivation. Intrinsic motivators must be present within all individuals. Moreover, extrinsic motivators, especially synergistic ones, must be in place throughout the organisation of Scania. *Creativity* must be in place within individuals through the presence of all its three components; i.e. creativity skills, task motivation and expertise. Yet, creativity skills were identified as the most critical component of creativity. Expertise was identified as the least critical component of creativity, as it can be compensated for through various external means. *Innovative features* must be present within individuals through three subcategories that were identified by the authors. These are personal traits, practical approach and intellectual skills. No single innovative feature was distinguished as utterly critical. Yet, individuals must possess innovative features of all three identified subcategories and preferably be particularly strong in at least one innovative feature of each subcategory. *Assignment* entails assigned general work field and inherent work tasks. Work field was identified to determine the general degree of innovation potential and hence is indirectly critical. Work tasks were identified as utterly critical, through their entailed degree of radical novelty, exposure to novel technologies and offered overall exploration potential. Particularly notably; assignment as a critical success factor for innovative performance was not explicitly articulated throughout the studied theory. *Time for innovation* must be offered through a certain degree of incorporated organisational slack. Yet, three identified fundamental prerequisites must be in place, in order for it to be favourable; the organisational slack must be balanced, flexible and properly managed. *Collaboration* is generally important to innovative performance. Yet, it is only critical on condition that some identified fundamental prerequisites are in place within the actual team. The most critical prerequisites of

favourable collaboration are shared elementary knowledge, clear communication and unified attitudes. Moreover, networks and skunk works were identified as the utmost favourable designs of collaboration.

In order to summarise the six identified critical success factors for innovative performance of individuals within Scania, the authors present the *MCLATC framework for individual innovative profile*, which can be considered an applicable tool in order to support the enhancement of innovative performance throughout the organisation of Scania.

Keywords:

Innovation, Critical Success Factors, Innovative performance, Scania, Motivation, Creativity, Innovative features, Assignment, Time for innovation, Collaboration, Managerial practices.

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This master thesis represents the final concluding part of our entire Master of Science degree in Industrial Engineering and Management at Lund Institute of Technology, Lund University. This master thesis project was conducted during the spring of 2012 at the office of Scania R&D in Södertälje, Sweden. Its very existence was initiated by Scania, while its explicit purpose was elaborated in close collaboration with the authors.

We would like to sincerely thank Scania in general and Scania R&D in particular for welcoming us with open arms and for endeavouring to make us an active part of the organisation. We would like to thank our supervisor at Scania; Katarina Lund, for her support and for constantly believing not only in our ideas but also in our ability to independently execute and freely deliver. We have sincerely appreciated the immense trust that we have been granted from day one. Moreover, we would like to express our explicit gratitude to all 24 respondents that wholeheartedly participated in the interviews within the scope of the executed case study. Without their unreserved devotion of time, the realisation of this master thesis project would have been hard. Also, we would like to gratefully thank the Patent Department that assisted us without reservation, along with the participator of the pilot interview and other key individuals within Scania R&D that provided us with valuable information and thus helped us to move forward. Last but not least, we would like to expressively thank the librarian at the internal library of Scania R&D; Iréne Wahlqvist. Her constant provision of the considerable quantity of literature that we requested has facilitated the execution of this master thesis project in a manner that we do not fully grasp. Her supportive service has been invaluable.

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We hope that the readers of this master thesis will find it interesting. In particular, we hope that Scania and its individuals will find it a pertinent tool for embarking on the path towards enhanced innovative performance.

Lund, June 14th 2012

Charlotte Möller and Madeleine Wahlqvist

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1. Introduction

This opening chapter aims at providing general understanding of the importance of ensuring innovative performance within companies, in terms of sustainable competitive advantage and long-term corporate innovative success. Therein, it demonstrates how the context of this master thesis project links to this comprehensive circumstance. The chapter starts with a brief account of the contemporary significance of innovative performance and proceeds with a thorough problem description. It continues with an account of the purpose of this master thesis project, along with corresponding delimitations and objectives. The chapter is concluded by an outline of this master thesis, with brief descriptions of all chapters.

1.1. Background

“Innovation is one of the few and perhaps the only consistent source of long-term competitive advantage in most industries and markets.”

- (Boston Consulting Group, 2008a)

The competitive corporate environment of today, as exposed to continuously enhanced global competition, forces companies to constantly adapt their current business activities in order to respond to competitive threats and excel. Changing customer needs, novel technologies, technological development, new governmental regulations and a harsh economic climate further contribute to the need for a strong corporate flexibility, through the ability of continuous adaptation. Present sustainable competitive advantages and strong brands are no longer regarded as secure guarantees in order to remain competitive over time. Instead, innovation is considered a critical imperative for the purpose of not only securing current market shares and maintaining competitiveness, but also for generating larger revenues, profits and shareholder returns. Hence, innovation can be considered an indispensable key to long-term corporate innovative success and accordingly also to ensured corporate survival. Consequently, innovation and related innovation activities optimally must permeate all corporate environments, contexts and settings. (Boston Consulting Group, 2008a; Boston Consulting Group, 2010a; PIEp, 2008a)

Accordingly, innovation must enjoy a strong priority status throughout all companies that wish to obtain and maintain competitive advantage, through a prominent placing on their corporate agendas. This is a fact that is widely acknowledged by companies across all industries. Global surveys of the attitudes towards innovation of senior executives in large companies speak for themselves. Recent studies indicate that 72 percent consider innovation a top-three priority on a corporate level. 84 percent consider innovation an important or an extremely important lever for their company’s ability to positioning itself in order to benefit from an economic recovery. Innovation is regarded as particularly vital within the highly competitive automotive industry, where 93 percent of the senior executives rank innovation as critically imperative to long-term corporate success. (Boston Consulting Group 2010a)

1.2. Problem description

With clear and proved links between successful innovation activities and strengthened revenue streams, companies must embrace innovation through the consequent incorporation of levers for innovative performance throughout the organisational hierarchy, all levels and functions. Researchers have devoted considerable efforts in literature to studies of how to enhance innovative performance at the holistic organisational level; e.g. through supportive top management, proper organisational alignment and visions. (Boston Consulting Group, 2008b) Moreover, the critical importance of particularly innovative individuals has gained increased attention in literature during the last decade, as their significant impacts on the absolute number of elaborated innovations of companies have been elucidated in a number of studies. Therein, particularly innovative individuals within companies have been identified as the single most critical element of secured corporate innovative success. (Boston Consulting Group, 2010b) Furthermore, a recent study of three large patent-intense companies (Andersson & Berggren, 2011) points out that a relatively small share of the total number of employees represents a predominant majority of the total number of filed patents of each of the studied companies (VINNOVA & Stiftelsen IMIT, 2012a). The underlying causes for this phenomenon are many and multifaceted and all successful innovations do not result in patents, due to both strategic reasons and legal reasons. Nevertheless, the findings of this study (Andersson & Berggren, 2011) indicate the immense importance of these particularly innovative individuals for the overall innovative success of these companies.

Hence, the task of scrutinising the underlying critical success factors for the significant innovative performance of these particularly innovative individuals within companies can be considered another key to long-term corporate innovative success (see 1.1). An identification of such critical success factors will assist companies in both creating and implementing appropriate conditions that enable innovative individuals to increasingly excel. Simultaneously, such an identification will assist companies in applying identified critical success factors on a larger scale throughout the organisation and thus enhance overall innovative performance among all its individuals. However, little space in literature has been devoted to all-embracing studies of specific critical success factors for innovative performance of particularly innovative individuals; neither on generalisation level, nor on individual company level.

1.2.1. This master thesis project

Scania CV AB, on behalf of its Research and Development unit, has initiated this master thesis project. Throughout this master thesis, Scania CV AB will be shortened Scania and its Research and Development unit will be named Scania R&D.

Scania operates within the fast-changing and highly competitive automotive industry and thus faces the indispensable innovation imperative (see 1.1). Moreover, Scania is one of the three studied large patent-intense companies in the above-mentioned study (Andersson & Berggren, 2011). Consequently, Scania's innovative success in the form of the absolute number of elaborated innovations heavily relies on the excellence of a relatively small number of particularly innovative individuals, i.e. its top innovators. As an important element of its corporate innovation priority and due to its heavy dependence on these individuals, Scania wishes to gain

profound understanding of the underlying critical success factors for their innovative performance, in order to be able to apply these factors on a larger scale throughout its organisation. Thereby, the major interest of Scania in this master thesis project is to understand the reasons for and the prerequisites of the innovative performance of its top innovators; i.e. their critical success factors for innovative performance. Scania has explicitly expressed a wish for a relatively broad perspective of such factors.

The conclusions of this master thesis project will support an efficient enhancement of the overall innovative performance of individuals throughout Scania.

1.3. Purpose

The purpose of this master thesis project is to identify critical success factors for innovative performance of individuals within Scania specifically. Hence, this master thesis project aims at increasing the corporate understanding therein.

The study will include the following parts:

- An extensive account of prevailing theory and existing research within the field of critical success factors for innovative performance of individuals. It will be presented from a relatively broad perspective of factors, as requested from Scania.
- An explanative case study of Scania, with exclusive focus on its most successful innovative individuals; i.e. its top innovators.
- A compilation of identified critical success factors for innovative performance of individuals within Scania.
- A compilation of recommendations to Scania and to its individuals of how to appropriately take action on the identified critical success factors for innovative performance of individuals within Scania, for the purpose of enhancing innovative performance throughout the organisation.

1.3.1. Delimitations

The exploration and the identification of critical success factors for innovative performance of individuals within Scania will be executed to include influencing factors at the individual level and at the collective level respectively. Influencing factors at the holistic organisational level will not be taken into account within the scope of this master thesis project.

The number of registered invention submissions in Scania's internal patent database will function as a key performance measure of innovative performance. These invention submissions are exhaustively secured to entail a considerable level of inventive step before being added to the internal patent database (see 2.4.1). I.e. specific innovations that are to be found outside Scania's internal patent application process and thus its internal patent database will not be taken into consideration within the scope of this master thesis project.

1.3.2. Objectives

The primary objective of this master thesis project is to identify critical success factors for innovative performance of individuals within Scania specifically.

The secondary objective of this master thesis project is to deliver recommendations to Scania and to its individuals of appropriate actions in order to enhance innovative performance throughout the organisation. These recommendations will be based on the identified critical success factors for innovative performance of individuals within Scania, in combination with their potential feasibility to be commonly incorporated throughout the organisation.

1.4. Outline of this master thesis

This master thesis follows a structured format where every chapter is introduced with a brief summary of its purpose and of its content. A short description of the outline of every chapter is presented below.

Chapter 1, *Introduction*, provides an account of the contemporary importance of ensuring innovative performance within companies. It links this circumstance to the problem description of this master thesis project. Therein, it introduces the purpose of this master thesis project, along with corresponding delimitations and objectives.

Chapter 2, *The Case Company*, provides an introductory overview of Scania and of its corporate functionalities, in order to ensure a thorough basis of understanding. In particular, the chapter introduces Scania's general commitment innovation and its particular focus on patents.

Chapter 3, *Methodology*, provides exhaustive insights into the applied methodology of this master thesis project, along with thorough explanations of methodological choices. Also, it provides an account of general aspects of trustworthiness and authenticity.

Chapter 4, *Theory*, provides the theoretical framework of this master thesis. Also, it introduces a theoretical account of how to measure innovative performance, in accordance with prevailing theory and existing research.

Chapter 5, *Empirical Data*, provides a comprehensive account of the gathered empirical data, through the presentation of an empirical framework. Also, it gives a descriptive account of the respondents and their background.

Chapter 6, *Analysis*, provides a thorough analysis of the gathered empirical data, through analysis of the presented empirical framework.

Chapter 7, *Conclusions*, provides the concluded critical success factors for innovative performance of individuals within Scania, which derived from the executed analysis. Moreover, the identified critical success factors are presented through an elaborated applicable framework; the *MCIATC framework for individual innovative profile*.

Chapter 8, *Recommendations of Further Work*, provides the recommendations to Scania and to its individuals. Moreover, it entails a discussion of the trustworthiness and the authenticity of the presented conclusions, along with an account of the contribution of this master thesis project.

2. The Case Company

This chapter aims at providing an introductory overview of Scania and of its overall corporate functionalities. The chapter starts with a general introduction to Scania and to its commitment to innovation. It continues with a more particular description of Scania R&D. The chapter proceeds with a thorough depiction of Scania's particular focus on patents and finishes with an account of Scania's incentive system for innovations.

2.1. Overall introduction to Scania

Scania is one of the world's leading manufacturers of heavy vehicles, engines and linked services (Scania, 2012a). The company was founded in 1891 (Scania, 2012b). For a more detailed time line of the history of Scania, see (Appendix A). Scania employs approximately 37 500 people and operates on all inhabited continents. Its earnings of the year of 2011 amounted to SEK 12 398 m, with an operating margin of 14,1 percent. (Scania, 2012c)

Scania is a public limited liability company and its shares are listed on the NASDAQ OMX Nordic Exchange Stockholm, Large Cap (Scania, 2012d). Volkswagen AG is its largest shareholder (Scania, 2012e).

The overall corporate objective of Scania is:

“...to provide the best profitability for its customers throughout the product life cycle by delivering optimised heavy trucks and buses, engines and services – thereby becoming the leading company in its industry. Scania's operations are based on the company's core values, its focus on working methods and its dedicated employees.”

- (Scania, 2012f)

2.1.1. Business areas and geographical markets

Scania operates within four business areas; heavy trucks, buses, engines and services. Heavy trucks comprise vehicles of long-haulage, distribution, construction and special-purpose character. Buses entail buses and coaches, i.e. vehicles for both city and intercity use. Engines include technical solutions for industrial, marine and power generation purposes. Services comprise adherent services, e.g. financial and maintenance related ones. (Scania, 2012g) Heavy trucks amounted to 64 percent of the global net sales of the year of 2011. Services represented 19 percent, while buses constituted 9 percent and engines amounted to 1 percent. The remaining 7 percent were made up by used vehicles and miscellaneous (see Figure 1). (Scania, 2012c)

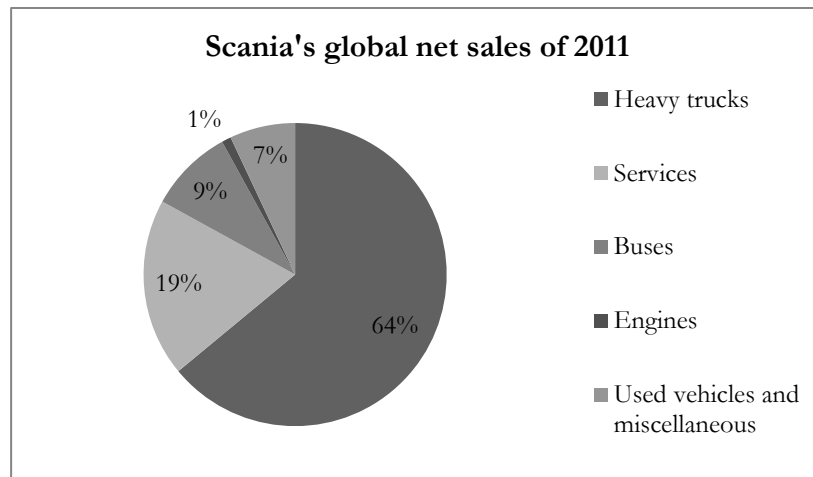


Figure 1: Scania's global net sales 2011 (Möller & Wahlqvist, 2012a)

Scania has organisations for sales and service located in approximately 100 countries. Its headquarter is located in Södertälje, Sweden, where also its Research and Development unit and its central Purchasing unit are situated. Scania's production units are spread throughout seven different countries; Sweden, France, the Netherlands, Poland, Russia, Argentina and Brazil. Moreover, Scania has regional product centres in six emerging markets and local procurement offices in five countries. Europe is the largest geographical market for heavy trucks, engines and services while Latin America and South America are the largest geographical markets for buses and coaches, from a volume point of view. (Scania, 2012c)

2.1.2. Organisational structure

Scania applies a cross-functional organisational structure throughout its organisation. Its main organisational structure consists of five corporate units; *Research and Development*, *Purchasing*, *Production and Logistics*, *Franchise and Factory Sales*, *Finance and Business Control* and *Sales and Service Management* (see Appendix B). As one corporate unit, *Research and Development*, *Purchasing* has the same, but are in all other respects managed separately. Each corporate unit comprises the four mentioned business areas (see 2.1.1). The corporate units are responsible for the very execution of set strategies and of general business operations. (Scania, 2012h)

2.1.3. Core values

Scania is a most value-driven company. Its three core values, cited below, are heavily emphasised throughout the daily work and permeate the entire corporate culture of the organisation.

- *Customer first*
- *Respect for the individual*
- *Quality*

The core values of Scania function as points of departure for all development initiatives and all improvement actions. (Scania, 2012f) For a more detailed description of each core value, see Appendix C.

2.2. Commitment to innovation

As all other companies within the automotive industry, Scania is affected by the innovation imperative and thus heavily depends on continuous elaboration of innovations on a significant scale (see 1.1.). Its organisational commitment to innovation has resulted in a prestigious distinction; Scania was named one of the Top 100 Global Innovators during the year of 2011 by the news agency Thomson Reuters. Scania was particularly recognised for its innovative technology and the commercialisation of its innovations. The global spreading of its innovations was emphasised, along with the innovative quality of these innovations, as acknowledged from patent offices across the world. (Scania, 2012i)

2.3. Scania R&D

A predominant majority of Scania's total number of innovations, and thus its total number of filed patents, derive from Scania R&D. This circumstance is due to the very characteristic nature and the scope of operations and activities of Scania R&D. (Scania, 2012j)

Scania R&D employs around 3 300 people in Södertälje, Sweden. This number corresponds to approximately one tenth of Scania's total number of employees, globally spread across the world. Scania's investments in research and development have been steadily around or above four percent of its revenues since the 1970's. Scania invested approximately 5,3 percent of its net sales in research and development during the year of 2011. (Scania, 2012c)

The corporate objective of Scania R&D is:

“...to develop heavy vehicles, engines and services that meet the future needs of our customers.”

- (Scania, 2012i)

The corporate objective of Scania R&D thus functions as a support to the fulfilment of the overall corporate objective of Scania (see 2.1). As reflected in its corporate objective and in line with the overall core values of Scania (see 2.1.3), Scania R&D has a strongly emphasised customer focus, which consequently permeates all actions, operations, processes and decisions. The customer focus of Scania R&D is often internal, as it derives from internal customers within Scania on behalf of the external customers of the company. (Scania, 2012i)

Scania R&D acts in accordance with a thoroughly elaborated structural framework, officially named Scania R&D Factory. It is based on four types of building blocks of core values, guidelines, principles and priorities. Scania R&D Factory entirely permeates the organisational manner of thinking. It functions as a guiding tool for the individuals of Scania R&D, as it describes how novel problem ought to be approached and how continuous work tasks ought to be executed. For a more detailed presentation of Scania R&D Factory and its four building blocks, see Appendix D. (Scania, 2012i)

2.3.1. Organisational structure

The organisational structure and thus the hierarchical levels of Scania R&D rank from sectors to department, sections and functional groups. Scania R&D is divided into four different organisational sectors. Scania R&D has approximately 250 functional groups in total, where each group has its own group manager. The groups are responsible for separate limited functional areas. (Scania, 2012i)

2.3.2. Product Development process

All product development assignments within Scania R&D are executed within the scope of its Product Development process, internally named the PD process. Scania R&D as a whole does not apply a separate explicit innovation process. Innovation is rather a fundamentally inherent part of its entire Product Development process. The Product Development process crosses all functional areas of Scania R&D. (Scania, 2012i)

The Product Development process consists of three different subprocesses, i.e. work fields; Pre-Development, Continuous Introduction, and Product Follow-Up (see Figure 2). Individuals often spend most of their working hours on work tasks within one specific work field. However, it is common that their total amount of working hours is relatively divided, i.e. that they spend working hours within two or more work fields. (Scania, 2012i)

- *Pre-Development* comprises feasibility studies, technology development and concept development. It has a heavy emphasis on research, novel technologies and unexplored areas and thus devotes considerable efforts to activities related to pure innovation. Its projects are far from ready actual product ranges and thus also market introduction. Pre-Development operates without the presence of clear deliverables, due to its considerably high degree of novelty and exploration. Its projects are not exposed to any tight deadlines; deadlines only exist to a very limited amount. Pre-Development is internally named *Yellow Arrow*. (Scania, 2012i)
- *Continuous Introduction* entails projects that are driven towards assured market introduction. As its projects implement product ranges that will be made available to customers, Continuous Introduction works with physically ready product ranges and concepts. The projects therein operate with clear deliverables and commonly tight deadlines. Continuous Introduction is internally named *Green Arrow*. (Scania, 2012i)
- *Product Follow-Up* manages issues that are related to reengineering and improvements of existing product ranges and concepts. It maintains and updated the product ranges that currently are available on the market. Hence, this subprocess is exposed to tight deadlines and clear deliverables. Product Follow-Up is internally named *Red Arrow*. (Scania, 2012i)

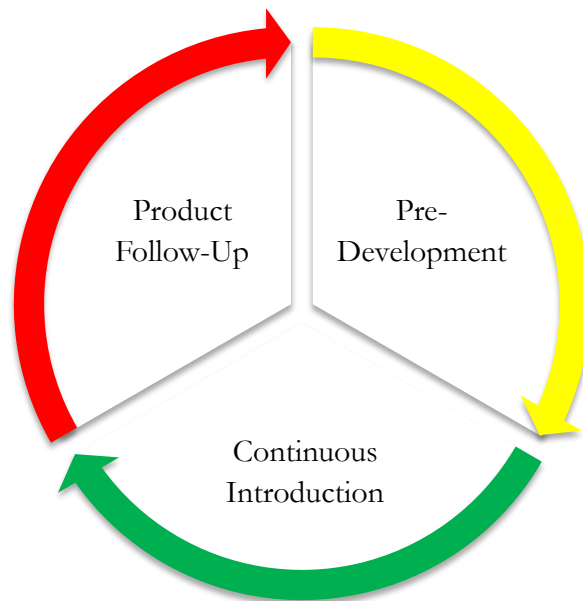


Figure 2: Product Development process (Möller & Wahlqvist, 2012b)

2.4. Focus on patents within Scania

Scania has an explicit corporate aim to legally protect all elaborated innovations to the utmost possible greatest extent. Due to the character of the automotive industry, most innovations are protected through patents. Scania has an internal Patent Department, which is responsible for all patent applications and their corresponding processes. Every department throughout Scania has access to its own patent engineer, who functions as a supporting expert resource throughout the patent application processes. Individuals are explicitly and heavily encouraged to submit their elaborated innovations, through multiple channels of information within Scania; e.g. monthly newsletters, meetings and wall placards. (Scania, 2012j)

The patent application process that Scania applies, from the initial innovation to the officially registered patent, consists of two subprocesses; one internal subprocess and one external subprocess. The internal patent application process is specific for Scania and is governed internally by its Patent Department. (Scania, 2012j) The external patent application process is nationally regulated in law, as governed and controlled foremost by the Swedish Patent and Registration Office (PRV, 2012a).

Only the internal patent application process of Scania will be accounted for in this master thesis, due to the central position of its inherent invention submissions within the chosen research method of this master thesis project (see 3.3.7). The national patent application process thus is considered to be outside the sphere of relevant information that is related to the scope of this master thesis project. Hence, it will not be described.

2.4.1. Internal patent application process

Scania's internal patent application process is divided into several subprocesses (see Figure 3). The three main subprocesses consist of the steps of inquiry request and of invention submission,

along with the step of patent application or prophylactic publication or corporate secret. (Scania, 2012i)

- *Inquiry request:* The inquiry request is the first step of the internal patent application process. This request is usually submitted by an individual, or by a number of individuals, within a development team. The inquiry request should be evaluated either by a relevant manager or by a technical expert within the field of the potential invention, in order to scrutinise its level of usefulness to Scania. It is also evaluated whether the innovation already is known to the manager or to the technical expert, i.e. its degree of novelty is evaluated. If the innovation is considered useful to Scania and not already known to the manager or to the technical expert, the inquiry request is registered at Scania’s Patent Department for a more thorough and qualitative evaluation of its degree of novelty and of its level of inventive step. (Scania, 2012i)

- *Invention submission:* If the Patent Department considers the innovation to be novel and to entail a considerable level of inventive step, the inquiry request is classed as an invention submission. The Patent Department continues with an investigation to elucidate whether the invention submission is feasible for a patent application. The results from the investigation together with recommendations from the Patent Department are sent back to relevant managers for another evaluation. The managers together with the direction of Scania R&D arrive at a final decision on how to protect the innovation. (Scania, 2012i)

- *Patent application/Prophylactic publication/Corporate secret:* If the decision is made to further protect the innovation, it can be protected through different manners. The choice of legal protection depends on the character of and field of application for the innovation, but also on its surrounding competitive environment. Most commonly, Scania decides to file a patent application to the Swedish Patent and Registration Office and thus the external patent application process follows. Patents are country-specific and if appropriate, one patent may be applied for in several countries. However, there may be occasions where protection through prophylactic publication or corporate secret is considered more suitable than protection through patent. (Scania, 2012i)



Figure 3: Internal patent application process (Möller & Wahlqvist, 2012b)

2.4.1.1. Internal patent database

As from the year of 2006, Scania uses an internal patent database named Memotech. It holds records that contain complete information of all executed inquiry requests, invention submissions and filed patent applications. Scania’s internal patent application process, and thus its registration

of applications and storage of information in Memotech, has been modified during the last years. The internal patent application process of today (see 2.4.1) was implemented and ready to use by the year of 2009. (Scania, 2012j)

2.5. Incentive system for innovations

Scania is a knowledge-intensive company that heavily relies on the expertise of its individuals, as previously described. In order to encourage its individuals to continuously elaborate innovations, Scania applies various incentives. (Scania, 2012i) The major elements of Scania's applied incentive system for innovations are explained below.

2.5.1. Monetary remuneration

Scania disburses monetary remuneration for an innovation in three sets, at three separate stages. Each stage is exclusive and applies its own criteria; to obtain remuneration at one stage is not a guarantee for another disbursement at a following stage. The first payment occurs if the innovation is classed as an invention submission and if a decision is taken to file a patent application. The second payment occurs if the patent application is filed or if the innovation is made public through prophylactic publication. The third and final payment occurs if a patent application is filed in more than one country. (Scania, 2012i)

The size of Scania's monetary remuneration is based on a basic amount. Several variables come into play; e.g. the number of inventors involved in the innovation and whether the innovation is classed as an A-invention or a B-invention. An A-invention falls within the frame of the inventor's work tasks or special assignments, whereas a B-invention goes beyond the inventor's daily duties. (Scania, 2012i)

2.5.2. Inventor party

Scania hosts an annual inventor party in order to celebrate and honour its inventors. All individuals who have been granted one or several patents during the previous year are invited, together with their managers and other key individuals within the organisation. A ceremony is held, where the inventors are presented with a metallic plate with their name and patent engraved along with a specially designed inventor pin. (Scania, 2012j)

If an anterior innovation has proved to be of certain significant value to Scania during a period of five years, the actual inventor will receive an invitation to the inventor party to receive a metallic diploma along with an extra amount of monetary remuneration. (Scania, 2012j)

2.5.3. Other recognitions

Scania recognises individuals who hold patents through hanging of plaquettes in a central corridor at Scania R&D. The plaquettes contain information of each patent together with details of the corresponding inventor. Information of granted patents is also published in a particular patent book that can be found in the Scania museum in Södertälje, Sweden. (Scania, 2012j)

3. Methodology

This chapter aims at providing a comprehensive, descriptive and logical overview of the research methodology that will be applied throughout this master thesis project. It starts with an account of the comprehensive scientific approach and proceeds with relevant descriptions of various methodological strategies and of different methodological techniques. Therein, methodological choices are thoroughly explained. The chapter finishes with an account of general aspects of trustworthiness and of authenticity.

Methodology provides the guiding principles of how to achieve knowledge-creation through studies of the reality. Appropriate methodology approaches thus ought to be thoroughly chosen, in accordance with the purpose, the objectives and the context of the given study. (Arbnor & Bjerke, 1994a; Höst et al., 2006a)

3.1. Scientific approach

The scientific approach assists in comprehensively approaching a given study, through the provision of a generally applicable methodology frame. It exist three generic types of scientific approach; the analytic approach, the system approach and the actor approach (see Table 1).

Table 1: The Arbnor & Bjerke framework (Arbnor & Bjerke, 1994b)

| | Analytical approach | System approach | Actor approach |
|------------------------------------|---|---|--|
| Prerequisites | <ul style="list-style-type: none"> - Existing analytical theory - Verified/Falsified hypothesis | <ul style="list-style-type: none"> - Existing system theory - Analogies (Homologies) | <ul style="list-style-type: none"> - Meta theory - Constitution factors - General pre-understanding - Interactive development of understanding |
| Explanation / Understanding | <ul style="list-style-type: none"> - Causality (Cause–effect) | <ul style="list-style-type: none"> - Finality (Indicator–effect) | <ul style="list-style-type: none"> - Dialectic (Thesis–antithesis–synthesis) |
| Results | <ul style="list-style-type: none"> - Absolute cause-effect connections - Logical models - Representative cases | <ul style="list-style-type: none"> - Partly unique cases - Classification mechanisms - Typical cases | <ul style="list-style-type: none"> - Language of description - Language of ideal types - Deliberating interactive action |

3.1.1. Analytic approach

The analytic approach aims at describing an objective reality (Arbnor & Bjerke, 1994c). It presumes that the reality is of summative character and that it can be analytically decomposed into independent components. I.e. the whole is a sum of its parts and the parts are mutually independent. Due to its summative construction, the reality is considered known when all components have been thoroughly explained. (Arbnor & Bjerke, 1994d) Theory is built through verified or falsified hypotheses, which arise from existing theory. Explanations are sought for through mapping of causality connections. As the developed knowledge is objective and

individual-independent, an analytic approach results in conclusions of generalisation character. (Arbnor & Bjerke, 1994c)

3.1.2. System approach

The system approach also asserts that the reality is objectively available (Arbnor & Bjerke, 1994e). However, it claims that the reality is arranged in a manner where the whole diverges from the sum of its parts, as built of non-summative components. These components thus are explained from the characteristics of the whole. (Arbnor & Bjerke, 1994d) The interrelated constructions between the components give rise to synergistic effects, where one component cannot be removed without further consequences. This mutual dependency implies that a certain number of components must be identified in order to fully reach an acceptable understanding of the whole. (Arbnor & Bjerke, 1994e) Theory is built through finality connections, which are identified through mapping of the connections between appropriate drivers and their effects. The developed knowledge thus is system-dependent, as valid mainly within the studied system and similar systems. It entails that a result from a system approach not is absolutely general in character. (Arbnor & Bjerke, 1994f)

3.1.3. Actor approach

The actor approach differs widely from the other two approaches. It perceives the reality as a social construction with humans as producing actors, which entails a high degree of individual-dependency. The whole and its parts are ambiguous and exist only as socially constructed structures. (Arbnor & Bjerke, 1994f) The whole is explained from the actors' interpretations of the reality. Theory is built through understanding of and explanation of dialectic connections between humans and reality, i.e. connections that are continuously re-interpreted or transformed according to present social constructions. The developed knowledge thus is individual-dependent. Moreover, the conclusions may provide increased understanding of the processes that socially construct the reality. (Arbnor & Bjerke, 1994g)

3.1.4. Chosen approach

In order to deliver an exhaustive mapping of critical success factors for innovative performance of individuals within Scania, a holistic view on innovation must be applied. It entails thereby a need for the application of a system approach throughout this master thesis project. The critical success factors for innovative performance are most certainly interlinked, or at least influenced by each other. I.e. they cannot be studied entirely separately. Presumably, these critical success factors are also influenced by Scania's core values, its R&D principles, its overall organisational settings and other implicit circumstances.

3.2. Research strategy and research ambition

Studies can be classified in accordance with their chosen research strategy and their set level of research ambition. The research strategy conventionally entails descriptive research, explorative research, explanative research, predictive research and normative research. (Lekvall & Wahlbin, 2001a) The research strategy should be chosen in accordance with the objectives and the

character of the given study. The research ambition should also be set accordingly. (Höst et al., 2006a)

3.2.1. Descriptive research

Descriptive research aims at mapping comprehensive facts related to a specific problem, in order to be able to describe the given problem area. It seeks to extensively describe area-specific functionalities, but without explanations of root causes to these described functionalities. Descriptive research is broad in character, in accordance with its descriptive purpose. The demands for statistical significance are considerably high. (Lekvall & Wahlbin, 2001a)

3.2.2. Explorative research

Explorative research seeks to provide exhaustive fundamental knowledge of a given problem, along with thorough understanding of it. It is often used when the existing knowledge of the actual problem area and of its related issues is very limited. I.e. an explorative study often serves as a pre-study to later investigations, with the purpose of presenting suggestions for different courses of actions. Hence, it provides necessary knowledge for decision analyses. (Lekvall & Wahlbin, 2001a)

3.2.3. Explanative research

Explanative research aims at elucidating casual connections within a given problem area. I.e. it aims not only to describe different factors, but also to connect these factors and to therein explain how they interact and influence each other. Explanative research bears certain subtle similarities with descriptive research, but differs in method. While descriptive research often has a broad approach as previously mentioned, the scope of explanative research is narrower. The latter focuses on fewer variables, where some explanative factors may have been identified in advance. (Lekvall & Wahlbin, 2001a)

3.2.4. Predictive research

Predictive research seeks to provide clear predictions of the future development of a certain phenomenon, along with distinct prognostications. From a solid line of arguments of cause and effect, driving development factors of certain goal variables can be feasibly identified and statistically secured. Predictive research is often based on certain given conditions. (Lekvall & Wahlbin, 2001a)

3.2.5. Normative research

Normative research touches upon theory building. It entails thorough explanation of how things are or of how things ought to be, of how they ought to be evaluated and of which measures of evaluation that should be appropriately applied. Normative research aims at resulting in normative suggestions of different courses of actions. (Wallén, 1993a)

3.2.6. Chosen research strategy and set research ambition

With the purpose to identify the critical success factors for innovative performance of individuals within Scania and thus also increase the corporate understanding therein, the research ambition is

to conduct the research strategy of explanatory research throughout this master thesis project. In order to be able to deliver clearly distinct critical success factors, the approach cannot be too broad and the focus must be on certain variables. Moreover, in line with the chosen research strategy and the set research ambition, it must be possible to explain potential connections and interactions between the identified critical success factors, in order to enhance the corporate value of and the practical implications of the academic contribution.

3.3. Research method

The research method entails overall research approaches of the various stages of a given project. Therein, desk studies, case studies, surveys, time series studies, modelling and action research can be found.

3.3.1. Desk studies

Desk studies entail gathering of and analysis of existing information, i.e. secondary data. They can be executed through a variety of sources; literature, academic journals and articles, web sites, etc. Desk studies are appropriate as a preceding step to case studies, in order to deepen the knowledge through taking advantage of existing information within the actual domain. (Lekvall & Wahlbin, 2001b)

3.3.2. Case studies

Case studies aim at deeply explaining why certain phenomena emerge, from a holistic perspective. I.e. the method goes beyond actual end products through analyses of underlying drivers, e.g. processes, relations and courses of events. Case studies focus on one or a few survey units and are executed in the natural environment of the studied objects. (Denscombe, 1998a) The method has a flexible design, which can be adapted to changing circumstances over time. The gathered data are mainly of quantitative character. (Höst et al., 2006a) As a major strength and due to their flexible design, case studies encourage the use of a combination of different techniques for data gathering and various methods for analysis. The use of a combination of multiple sources is also supported. This feature facilitates triangulation, which in turn increases the validity of the inferred conclusions (see 3.6.3). However, case studies are critical in their relative shortage of a trustworthy degree of generalisation across various contexts and settings. (Denscombe, 1998b) The researcher must also endeavour to minimise their personal influence on the studied objects (Höst et al., 2006a).

3.3.3. Surveys

Surveys are suitable when the purpose is to profoundly describe a certain phenomenon. The gathered data can be either quantitative or qualitative, but are foremost of quantitative character. The method has a fixed design that must be set in advance. (Höst et al., 2006b) Surveys are based on a given population, of which a sampling frame is established as a list of all participating individuals. If the population is large, a sample is drawn from the sampling frame. (Höst et al., 2006a) The sampling frame therefore must be representative (Denscombe, 1998c). Since conclusions on the whole population are drawn from the results of the sample, the method used for selecting the sample is critical to the validity of the results (Lekvall & Wahlbin, 2001c).

3.3.3.1. Sampling frame

If an appropriate sampling frame does not exist, one must be constructed. A representative sampling frame contains information that is relevant, complete, exact and actual. However, the researcher must always reflect on the potential shortages of the used sampling frame and openly discuss their potential impact on the sample and the presented conclusions of the survey. (Denscombe, 1998c)

3.3.3.2. Sample

There are two categories of sample methods; probability samples and non-probability samples. Each category has a variety of submethods. Probability samples render it possible to quantitatively calculate random uncertainty risks, while non-probability samples are obliged to use more qualitative and intuitive methods of inaccuracy. The primary criterion for probability samples is that the probability for every unit of the population to appear in the sample must be known. (Lekvall & Wahlbin, 2001c)

3.3.4. Time series studies

Time series studies are conducted when purpose is to study and to map how patterns develop over time, as reflected through a set number of quantitative variables (Lekvall & Wahlbin, 2001b).

3.3.5. Modelling

Modelling is used when the aim is to describe a certain phenomenon, or when there is a need for further analysis of it. However, a model is inevitably a simplification of the reality, as it reduces the number of complex details. (Höst et al., 2006c)

3.3.6. Action research

Action research strives to improve or to solve a problem, simultaneously as it is observed. It is an iterative process that includes three main steps; observation of the phenomenon, elaboration of and implementation of the solution and evaluation of the solution. Action research is mainly used when the purpose is to elaborate process improvements or to improve quality. (Höst et al., 2006b)

3.3.7. Chosen research method

A solid theoretical basis is needed in order to obtain a profound understanding of the domain of underlying driving factors for innovative performance of individuals and the existing research therein. Such a basis will be acquired through exhaustive desk studies. Existing theory and concepts will be gathered. The main sources used will be academic literature together with academic articles of scientific journals and scientific publications. Thereafter, the accumulated theory and concepts will be analysed and evaluated and the feasible ones will constitute the basis for the theory chapter.

In order to understand the critical success factors for innovative performance of individuals within Scania, case studies will be applied as a comprehensive overall research method

throughout this master thesis project. The research focus will be on outstanding innovative cases, from the perspective of particularly innovative individuals in terms of top innovators. Such remarkably successful innovative individuals within Scania will be interviewed in their corporate environment, in order to understand their paths to and their driving factors for innovative success. Their qualitative input will constitute the basis for the empirical chapter. Further, their provided answers will be analysed in order to identify the critical success factors for innovative performance within Scania.

As a preceding step to the case studies, an extensive quantitative survey will be conducted. It will constitute the selection basis for which survey units to include in the case studies, i.e. which top innovators to interview. The survey will map all existing innovators within Scania and thereafter distinguish and identify its most outstanding ones; i.e. its top innovators. The number of registered invention submissions will function as an overall selection criterion, as it can be considered a key performance indicator of innovative performance. For a more detailed and theoretically based justification of this choice of selection criterion, see 4.1. The given population will be all individuals within Scania who potentially could contribute with innovations. The sampling frame will be Scania's internal patent database, through which all registered invention submissions pass (see 2.4.1). As several invention submissions are collectively submitted by two or more individuals, such invention submissions can either be weighted in accordance with their number of contributors or counted as one invention submission per contributing individual. Throughout this master thesis project, the latter alternative will be applied. I.e. the absolute number of invention submissions per individual will determine which individuals to interview. Hence, it is in fact the total number of invention submissions that an individual has participated in that in detail constitutes the very above-mentioned selection criterion. Moreover, the registered invention submissions will not be classified in accordance with the value that their corresponding innovations have generated or potentially will generate in the future. Nor will they be ranked in accordance with the potential international spreading of the patents that potentially have derived from them. I.e. all registered invention submissions will be considered of equal level of inventive step. The survey will gather data for a time period of three years; 2009, 2010 and 2011. The number of top innovators to interview will not be determined in advanced. However, the ambition is set to approximately 25 interviews and not less than 20 interviews.

3.4. Data gathering techniques

Data gathering techniques entail interviews, observations, questionnaires, measurements, simulations and experiments, previous research and literature studies. When applying any of these data gathering techniques, strong ethic height must be taken into consideration.

3.4.1. Interviews

Interviews are a qualitative data gathering technique that can be described as systematic interrogations of interview objects, where the general theme is clearly defined. Interviews can be executed directly in person or on distance, if the interviewer and interview objects are geographically scattered. The interview objects are selected through a sample of a given population. (Höst et al., 2006d) Interviews can be held either individually or in groups. This technique is resource demanding in terms of both time and financial resources. Interviews are

therefore most suitable when the given study demands detailed and deeper information from fewer individuals, rather than cursory information from a larger number of respondents. Interviews must also have a high degree of practicability. I.e. it must be possible to get into direct contact with and engage the potential interview objects. (Denscombe, 1998d)

It exists three main types of interview structures; open interviews, semi-structured interviews and structured interviews (see Table 2) (Höst et al., 2006d).

Table 2: Three types of interview structures (Höst et al., 2006g)

| | Open interviews | Semi-structured interviews | Structured interviews |
|-----------------------------|---|---|--|
| Objective | The interview object's experience of the qualities of a phenomenon | The interview object's experience of quantities and qualities of a phenomenon | The interviewer seeks knowledge of a phenomenon, through connections and relations between conceptions |
| Setup | Interview template with defined domains of questions; open within the given domains | Open questions mixed with closed questions | Closed questions with fixed answers |
| Purpose and ambition | Explorative | Explanative / Descriptive | Explanative / Descriptive |

3.4.1.1. Open interviews

Open interviews are directed by a prepared interview template, which loosely circles around pre-defined domains of questions. The interview object directs the interview, through his or her propensity to dig deeper into certain domains and through the length of the provided answers. I.e. the interviewer must potentially secure that all domains are covered through active introduction of them. (Höst et al., 2006d) However, the interviewer should strive to intervene as little as possible and rather encourage the interview object to unreservedly express his or her thoughts (Denscombe, 1998d).

3.4.1.2. Semi-structured interviews

Semi-structured interviews follow a prepared list of domains to cover, while mixing open questions with closed questions. The interviewer has a flexible approach regarding the sequence of the open questions, but yet strives to secure a holistic coverage of the given domains. However, the closed questions should be put in the same order throughout all executed interviews, in order to secure consistency. (Höst et al., 2006d) The emphasis of semi-structured interviews is that the interview object freely should develop his or her points of view. Furthermore, the interview object should direct the length of the answers (Denscombe, 1998d).

3.4.1.3. Structured interviews

Structured interviews function as oral questionnaires (Höst et al., 2006d). The interviewer has a prepared list of detailed questions and presents a limited set of alternative answers. Every interview object is provided with exactly the same questions and exactly the same answers, in exactly the same sequence. I.e. the interviewer fully controls the interview and the level of standardisation is remarkably high. These circumstances facilitate the following analyses of the gathered data. (Denscombe, 1998d)

3.4.2. Observations

Observations entail data gathering regarding a specific phenomenon, through the physical study of related processes, situations and courses of events. The observer's degree of interaction varies from active participation to pure observation. Active participation may influence the studied phenomenon, while pure observation may leave the observed objects unaware of the observer. (Höst et al., 2006d)

3.4.3. Questionnaires

Questionnaires support large-scale data gathering from a noticeable number of respondents. They may have a high degree of generalisation, depending on how the respondents have been selected from the identified population and on the constructed selection frame. Moreover, the degree of non-response must not be too high. (Höst et al., 2006e)

3.4.4. Measurements

Measurements link quantitative values to descriptive attributes of a specific phenomenon. They can be either direct and absolute or indirect and relative. (Höst et al., 2006d)

3.4.5. Simulations and experiments

Simulations aim at revealing the influence of different factors on a certain phenomenon. Through simultaneous variation of multiple factors, correlations and interplays can be mapped and studied. (Höst et al., 2006f) Experiments isolate individual factors for the purpose of studying their influencing effects on a specific object or on a certain process (Denscombe, 1998b).

3.4.6. Previous research

Previous research entails data gathered by others, in the context of another purpose than the one that exists for the study in question. I.e. these data must be critically analysed in order to clarify its feasibility. It exists four types of data related to previous research; revised data, available statistics, register data and archive data. (Höst et al., 2006f)

3.4.7. Literature studies

Literature studies are a critical starting point for any research study (Höst et al., 2006h). If executed efficiently, they provide a comprehensive overview of existing knowledge and prevailing theory, upon which empirical research can be built (Denscombe, 1998e). Literature studies are an iterative process and the gathered information can be continuously refined along the study course. The scope of the search depends on the actual stage of the study. It is often broad and

general in the very beginning, in order to provide a solid basis and a comprehensive understanding. As adjacent problems and delimitations become clearer, the scope naturally gets more narrow and focused. Literature can be sought for through a variety of sources; e.g. academic articles, scientific publications and existing literature. All sources used must be carefully evaluated in order to ensure their academic reliability and their scientific height; this is an inherent element of qualitative literature studies. (Höst et al., 2006h) Credible and explicitly accounted sources are also important in order to build traceability throughout a written report; e.g. a master thesis (Denscombe, 1998e).

3.4.8. Ethics in data gathering

Ethical issues may arise towards the corporate constituent. Non-disclosure agreements ensure that confidential information is kept secret and such agreements thus must be signed and legally followed by the researcher. However, ethical issues are often related to the very publication of the studied material and the gathered information, which may contain sensitive details. Non-disclosure agreements must never hinder an academic publication; it must only direct which detailed information that should be presented anonymously. The researcher must always be able to balance the demands from the corporate constituent with the demand for academic height and their inner moral and personal values. (Höst et al., 2006c)

Ethical dilemmas may also appear in relation to potential interview objects and thus respondents, i.e. individuals who provide information to the actual study. All forms of participation must be voluntary and all participators must be relevantly informed of the purpose. Personal integrity must be protected through the use of codified information that omits individual details and thus prevents later identification. The gathered data must be used in the context of which they originally were informed to be used within; if not, information may be misinterpreted and moral barriers may be exceeded. (Höst et al., 2006c)

3.4.9. Chosen data gathering techniques

It exists an absolute need for detailed qualitative data from top innovators, in order to fully meet the primary objective of this master thesis project (see 1.3.2) and thus support the fulfilment of its purpose (see 1.3). Consequently, interviews will be the main data gathering technique used throughout the case studies, as explained in 3.3.7. The utmost majority of the interviews, or potentially all interviews, will be executed person-to-person. Interviews on distance will only be held if the interview object in question is geographically distant. All interviews will be held individually, in order to fully scrutinise the experience of every top innovator, in line with the very purpose of this master thesis project. The interview objects will be selected as described in 3.3.7. All interviews will be semi-structured in character, in accordance with the set purpose and the selected paths. As mentioned, this master thesis project has an explanative research strategy and research ambition (see 3.2.6). Semi-structured interviews will allow the interview objects to express their experience and thoughts in detail, while still covering the theoretical domains that will have been identified through the pre-executed desk studies (see 3.3.7). All interviews will follow the same prepared interview template (see Appendix F), which in turn will be elaborated from the studied research and the studied theory that will have been accumulated throughout the desk studies. Since the gathering of the empirical data entirely will be entirely based upon

interviews, a pilot interview will be conducted prior to the start of the actual interviews. The pilot interview will assist in verifying the elaborated interview template and its contents, simultaneously as it will evaluate the very conduct. Potential deficiencies of the interview template thus will be corrected thereafter, in accordance with provided feedback. The pilot interview object will be an individual who is similar in character to the actual interview objects, but with explicit experience of interview contexts. The gathered data from the pilot interview will not be included in the data of this master thesis project.

As described in 3.3.7, interview objects will be sampled through a quantitative survey, where the sampling frame will be constituted of Scania's internal patent database. I.e. previous research will be used throughout the survey, in the form of register data from this internal patent database. Previous research will also be applied when gathering various Scania-specific information.

Literature studies will be applied as data gathering technique throughout the initial desk studies (see 3.3.1), but they will also be used as an iterative process throughout the continuation of this master thesis project, if required. Literature studies will play an important role within the desk studies, through aiming at providing thorough knowledge in the domain of critical success factors for innovative performance of individuals. Literature studies as a part of the desk studies will constitute the basis for the theory chapter, upon which the interview template and thus potentially also the empirical chapter will be built.

Strong ethics in data gathering will be applied throughout all stages of this master thesis project. Personal integrity will be a guiding principle throughout the interviews. Participation will be voluntary and the purpose of the interviews will be explicitly explained before the start of all interviews. All interview objects along with their provided information will be kept anonymous, which is feasible when using a system approach.

3.5. Closeness to data source

Closeness to data source entails the character of data along with their origin and their potential intermediaries. Qualitative data and quantitative data together with primary data and secondary data are different related measures of such closeness.

3.5.1. Qualitative data

Qualitative data perceive words, concepts and descriptions as the primary key units of analysis. They are rich in details, nuances and values. (Höst et al., 2006a) Qualitative data are produced simultaneously as they are gathered, used and analysed by the researcher. I.e. qualitative data are an accumulated product of subjective processes of interpretation. (Denscombe, 1998f) Qualitative research strongly emphasises a holistic perspective, as it strives to understand the interplay of and the interdependency of various contextual factors (Denscombe, 1998g).

3.5.2. Quantitative data

Quantitative data perceive numbers and metrics as the primary key units of analysis (Höst et al., 2006a). Since quantitative data apply statistical methods for processing, they may provide a stronger sense of objectivity compared to qualitative data (see 3.5.1). Quantitative research takes

on a more narrow focus compared to qualitative research, as it focuses on specific factors. These factors are isolated from and uncovered from their natural context and their functionalities are studied in relation to other specific factors, along with their potential effects. (Denscombe, 1998g)

3.5.3. Primary data

Primary data imply gathering of data from the original source, in the context of a specific study. I.e. there are no intermediaries between the researcher and the origin of the studied objects. (Lekvall & Wahlbin, 2001b)

3.5.4. Secondary data

Secondary data refer to data that have been gathered for other purposes and put together in other contexts than the current ones; e.g. prevailing research and existing statistics. I.e. the origin of the secondary data must be thoroughly evaluated, in order to prove their reliability. (Lekvall & Wahlbin, 2001b)

3.5.5. Data used

Complex problems that involve human actions preferably use a combination of qualitative data and quantitative data (Höst et al., 2006a). Properly, this master thesis project will be built on a both categories. The initial desk studies with their adherent literature studies will potentially bring qualitative data as well as quantitative data. The survey, which will distinguish the most prominent innovators, will consist of quantitative data. The semi-structured interviews within the case studies will provide qualitative data.

Desk studies are built on secondary data (Lekvall & Wahlbin, 2001b). As mentioned, existing statistics also belong to this category. Hence, secondary data will be used to a great extent throughout this master thesis project; especially throughout its initial stages. The interviews will most probably foremost provide primary data. However, interviews may always provide also secondary data, if the interview object itself not has experienced the depicted phenomena.

3.6. Argumentation techniques

Argumentation techniques are applied in order to perform analysis of the gathered data. Such techniques can be executed through qualitative data analysis or through quantitative data analysis. The measure of triangulation can be applied in order ensure valid coverage. Deduction, induction and abduction are various scientific techniques for data analysis.

3.6.1. Qualitative data analysis

Qualitative data analysis focuses on the occurrence of and the frequency of certain words, concepts and descriptions, through classification and categorisation (Höst et al., 2006i). The researcher strives to structure the gathered data. It is done through identification of common patterns and of deviant nuances, together with mapping of recurrent themes and of particular connections. (Denscombe, 1998f) The conclusions drawn are profound, detailed and of discussing character. They are anchored in the reality, as the qualitative data arise from social

contexts. As the qualitative data analysis reflects the reality, alternative explanations are tolerated. Contradictions are accepted, as there must not be one correct explanation and as the results depend on the interpretation of the researcher. However, the level of generalisation may be relatively low, due to low data representativeness and due to the subjective and interpretive character. (Denscombe, 1998h) Qualitative data analysis thus demands a high level of traceability. Hence, the groupings of theory and of empirical information and their following analyses from which conclusions are drawn must be clearly documented, in order to render it possible to trace the presented conclusions. Moreover, sources must be clearly stated. (Höst et al., 2006i)

3.6.2. Quantitative data analysis

Quantitative data analysis focuses on absolute numbers and on numerical values, through incorporation of statistical methods based on mathematical principles and probability theory. The researcher searches for trends and patterns among groupings of measured frequencies. (Höst et al., 2006j) Quantitative data analysis can be stated as objective and scientific, as conclusions appear to be drawn upon statistical relations rather than upon the interpretations of the researcher. Hence, they can easily be controlled and scrutinised. Tests of statistical significance may further strengthen the reliability of the presented results. However, one must always be aware of that quantitative data can be manipulated; e.g. through manipulation of categories and of set limits of different groupings. (Denscombe, 1998i)

3.6.3. Triangulation

Triangulation entails the use of several different methods or sources of data. It thus provides a more holistic coverage of and various perspectives on the specifically studied phenomenon. Triangulation thereby strengthens the validity of the deriving results and the presented conclusions. (Höst et al., 2006i)

3.6.4. Deduction

Deduction is a scientific technique for data analysis, with a particular view on the relationship between theory and research (Arbnor & Bjerke, 1994h). Based on existing theory within a particular domain, it deduces one or several hypotheses that later are subjected to empirical scrutiny. Depending on whether the hypotheses are confirmed or rejected, existing theory is revised. I.e. theory is verified through empirical research, when applying a deductive approach (see Figure 4). Deduction is strongly linked to quantitative research techniques. (Bryman & Bell, 2011a)

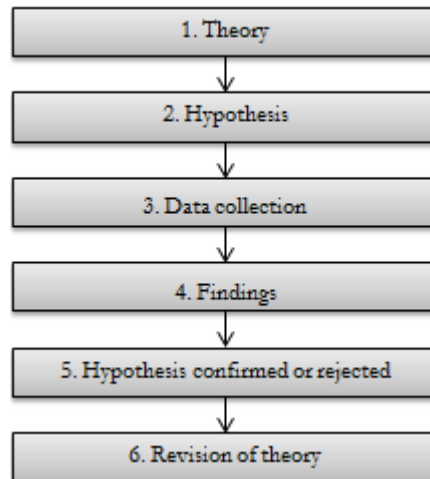


Figure 4: The process of deduction (Bryman & Bell, 2011b)

3.6.5. Induction

Induction is another scientific technique for data analysis, but with a reversed view on the relationship between theory and research compared to deduction. Induction aims at drawing generalisable conclusions from observations and from empirical findings. Hence, it strives to build theory. (Arbnor & Bjerke, 1994i) I.e. theory is the outcome of the actual research, when applying an inductive approach (see Figure 5). Induction is typically associated with qualitative research techniques and is feasible for research that explores entirely novel domains. However, the provided theoretical significance may be relatively vague and of predominantly empirical character. (Bryman & Bell, 2011a)

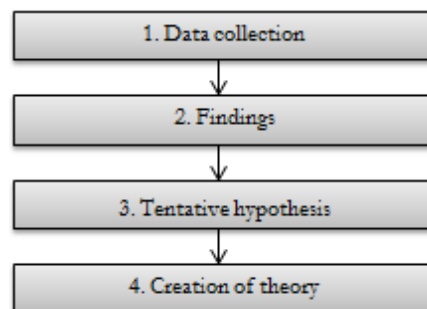


Figure 5: The process of induction (Möller & Wahlqvist, 2012c)

3.6.6. Abduction

Abduction is a combination of the technique of deduction and the technique of induction. This hybrid scientific technique for data analysis uses existing theory and empirical data simultaneously, without any constraints. Gathered empirical data can verify existing theory, but may as well reveal novel relationships and undiscovered connections. (Kovács & Spens, 2005a; Wallén, 1993a)

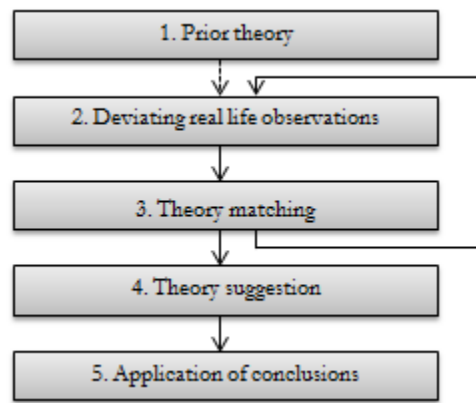


Figure 6: The process of abduction (Möller & Wahlqvist, 2012e)

3.6.7. Chosen argumentation techniques

Qualitative data analysis will be used as the predominant argumentation technique throughout this master thesis project. It is a natural consequence of the fact that interviews will be the main data gathering technique within the case studies (see 3.4.9). Qualitative data analysis is also in line with the purpose of this master thesis project, as it is anchored in the everyday context of Scania. However, quantitative data analysis will be used in the initial survey of Scania's internal patent database, as its aim is to correlate the largest numbers of invention submissions with individual innovators.

Triangulation will be applied throughout this master thesis project, regarding methods for data gathering as well as methods for data analysis. As mentioned, data will be gathered through a variety of data gathering techniques (see 3.4.9). Data will also be gathered from both primary sources and secondary sources (see 3.5.3 and 3.5.4). Moreover and as mentioned, the overall data analysis will have a predominant qualitative approach but yet will be preceded by a quantitative data analysis.

Abduction will be used as the scientific technique for data analysis, due to the overall methodology of this master thesis project. The empirical data that will be gathered throughout the case studies will be used to identify critical success factors for innovative performance of individuals within Scania. The interview template will be based on existing theory, which will have been identified through the desk studies (see 3.4.9). The final conclusions of this master thesis project thus may be built on a combination of existing theory and empirical findings; or on empirical findings only.

3.7. Trustworthiness and authenticity

The degree of trustworthiness and the degree of authenticity of the presented conclusions of a given study can be reflected through focused discussions of reliability, validity, transferability and representativity respectively.

3.7.1. Reliability

Reliability secures that the presented conclusions of a given study are thoroughly supported through strong authenticity in data gathering and in executed analyses. The applied methodology must be exhaustively described, as it strengthens the understanding of potential readers and facilitates scrutiny and traceability. All sources must be clearly stated, in order to further facilitate traceability. The use of sample is a factor that may influence the reliability of a study. Sampling frames and samples thus must be appropriately selected. (Höst et al., 2006b)

3.7.2. Validity

Validity focuses on the connection between the studied object and what actually is studied. It ensures that appropriate methods for data gathering are consistently used and thus ensures that the derived results and the presented conclusions are valid. I.e. validity secures that the findings of a study represent the studied phenomenon as objectively as possible. Triangulation can be used in order to further increase the validity of the presented conclusions of a given study (see 3.6.3). (Höst et al., 2006i)

3.7.3. Transferability

Transferability refers to the degree to which results of qualitative research can be generalised or transferred across different contexts and organisational settings. It can be enhanced by thorough descriptions of research contexts together with central assumptions and clearly stated delimitations. (Bryman & Bell, 2011b)

3.7.4. Representativity

Representativity constitutes the basis for generalisation of the presented conclusions of a given study. Regarding surveys, the degree of representativity heavily depends on the sample. The non-response should be moderate in size and not remarkably category specific. Case studies are usually non-generalisable. (Höst et al., 2006b)

3.8. Practical mode of procedure

The outline for the practical mode of procedure of this master thesis project is depicted in Figure 7. It demonstrates the applied research methods with their inherent data gathering techniques. The initial phase entails the establishment of a project plan. It aims at setting the scope of this master thesis project, through explicit formulation of its purpose, its delimitations and its objectives. The project plan functions as a supporting means in order to align the perceptions of the authors with the perceptions of the corporate constituent, i.e. Scania. Thereafter, desk studies follow. They entail inherent literature studies, which provide data to the theoretical framework. The desk studies are followed by a quantitative survey, which aims at selecting the interview objects. They are sampled through previous research, in the form of register data from Scania's internal patent database. Thereafter, case studies follow. They are built upon semi-structured interviews, which constitute the main source of empirical data of this master thesis project. The case studies are followed by a thorough analysis of the gathered empirical data. Finally, conclusions and recommendations are elaborated.

The up down arrows indicates the interplay between all phases. All phases are inherently interdependent in terms of gathered data and the flow of information circulates between them without limitations.

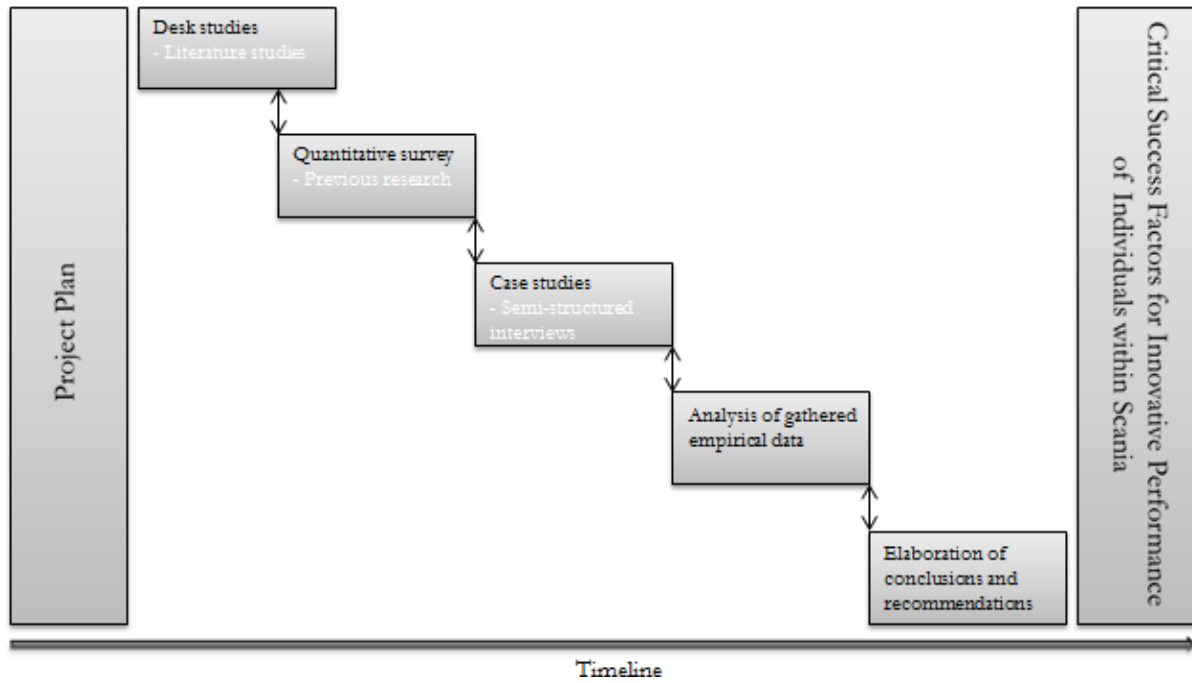


Figure 7: Outline for practical mode of procedure (Möller & Wahlqvist, 2012d)

4. Theory

This chapter aims at presenting the theoretical framework that is applied throughout this master thesis, which emerged from the executed desk studies. The chapter starts with a thorough description of this theoretical framework, in which its degree of identified ambiguity is reflected. It proceeds with an account of how to measure innovative performance. The presentation of the theory follows the structure of the identified theoretical framework.

As described in 3.3.7, relevant theory and pertinent research have been accumulated through extensive desk studies. The initial purpose of these desk studies was to establish a solidly unanimous theoretical frame of reference, which was supposed to be built on acknowledged theory and well-founded research. The ambition of the authors was to identify some sort of generally recognised theoretical framework of critical success factors for innovative performance of individuals. Yet, throughout the execution of the desk studies, it became evident that recognised relevant theory and pertinent research are relatively vague and ambiguous in character.

Hence, due to this discrepancy both in prevailing theory and in existing research, a relevant accumulated theoretical framework has been put together by the authors. This framework has emerged from theoretical studies of separate pertinent areas that theory and research commonly identify as critical to innovative performance of individuals. Accordingly, this theoretical framework is based on six separate pertinent areas of theory. Each area has been assigned to individual level or to collective level (see 1.3.1), depending on its inherent influencing character. The six identified pertinent areas are motivation, creativity, innovative features, allocation of resources, collaboration and managerial practices. Jointly, these six pertinent areas constitute the theoretical framework of this master thesis (see Figure 8).

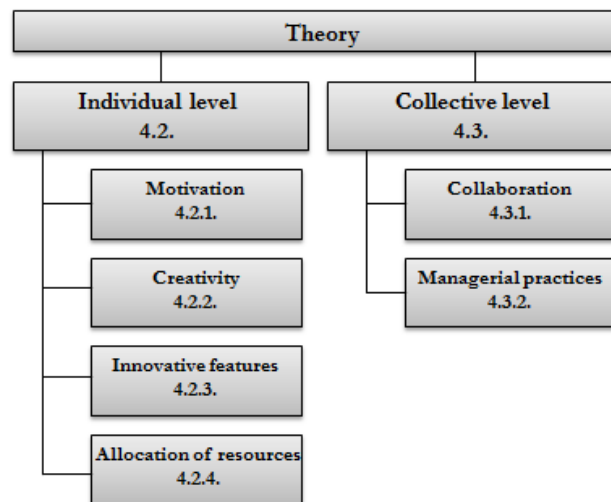


Figure 8: Theoretical framework (Möller & Wahlqvist, 2012d)

Throughout this chapter, each pertinent area is separately described, in accordance with the presented numbered structure of the theoretical framework (see Figure 8). First, a theoretical account of how to feasibly measure innovative performance is given.

4.1. A note on patents as a key performance indicator of innovative performance

As explained in 3.3.7, this master thesis project uses the number of registered invention submissions as a key performance indicator of innovative performance. Hence, this measure functions as a selection criterion throughout this master thesis project, in order to identify top innovators within Scania.

Over the years, quantitative patent data have increasingly acquired a more central role in research related to innovation. Within the relatively intangible character of this research field, patent data provide useful tangible parameters. Throughout research related to innovation, it is commonly considered that the number of patents is an adequate key performance indicator of innovative performance. In particular, it is a representative indicator in knowledge-intensive industries where patents are central to maintained corporate competitiveness and where the strategic corporate propensity to patent innovations is considerably high. (Bessant & Tidd, 2007a; Mueller, 2001a) Yet, one must be aware of the ambiguity of patents and of the complexity of their related processes. It must also be clearly stated that not all innovations are filed for patent applications, due to various reasons of both legal and strategic character. (Gittelman, 2008a)

The number of patents as a key performance indicator of innovative performance is appropriate throughout this master thesis project. Partly as Scania operates within a knowledge-intensive industry, but also due to the circumstance that Scania has a strong corporate focus on legal protection of innovations (see 2.4). As described in 2.4.1, invention submissions within Scania precede patents and are secured to be of considerable innovative height. This circumstance is the reason for why the above-mentioned selection criterion has been set to include not only the subset of patents but also all registered invention submissions. This measure secures the largest possible coverage of potential top innovators within Scania, while it still ensures that all comprised innovations demonstrate high innovative quality.

4.2. Individual level

This subchapter presents the four separate general areas at the individual level that theory commonly claims as critical to innovative performance of individuals. These areas are motivation, creativity, innovative features and allocation of resources (see Figure 9).

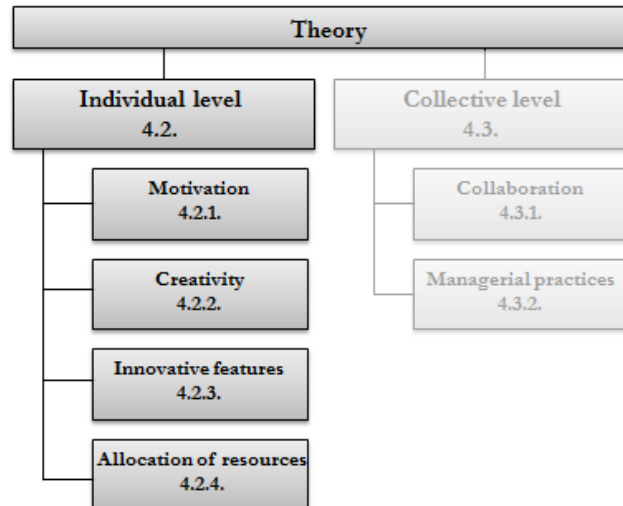


Figure 9: Theoretical framework at individual level (Möller & Wahlqvist, 2012d)

4.2.1. Motivation

Research indicates that the presence of motivation within individuals is a significant prerequisite of innovative performance. An adequate level of motivation encourages individuals to engage in overall exploration of potentially feasible ideas, which lay the basis of the elaboration of innovations. Motivation is also an inherent component of individual creativity (see 4.2.2.1), which further increases its importance to innovative performance. (Amabile, 1997a; Dewett, 2007a) Hence, the presence of motivation within individuals is a fundamental condition, in order to leverage both creativity and innovative performance.

However, as reflected in the account of the ambiguity in theory above, researchers disagree on the subtle link between the presence of motivation and innovative performance. Some researchers assert that the presence of motivation is a prerequisite of creativity (see 4.2.2.1) and thus an indirect prerequisite of innovative performance. Other researchers rather assert that the presence of motivation directly influences innovative performance, without any intermediaries. Yet, in spite of these obscurities, existing research commonly agrees on that the presence of motivation is critical to innovative performance, irrespective of which paths it wanders. Hence, the accounted theory throughout this subchapter will take this agreement as a starting point.

4.2.1.1. Generic types of motivation

It exists two commonly recognised generic types of individual motivation. Accordingly, individual motivation can be classified either as *intrinsic motivation* or as *extrinsic motivation*. Within each form of motivation, it exists inherent motivators that stimulate its very occurrence. (Amabile, 1998a)

4.2.1.1.1. Intrinsic motivation

Intrinsic motivation refers to the inherent driving force that rests within individuals to various extents, along with an internal desire to perform and to accomplish certain tasks and challenges. Hence, intrinsic motivation is inherently self-based and partly derives from the unique personality of every individual. (Amabile, 1998a) However, social settings, work environment and other external factors may exert significant influence on the present level of intrinsic motivation of individuals, at any point in time; positively as well as negatively (Amabile, 1997b). The basic level of intrinsic motivation within individuals foremost depends on the presence of various intrinsic motivators. Such intrinsic motivators are clearly individual-dependent. The primarily mentioned intrinsic motivators in theory and in research are pertinent interest, sense of challenge, sense of autonomy, enjoyment and satisfaction. Intrinsically motivated individuals are motivated by the work itself. Such individuals primarily engage in work tasks due to their relevant interest in them or for the positive sense of challenge, for the experienced enjoyment or for the satisfaction that the work tasks may bring; and not due to any external pressure or due to any expectations of external rewards. (Amabile, 1998a; Davila et al., 2006a; West et al., 2004a)

Researchers have devoted considerable efforts to elucidate the influence of intrinsic motivation on creative efforts and on innovative performance. Several studies over several decades support the same significant inferences. Intrinsic motivation exerts large influence on and is conducive to long-term durable innovative performance of individuals; also compared to extrinsic motivation. Hence, it is considered a primary prerequisite of innovative performance of individuals. (Amabile, 1997a; Amabile & Kramer, 2007a; Paulus & Nijstad, 2003a) The ensured presence of intrinsic motivators over time thus is critical within industries where innovative performance and its adherent elaboration of innovations are keys to competitiveness (Dewett, 2007a). Consequently, it is imperative that the specific work tasks are compatible with the specific intrinsic motivators of the actual individuals, in order to sustain and enhance their innovative performance over time (West et al., 2004a; Amabile 1997a).

4.2.1.1.2. Extrinsic motivation

Extrinsic motivation refers to motivation that derives from external factors. Hence, extrinsic motivation arises from mitigating factors that are external to the work tasks; i.e. factors that are externally imposed to the individuals who execute the actual work tasks. (Wylant, 2008a) Extrinsically motivated individuals engage in and perform work tasks in order to obtain specific tangible outcomes or promised carrots; and thus not due to the very character of the specific work tasks. The level of extrinsic motivation can be stimulated through various extrinsic motivators, which effects vary from individual to individual. The most commonly mentioned extrinsic motivators in theory and in research are monetary remuneration, recognition from colleagues and managers, promise of particular rewards, set deadlines, clearly defined goals, constructive feedback and internal or external competition. (Amabile, 1998a) These extrinsic motivators can be generically divided into three subcategories, depending on their character and on the context on which they are applied. These three subcategories are informational extrinsic motivators, enabling extrinsic motivators and controlling extrinsic motivators. The first subcategory confirms competencies or provides information on how to improve innovative performance through feedback or recognition, while the second subcategory directly increases the individual's involvement in the actual work tasks through similar means. The third and latter

subcategory put constraints on how work tasks should be executed, through various means. (Amabile, 1997c)

Similarly to intrinsic motivators, researchers have devoted equally considerable efforts to elucidate the influence of extrinsic motivation on creative efforts and on innovative performance. Several studies over several decades support the same significant inferences, also in this case. Extrinsic motivators often play an essential role in short-term settings, but not all extrinsic motivators exert significant influence on the long-term constancy of creative efforts and of innovative performance of individuals. (Davila et al., 2006a; Paulus & Nijstad, 2003b) Certain extrinsic motivators may even be detrimental to and hamper innovative performance over time. Such extrinsic motivators foremost belong under the subcategory of controlling extrinsic motivators. (Amabile, 1997c) Consequently, extrinsic motivators may be of less significant importance to innovative performance of individuals, compared to intrinsic motivators. Hence, the choice of which extrinsic motivators to apply must be carefully evaluated, in order to benefit from favourable effects and simultaneously avoid potentially detrimental ones (see 4.2.1.2.2).

4.2.1.2. Motivational synergy

The interactions between intrinsic motivators and extrinsic motivators have been thoroughly studied by researchers. The primary purpose of this research has been to ascertain whether these motivators can be synergistically combined and thereby deliver motivational synergy and enhanced innovative performance. If so, it would be possible to directly capitalise on the favourable effects of certain extrinsic motivators, simultaneously as exclusively inherent intrinsic motivators are stimulated. (Amabile, 1997c)

Conscious combinations of intrinsic motivators and of extrinsic motivators are relatively common throughout corporate R&D settings. However, one type of motivator is always likely to be inherently primary to individuals for a given work task. Prevailing empirical theory from field research in business organisations claims a general antagonism; as the intrinsic motivation for a work task increases, the extrinsic motivation for the same work task decreases. (Amabile, 1997c) However, this field research has also given rise to divergent evidence. It points to that specific extrinsic motivators potentially may enhance the positive effects of present intrinsic motivators on innovative performance, under certain conditions. (Amabile, 1997c; Paulus & Nijstad, 2003a)

4.2.1.2.1. Prerequisites of synergistic motivational effects

Three factors, i.e. prerequisites, determine whether extrinsic motivators will exert synergistic motivational effects. These identified prerequisites are the initial level of intrinsic motivation within the actual individual, the type of applied extrinsic motivators and the timing of the applied extrinsic motivators. (Amabile, 1997c)

Initial level of intrinsic motivation

Deeply intrinsically motivated individuals are less influenced by external motivators, as their inherent passion precedes the value of the potential rewards (Davila et al., 2006b). If the initial degree of intrinsic motivation of such individuals is particularly salient, they may be relatively impervious to the potentially undermining effects of extrinsic motivators (Amabile, 1997c). The effects may instead become additive. On the other hand, if the present degree of intrinsic

motivation is ambiguous, the individuals will be much more susceptible to extrinsic motivators. This may in turn undermine their innovative performance. Consequently, additive and thus synergistic effects of extrinsic motivation can be expected when the initial level of intrinsic motivation is high. On the contrary, negative effects can be expected when the initial level of intrinsic motivation is relatively vague. (Amabile, 1997c)

Type of applied extrinsic motivators

As mentioned, it exists three main types of extrinsic motivators; informational extrinsic motivators, enabling extrinsic motivators and controlling extrinsic motivators (see 4.2.1.1.2). Informational extrinsic motivators and enabling extrinsic motivators may operate as support to innovative performance, through additive effects on the present level of intrinsic motivation. Controlling extrinsic motivators will never be positively combined with intrinsic motivators, as they undermine the inherent driving force of individuals. I.e. the first two subcategories of extrinsic motivators may exert synergistic influence, while the latter subcategory rather has detrimental effects on the level of intrinsic motivation. Examples of synergistic extrinsic motivators are clearly defined goals, frequent constructive feedback and recurrent recognition for particularly creative ideas. (Amabile, 1997c)

Timing of extrinsic motivators

The timing of the applied extrinsic motivators determines their synergistic potential. The focus on novelty versus appropriateness varies along the creative process. Determination of appropriateness of the final solution is marked by information gathering, by validation and by external focus. Extrinsic motivators will be as most synergistic during these stages, as they may further engender the external focus. On the other hand, extrinsic motivators may have an undermining effect on the stages marked by novelty; e.g. idea generation or problem formulation. (Amabile, 1997c)

4.2.1.2.2. Implications of synergistic motivational effects

Indicatively, the presence of intrinsic motivators in combination with the presence of extrinsic motivators is not enough, in order to significantly enhance innovative performance of individuals. Hence, attention must be paid to the type of applied extrinsic motivators and to the context in which they are deployed. Evidently, deployed extrinsic motivators should be of synergistic character. All extrinsic motivators of detrimental character should be avoided, in order to not undermine the present level of intrinsic motivation of individuals. (Amabile 1997a)

4.2.1.3. The Intrinsic Motivation Principle of Creativity

The Intrinsic Motivation Principle of Creativity (Amabile) is a widely recognised conceptual theory. It summarises the accumulated depicted research on the interrelated effects of intrinsic motivators and of extrinsic motivators on the creative efforts and on the level of innovative performance of individuals. (Amabile, 1997c; Amabile & Kramer, 2007a)

“Intrinsic motivation is conducive to creativity. Controlling extrinsic motivation is detrimental to creativity, but informational or enabling extrinsic motivation can be conducive, particularly if initial levels of intrinsic motivation are high.”

- (Amabile, 1997c)

4.2.2. Creativity

“Creativity is the seed of all innovation (...)”

- (Amabile et al., 1996a)

Creativity as a prerequisite of innovative performance is an undisputed fact among researchers. The presence of creativity within individuals thus is considered critical in order to ensure the durable propensity of individuals to elaborate innovations. (Amabile, 1997b)

The conventional idea among researchers is that all individuals possess the attribute of creativity to some extent. All individuals thus have the required capacities to potentially perform moderately creative work tasks. (Amabile, 1997c; Bessant & Tidd, 2007b) However, the frequency of the delivered creative efforts along with their demonstrated quality may differ widely among individuals within the same working context and organisational settings (Bessant & Tidd, 2007b). In order to understand why certain individuals demonstrate higher level of creativity than others, the componential construction of individual creativity must be theoretically understood.

4.2.2.1. The Componential Theory of Creativity

The Componential Theory of Creativity (Amabile) is a widely recognised conceptual theory of the componential construction of creativity. The theory can be applied both on individual contexts and on group contexts. Hence, it is an appropriate tool for understanding underlying reasons for a potential lack of sufficient creativity in various contexts and settings. The theory describes creativity as a function of three fundamental components; creativity skills, task motivation and expertise (see Figure 10). The presence of each component is mandatory in order for creativity to occur and to flourish. The components can be present to various extents. The higher present level of each component, the higher present level of creativity. (Amabile, 1997c)

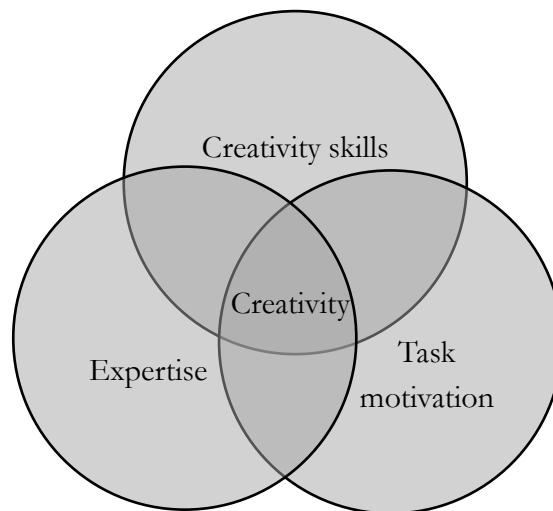


Figure 10: The Component Theory of Creativity (Amabile, 1997d)

Creativity skills

The component of creativity skills is in two pieces; it partly depends on cognitive skills, partly on personality characteristics. Cognitive skills entail the ability to exert flexible exploration of problems through creative application of and combination of existing ideas, knowledge and experience. Hence, cognitive skills may influence the degree of novelty in creative efforts. (Amabile, 1998a) Personality characteristics entail various personality aspects that directly may support creative efforts; e.g. preferred independence, self-discipline, preferences for risk aversion, tolerance for ambiguity and perseverance in case of reverse or of disagreement (Wylant, 2008a). It is critical to emphasise that individuals can develop the component of creativity skills over time, through strengthening of either cognitive skills or personal characteristics; or both. Such enhancement can be accomplished through improvement of existing cognitive flexibility and through strengthening of the adherent skills, along with significant personal development and enhanced maturity. (Amabile, 1997c; Bessant & Tidd, 2007b)

Task motivation

The component of task motivation links together the three components of creativity. While the component of creativity skills and the component of expertise foremost determine what individuals can do, the component of task motivation determines what individuals actually will do. I.e. it settles to which extent individuals will engage their creativity skills and their expertise in specific work tasks. As mentioned (see 4.2.1.1), motivation can be of either intrinsic character or extrinsic character. As conducive to creativity, task motivation is constituted primarily of intrinsic motivation (see 4.2.1.1.1). Even if all three components of creativity are critical in order for creativity to arise and endure, the present level of task motivation through the presence of intrinsic motivation may compensate for deficiencies in any of the other two components, if the present level of this component is sufficiently high. The explanation to this phenomenon is that highly intrinsically motivated individuals may be inclined to develop their creativity skills through extensive training or to purposefully acquire non-present required expertise through various means. (Amabile, 1997c)

Expertise

Expertise constitutes the foundation of all creative efforts (Amabile, 1997c). The component of expertise is built on embodied areas of individually unique knowledge and of domain-relevant skills within individuals, which have been acquired and accumulated over time. As it assists in intellectually exploring networks of possible pathways of solutions simultaneously as it ensures provision of required input, the component of expertise is a vital tool in order to efficiently enable complex problem solving through creative efforts. (Amabile, 1997c; Amabile, 1998a)

4.2.2.2. Influence on and development of creativity

The three components of creativity are not isolated from external factors of influence. Surrounding work environment, present external settings and applied managerial practices may exert direct influence on all three components. If the influence is favourable, the creativity of individuals can be strengthened and developed over time. (Amabile, 1997c) However, the three components of creativity differ in improvement potential. The component of creativity skills along with the component of expertise are more resource demanding to influence, compared to the component of task motivation. As it often is relatively simple to enhance the level of intrinsic motivation of individuals through deployment of synergistic extrinsic motivators (see 4.2.1.2), the component of task motivation is an efficient lever for creativity that must not be neglected. (Amabile, 1998a)

4.2.3. Innovative features

This subchapter covers ten different areas of innovative features that are considered critical to innovative performance, but to various extents and for different reasons. These areas are association skills, propensity to network, risk propensity, questioning ability, observation skills, propensity to experiment, opportunity understanding, ideation, action planning, and collaborative mindset. (Bessant & Tidd, 2007b; Dyer et al., 2011a)

Association skills

Association skills can be described as the ability to perform connections across different areas of e.g. various knowledge, industries, ideas, objects, technologies and geographies. These skills are primordial to innovative performance. A strong set of association skills supports individuals to discover new feasible directions and thus explore new potential solutions, through identifying connections across areas that seem unrelated at the first glance. It is particularly helpful since innovations often arise in the very intersection of unrelated fields. Association skills can be more or less inherited. However, they can also be strengthened over time; e.g. through acquisition of knowledge and experience and through exposure to new circumstances. The more diverse knowledge basis that individuals possess, the better are thus their opportunities of performing successful associations. (Dyer et al., 2011b)

Propensity to network

Particularly innovative individuals often apply networking to a considerably large extent. It is a means through which they exploit the expertise and the competencies of others and acquire new perspectives; and consequently expand their own knowledge basis. Networking is often purposefully applied by discovery-driven innovative individuals. (Bessant & Tidd, 2007b; Dyer et

al., 2011c) In particular, networking contributes to innovative performance when individuals actively choose to network with diversified groups of individuals that differ from themselves in some aspects. It entails networking with experts, with non-experts and with individuals who has diverse backgrounds. There are many easily applicable means through which active networking may occur; e.g. through informal contact with experts within a different function field, through attendance of formal networking events or simply through establishing and exploiting personal networks. (Dyer et al., 2011d) When relying on personal networks, individuals should be skilled at leveraging the value of them. It is done through ensuring that there is a good balance within the networks; i.e. a balance of close relationships and of more broad connections to individuals who differ along various parameters. (Gratton, 2009a)

Risk propensity

Particularly innovative individuals possess the courage to innovate without any larger constraints. This circumstance is strongly linked to the demonstration of a certain level of risk propensity, as a willingness to be exposed to risks enhances the propensity to experiment and to test novel solutions. Hence, risk propensity allows individuals to make mistakes and to learn from them. (Dyer et al., 2011a) Consequently, risk propensity is important to innovative performance (Bessant & Tidd, 2007b).

Questioning ability

In order to receive new insights or to thoroughly understand a certain phenomenon, particularly innovative individuals frequently and systematically ask questions. These individuals can be distinguished from others through their means of asking. They ask more questions and they avoid asking safe questions; they rather ask provocative, challenging or unhinged questions, as such questions may bring more valuable input. (Dyer et al., 2011e) Moreover, particularly innovative individuals often repetitively ask descriptive questions followed by disruptive questions. Through initially asking descriptive questions such as “what is?” and “what caused?” they gain profound understanding of the present matter and of its functionalities. Thereafter follow disruptive questions, such as “why?” or “why not?”, which are used to acquire critical insights. These questions are often followed by questions of “what if?”, which are used to eliminate constraints and limitations in order to allow a more free thinking process and thus improve the innovative performance. (Dyer et al., 2011f)

Observation skills

Observation skills can be applied in order to acquire new or additional input for novel ideas. Many innovative individuals are intense and eager observers; they observe surrounding phenomena and use them as new input, which further can be used for associating and analysing. (Dyer et al., 2011g) The application of observation skills can have different purposes. The types of observation that are most commonly applied by particularly innovative individuals can roughly be divided into two categories; observation with the purpose of obtaining insight of the needs of others and observation with the purpose of finding feasible solutions to apply. Observation with the purpose of receiving insight of the needs of others can be executed through observing patterns of behaviour. When understanding such needs, existing solutions can be improved or novel solutions can be elaborated accordingly. Observation with the purpose of finding feasible

solutions to apply is related to the ability of perceiving solutions that can be applied on entirely different contexts. This type of observation is most often executed via existing products or via current processes. (Dyer et al., 2011h)

Propensity to experiment

While the innovative features of propensity to network, of questioning ability and of observation skills are efficient means in order to provide information of the past or of the present, the innovative feature of propensity to experiment is the best means to generate data of which potential solutions that may function. Hence, the propensity to experiment acquires realistic information of the future, which in turn is favourable to innovative performance. (Dyer et al., 2011i) Particularly innovative individuals mainly apply three ways of experimenting. The first way is to acquire experience through exploration; e.g. to develop a new skill or to work in multiple industries. Through this means, broader and more diverse knowledge is gained. The second way is to either physically or mentally take things apart; e.g. disassemble a product, map out a process or deconstruct an idea. Through this means, profound understanding of functionalities is gained. The third way is to test ideas through prototypes and through pilot tests; e.g. through building a prototype or through piloting a new process. Through this means, insights into whether a theoretical idea practically works are gained. (Dyer et al., 2011j)

Opportunity understanding

Opportunity understanding is indispensable to innovative performance, as it an inherent initial step of the cognitive process of elaboration of innovations. It is an active construction rather than a fixed process and is executed individually or in teams. Opportunity understanding, through opportunity definition, states the very goal through defining the area of identified needs or the areas of unexplored challenges. Hence, it can be considered a starting point of all innovations. There are several techniques and various tools that support a better understanding of opportunities; e.g. Pareto analysis, Cause and effect analysis and Cognitive mapping techniques. (Bessant & Tidd, 2007b)

Ideation

Ideation refers to the general process of idea generation and thus is fundamental to innovative performance of individuals. Its primary objective is to generate as many feasible options as possible to certain open-ended problems. It exists a variety of systematic techniques for ideation, whereas brainstorming is the most recognised one. This technique applies both divergent thinking and convergent thinking, in order to set off with as many feasible alternatives as possible and through evaluation identify the most feasible one. (Bessant & Tidd, 2007c)

Action planning

Action planning is especially useful when an individual who perceives the potential in an existing idea also understands that this idea may not be useful without additional efforts. Action planning involves two components; development of solutions and building of acceptance. Development of solutions includes analysis, redefinition and development of selected options. Its primary emphasis is to prioritise and to focus on specific options. Building of acceptance aims at paving

the way for the selected options. It includes search for complementary resources of assistance, as well as search for possible sources of resistance to potentially overcome. (Bessant & Tidd, 2007c)

Collaborative mindset

Collaboration is essential to innovative performance of individuals (see 4.3.1). Hence, a collaborative mindset is a necessary innovative feature as it lays the basis for the elaboration of innovations. It entails a certain level of goodwill and of trust, along with general collaborative habits and related practices. Favourable collaboration that results in innovations of considerable quality often demand collaborative settings that go beyond the comfort zone of individuals, through exposure to different personality characteristics and to diverse functional backgrounds. This circumstance further increases the need for a collaborative mindset in order to ensure innovative performance of individuals. (Gratton, 2009b)

4.2.4. Allocation of resources

Innovative performance is highly dependent on the access to an appropriate amount of adequate resources. Resources include everything that organisations can offer individuals in order to enable enhanced innovative performance. (Amabile, 1997a; Bessant & Tidd, 2007d; PIEp, 2008b)

Resources affect innovative performance in several ways. First, lack of resources obviously leads to practical limitations of what individuals can accomplish within the scope of their work tasks. (Bessant & Tidd, 2007e) Second, the perception of the adequacy of resources may have psychological effects on individuals, through leading to beliefs of the perceived value of the project on which they currently work (Amabile et al., 1996a). Third, the guarantee of sufficient accessible resources over time prevents tight and non-value adding deadlines and ensures long-term commitment, which in turn facilitates the establishment of shared goals that are stable over time (Amabile, 1998a). Moreover, the risk of not providing individuals sufficient resources may imply that they channel their innovative energy to efforts of finding additional resources, rather than channel it to exploration of novel ideas and of new information. (Amabile et al., 1996a)

4.2.4.1. Organisational slack

To be granted access to an infinite amount of resources does not increase innovative performance. Hence, all resources should be allocated at an appropriate level. The optimum level of generic resources occurs through the incorporation of organisational slack. Organisational slack is the difference between resources currently needed and resources currently available within the actual organisation. (Bessant & Tidd, 2007e) Hence, it may imply an adequate amount of accessible resources for free exploration (Amabile, 2008a).

When the organisational focus is exclusively on productivity, organisational slack is commonly ineffective. However, when there is a strong organisational ambition to demonstrate a continuous stream of elaborated innovations of high quality, the presence of organisational slack is an utmost necessity. Accordingly, an appropriate degree of organisational slack is associated with durable innovative performance and thus long-term corporate growth. (Amabile, 2008a; Bessant & Tidd, 2007e)

4.2.4.2. Generics types of resources

The most important generic resources to innovative performance of individuals are time, information and financial funds and tangible resources (Bessant & Tidd, 2007e).

Time

Time is a vital element to innovative performance of individuals. Research indicates that overall innovative performance decreases significantly when individuals are exposed to certain time pressure. Within the context of innovation, the time needed is foremost in the form of idea time; i.e. time to freely generate novel ideas, without constraints. When the allocation of idea time is relatively high, individuals are granted possibilities to thoroughly discuss and to test impulses and suggestions of potential solutions that go beyond the scope of their ordinary work tasks. A lower level of accessible idea time implies that every minute is specified to a certain activity, according to the ordinary schedule. However, the allocation of available time must be balanced, which closely links it to organisational slack (see 4.2.4.1). (Bessant & Tidd, 2007e)

The relationship between innovative performance and organisational slack related to time specifically, can be illustrated through an inverted U-shape. Too little organisational slack does not allow sufficient time for innovative efforts. When there is insufficient time to generate novel ideas, individuals usually tend to only focus on and prioritise their ordinary work tasks. Therein, individuals tend to perceive e.g. experimenting, professional development and corporate trainings as time obstacles to the completion of their work tasks, rather than factors that support and potentially enhance innovative performance. On the other hand, too generous organisational slack may result in that individuals eventually become bored. Also, lack of discipline and of work efficiency may arise. Another risk is that time for decision making may be prolonged, as there are too many generated ideas to take into consideration. (Bessant & Tidd, 2007e; Richtnér & Åhlström, 2010a)

Information

Access to latent information within the organisation through the presence of knowledge, of expertise and of experience is a key resource to innovative performance of individuals (Björk & Magnusson, 2009a; Richtnér & Åhlström, 2010a). The most important source of information is surrounding colleagues who possess relevant expertise. (Amabile, 1997a; Bessant & Tidd, 2007d; Limapornvanich et al., 2011a; PIEp, 2008b)

Financial funds and tangible resources

Other resources that influence innovative performance are financial funds and tangible resources. Financial funds are funds that are allocated to innovative activities specifically; i.e. funds for research and development, for knowledge acquisition or for professional development of individuals. Tangible resources entail access to material, to technically advanced equipment and to work facilities. (Amabile, 1997a; Limapornvanich et al., 2011a)

4.3. Collective level

This subchapter presents the two separate general areas at the collective level that theory commonly claims as critical to innovative performance of individuals. These areas are collaboration and managerial practices (see Figure 11).

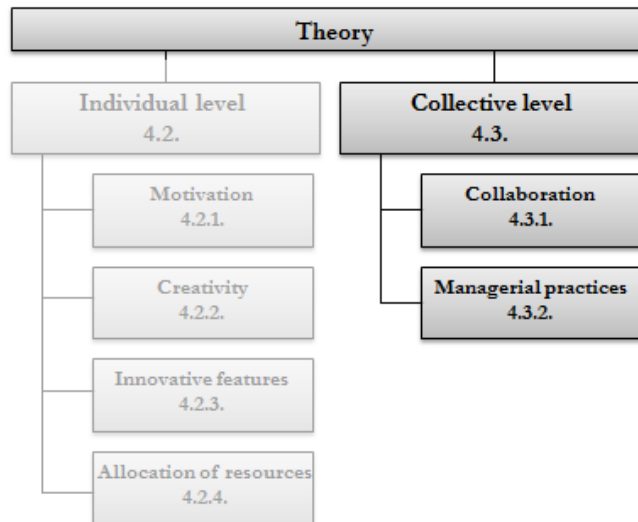


Figure 11: Theoretical framework at collective level (Möller & Wahlqvist, 2012d)

4.3.1. Collaboration

Collaboration is commonly recognised as indispensable to innovative performance of individuals, as strong innovations often emerge from specifically collaborative contexts (Gratton, 2009b). This subchapter is divided into two parts. The first part treats favourable implications of collaboration, while the second part presents an account of favourable designs of collaboration.

4.3.1.1. Favourable implications of collaboration

Collaboration entails favourable implications that generally enhance innovative performance of individuals (Bessant & Tidd, 2007f; Gratton, 2009b). This subchapter covers the most common favourable implications. These implications are knowledge sharing, favourable diversity, favourable dissensions and mutual inspiration.

4.3.1.1.1. Knowledge sharing

Knowledge is a key resource to innovative performance of individuals (Björk & Magnusson, 2009a; Richtnér & Åhlström, 2010a). The required knowledge that must be in place in order to enable elaboration of innovations often entails not only existing knowledge but also acquisition of complementary knowledge. Hence, knowledge sharing is necessary in order to render possible efficient generation of innovations. As collaboration facilitates the capitalisation on existing competencies within organisations, knowledge sharing is an utmost favourable implication of collaboration. (Björk & Magnusson, 2009a)

Knowledge sharing is the process through which information from various sources is shared. Hence, it leads to overall acquisition of complementary knowledge along with acquired increased understanding of certain phenomena. Research commonly states that purposeful development of

knowledge sharing, along with organisational facilitation of it, significantly increase innovative performance of individuals. It is foremost due to the circumstance that knowledge sharing may lead to enhanced organisational learning. This form of learning occurs when individual knowledge is transformed into organisational knowledge and consequently organisational learning, through the means of knowledge sharing. (Al-Husseini & Eibeltagi, 2012a; Bessant & Tidd, 2007g; Richtnér & Åhlström, 2010a)

The form of the very shared knowledge affects the actual process of knowledge sharing. Knowledge can be of two forms, i.e. explicit knowledge or tacit knowledge. Explicit knowledge is articulated knowledge that can be found in literature and in databases. Hence, it can easily be shared and accessed. Tacit knowledge refers to embodied individual knowledge that has been accumulated through experience. Consequently, it is more difficult to transmit and to share tacit knowledge, compared to explicit knowledge. Hence, tacit knowledge is mainly transferred through social interactions and through interpersonal communication. (Al-Husseini & Eibeltagi, 2012a; Bessant & Tidd, 2007g) The efficient sharing of tacit knowledge thus depends on the quality of the relationships between the actual individuals, which often are strengthened through favourable collaborative contexts (Gratton, 2007a). As explicit knowledge and tacit knowledge are complementary in character, organisations must ensure that both forms of knowledge are shared, in order to secure innovative performance over time (Al-Husseini & Eibeltagi, 2012a; Bessant & Tidd, 2007g; Richtnér & Åhlström, 2010a).

4.3.1.1.2. Favourable diversity

Diversity simply means variety and reflects the degree of heterogeneity of a given team. Researchers disagree on the subtle link between the present degree of diversity within teams and innovative performance of individuals within such teams. Some researchers assert that the presence of diversity nearly is a prerequisite of innovative performance. However, other researchers rather assert that the presence of diversity directly influences creative efforts; i.e. that it affects innovative performance of individuals through this form of intermediaries. Yet, in spite of these obscurities, existing research commonly recognises the presence of diversity as critical to innovative performance of individuals, irrespective of which paths it wanders. Hence, the accounted theory throughout this chapter will take this recognition as a starting point. (Amabile, 1998a; Amabile 2008b; Paulus & Nijstad, 2003c; West et al., 2004b; Zhou & Shalley, 2008a)

“...innovation is more likely when people of different disciplines, backgrounds, and areas of expertise share their thinking.”

- (Amabile, 2008b)

As a relatively broad concept, diversity can be divided into two generic subcategories; undetectable diversity and detectable diversity (Paulus & Nijstad, 2003d).

Undetectable diversity

Undetectable diversity implies differences in unobservable variables of individuals; e.g. values, opinions, education, knowledge, expertise and socio-economic background. Cognitive diversity, i.e. diversity that is related to the cognitive processing of information and to different ways of thinking, is a subset to undetectable diversity. Cognitive diversity is the form of undetectable

diversity that appears to exert primary influence on innovative performance of individuals within given teams. (Paulus & Nijstad, 2003d)

Detectable diversity

Detectable diversity entails differences in readily observable attributes; e.g. gender, age, language and ethnical background. Detectable diversity is more apparent throughout initial team interactions and acts more immediately on intergroup processes, compared to undetectable diversity. However, it is important to emphasise that not all observable differences exert influence on intergroup processes, as it to a large extent depends on adherent personal perceptions as well as on team composition and on contextual settings. (Paulus & Nijstad, 2003d)

Implications of favourable diversity

The principal benefits of diversity to innovative performance of individuals are generation of novel ideas and generation of novel patterns of thinking.

Generation of novel ideas often emerges from intersections of existing knowledge and of present assumptions. Hence, in order to actually generate novel ideas, individuals must be exposed to various forms of knowledge and to a broad range of assumptions. (Björk & Magnusson, 2009a) Diversity within collaborative contexts implies that individuals will bring various backgrounds, diverse intellectual bases along with different skills and competencies into the very collaboration. Hence, through providing a broad range of various perspectives, input, knowledge and assumptions to collaborative contexts, diversity assists individuals therein in generation of novel ideas. (Amabile, 1998a; Paulus & Nijstad, 2003e, West et al., 2004b)

Innovations often arise due to various mindsets, as such variations often result in novel patterns of thinking. Collaborative contexts that include individuals with various perceptions and thus various cognitive approaches can challenge pre-set mindsets and prevailing patterns of thinking. Diversity thus is a primary means in order to overcome collective uniformity in processes of thinking; a factor that is essential for innovative performance of individuals. (Amabile, 1998a; Paulus & Nijstad, 2003e, West et al., 2004b)

4.3.1.1.3. Favourable dissensions

The common definition is that dissensions are consequences of perceived incompatibilities among individuals. In collaborative contexts, situations of dissensions can hardly be avoided. (Badke-Schaub et al., 2010a) Research indicates various results of whether dissensions within collaborative contexts exert positive or negative influence on innovative performance of individuals (Ekvall, 1996a). However, researchers commonly agree on that certain forms of dissensions may have favourable effects on the propensity of individuals to generate innovations. It exists three generic forms of dissensions; cognitive dissensions, affective dissensions and process dissensions. Generally, foremost cognitive dissensions exert favourable influence on innovative performance of individuals. (Badke-Schaub et al., 2010a)

Cognitive dissensions

Cognitive dissensions refer to disagreements in issues that are related to specific work tasks; e.g. how to attain certain goals or how to consider the very pertinent content of the actual work tasks. Research reveals that teams that are able to capitalise on cognitive dissensions significantly may

strengthen the innovative performance of its individuals. This circumstance is due to two general benefits of cognitive dissensions. First, they may allow various insights to rise to the surface and to thus be brought up to discussion. This benefit provides diverse perspectives of potential opportunities and allows minorities to influence the on-going processes. Moreover, cognitive dissensions may increase re-examination of pre-set values and of prevailing perspectives and thus may bring new ways of thinking. This benefit results in a more qualitative decision making. Both benefits are of utmost importance to innovative performance of individuals within teams. (Badke-Schaub et al., 2010a; Bessant & Tidd, 2007e; De Clercq et al., 2008a; Zhou & Shalley, 2008b)

Cognitive dissensions commonly occur in collaborative contexts that are permeated by undetectable diversity. This phenomenon can be explained through the similarity-attraction paradigm, which states that similarities in interests and in attitudes correlate with social attraction and unified opinions. Oppositely, differences in interests and in attitudes, i.e. general traits of undetectable diversity, are linked to opposite opinions, which in turn may result in cognitive dissensions. (Badke-Schaub et al., 2010a) Cognitive dissensions only exert positive influence on innovative performance if individuals find themselves within a collaborative environment where mutual beneficial goals are emphasised, rather than within a more competitive environment. I.e. individuals must feel that their competencies are confirmed rather than frequently questioned. Hence, if managed correctly, cognitive dissensions may bring the above-mentioned valuable contributions to innovative performance of individuals within teams. (Zhou & Shalley, 2008b)

Affective dissensions

Affective dissensions refer to more emotional concerns, as linked to factors of personality issues, of negative emotions and of dissatisfied relationships within teams. Affective dissensions are characterised by expressions of hostility and of signs of anger. They commonly result in lowered levels of general motivation along with decreased openness and reduced interpersonal communication. Hence, affective dissensions generally exert negative influence on innovative performance. (Badke-Schaub et al., 2010a; Bessant & Tidd, 2007e)

Process dissensions

Process dissensions are linked to the actual work tasks, in the same manner as cognitive dissensions. However, process dissensions rather refer to how work tasks should be accomplished and which measures and which means that should be applied along their very execution. Process dissensions thus may arise in the form of disagreements in timing, in planning or in scheduling of work tasks. Research indicates that process dissensions may lead to decreased overall level of productivity. Hence, they are not favourable to innovative performance of individuals within teams. (Badke-Schaub et al., 2010a; Bessant & Tidd, 2007e)

Efficient solving of dissensions

When dissensions arise within collaborative contexts, it exists a strong correlation between how these dissensions are solved and whether they will have positive effects on innovative performance of individuals. This circumstance is particularly valid for cognitive dissensions. (Badke-Schaub et al., 2010a; Gratton, 2007b) Hence, efficient solving of dissensions is a key to the potential release of favourable influence of cognitive dissensions on innovative performance.

Successfully executed solving of dissensions can be regarded as a three steps process. The first step entails active acknowledgment of the actual dissensions, as soon as they occur. The second step involves ensuring a common will and a shared commitment throughout the actual team to solve the arisen dissensions. The third step entails direct confrontation of the dissensions; executed by the individuals within the actual team, which will enable them to move forward simultaneously as they learn from the experience. (Gratton, 2007b)

4.3.1.1.4. Mutual inspiration

Mutual inspiration that is favourable to innovative performance arises when particularly innovative individuals inspire each other to take on and to pursue with challenges of particular inventive step. Research demonstrates that already innovative individuals tend to further enhance their innovative performance when collaborating with colleagues that are at least equally innovative. Yet, the inspirational effect exerts even greater influence on the innovative performance of those individuals who claim themselves not to be particularly innovative. This enhanced inspirational effect simply occurs due to the fact that moderately innovative individuals get explicitly inspired through perceiving the thinking processes of and the behaviour styles of those individuals who demonstrate a significant higher level of innovative performance. Connecting moderately innovative individuals with particularly innovative individuals thus significantly may assist in enhancing overall innovative performance of individuals within teams. (Zhou & Shalley, 2008c)

4.3.1.2. Favourable designs of collaboration

Besides the stated favourable implications of collaboration, research indicates that innovative performance of individuals within teams largely relies on processes and on structures that enable acquisition of information throughout organisations, along with similar spreading mechanisms. This circumstance is strongly linked to favourable designs of collaboration. (Wells, 2008a) This subchapter covers the most commonly applied designs of collaboration that theory describes as particularly favourable to innovative performance. These are networks, skunk works, cross-functional work and workshops.

Networks

Networks are built on relationships of various characters between individuals. They are efficient means of both sharing and acquiring knowledge. Networks entail many implications that are utterly favourable to innovative performance of individuals, of which all are based on the foundation of relatively free access to complementary expertise or new knowledge, to relevant input and to complementary resources. (Bessant & Tidd, 2007h; Bjerke, 2005a) The more interconnected individuals are within the actual networks, the greater amount of accessible knowledge. (Björk & Magnusson, 2009a)

Networks can be characterised in accordance with two different parameters. These two parameters are the degree of external constituents along with the degree of formality. Collaboration through networks can be executed through internal networks or through external networks. Internal networks are based on individuals within the actual organisation, while external networks entail individuals beyond organisational boundaries. Commonly applied forms of external networks are collaboration with suppliers and with customers, or collaboration with

professional industrial organisations and with related interest groups. (Bessant & Tidd, 2007h) Collaboration through application of networks can either be informal or formal in character. Informal networks are based on spontaneously formed groups of individuals that share knowledge and expertise in a free-flowing way; e.g. through personal networks within organisations. Such networks are recognised as highly important to creation of knowledge and to general innovative performance. (Björk & Magnusson, 2009a) In order to maximise innovative performance, informal networks should contain an adequate balance of both depth and breadth within the present relationships. Individuals need close relationships, as they provide safety and sense of self-worth. However, close relationships ought to be balanced with more loose ones, which are broader in character. Such relationships entail more diverse sets of individuals, which consequently can contribute with various perspectives, input and knowledge. (Gratton, 2009c) Formal networks are more structured in their very settings. They can be formed through various means and have different purposes. Networks that are established directly for the purpose of enhancing innovative performance are often effective within organisations. (Bessant & Tidd, 2007h) Yet, formal networks commonly stretch beyond internal corporate settings, through connections with professional industrial organisations and with related interest groups, as mentioned above. Similarly to informal networks, formal networks should be constituted of an appropriately balanced mix of individuals, in order to ensure a certain degree of diversity and thus secure the provision of complementary competencies and required expertise. (McKinsey, 2008a) Preferably, formal networks ought to include both individuals from the actual organisation and individuals from external settings, in order to capitalise on the potentially enriching perspectives and input of the latter ones (Davila et al., 2006c).

Skunk works

Skunk works are a spontaneous and a relatively unstructured form of collaboration. The form is of temporarily character, where individuals gather and isolate themselves from influence of others within the organisation, for the purpose of solving a clearly specific problem. The composition of individuals varies from skunk work to skunk work and all compositions are dissolved when the very problem is solved. The collaboration form of skunk works is recognised by management scholars as stimulating to innovative performance, due to its structural freedom and its focused purpose. Skunk works are employed throughout numerous organisations that are recognised as particularly innovative. (Fosfuri & Ronde, 2009a; Rich, 1988a)

In order for skunk works to be generally favourable, three prerequisites must be securely in place. First, the actual organisation must be relatively flexible, as skunk works function most efficiently within organisations where skilled individuals can be gathered on a short notice in order to solve the particular problem; and thereafter immediately return to their ordinary work tasks. The degree of flexibility also entails secured access to feasible facilities and to required technical tools.

Second, the right individuals must be engaged. When selecting participating individuals, only those who are able to contribute with directly valuable input to the narrow problem must be selected. The headcount should be kept to a minimum, in order to pave the way for focused work. (Rich, 1988a) The sum of the involved individuals ought to represent an appropriate mix of complementary knowledge, skills and innovative features. Therein, they should demonstrate a shared evident will to collaborate. As skunk works grant their individuals a considerable level of

freedom, it requires that the actual individuals are capable of managing this assigned autonomy. Hence, all individuals must possess a strong driving focus and a distinct ability to keep focus. Third, clear communication is yet another prerequisite of innovatively successful skunk works. The temporary team should only focus on solving the specific problem for which they have gathered. It ensures rapid transfer of knowledge and thus secures that the specific problem actually is solved within reasonable time. (Single & Spurgeon, 1996a)

Internal teamwork

Internal teamwork is executed on a daily basis within most organisations across all industries. It is favourable to innovative performance of individuals due to two main reasons. First, it facilitates an everyday exchange of knowledge and of ideas. Second, internal teamwork lays the basis for the emergence of spontaneous discussions. (Bessant & Tidd, 2007g)

Cross-functional work

Cross-functional work is a relatively structured form of collaboration. It is commonly used throughout organisations in order to ensure continuous exchange of functional knowledge. The applied degree of cross-functional work in collaborative contexts can be ranked in accordance with the degree of engagement of various functional areas. Cross-functional work can either be of interdepartmental character or occur within each functional department, i.e. between separate subfunctions. Irrespective of character, cross-functional work commonly is considered critical to innovative performance of individuals, as it ensures access to various functional perspectives of one single problem. (Bessant & Tidd, 2007i; Wells, 2008a)

Workshops

Structured workshops are a commonly applied form of collaboration. It is not as temporary and as spontaneous as skunk works, but is still brief and concise in character. Workshops are often gathered by individuals who need input to a specific problem and thus function as support to elaboration of innovations. Workshops entail various degrees of cross-functionality, depending on the character of the very problem. The number of participants is often relatively unlimited. Workshops can also be an efficient means to spread knowledge throughout organisations and thus enhance the overall innovative performance, or to simply inspire and engage individuals to take on new challenges. (Gratton, 2007c; Bessant & Tidd, 2007g)

4.3.2. Managerial practices

Generally, managerial practices are considered a subset of their adherent organisations. Researchers and adjacent academic literature commonly disagree on to which extent managerial practices exert influence on innovative performance of individuals. Some researchers assert that managerial practices directly affect innovative performance. Other researchers claim that managerial practices directly influence creative efforts of individuals and thus rather indirectly affect their innovative performance through this form of intermediaries. Yet, in spite of these disagreements, existing research commonly recognises that managerial practices are critical to innovative performance, irrespective of which paths they wanders. Consequently, the accounted theory throughout this chapter will take this recognition of the importance of managerial practices to innovative performance as a starting point. (McKinsey, 2008a; West et al., 2004b) This subchapter includes two areas of managerial practices that existing theory claims to be

utterly important to innovative performance. These areas are areas of managerial responsibility and managerial styles.

4.3.2.1. Areas of managerial responsibility

This subchapter covers two subcategories of areas of managerial responsibility that theory identifies as extra important. These subcategories are adequate work tasks along with managerial encouragement and managerial recognition.

Adequate work tasks

In order to enhance innovative performance of individuals, managers should endeavour to match individuals with appropriate work tasks. A perfect match involves challenging work tasks that keep their mindset active, but which still are balanced in their degree of exposed challenge.

The entailed degree of challenge exerts important influence on innovative performance of individuals, as it is closely linked to one commonly vital intrinsic motivator (see 4.2.1.1.1). Favourably challenging work tasks should stretch the competencies of the actual individuals, as well as include both skill variety and task significance. Skill variety reflects the degree of different skills, talents and activities that are required in order to accomplish the actual work tasks; i.e. it reflects their level of embodied complexity. Task significance reflects the organisational importance of the assigned work tasks and thus their potential impact when completed. I.e. task significance shows that the results and their implications matter to the organisation or other important subgroups, internally or externally. (Amabile, 1998a; West et al., 2004a)

Moreover, in order to increase the sense of ownership of the actual work tasks, managers should grant individuals a certain level of autonomy. Also this factor is strongly linked to one specific intrinsic motivator (see 4.2.1.1.1) and thus is favourable to innovative performance of individuals. Autonomy entails independence in deciding how to approach and execute work tasks. It thus allows individuals to decide through which means they will attain their task goals. Hence, a balanced level of autonomy should be granted along all work processes and not only as selective measures during certain stages. (Amabile, 1998a; Bessant & Tidd, 2007e; West et al., 2004a)

Managerial encouragement and managerial recognition

Research indicates that managerial encouragement and managerial recognition exert positive influence on innovative performance of individuals (Amabile, 1998a; Bessant & Tidd, 2007e). Encouragement and recognition from managers are important, as these factors are closely linked to one vital synergistic extrinsic motivator (see 4.2.1.1.2). Managerial encouragement and managerial recognition that support innovative performance generally entail practical support of attempts to introduce new and improved ways of execution (Bessant & Tidd, 2007). The two factors imply generous recognition of innovative efforts and continuous greeting of new ideas, which in turn ignite a will within individuals to continue to purposefully elaborate innovations. Moreover, managerial encouragement and managerial recognition are necessary in order to sustain individual passion within teams, as they acknowledge the significant value of individual contributions and therein demonstrate their parts of the whole. Thereby, ensure that individuals work towards commonly set goals and not for their own personal gains. (Amabile, 1998a) Managerial encouragement and managerial recognition can be executed through various means,

of which feedback is the most commonly deployed. Managers who encourage individuals through provision of constructive feedback significantly contribute to the enhancement of their innovative performance. (Bessant & Tidd, 2007e; Zhou & Shalley, 2008c) Constructive feedback helps individuals to become aware of their gaps of performance and to identify new ways of working in order to fill in these gaps; and thus potentially enhance their innovative performance. Accurate and timely feedback thereby provides individuals with clear goals of improvement to work towards; i.e. carrots. (West et al., 2004a)

Hence, it is important that managerial encouragement and managerial recognition are appropriately executed. Preferably, managers should neither encourage nor recognise the particular outcome of innovative efforts; but rather the pure innovative efforts themselves. Such measures increase the sense of individuals that their continuous efforts matter to the organisation. (Amabile, 1998a) Yet, managerial encouragement of innovative ideas must be balanced. Too eager stakes of managerial encouragement may result in that individuals do not prioritise among their generated ideas and consequently defer necessary evaluation of feasibility. (Bessant & Tidd, 2007e) Managerial recognition should only be devoted to real efforts of innovative attempts and not to half-hearted ones. However, managerial recognition always must be securely in place throughout organisational settings, as efforts of innovative attempts without following managerial recognition may result in both anger and acrimony. (Amabile & Kramer, 2007b)

4.3.2.2. Managerial styles

Researchers have devoted considerable efforts during the last years to understand the role of managerial styles within knowledge-intense organisations; i.e. organisations which corporate success depends on their overall innovative performance to a considerably large extent. One such attempt to elucidate the potential effects of various managerial styles is presented in Figure 12. The presented matrix has two axes. Its vertical axis represents the degree of managerial intervention in the individuals' work tasks, while its horizontal axis represents the degree of managerial functional knowledge in relation to the individuals. When observing this matrix, it is important to bear in mind that managers may alter along the axes over time. (VINNOVA & Stiftelsen IMIT, 2012b)

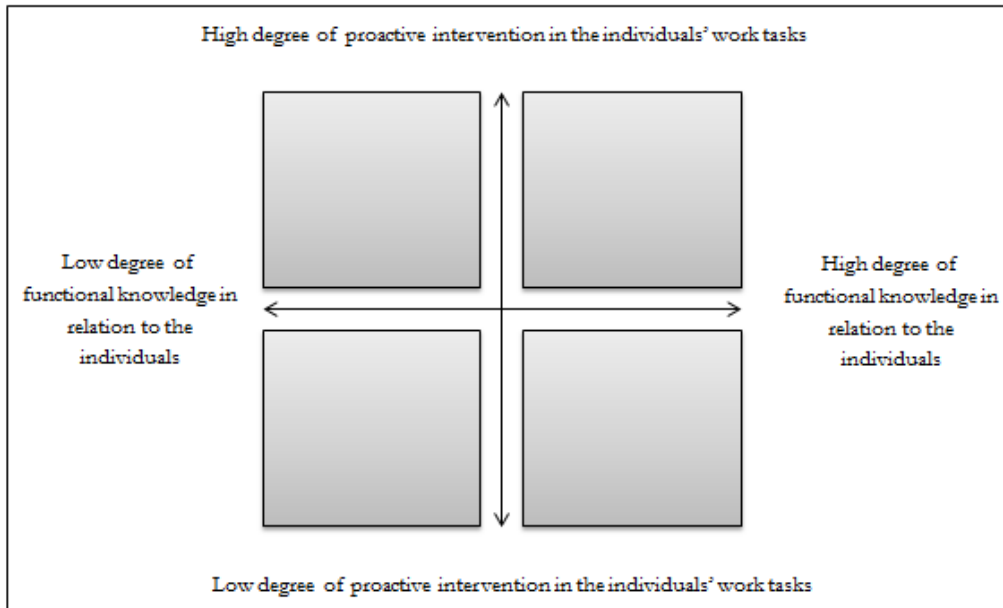


Figure 12: Four positions for management of innovative work (VINNOVA & Stiftelsen IMIT, 2012c)

Degree of managerial proactive intervention

A high degree of managerial proactive intervention in individuals' work tasks implies that managers actively take initiative to and initiate continuous catch-ups. Such managers seek contact with the individuals and actively ask questions that directly concern their work tasks; foremost in an encouraging attempt. The intervention purely occurs on initiative of managers and not due to any orders from higher corporate hierarchical levels. On the contrary, a low degree of managerial proactive intervention in individuals' work tasks implies that it is the individuals themselves who initiate contact with their managers. (VINNOVA & Stiftelsen IMIT, 2012b)

Degree of managerial functional knowledge

A high degree of managerial functional knowledge in relation to the individuals implies that managers possess a higher level of relevant expertise, compared to their subordinates. Hence, managers may actively guide the individuals towards a certain solution, through provision of pertinent knowledge. Moreover, besides ensuring a thorough understanding of technically complex details, a high degree of managerial functional knowledge almost guarantees that managers speak the same technical language as the individuals. On the contrary, a low high degree of managerial functional knowledge in relation to the individuals implies that managers are not directly involved in explicit technical development and thus elaboration of innovative solutions; it is rather in the hands of the individuals. (VINNOVA & Stiftelsen IMIT, 2012b)

Preferred managerial style for enhanced innovative performance

Empirical research demonstrates that the specific managerial style that combines a lower degree of managerial functional knowledge in relation to the individuals with a lower degree of managerial proactive intervention is highly preferred by individuals, in order to support them in their innovative work and thus potentially enhance their innovative performance. The fact that this selected managerial type demonstrates a lower degree of managerial functional knowledge in relation to the individuals does not imply that such managers cannot assist individuals throughout

their innovative work. Managers who apply this managerial style leave the technical development to the individuals within their team. Rather, their philosophy is to focus on support and on guidance and to facilitate organisational obstacles and impeding political implications. The lower degree of managerial proactive intervention implies that individuals prefer to ask for more reactive interventions when required; e.g. for assistance with issues that they cannot solve on their own or for second opinions on various feasible alternatives. (VINNOVA & Stiftelsen IMIT, 2012b)

5. Empirical Data

This chapter aims at presenting the empirical data of this master thesis project, through the presentation of an empirical framework. It starts with a background description of the respondents of the interviews. The account of the empirical data follows the structure of the presented empirical framework, which emerged from the previously presented theoretical framework throughout the execution of the interviews. The empirical data are presented through a balanced mix of running text and pertinent quotes.

As described in 3.4.9, empirical data were gathered through the execution of semi-structured interviews, which generically followed the structure of the presented theoretical framework (see Figure 8). Yet, due to its accounted vague aspects and its described ambiguity, the theoretical framework has been relatively carefully applied in order to allow respondents to freely reflect beyond its six pertinent areas. Nevertheless, the respondents confirmed all areas as more or less important to their innovative performance. However, the area of allocation of resources was narrowed down to the semi-new area of time for innovation. Moreover, the respondents identified the additional area of assignment as pertinent to their innovative performance. Hence, an empirical framework emerged, which slightly differed from the theoretical framework (see Figure 13).

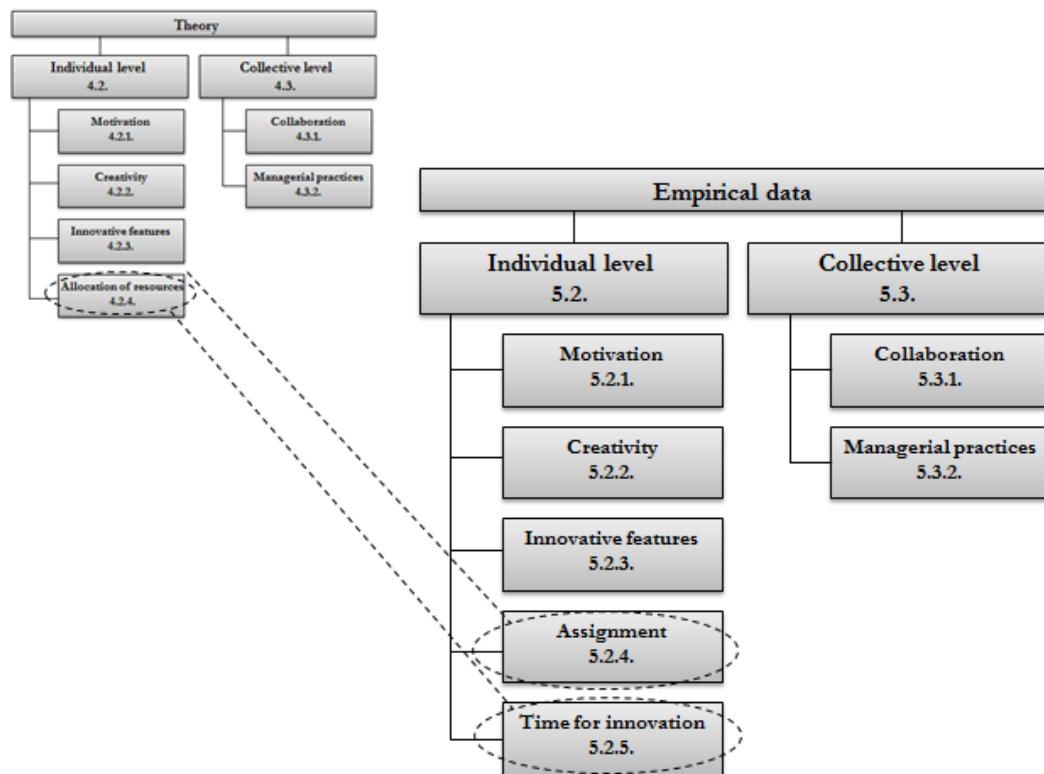


Figure 13: Empirical framework (Möller & Wahlqvist, 2012d)

Throughout this chapter, each pertinent area that emerged throughout execution of the interviews is separately described, in accordance with the presented numbered structure of the presented empirical framework (see Figure 13). First, a background description of the respondents is given.

Throughout this chapter, it is important to keep in mind that the pertinence of each area is described in accordance with the frequency of the provided answers. Moreover, no answers will be directly connected to individual respondents, due to the use of system approach throughout this master thesis project (see 3.4.9).

5.1. Background

Interviews with 24 top innovators within Scania constituted the generic approach for the gathering of empirical data throughout this master thesis project. Every interview lasted for approximately one hour. The main purpose of the interviews was to understand the critical success factors for the significant innovative performance of these particularly innovative individuals. The interview objects, i.e. Scania's top innovators, were selected in accordance with their number of registered invention submissions during the years of 2009, 2010 and 2011 within Scania's internal patent database (see 3.3.7).

In order to secure an adequate number of interviews and in accordance with the pre-set ambition (see 3.3.7), the 31 top innovators within Scania were contacted and asked if they would like to participate in individual interviews. Out of them, seven top innovators were on paternity leave, did no longer work within Scania or wished to not participate in this master thesis project. The remaining 24 top innovators agreed to participate. Hence, they constitute the group of individuals that is named respondents throughout this master thesis. These 24 top innovators represent top 1-10, 12-15, 17-21, 23-24, 26, 29, and 31 of Scania's innovators (see Appendix E). Consequently, the top innovators who were ranked 11, 16, 22, 25, 27-28, and 30 did not participate. 22 interviews were executed person-to-person. Two interviews were executed by phone, as the respondents were geographically distant. All 24 respondents worked within Scania at the point in time of their interview.

5.1.1. A note on the innovativeness of the respondents

As mentioned, Scania has approximately 37 500 employees (see 2.1). Out of them, 721 individuals are represented in Scania's internal patent database for the years of 2009, 2010 and 2011. During these three years, 1 347 invention submissions were registered within Scania. When taking into account that several invention submissions are submitted by two or more contributors, this number amounts to 2 611 registered invention submissions, in accordance with the criterion of selection of this master thesis project (see 3.3.7). The 24 respondents represent 627 registered invention submissions of out this total number of 2 611 registered invention submissions.

Hence, approximately two percent of Scania's total number of employees registered an invention submission during the years of 2009, 2010 and 2011 (see Figure 14). The respondents represent approximately three percent of these individuals (see Figure 15). However, the registered invention submissions of the respondents represent as much as 24 percent of the total number of registered invention submissions during the years of 2009, 2010 and 2011 (see Figure 16).

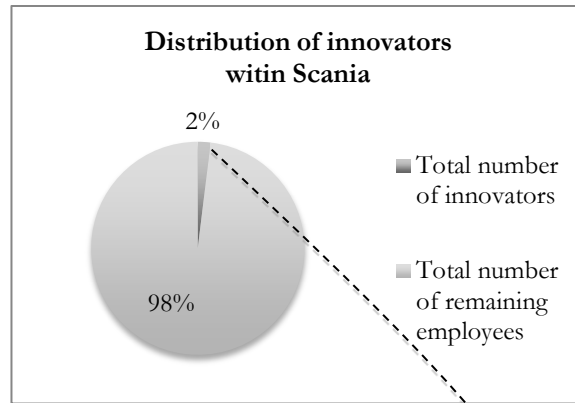


Figure 14: Distribution of innovators within Scania (Möller & Wahlqvist, 2012d)

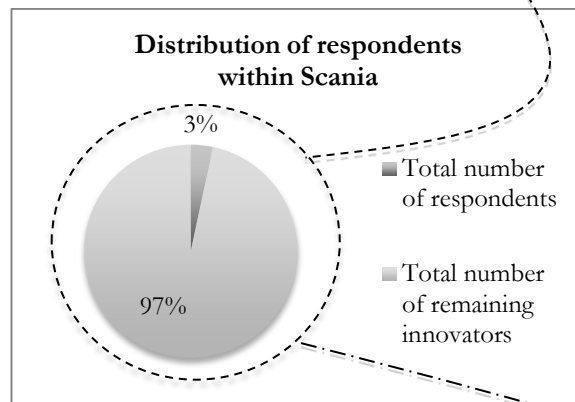


Figure 15: Distribution of respondents within Scania (Möller & Wahlqvist, 2012d)

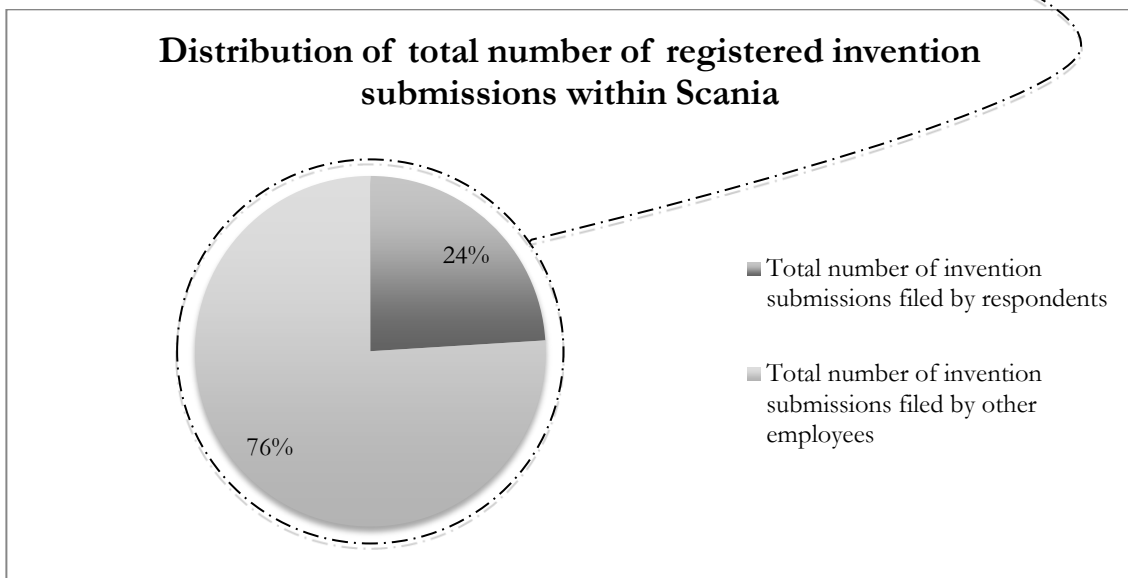


Figure 16: Distribution of total number of registered invention submissions within Scania (Möller & Wahlqvist, 2012d)

5.1.2. Character of respondents

All 24 respondents were men (see Figure 17). A majority of them were in the age of 30-39 years, while only one respondent was older than 50 years (see Figure 18). One third of the respondents had worked less than five years within Scania, while yet another third had worked more than five years but less than ten years within Scania (see Figure 19). All respondents belonged to Scania R&D. The share of the respondents that devoted more than 80 percent of their working hours to Pre-Development during the years of 2009, 2010 and 2011 was of equal size as the share that devote less than 20 percent to Pre-Development during the same period of time (see Figure 20). A majority of the respondents held truck driving license (see Figure 21).

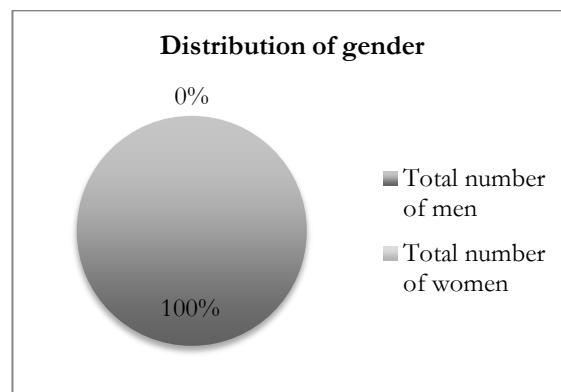


Figure 17: Distribution of gender (Möller & Wahlqvist, 2012d)

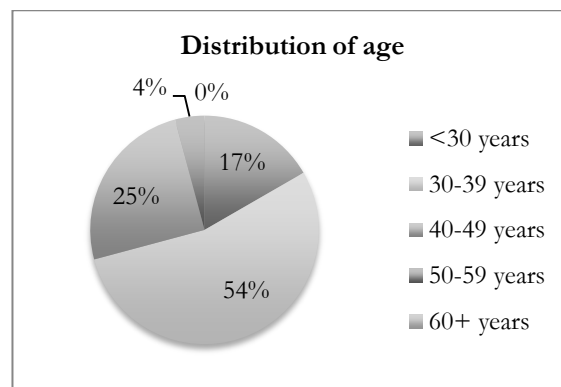


Figure 18: Distribution of age (Möller & Wahlqvist, 2012d)

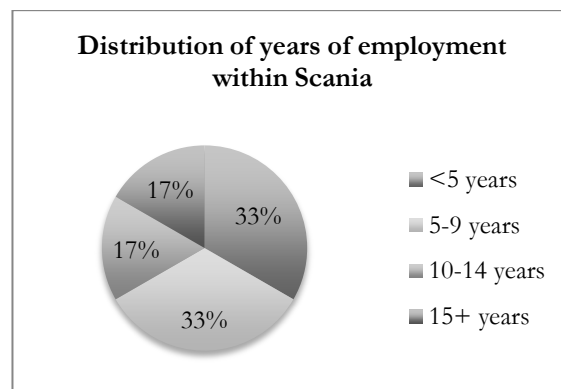


Figure 19: Distribution of years of employment within Scania (Möller & Wahlqvist, 2012d)

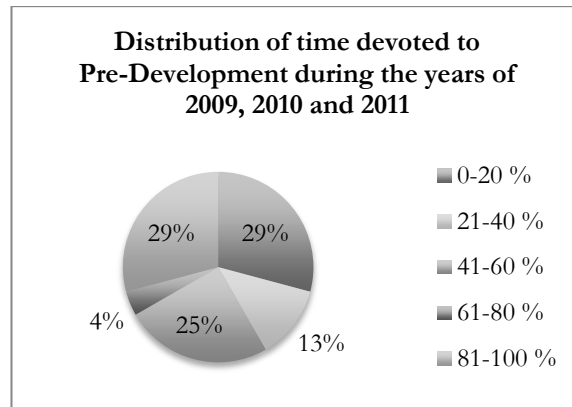


Figure 20: Distribution of time devoted to Pre-Development during the years of 2009, 2010 and 2011 (Möller & Wahlqvist, 2012d)

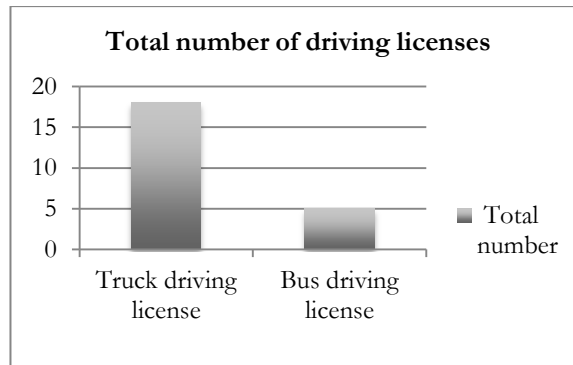


Figure 21: Total number of driving licenses (Möller & Wahlqvist, 2012d)

5.2. Individual level

This subchapter presents the individual empirical data, through five separate areas that the respondents identified as critical to their significant innovative performance. These areas are motivation, creativity, innovative features, assignment and time for innovation (see Figure 22).

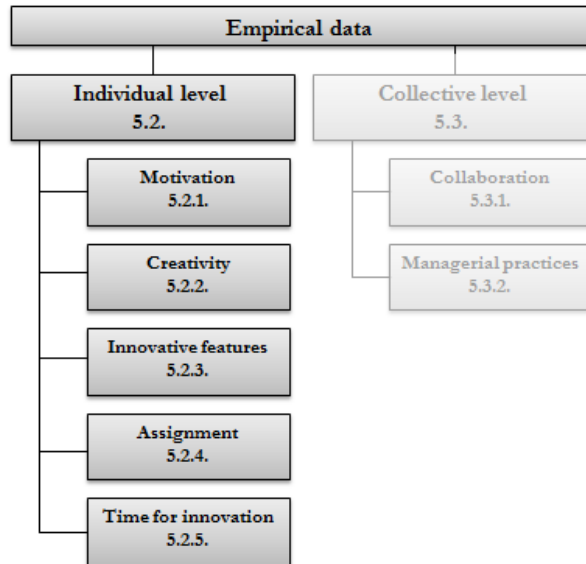


Figure 22: Empirical framework at individual level (Möller & Wahlqvist, 2012d)

5.2.1. Motivation

The potential importance of motivation to innovative performance was thoroughly discussed throughout the interviews. All respondents explicitly claimed that the presence of motivation is absolutely necessary in order to enable any generation of innovations at all. A majority of the respondents considered general motivation a fundamental condition in order to be able to pursue and to elaborate robust innovations over time, as they testified to evident links between an adequate present level of motivation and the level of innovative performance. Several respondents described how experienced periods of lower level of motivation had resulted in a significantly reduced number of elaborated innovations.

The general concepts of intrinsic motivation and extrinsic motivation respectively were thoroughly explained to the respondents throughout the interviews. The respondents were asked to account for their perception of the importance of these separate forms of motivation to their innovative performance. All respondents claimed that intrinsic motivation in general and inner personal drive in particular must be present in order to enable them to continuously elaborate strong innovations. Several respondents claimed that without such presence, their innovative performance would have been significantly hampered.

“Without any motivation, drive or will, I would not come up with any solutions at all.”

“Regarding innovative solutions; it is very seldom indeed that you get ordered to come up with a specific innovation. Personal drive is a prerequisite in order to get on with something at all.”

A majority of the respondents commonly stated that extrinsic motivation is almost equally important as intrinsic motivation to their innovative performance. Yet, nearly every respondent claimed that extrinsic motivation is ineffective if intrinsic motivation not is present.

“If you do not have any inner drive of your own, then it makes no difference which carrots the organisation tries to motivate you with.”

5.2.1.1. Specific motivators for innovations

The respondents were exposed to a spectrum of various intrinsic motivators and extrinsic motivators, of which all were mentioned in the studied theory (see 4.2.1.1). The respondents were asked to identify and to discuss the motivators that they considered to exert critical influence on their level of motivation, along with complementary experienced ones that they were allowed to freely add. All respondents claimed that the presence of various intrinsic motivators is vital to their level of intrinsic motivation. Moreover, all respondents identified at least one specific extrinsic motivator that they stated to be critical to their level of extrinsic motivation. However, most respondents claimed that a balanced mix of intrinsic motivators and of extrinsic motivators is most favourable to their overall level of general motivation.

5.2.1.1.1. Intrinsic motivators

This subchapter presents the intrinsic motivators that the respondents identified as particularly critical to their level of intrinsic motivation and thus to their innovative performance. These intrinsic motivators are pertinent interest, sense of challenge, sense of autonomy, enjoyment and satisfaction.

Pertinent interest

Nearly all respondents claimed that a strong pertinent interest is of utmost importance. They declared it to be the ultimate starting point for and a vital basis for innovative performance over time. Many respondents mentioned that a genuine pertinent interest secures a certain level of commitment to the assigned work tasks. The aspect of pertinent interest was explained to be of two forms of interest; either of the form of interest in general problem solving (see 5.2.3.2) or of the form of interest in specific work tasks, in technology or in related functional fields. The latter form of interest was most common for respondents who mainly work within Pre-Development. However, many respondents confirmed that pertinent interest is a combination of both forms.

Many respondents explicitly expressed their pertinent interest in practical problem solving as a primary driver. They stated that their will to improve functionalities permeates their daily work. These respondents mentioned how the level of constant problem solving within their main work field triggers them to perform better. They explained that their very interest lays in finding the best innovative solution to a problem and vividly described the enjoyment and the satisfaction that turn up every time they succeed.

“I find it amazingly fun to do novel things. If you come across problems; there is nothing more fun than to solve them. That is the driving force.”

“The problem that I want to solve or the functionality that I want to improve; that is the factor that drives me the most.”

Respondents emphasised that the possibility to work within a certain work field or with work tasks that are anchored in a passionate interest many times is superior to the possibility to earn a higher salary. Several respondents describe how their pure passion for technology drives them to endeavour to thoroughly understand underlying connections, in order to elaborate novel functionalities.

“I have got the privilege to work within a field that sincerely interests me.”

“We had a project where I was extremely passionate about coming up with a novel functionality.”

Sense of challenge

A majority of the respondents declared a certain sense of challenge to be the primary motivator to their innovative performance. They described that pursued challenges generate significant enjoyment and distinct satisfaction. The respondents considered sense of challenge foremost linked to the aspect of pure complex problem solving. Situations where problems are randomly uncovered were explained as triggering.

“I believe that it is the challenge itself. It is the greatest intrinsic motivator.”

“To come up with the best solution of a complex problem; that challenge is very motivating, according to me.”

Several respondents also connected sense of challenge to the aspect of being responsible for work tasks of which the results and the implications highly matter to the organisation of Scania or to other important subgroups; internal ones or external ones.

One respondent stated that the most motivational condition is to take on challenges that no one has taken on before. Moreover, he described how he tries to see challenging possibilities for innovations throughout all contexts that he works within. Several respondents described how they continuously endeavour to expose themselves to dynamically changing conditions and to new facts and novel prerequisites. Along this, they explained that they constantly seek for challenging work tasks themselves within Scania. Moreover, they study existing innovations and current patents and strive to find potential gaps therein, in order to identify opportunities to elaborate more complete solutions; either to the existing actual problem or within novel related fields. I.e. many respondents described how they find their own challenges within Scania, in order to maintain their level of intrinsic motivation.

“Briefly, I would say that my everyday work life is the exact opposite of monotonous. I get to see novel things and obtain new impressions all the time. This circumstance

strengthens my personal drive and I believe that is the reason why I become more and more innovative.”

A number of respondents connected the sense of challenge to the sense of stretched freedom. They claimed that the experienced sense of challenge can be enhanced through a considerable level of granted autonomy of the approach and of the execution of certain work tasks. I.e. these respondents considered autonomy to be a lever for the motivators of sense of challenge.

However, several respondents emphasised that the level of challenge must be balanced in order to maintain its positive sense and its favourable influence on their innovative performance. Several respondents mentioned that work tasks should be challenging in character, but that they must not be far beyond the functional capacity of the actual individual, in order to not involve any significant loss of control.

Sense of autonomy

To enjoy a certain degree of autonomy through the sense of stretched freedom with responsibility in the execution of work tasks is deeply intrinsically motivating, according to many respondents. A sense of independent mandate provides a certain sense of ownership of work tasks and of potential solutions, which further enhances the level of intrinsic motivation. Several respondents explicitly mentioned that the degree of ownership exerts particularly important influence on their level of intrinsic motivation.

“If you receive an overall responsibility to do something... (...) It feels like, ‘this is my task, this is what I should solve’ and then you let yourself go and devote yourself to the assignment.”

A number of respondents explicitly connected the sense of being given a free rein to the factor of managerial practices (see 5.3.2.1).

Enjoyment

Enjoyment was described to derive from solved challenges and from delivered innovations. The respondents also declared the inevitable importance of the continuous presence of enjoyment throughout their daily work tasks, in order to enable their innovative performance to flourish. Many respondents linked enjoyment to the earlier mentioned opportunity to take on work tasks that appeal to their individual interests and that are challenging in character.

“It must be fun. If so, you will be more positively disposed to come up with novel solutions, rather than just sticking to the same old tracks.”

Two respondents said that pure enjoyment of engineering is necessary. Another respondent claimed that the enjoyment of discovering something that is both novel and useful is the most critical prerequisite of his intrinsic motivation and thus his innovative performance.

“Enjoyment is the most important of them all. To think, mumble and get that feeling of ‘What did I say there?! I have never seen that before. I can use this. Do any competitors have this? No! Cool!’ It is a sort of self-fulfilment.”

Satisfaction

Also satisfaction was said to derive from solved challenges and from delivered innovations. Satisfaction as an intrinsic motivator was foremost mentioned in the context of the satisfactory feeling of delivering tangible results that can be measured and thus demonstrated to managers. Several respondents mentioned that the number of elaborated innovations, of submitted invention submissions or of filed patents is the only direct key performance indicator of innovative performance within Scania. They described that their inclination to prioritise elaboration of innovations is linked to this circumstance, due to their wish to deliver measurable results that can be pointed out in certain situations, in order to demonstrate their level of innovative performance.

“An invention submission or a patent or an innovation, that is a quite tangible result. It is in the nature of research and development, that you will deliver this type of results, as it feels satisfactory. I consider it a good measure of how good you are at innovating.”

5.2.1.1.2. Extrinsic motivators

This subchapter presents the extrinsic motivators that the respondents identified as particularly critical to their level of extrinsic motivation and thus to their innovative performance. These extrinsic motivators are recognition and encouragement, adequate level of resources, character of assignment, competition, expectations, deadlines and monetary remuneration.

Recognition and encouragement

A majority of the respondents said that stimulus from managers and from surrounding colleagues in everyday situations are critical to their innovative performance. Informal expressions of appreciation and recurrent positive feedback on performance were explained to encourage the respondents to pursue novel solutions, to believe in their ideas and to stick to their gut feeling, simultaneously as it enhances their overall joy. Recognition and encouragement can either come from direct or distant colleagues or from managers at different organisational levels. Both forms were identified as important to the presence of extrinsic motivation and thus innovative performance. However, input in the form of managerial recognition and managerial encouragement was considered extra critical, foremost due to hierarchical reasons. Such supportive input preferably ought to be continuously executed on an informal everyday basis, according to the respondents.

“The fact that somebody notices that you are enterprising and innovative... To receive appreciation from outside; that is extremely important.”

Several respondents related managerial recognition and managerial encouragement to the aspect of receiving explicit confidence and trust from managers; e.g. through assignment of high-priority work tasks with especially high impacts, which potentially may draw considerable external focus and attention. The respondents recognised this form of directly distributed confidence to be particularly extrinsically motivating.

“When I reflect on the confidence that we were assigned through that task... It was immense! And that was triggering!”

Organisational recognition along with organisational encouragement were mentioned as extrinsically motivating by several respondents, preferably through informal explicit means of encouraging feedback and through continuous informal signs of appreciation. Only two respondents explicitly mentioned physical honours as particularly motivating; one respondent mentioned Scania's yearly patent party, while another one mentioned the hanged plaquettes on the particular corridor wall at Scania R&D.

Adequate level of resources

All respondents reflected on the impact of secured access to resources on their level of extrinsic motivation. One single sort of resource totally dominated the discussions throughout all interviews and the message was clear.

"Time is motivating!"

A clear majority of the respondents threw light upon the aspect of time and emphasised its immense potential to increase their level of extrinsic motivation. Some respondents described it as a purely motivational privilege to receive the opportunity to spend valuable time on elaboration of innovations within their areas of interest. Other respondents emphasised that to be granted additional time to exclusively dedicate to innovative work is not only inspiring in itself, but is also particularly encouraging and stimulating and thus motivating. Several respondents further explained that they have experienced such measures as signs of personal recognition of their innovative efforts, which consequently further have increased their level of extrinsic motivation. These respondents clearly stated that they regard the circumstance of being granted extra time for innovative work as explicit evidence of support, of trust and of recognition from their managers.

"When you receive the time... That is maybe the most important outer aspect, that you get directly encouraged to generate innovations."

However, nearly all respondents emphasised that the granted access to available time must be balanced, in order to maintain its motivational effect. A constant abundance of available time does not exert any motivational influence at all, according to these respondents.

Character of assignment

A clear majority of the respondents emphasised the motivational influence of the character of their specific assignment, i.e. their assigned work field and their assigned work tasks therein. Almost all of these respondents spend most of their working hours within Pre-Development. In particular, they expressed the very opportunity to work with new-development and with novel technologies as extremely motivating.

"It is nothing but a motivational privilege to work on the front line of novel technologies."

The respondents described the possibility to be allowed to spend a considerable amount of time on work tasks that directly appeals to their pertinent interest in technology as immensely stimulating. Moreover, they explained how the high degree of innovation potential of their work tasks exerts immediate motivational influence, due to the particularly exciting character of their

unexplored areas. Several respondents also accounted for how such an exciting character significantly has strengthened their experienced inner sense of challenge and provided an extra dimension of experienced responsibility.

Moreover, several respondents across Pre-Development, Continuous Introduction and Product Follow-Up mentioned that their experienced change of assignment has exerted strong influence on their level of motivation. They described such a change to render possible an accelerating learning curve, which in turn implies new peaks of motivation and prevents stagnation.

Competition

External competition was commonly mentioned among the respondents as a driver for their innovative performance. The ambition to constantly perform better than Scania's closest competitors and to be the first player on the market with particularly innovative solutions permeated many answers. Many respondents expressed that they view sharp external competition as an extra explicit motivational challenge; i.e. as something that directly drives them to perform better simultaneously as it enhances their inner sense of challenge. These respondents claimed that they regard external competition as a race where only one player can win.

“It is an inherent part of the process of finding the perfect solution, to find that little extra that make us better than the other truck manufacturers.”

“It is always fun to perform better than someone else with similar prerequisites, so it is sort of a race. It is a stimulus.”

Several respondents commonly explained how they, throughout their different projects, picture for themselves certain specific competitors to beat, along with their products and their technical progresses. These pictures, explicit ones or mental ones, trigger their innovative performance, according to these respondents. They said that it is important to possess knowledge of the other players on the market, in order to understand Scania's relative competitiveness.

Internal competition was less mentioned as a driver. Only a very limited number of respondents mentioned it as triggering and as favourable to innovations. Most respondents explicitly claimed that internal competition does not exist within Scania.

Expectations

Several respondents mentioned expectations from managers and from the overall organisation of Scania as an important extrinsic motivator, due to their stimulating effects. They described that such expectations can be either explicit or implicit and of either direct or indirect character.

“Our closest managers expect us to constantly push the limits; to maybe include things that not yet are practicable in the present situation.”

However, many respondents claimed that both managerial expectations and organisational expectations must be balanced in order to be favourable. Optimally, such expectations should be intellectually complex and stimulating in character, rather than involving additional heavy workload. The respondents expressed their aversion for excessive workload, as they testified to its restraining influence on their level of motivation. One respondent pinpointed the fundamental

difference between an expectation and an order; and clearly emphasised that the effects from an order are reverse on his level of motivation.

Deadlines

Many respondents do not experience the context of deadlines in their daily work, as deadlines do not exist to any large extent within the work field of Pre-Development. However, several of the remaining respondents expressed experiences that testified to positive effects of deadlines on innovative performance. They stated that deadlines set the limits and prevent work without definite deliveries. Deadlines were also described as fun to work towards by several respondents.

“Deadlines clearly assist me, from the point of view of innovation. They drive you; you must come up with something, but they also push you to take decisions and select. We have three solutions; we can either do this or that or that.’ Deadlines force you to select.”

However, a small number of respondents outside Pre-Development claimed that deadlines neither stimulates inspiration nor the elaboration of novel solutions, as they rather put all focus on the very set point of time than on the quality of the elaborated innovations.

Monetary remuneration

Nearly all respondents claimed that monetary remuneration does not exert any significant influence on their level of motivation and thus on their innovative performance, even if they explicitly described it in strongly appreciative terms. A few respondents considered monetary remuneration a carrot, but the majority described it as a “*fun thing*” and “*nice to have*”. Some respondents explained how monetary remuneration provides a sense of justice, as it symbolically compensates the potential monetary profits that the patented innovation may bring to Scania. Nevertheless, a clear majority of the respondents regarded monetary remuneration rather as a confirmative message of organisational appreciation than a direct extrinsic motivator to innovative performance.

“If I come up with an idea, I come up with an idea. It is not related to... You cannot push good ideas with monetary incentives.”

Instead, these respondents described monetary remuneration to be of utmost importance for their propensity to submit time-consuming and complex invention submissions, rather than for their very propensity to generate innovative ideas and develop them further into feasible innovations.

“It influences the propensity to apply for patents and to submit invention submissions. But it does not influence the ability to...come up with the very innovation. However, it is still important with such incentives, in order to complete the process and protect the innovations.”

5.2.1.2. Synergistic motivational effects

As accounted for, many respondents testified to experience of how certain extrinsic motivators demonstrate efficient synergistic motivational leverage. These respondents explained how these

particular extrinsic motivators are able to synergistically enhance the motivational effects of their present intrinsic motivators. Recognition and encouragement from managers, adequate allocation of time resources, character of assignment, external competition, managerial expectations and organisational expectations along with realistic deadlines were all commonly mentioned as efficient synergistic extrinsic motivators.

“External competition becomes a challenge. It has a double influence on my performance, as it enhances my motivation.”

“Partly as I found it really fun to do this. (...) It is both an expectation from the managers and my own will to sit down and reflect on the problem, from another point of view.”

“I was passionate about the task and everything was about not exceeding the deadline. And I wanted it to be great.”

Commonly, increased involvement in work tasks through the various above-mentioned extrinsic motivators was mentioned as particularly important to the overall level of general motivation and thus to innovative performance.

5.2.2. Creativity

The potential influence of creativity on innovative performance along with its three inherent components; creativity skills, task motivation and expertise (see 4.2.2.1) were thoroughly discussed throughout the interviews. All respondents claimed that creativity represents a fundamental constituent of their innovative performance. A majority of the respondents recognised themselves as relatively creative, of whom many explicitly acknowledged their level of creativity to be a critical component of their innovative success.

“In my case, what distinguishes me the most, is that I am very creative. It is my first characteristic.”

All respondents recognised the three components of creativity and confirmed them as fundamental levers for their individual creativity. Hence, they stated that their creativity arises from a balanced mix of these inherent components, where the presence of each component is necessary in order to ensure creativity over time.

Throughout the interviews, the respondents were asked to rank each component in accordance with its influence on their individual level of creativity. The perceived relative importance of each component differed slightly among the respondents (see Figure 23).

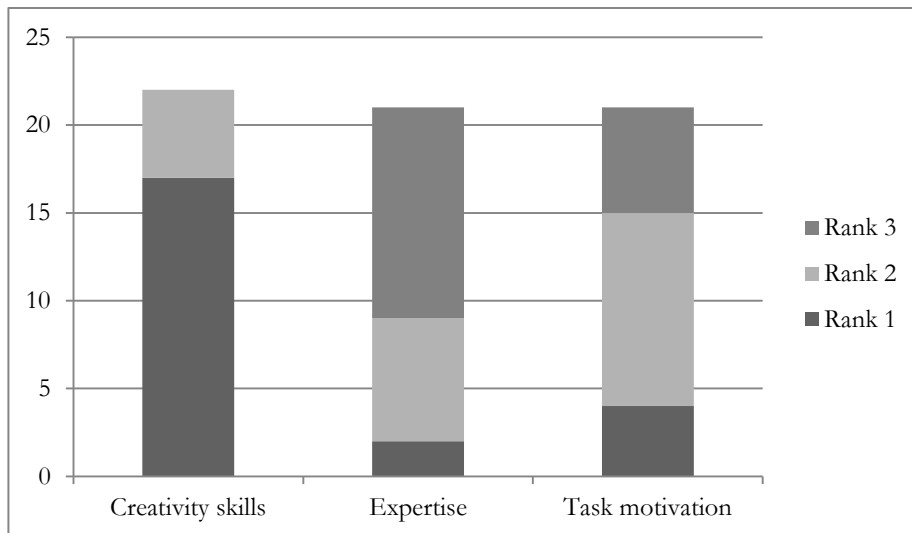


Figure 23: Ranking of the three components of creativity (Möller & Wahlqvist, 2012d)

5.2.2.1. Creativity skills

A clear majority of the respondents declared that creativity skills are the most critical component of their individual creativity and thus the most important one to their innovative performance. According to several respondents, creativity skills are necessary in order to come up with a variety of feasible ideas that finally may happen to result in strong innovations.

“I would say that creativity skills are the key. They must be in place in order to come up with an innovation.”

“This is about being able to draw conclusions and to ‘extrapolate’. I really believe that this is the key to creativity.”

Many respondents discussed why they considered creativity skills so central to their individual creativity. One respondent explained that his first innovations within Scania were time-consuming and very complex and theoretical in character. Today, he dares to rely more on engineering and on his creativity skills and thus delivers less complicated and more applicable solutions through a more efficient manner.

“...the more you know and learn about your field and the product, the more things you come up with. (...) You know what has been done and you know what is novel and you understand...”

Another respondent described creativity skills as an efficient tool for getting out of static conditions and for avoiding prevailing conformist mindsets. Moreover, several respondents described that strong creativity skills may compensate for weaker dimensions of the two other components of creativity.

According to the presented recognised theory of creativity (see 4.2.2.1), the component of creativity skills can be divided into cognitive skills and personality characteristics. Throughout the

interviews, the respondents were asked to reflect on the importance of these two subcomponents to the component of creativity skills.

5.2.2.1.1. Cognitive skills

Cognitive skills were frequently mentioned as the most important constituent of creativity skills. A majority of the respondents declared that cognitive skills are the factor that prevents them from reinventing the wheel.

Several respondents connected cognitive skills with skills that entail a strong analytical ability, a critical mindset and a structured way of thinking. Moreover, they stated that the propensity to see the whole of a certain problem instead of its inherent small parts is a vital cognitive skill. These respondents explained cognitive skills as the propensity to draw the perceptual map of the problem and of its potential solutions. It entails the ability to perceive how things should function and which input and which types of knowledge that are required in order to solve a problem, rather than immediately dive deep into details. Moreover, many respondents pinpointed the importance of initially being able to picture how a solution should function or what a component conceptually should look like.

“In my case, these skills are foremost a structured mindset, needed in order to be able to be innovative.”

“I believe that (...) this ability to think a little broader and in novel lines of thinking is a much more important quality than purely theoretical knowledge in many situations.”

As a particularly fundamental quality, many respondents explicitly stated the ability to associate (see 5.2.3.3); i.e. to connect and to combine unrelated ideas, knowledge and experience, or even existing innovations, into something novel. Accordingly, many respondents described how they often put together existing subsystems and successfully combine them with ideas and technologies taken from a totally different industry than the automotive one. In order to be able to practice this ability of combination, several respondents mentioned the aptitude for seeing potential connections between prevailing ideas and existing innovations as critical; then one can pick the most feasible ingredients from each area.

“To sit down and think and to combine different things; that was what it was all about.”

Some respondents broadened the concept of cognitive abilities to also include the ability to apply existing proven ideas on novel areas and on new contexts. These respondents thus emphasised the critical importance of the ability to think outside the box and by that find novel fields of application for prevailing ideas and existing technologies. This ability was also said to require the aptitude for identifying potential connections between existing feasible solutions and the concerned problem. One respondent described how he continuously endeavours to recycle robust ideas and applied solutions in order to deliver stronger innovations.

“It is partly about knowing little about a lot, partly about being able to combine little with a lot. To know a little slice of everything and to be able to apply something that

is known on something that is completely novel. That is often what it is all about. There are probably no innovations today that are based on any novel revolutionary discoveries, or at least very few.”

5.2.2.1.2. Personality characteristics

Personality characteristics were described as important drivers for creative efforts, if not to the same great extent nor in the same detail as cognitive skills.

“It is not black or white, but I believe that it to a very great extent depends on my personality characteristics.”

Risk propensity

Risk propensity was said to assist a majority of the respondents in their creative efforts that result in innovations. They explained that their risk propensity encourages them to experiment rather than to be forced to do things entirely correctly from the very beginning. I.e. risk propensity allows these respondents to dare to think freely, to brainstorm and to generate a great variety of different ideas, before critically evaluating the feasibility of them.

Perseverance

Perseverance was commonly mentioned as a continuous support for creativity. It allows individual creativity to flourish without any constraining impatience and thus secures that a variety of ideas are generated. The respondents who declared to have a clear propensity to avoid risk taking particularly emphasised the need for perseverance throughout the elaboration of innovations, in order to be able to balance a high level of creativity with a moderate level of risk.

“Perseverance on the other hand; it requires a lot of it for me in order to be creative and innovative with sufficiently low risk.”

Application of work methods

Several respondents expressed their applied work methods for enhanced creativity specifically as critical to their level of creativity. These work methods have been personally developed by and adapted by the respondents themselves, throughout the course of their career. The respondents clearly stated the importance of having a solid approach to lean against and to rely on when creatively approaching a complex or a vague problem.

Focus on solutions

Several respondents expressed their strong inherent will to deliver novel technological solutions and innovative improvements, which constantly permeates their mindset and their actions. These respondents explicitly explained how this strong focus on solutions assist them in being more creative, as creativity is a tool for achieving this constant goal of delivering novel solutions. The innovative feature of indifference to prestige assists them in this process (see 5.2.3.1).

“I find myself creative in everything that I do. (...) I always want to find novel solutions, new improvements... It spurs me to be even more creative.”

Ability to benefit from external input

The ability to benefit from external input was mentioned by a few respondents as a driver for creativity, due to its inspirational effects. The propensity to pick up information from external contexts that differ widely from the ones of automotive industry was explained as beneficial. This ability to use one's individual radar outside the immediate corporate environment of Scania links to the innovative feature of the ability to connect and to combine ideas from widely different contexts, i.e. association skills (see 5.2.3.3).

"...the innovations that I have discovered... It is often about something that I have observed out in real life. If you pass an Internet café or something and people sit there and play games and chat with each other... And if working in the automotive industry you start thinking 'why cannot cars talk to each other as well?', 'why cannot they send messages to each other about interesting things?'... In that way, we can organise the traffic and the trucks in a better way."

5.2.2.2. Task motivation

A majority of the respondents considered task motivation to be critical to creativity, almost equally fundamental as creativity skills. Most respondents described it as a prerequisite of all creative efforts. The respondents described task motivation as the engine behind their driving force to develop creative solutions; if it is missing, nothing will happen nor be delivered. Many respondents mentioned a potential lack of task motivation as a valid reason to look for new professional opportunities; inside or even outside Scania.

"It does not work without strong motivation for the work task; everything falls without it."

"The task motivation is why I am still here. If not motivated, I would not have stayed."

"You must probably be passionate about your work task in order to be able to put in that little extra that is necessary to be creative. That is key."

Many respondents explicitly explained how their strong task motivation enhances their individual creativity, through their strong will to solve technological problems in the most appropriate way and thereby find the most feasible and the most robust solutions. Respondents who described themselves as particularly task motivated explained how their level of task motivation drives them to continuously reflect on specific technological problems even outside the work environment of Scania. Moreover, they expressed how their task motivation drives them to constantly challenge themselves at most, to pick up extra input and to not be satisfied with a mediocre solution without any level of inventive step.

"Without task motivation, I do not think that I would enjoy to sit down and try to solve the problem. At least not in a creative manner, nor in an innovative one. (...) I would only try to find a solution that works, irrespective of its level of inventive step or not."

Several respondents pinpointed that the component of task motivation is superior to the component of expertise. One respondent described how his level of expertise could be infinitely high; if his task motivation would not be in place, he would still not be creative to any remarkable extent.

“If I am totally unmotivated, nothing will come off. Then I can be the greatest expert of them all; it does not matter anyhow.”

However, not all respondents confirmed experienced high level of task motivation at present within Scania. A few respondents clearly stated their total lack of task motivation. They explained how their task motivation initially had been in place, but how it continuously had disappeared during their time within Scania. Facing this total lack of task motivation, they compensate and leverage their creativity through the other two components; i.e. through remarkable expertise and strong creativity skills. However, these respondents made clear that this manner of working is not tenable over time.

“It is owing to my theoretical background and the expertise that I have managed to acquire over the years... That is what I live on. Together with my creative ability that enables me to find novel solutions all the time. That is what it looks like today.”

5.2.2.3. Expertise

A clear majority of the respondents placed expertise as the least critical component of their individual creativity. Only a very small number of respondents ranked it as the most important component. Nevertheless, expertise was commonly recognised as an essential ingredient in order to be able to deliver qualitative creative output and thus strong innovations, as expertise itself ensures a thorough knowledge basis and genuine understanding of the actual field.

“In order to achieve something useful, you must have some sort of technological competence or understanding for the problem.”

Several respondents declared that their profound technological skills, in combination with their genuine interest in technology, are some of their most important assets. Particularly one respondent recognised his deep expertise, which he explained to have gained through a broad general interest in technology, as a driving factor for his innovative performance. Other respondents said that expertise is critical in order to be exposed to and get in touch with novel technologies. Many respondents linked the necessity of expertise to creativity skills. Expertise, particularly in a broad technological manner, was stated to be particularly useful in order to know what already exists and what is to be discovered within the actual field. Accordingly, a majority of the respondents claimed that an adequate level of expertise is a prerequisite in order to carry out the ability of connecting and of combining existing ideas, solutions and knowledge (see 5.2.3.3). Expertise was also said to assist in detecting potential technological obstacles and was described as an efficient tool for securing that functional and robust solutions are reached.

“...it works only you have enough (expertise) to combine and also to see difficulties.”

“Regarding the cognitive aspect, to be able to put together many different things. (...) ...it requires relatively deep theoretical knowledge in order to be able to do it; to combine this and that, as the elaborated innovation actually must function in order to be useful.”

“...you must know and be familiar with a great number of different technological solutions in order to be able to combine them.”

According to a small number of respondents, expertise is not critical to the very origin of the creative ideas. However, it secures their level of feasibility and of applicability. In accordance with these answers, expertise influences the quality of the resulting innovations rather than the quantity of them.

“You may end up with an innovation that cannot be executed or implemented. Expertise is useful in that respect. It is a sort of guarantee of quality.”

A few respondents mentioned the aspect of anchorage. With proven and reputable expertise, they have experienced it easier to anchor their creative ideas to the organisation of Scania, which may have facilitated the path from a creative idea to an implemented innovation.

Several respondents explained that a majority of their elaborated innovations can be found within functional fields that differ widely from their origin fields of academic education. Some respondents described experienced projects, where they initially had very limited expertise in the actual field, but that this circumstance yet did not hinder them from developing creative solutions that resulted in strong innovations. Simply, these respondents claimed that it is far from necessary to have deep expertise in a specific field, in order to be significantly creative therein.

“...strong innovations are rarely about rocket science. If they are about rocket science, they are, in my opinion, probably quite inferior innovations as they are too complex. The best innovation is if you have found something that is super easy to put into practice but that conveys a very great value.”

Lack of expertise may even function as a catalyst for creative ideas, according to a few respondents.

“Lack of expertise can often give rise to that you ‘think outside the box’ and discover novel things.”

A majority of the respondents explained expertise as subordinate to the other two components of creativity, due to its non-exclusiveness. According to their reasoning and in contrast to creativity skills and to task motivation, expertise can always be secured through various external means, either within or outside Scania. I.e. the innovator must not necessarily be constrained by a shortage of relevant expertise, as there is always a way to pass around such a lack. Several respondents described how they use experts and networks at the very moment when they are in need of specific profound expertise. According to some respondents, the force behind the very creative ideas is not the individual who possesses the expertise; it is the individual who drives the actual process that generates the very idea and further refines it.

“You need basic competence, but you do not need that little extra all the time.”

“In many respects, during the part of the process where you need expertise, it is foremost a question of going and searching for it.”

A large majority of the respondents who have worked within Scania for a relatively considerable period of time claimed that experience is the most important efficient lever for expertise. They explained how their number of elaborated innovations has increased exponentially rather than linearly during their time within Scania, with surrounding conditions fixed. Previous ideas and applied solutions are recycled and conclusions are drawn from lived experiences, which all together contribute to a constant continuous learning and an elevated learning curve. Some respondents mentioned that their shift from one functional area to another one within Scania has entailed an accelerating learning curve, as they have been exposed to new challenges and to new problem characters. In turn, this experience has enhanced their level of expertise. In addition, several respondents claimed that the presence of task motivation is a fundamental condition in order to build expertise through experience.

“...it is obvious that you have learned; you have seen solutions before, know what they may look like, know a lot about pros and cons with different solutions...”

Moreover, the respondents considered this lever for expertise to simultaneously leverage their creativity skills; more expertise through experience enhances the ability to connect and to combine ideas and knowledge, as it enlarges the pool of expertise to pick from.

5.2.3. Innovative features

Nearly all respondents claimed that their personality and its inherent features exert important influence on their innovative performance. Almost all of these respondents confirmed that it occurs more or less constantly; even if they expressed thoughts of that their personality many times also may influence them unconsciously.

“I do not think that one can be taught how to be innovative in any way. Some amount of frames can probably be set up, but the really great solutions derive from of one's personality, I think.”

The respondents expressed a wide scope of innovative features that they considered to be utmost important to or even indispensable to their propensity to elaborate innovations. Several respondents expressed more abilities than only one single. The innovative features that arose throughout the interviews can be grouped into three subcategories; personality traits, practical approach and intellectual skills.

5.2.3.1. Personality traits

This subchapter presents the innovative features of personality traits, which concern the inherent traits of character of individuals. They entail perseverance, indifference to prestige, risk propensity, curiosity in technology and working capacity.

Perseverance

A clear majority of the respondents stated perseverance to exert significant influence on their innovative performance, of which many claimed it to be a necessity. Many respondents linked strong perseverance to a relatively high level of discipline. The respondents claimed to benefit from their considerably high level of perseverance when working towards solutions and explained how it assists them in not giving up, even if the process towards potential innovations often is bordered with setbacks. Perseverance significantly helps both in identifying the real problem and in elaborating innovative ideas and solutions, according to many respondents. If a solution does not appear to be immediately feasible, the respondents said that they do not drop it; instead, they iterate and analyse or try another approach. Several respondents mentioned that high level of perseverance may have additional positive impacts on innovative performance, as it influences the approach of associating and spurs it not to be finished until a feasible solution is found.

“You do not just give up. (...) You do not throw away the ideas until you know what the real problem is.”

One respondent further explained perseverance as not enjoying leaving problems unsolved. This characteristic often results in that the respondent never completely stops reflecting on the actual problem until every possible feasible idea is carefully evaluated. When the most feasible solution finally is identified and elaborated, the respondent described it as receiving immense satisfaction.

“It is my perseverance that pushes and when I find a solution I get a great sense of satisfaction. So what can I say... It is definitely a bit of a feel-good feeling.”

Another respondent discussed how he uses his perseverance when exploring existing patents within the area where he presently works on innovations. If coming across a patent similar to the innovation on which he works, he does not give up. Rather, he uses this finding as inspiration and seeks after unexploited opportunities within the existing patent.

Nevertheless, a few respondents mentioned their high level of impatience as a driver for novel creative ideas to arise. When not being able to immediately solve a problem, they allow themselves to drop it. They get back to their idea on a later occasion and thereby rely on their inner trust on that the solution will come sooner or later, if only the problem is allowed to rest for a while.

Indifference to prestige

To possess the characteristic of indifference to prestige was commonly mentioned by a large number of respondents as an important factor for innovative success. One respondent explicitly stated that this characteristic is critical to his demonstrated level of innovative performance. Another respondent said that this characteristic supports him to further elaborate ideas that appear silly at the first glance, but which may end up as successful innovations; and he testified to that it often occurs.

“I would say that I am rather indifferent to prestige. That is why I am not afraid to start off with silly and stupid solutions, which actually may generate something.”

A majority of the respondents explicitly claimed their indifference to prestige to be favourable also to the aspect of collaboration, in terms of innovative performance.

"It is as nice when someone else comes up with something, as when I come up with the idea. And I am not afraid of being wrong; I guess that it is a consequence of my indifference to prestige."

Other respondents explained that their indifference to prestige helps them in various contexts of networking (see 5.2.3.2). One explanation given was that it entails the important aspect of not being afraid to contact individuals with deeper necessary knowledge within the actual field of interest. Thereby, one can easily gain more of the knowledge particularly needed for a specific innovation.

Another explanation given was that indifference to prestige often is beneficial when aiming at enhancing idea generation. One respondent said that he commonly benefits from it when discussing ideas and potential solutions with colleagues. On such occasions, his indifference to prestige results in that he is not afraid to blurt out silly ideas or stupid proposals for solutions. Consequently, his indifference to prestige helps others to feel more secure and thus encourage them to dare to speak out and to account for their ideas, which they may find silly too. In turn, this respondent accounted for how such a circumstance several times has led to favourable combinations of ideas, where colleagues thus have elaborated the innovative solution together.

Risk propensity

Several respondents mentioned their strong risk propensity to be of particular importance to their innovative performance. One respondent stated risk propensity to be the utmost contributor to his innovative success. The respondents explained risk propensity as an encouraging attitude towards uncertainty, as it provides the willingness to think freely and to experiment with a variety of ideas, even if these ideas initially may have seemed either too simple or too complex or not even feasible.

One respondent linked risk propensity to childhood experience, to upbringing and to parental encouragement.

"I know how many old tools I took apart when I was little, just to see what they looked like inside. And I never managed to put them together again. But I rarely was told 'do not do that'. This can have resulted in one not being as afraid to try novel things or to involve oneself in something you do not understand."

A number of respondents considered risk propensity as something that can be learned over time. One respondent gave an example; initially in his career, he perceived innovations and patents as something unattainably complex, which must be complicated and on a technically advanced level. Consequently, he hesitated to take on such challenges. However, when studying existing patents, the respondent realised that innovations must not be more complicated than necessary. He thus began to work in accordance with that philosophy, which resulted in a considerable number of elaborated innovations.

However, a few respondents declared themselves as relatively risk averse; but still not exaggeratedly afraid to take risks. They explained this behaviour by a reasoning of that risk and innovation must not obligatory linked. Even if working with something that is novel and relatively unexplored, one can still know what one is doing and thus take and be exposed to a relatively low risk.

Nevertheless, independently of their attitude towards risk taking, all respondents claimed that the level of risk that they are exposed to through innovative work must be balanced, in order to be favourable to their innovative performance.

Curiosity in technology

Curiosity in technology, based on a genuine interest in the same, was commonly mentioned as a driving factor for the respondents' propensity to elaborate innovations. A few respondents even claimed their curiosity to be the most important contributor to their innovative performance. One respondent stated that he regards himself as considerably curious in technology, relatively his colleagues. Several respondents said that curiosity in technology often assists them in gaining expertise and thus also in strengthen their ability of associating (see 5.2.3.3). Moreover, several respondents linked the aspect of curiosity in technology as synergistic to the characteristic of a critical mindset (see 5.2.3.3).

“Curiosity has to do with to always want to learn something new, to always ask oneself ‘is there any better technical solution to this problem?’. Whenever you get novel hardware or novel software in your hand; to always think ‘what else can we use this for?’”

One respondent mentioned that his interest in technology drives him to search for challenging work tasks on his own. Moreover, a number of respondents described how their curiosity in technology constantly spurs them to acquire broad technical knowledge. Thereby, it continuously provides them with a deeper understanding of technical aspects and of underlying factors for current problems.

Working capacity

A few respondents mentioned working capacity as prerequisite of innovative performance. They described that the ideas that leads to innovations often are the results of intense work with relatively novel technologies during a certain period of time.

Moreover, the respondents linked working capacity to high level of perseverance and claimed that perseverance is a prerequisite of considerable working capacity. They claimed that innovations do not happen by accident, through *“twiddling one’s thumbs”*. Rather, continuous elaboration of innovations requires focused hard work, purposefulness and accomplishment and consequently perseverance, according to these respondents.

5.2.3.2. Practical approach

This subchapter presents the innovative features of practical approach, which relate to how individuals approach problems and elaborate innovations and which measures they undertake in

order to do so. They entail acquisition of information, networking skills, application of work methods, focus on solutions, clearly defined goals and customer focus.

Acquisition of information

Almost all respondents stated acquisition of information to be a strong prerequisite of their innovative success. They stated that they execute acquisition of information actively and purposefully, on a daily basis. One respondent claimed it to be the most critical factor, with the largest exerted influence on his innovative performance.

The respondents explained two different sorts of acquisition of information that they commonly apply, which occur through two different media and with two different purposes; acquisition of information through human sources and acquisition of information through technical sources. Acquisition of information through human sources was described to occur via identified experts or via random colleagues. It aims at gathering certain focused expertise or specific viewpoints. The respondents claimed that it is beneficial to have a talent for networking in order to render the acquisition of information more efficient. Nearly all respondents use this sort of acquisition. Acquisition of information through technical sources was said to foremost occur via technical literature along with via external newsletters from related industrial organisations and related interest groups. According to the respondents, this sort provides broader field knowledge than acquisition through human sources, which often provides narrower knowledge and more directly field related information. Fewer respondents claimed to use this sort of acquisition. However, these respondents claimed to apply it very intensively and on a regular basis.

As a part of experienced successful innovation processes, some respondents described that they often divide acquisition of information into two phases. Initially, they gather related information through technical sources. The scope is relatively broad and possible solutions are reflected on. During the latter phase, these respondents approach identified feasible experts and appropriate colleagues with more specific problems, narrow ideas and focused questions. The information that has been acquired during the first phase assists in asking the right questions, as a more thorough understanding of the very problem has been gained.

Networking skills

A clear majority of the respondents commonly mentioned networking and its adherent communication skills as critical to their innovative performance. A few respondents even claimed networking to be a particularly influencing factor, as a fundamental constituent of their propensity to innovate. They explained how it assists them in collaborating with colleagues and thereby in benefiting from their ideas and their complementary competencies. Moreover, networking helps them in the important process of acquiring information and exploring novel fields. The respondents described that networking is about taking advantage of that someone may have elaborated a similar, or at least a related, solution before. It thus is about capitalising on existing knowledge and benefiting from derived insights of surrounding individuals.

Some respondents also explained that the combination of networking and their indifference to prestige (see 5.2.3.1) has been particularly favourable to their innovative performance. They said that this combination results in a propensity to actively search for individuals with additional required knowledge within the actual field, when facing a problem that partly goes beyond the

respondent's area of expertise. The ability of networking entails identification of and contacting of the right individuals, while the character of indifference to prestige prevents that some questions remain unasked and thus ensures that all available knowledge is securely acquired. Moreover, the combination of networking and indifference to prestige often results in the productive enjoyment of discussing problems and related ideas with various individuals, with the purpose of elaborating novel or improved innovative solutions.

"I think it is fun to discuss problems with individuals who can provide new approaches and points of view. I truly enjoy doing it. That is how you come up with things."

Application of work methods

Several respondents accounted for their propensity to apply certain work methods when elaborating innovations as vital to their innovative performance. They explicitly claimed the importance of having a solid but yet flexible work method to rely on when approaching various problems. The respondents sometimes combine existing work methods, but foremost expressed that they have developed and adjusted their own approaches and their own work methods throughout course of their careers. One respondent explained his commonly applied approach; to try to describe the very problem in only one sentence. This sentence often ends up as a contradiction. When the formulation of the sentence finally is carried out, the respondent said the he often finds himself close to the very solution.

Furthermore, some respondents stressed that their creativity partly is founded in the ability to find a suitable work method (see 5.2.2.1.2).

"I do not really know if I think that certain individuals are creative while some other individuals are not. For me, it has been a training process, at least to a certain extent. For me, it has been about finding a method that suits me."

Focus on solutions

Several respondents stated that their strong focus on solutions, in combination with their inherent interest in problem solving, is critical to their propensity to elaborate innovations. They described that they often proactively search out for problems to solve, on their own initiative. A large share of these respondents explained that they simply enjoy working with problems and finding innovative solutions to them. They described their focus to always be on the very solution.

"I also enjoy problems; I think it is great fun to work with things that you do not have found a solution for. I feel drawn to things that do not work."

Many respondents linked their strong focus on solutions to their will to see results, to create something novel and to constantly strive for technological improvements, which they further linked to their high level of ambition.

The ability to keep a strong focus on solutions by means of an extreme concentration on the actual task was also stated as critical to innovative performance by some respondents. These respondents described themselves as relatively introvert. They described how they use their

valuable time to reflect on technological solutions rather than to socialise with colleagues to any considerable extent. They explained how this circumstance assists them in remaining focused on the very task and how it thereby enables them to elaborate innovative solutions in an efficient manner. Explicitly, they stated their focus on solutions rather than on inter-colleague-relations to be critical to their innovative performance.

Clearly defined goals

A number of respondents accounted for experienced clearly defined goals on an individual level as favourable to their innovative performance. Commonly, all these respondents have defined and set their own goals on their own initiatives, without any managerial interference or any organisational imperative. They claimed that this circumstance provides a significant greater sense of ownership. Moreover, the respondents described the necessity of having something fixed and scheduled to work towards; something that can be quantified and pinpointed. The respondents clearly stated that their goals function as an explicit spur, as they constantly encourage to further generation of innovations.

“I tend to set my own goals. I take myself as a starting point, which often entails that they get very ambitious and difficult to attain. And then I push myself to try to attain these goals... And in order to achieve this, one must be innovative.”

One respondent described how he commonly decomposes the overall key performance indicator of how many patented innovations his team should deliver into his own individual quantifiable goal. Hence, he sets out his own direction within the frame of his team and thus is allowed to accelerate his innovative work without constraints.

Customer focus

The ability to apply commercial thinking through maintained focus on customer needs was stated by many respondents as a support in their innovative work. The common explanation was that customer needs are a source of inspiration and thereby create a general driving force for innovative work.

“It is the customer focus that drives me to do this.”

The respondents explained that their customer focus is obtained and maintained mainly through customer input. I.e. customers provide information of certain experienced problems or give request for improvements; and thereby create a purpose for the elaboration of innovative solutions. In order to obtain more customer input and thus better understanding of customer needs, some specific methods were mentioned. Some respondents stated efficient communication, e.g. through recurrent customer visits, along with improved knowledge of the customer world of truck driving or bus driving, as feasible methods.

“We would have done it even better if we had been better at talking to the customer. (...) Then we would have got even more innovations. The more you talk to customers, the better it goes (...) because then you are talking to someone who knows the problem.”

“It can be the (...) truck driver (...); you acquaint yourself with their world and try to think what problems they experience. And somehow, the solutions start to arise.”

Besides the aspect of source of inspiration, another benefit of customer input was mentioned. Some respondents described that it assists in maintaining focus on the significantly important things when elaborating innovative solutions; i.e. the things that really add value to the customer experience. This was in turn said to lead to innovations that are commercially viable.

“It is one thing to come up with a smart idea, but if it is an idea which only can be realized under special circumstances like on the moon; then it is a useless innovation.”

Throughout the interviews, it became evident that the respondents have different sorts of customers in mind. Customers were explained to be either internal or external. Internal customers operate within Scania; e.g. groups that work with other components of the truck or the bus. External customers can be hauliers or truck drivers and bus drivers. Which customers the respondents are exposed to depend entirely on which function they mainly work within, along with their assigned work tasks. The respondents who expressed the supportive importance of customer focus mainly work within Continuous Introduction and Product-Follow Up. The respondents within Pre-Development claimed to be more far away from the customers; internal ones as well as external ones.

5.2.3.3. Intellectual skills

This subchapter presents the innovative features of intellectual skills, which link to how individuals structurally think and cognitively treat and analyse information. They entail analytical skills, critical mindset, association skills and observation skills.

Analytical skills

A set of strong analytical skills is of utmost importance to innovative performance according to many respondents, of whom several claimed it to be the most critical factor.

“It is when something does not work that one is forced to be innovative. (...) I would like to say my analytical ability; I think that is the most important.”

Some respondents claimed to foremost apply their analytical skills in order to solve complex problems that they come across. These skills assist them in thoroughly understanding the constituents of and the underlying impact drivers of the very problem.

“In my case, I am quite analytical and theoretical as a person (...) and want to sort things out in order to understand exactly how it works or why it behaves in a certain way. This has led to me being able to do things differently from what we have known before.”

Other respondents described that they use their analytical skills in order to create appropriate work methods and solution approaches, through which they try to find the source of the problem in a structured manner.

“I think, for me, it is very much about my analytical skills. (...) It is the very method to tackle a problem. Suppose that nothing works; what do you do? I start at one end and then I unravel it until I find the actual bug.”

Critical mindset

Many respondents stated that their critical mindset has been fundamental to their innovative success, due to its vital ability to constantly questioning prevailing facts and existing phenomena. According to these respondents, a critical mindset has the power to question individuals as well as technologies and products. They described how they in innovative work find it hard to accept the state of things and to adapt themselves and their solutions to fixed systems, models and work methods. Their critical thinking forces them to constantly challenge prevailing conditions and provides them with an important willingness to search for novel ways to improve things, which in turns lead to stronger innovations.

A number of respondents stated that their critical mindset is linked to their curiosity in technology (see 5.2.3.1). They explained that critical mindset and curiosity in technology are interrelated and that both are related to their will to constantly understand and find explanations various phenomena. Moreover, several respondents described how they combine their critical mindset with their observation skills. They observe existing products, technologies and trends and thereafter critically examine their gathered observations. Some respondents mentioned this combination to be particularly beneficial when test driving trucks or buses inside Scania, or when driving any other vehicle outside Scania.

“You see the solutions available and you think that they are really cool since they are based on the latest technology. Then you think: ‘Where have they missed anything; are there any gaps?’ or ‘What could we do beyond this that is even better?’”

One respondent mentioned his critical mindset as one of the most contributing factors to his innovative performance. He described how he, more or less constantly, questions his colleagues’ ways of working according to old ruts and to stagnated routines and how he criticises them due to their unwillingness to change.

Association skills

Almost all respondents said that a strong set of association skills is a vital ingredient of their innovative performance. Several respondents stated association skills as one of the most critical factors. Association skills were commonly described as the ability to connect and to combine ideas, knowledge and experience, into something that is radically novel or significantly improved. The respondents described how they gain inspiration from related or unrelated systems, technologies and industries and how they adjust this input to the problem area within which they currently work.

“To combine things; that is the context where many innovations are to be found, in the combination of known things into something completely novel.”

Several respondents emphasised that a necessary ability in order to be able to execute association, is the ability to perceive and to understand the whole and its impacting drivers, along with its potentially feasible connections to the actual problem area.

“I like to see the overall picture, and this has helped a lot. (...) It is probably about connecting different things.”

A number of respondents explained a similar approach of which they use their association skills, when actively trying to gain valuable information. They study areas that are similar to the actual problem area and try to identify similar solutions therein that can be applied on the specific problem. Yet, other respondents emphasised the importance of gathering ideas beyond related product fields, markets and industries. They claimed that their best solutions have arrived when connecting and combining radically different ideas.

Some respondents said that their curiosity in technology (see 5.2.3.1) significantly has strengthened their association skills. As this curiosity has resulted in the gain of well-founded technical knowledge, it provides a wider scope of ideas and of knowledge to combine and to connect. As a telling example, one respondent claimed to have a genuinely established interest in cars in general. He explained that it has spurred him to voluntarily acquire broad knowledge of all subsystems of trucks and of buses, which has been a major advantage in his innovative work, as it has enhanced his association skills.

“I am very interested in cars. (...) I am interested in all of the inherent systems. (...) Then I know that there is a solution in another system and then I can connect them subconsciously. If an individual knows many different things, it is easier to see connections, compared to an individual who has a more narrow and niched scope of knowledge.”

Several respondents claimed that a good set of observation skills is a prerequisite in order to enable association, as these skills secure the procurement of ideas and of knowledge from various contexts, to further connect and combine.

Observation skills

A number of respondents stated observation skills as a vital cognitive ability in order to enable innovative performance. The use of observation skills was mainly described as an efficient manner to acquire broad and various external input to novel ideas and to new solutions, along with general inspiration. According to the respondents, the input can be of various forms; e.g. novel technologies, new corporate strategic directions, changes in product ranges, environmental trends, observed social patterns or regulatory changes. Several respondents also emphasised the importance of paying attention to other industries, beyond the automotive one, as such input was described as radically favourable. The respondents described themselves as attentive to and susceptible to changes around them; i.e. always ready to take advantage of them. Moreover, several respondents said that they combine their observation skills with their critical mindset when first observing existing products, novel technologies and emerging trends; and then critically examining the gathered observations.

One respondent particularly claimed that his observation skills are one of the most influencing factors for his innovative performance. He described how he constantly listens to others, absorbs all input and stores it in the back of his head; irrespective of the degree of direct feasibility of the provided input. Whenever this respondent works on a problem, he always has his stored observations at his disposal.

5.2.4. Assignment

Throughout the interviews, a clear majority of the respondents explicitly stated that the overall character of their overall assignment exerts important influence on their propensity to deliver innovations. They explained that their assignment consist of a predominant general work field; i.e. Pre-Development, Continuous Introduction or Product Follow-Up (see 2.3.2), with specifically assigned work tasks therein. Moreover, the respondents heavily emphasised the significance of the allocation of time that is adherent to the very assignment.

5.2.4.1. Work field

A majority of the respondents claimed that the character of their assigned work field is one of the major reasons for their considerably large number of generated innovations. Continuous Introduction and Product-Follow Up do not generate nearly as many innovations as Pre-Development (see 2.3.2), as they represent the later phases of projects. Many respondents described that they work within a mix of Pre-Development and Continuous Introduction, while other respondents explained that they work strictly within one of the three fields; foremost within Pre-Development. To get the opportunity to only spend working hours within Pre-Development was described as a particularly favourable prerequisite of the opportunity to elaborate a considerable number of innovative solutions. Several respondents explicitly named it a benefit.

“Most important; I work within a part of the organisation that is assigned to come up with novel ideas and develop novel concepts. It is in the nature of our work to generate innovations.”

A broad share of respondents emphasised the critical importance of constant exposure to novel technologies and to new information. These respondents explicitly claimed that a work field must be able to offer such opportunities, in order for them to demonstrate considerable innovative performance.

“I have the clear privilege to work intensively with novel technologies. (...) I would certainly not have been as innovative within another work field.”

The respondents who work only within Pre-Development explained that they are expected to deliver innovations on a continuous basis, as their focus is on the very early phases of the potential product. Several respondents described how radical novelty, through exposure to novel technology and to novel functionalities, permeates their work field rather than direct orders of what to incrementally improve. Moreover, they explained that their work field allows them to constantly and relatively freely explore novel undiscovered areas of problems to solve. Consequently, this circumstance paves the way for a constant stream of innovations.

“If you work within a totally novel territory, there is a natural superfluous supply of novel things to explore. So it is all about taking advantage of it.”

The respondents who mainly work within Continuous Introduction or within Product-Follow Up described another approach, through a more directed work with clearly defined deliverables and with a strong customer focus. They described that their generated innovations are more directed by organisational orders and most often are linked to more incremental improvements.

5.2.4.2. Work tasks

As subsets to their assigned work field, nearly all respondents considered the specific scope of their assigned work tasks to be of equal importance to their number of delivered innovations.

“The ideas that you come up with are almost always directly related to your work tasks.”

The respondents described how the degree of novelty and thus also the degree of innovation potential differ widely between functional subunits within Scania, even within Pre-Development. Certain functional areas are more unexplored and depend more on novel technology compared to other ones, which naturally increases their degree of innovation potential.

“If your work tasks are related to the development of novel concepts within a brand new functional area of technology; then, of course, it is easier to elaborate novel things.”

With elaboration of innovations in mind, the respondents emphasised the importance of being granted relatively novel work tasks that are related to new-development rather than to administration and management of existing products. Many respondents claimed that, in an ideal world, work tasks should entail an organisational imperative to be innovative, in one manner or another.

“If you work within a group which main work task is not to be innovative, which main work task is not to elaborate novel things... This group will obviously demonstrate a considerably lower number of innovations.”

However, nearly all respondents who spend most of their working hours within Continuous Introduction or within Product Follow-Up emphasised the impact of the scope of the work tasks on innovative performance, compared to the respondents that mainly work within Pre-Development. Many of these respondents described their luck to work with novel technology within a front edge area, still within Continuous Introduction or within Product-Follow Up, instead of performing work tasks that do not involve much of technology exploring and thus entail a lower degree of innovation potential.

5.2.4.3. Time allocation

The respondents linked the character of the assigned work field to the inevitable aspect of time allocation and expressively described how this relation affects their innovative work.

“I have enjoyed the benefit to work with research and pre-development, i.e. I have had more time to think novel and to think ahead. You do not have that opportunity when

working with continuous improvements; then everything is about reactive delivery of urgent solutions.”

The respondents explained how Pre-Development has the explicit organisational support to devote time to activities that are inherent to the generation of innovations; e.g. brainstorming sessions and individual exposure to novel information through various forums. All respondents within Pre-Development said that this was a prerequisite of their number of elaborated innovations. These respondents described that they are vividly encouraged by their closest manager to allocate time to sit down and only think. They said that this expressed managerial support has made it easier to actually set aside time to reflect on potential areas of innovations. One respondent described how he was allowed to pause all other work tasks and only devote time to one problem.

The respondents who work within Continuous Introduction and thus are exposed to series development, explained that they are heavily directed by tight deadlines and by clear deliverables. Accordingly, they described their projects as non-compatible with innovation.

“The recurrent question, and the often relevant question, is always: ‘When should it be finished?’ But it is an irrelevant question in regards to innovation. Certain things and activities cannot be scheduled and timed.”

The respondents who dedicate their time to a mix of Pre-Development and Continuous Introduction described that the work tasks within Continuous Introduction tend to take valuable time from the work tasks that are related to Pre-Development, as they have a higher immediate priority.

5.2.5. Time for innovation

Every single respondent explicitly emphasised the aspect of access to free time to be an utmost fundamental condition in order to render possible strong innovative performance. Foremost since surplus time allows the possibility to sit down and reflect on novel solutions, but also as it facilitates the essential aspect of keeping up to date with outer research, novel technologies and new information.

“Everything is due to your available amount of time to freely spend. (...) When you do not have enough time to sit down and finish your innovations... Then there will obviously be fewer of them.”

“It is related to the amount of time that I am allowed to spend on different areas. My observation is that individuals who have the privilege to spend time on novel technologies, who are allowed to spend time on finding novel solutions, who can spend time on being exposed to the latest research... That is where strong innovations arise.”

A large number of respondents claimed that the amount of time that they actually have been granted has been critical to their innovative performance, through their elaborated innovations. They stated this amount of time to be relatively generously allocated. Moreover, several of these

respondents described that they are vividly encouraged by their closest manager to reserve time to free unlimited thinking in their weekly calendar, without any specific deliverables linked to this activity and without any extra-added workload. These respondents foremost work within Pre-Development.

“Often, you have an idea that emerges, which you ponder over every now and then. But to proceed from that phase to test and see if it works, that is a question of time and of how much time you allocate.”

Yet, worth mentioning, a number of respondents stated that they had not been assigned enough amount of time in order to be able to specifically work on innovations. A clear majority of these respondents work within Continuous Introduction or within Product Follow-Up.

5.2.5.1. Organisational slack

A majority of the respondents within Pre-Development explicitly said that they have experienced recurrent organisational slack within their assigned work tasks. The respondents expressed that they have had the favourable possibility to set off time to sit down, think ahead and reflect on novel solutions. They described these periods of lower workload and thus the arisen surplus time that allows unlimited novel thinking, as absolutely necessary to their innovative performance. Several respondents said that they have received managerial permission to pause other development projects in order to focus all their time on one single problem.

“There has been extra time...there has been a slack in the calendar. There has been time for reflection, time for innovation.”

Several respondents claimed that organisational slack must not only occur as a scheduled gap in the calendar, since it is hard to be innovative to order during some forced scheduled hours. Instead, these respondents mentioned that organisational slack rather should be an inherent part of every individual’s manner of working, through a higher degree of incorporated flexibility and of spontaneity and less direct control of individual work tasks.

“I find it important to have a way of working that makes it possible to take time at short notice; to be able to sit down by myself.”

One respondent explained that he has noticed a recurrent pattern of how and when most of his innovations arise; a pattern that he links to organisational slack. The respondent gave a detailed description of this observed pattern. When having worked intensively with a novel technology and obtained numerous impressions, he often experiences a moderate decline in workload. This surplus time allows his brain to digest, to work up the ideas that have arisen along the way and to reflect on novel solutions. The respondent commonly denominates this moderate surplus time as recovery time for the brain. He clearly stated that this recovery time is critical to his innovative performance and that it must not be too short.

“Precisely this recovery time is extremely important, at least to me, as regards innovations.”

5.2.5.2. **Balanced allocation**

However, no respondents considered a total redundancy of time available to be favourable to their innovative performance, with regard to their own experience of organisational slack. Instead, many respondents emphasised that the amount of surplus time must be balanced and levelled, in order to maintain efficiency in the individual innovator's lines of thoughts and ways of working.

“Extreme amounts of superfluous time does not make me more innovative. Organisational slack must rather be offered at a somehow optimum level.”

5.2.5.3. **Efficient means**

Surplus time can either be allocated by managers or liberated by the individuals themselves. A majority of the respondents claimed that it is important to have the managerial support to free up time, but testified to that it is most efficient if individuals do it on their own initiative. However, the respondents said that this is easier said than done; especially the respondents who spend the greater part of their working hours outside the work field of Pre-Development.

The respondents who mainly work within Continuous Introduction or within Product Follow-Up commonly stated that there is one means that particularly efficiently assists them in freeing up time and in reserving it for activities related to innovation. That tool is relevant clearly defined goals for innovations; i.e. some sorts of key performance indicators for innovative performance. The respondents explained that such goals can be set either on individual level or on group level. Most importantly and independently of whom they touch, the set goals must be clearly aligned with the actual manager in order to gain power and provide the individual with the aimed ability to take action, according to the respondents.

“If there is a goal, you must allocate time to it in your calendar.”

“Without any goal, you must do it beside other work tasks. If so, you will do it as far as the time available admits. That is; goals have a clear influence, without any doubts.”

The respondents who mainly work within Pre-Development, i.e. the ones who foremost had experienced the favourable organisational slack, did not express the same urgent need for clearly defined goals in order to free up time for innovative work. Partly due to its research-intensity and its unpredictable nature, but foremost due to the circumstance that this work field has the clear organisational support to allocate time to all sorts of activities that may increase the stream of elaborated innovations; from individual free thinking to collective brainstorming. This support was said to totally permeate the manner of working within Pre-Development.

“It is pretty explicit; ‘our task is to work with this’. (...) We reserve a couple of hours and sit down together.”

“It is often like that; we take the time to sit down and to brainstorm around it. A critical prerequisite is that the initiative often comes from the management team, which gives it a sense of encouragement and practicability.”

5.3. Collective level

This subchapter presents the collective empirical data, through two separate areas that the respondents identified as critical to their significant innovative performance. These areas are collaboration and managerial practices (see Figure 24).

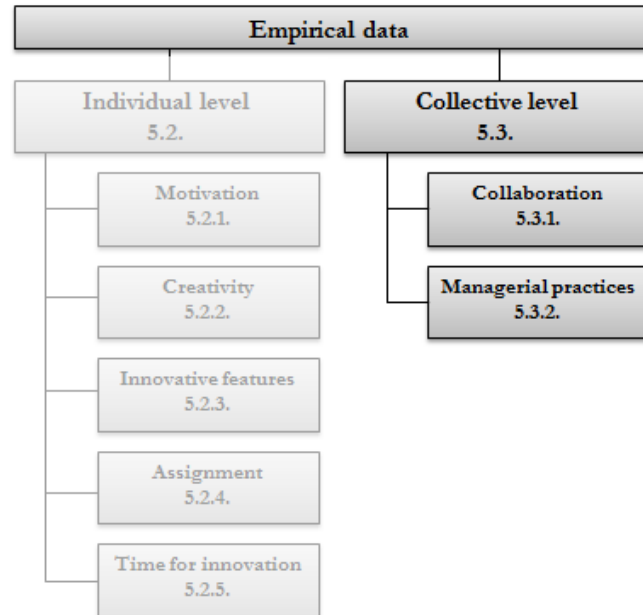


Figure 24: Empirical framework at collective level (Möller & Wahlqvist, 2012d)

5.3.1. Collaboration

A majority of the respondents claimed that different designs of collaboration, along with various applications of it, are significantly favourable to overall innovative performance of individuals. However, several answers were provided with a certain degree of ambiguity (see 5.3.1.2).

“I believe that all individuals, myself included, only make considerable progress on their own to a certain limited extent.”

A few respondents did not regard collaboration as a factor that necessarily contributes to strengthened innovative performance of individuals. One explanation given was that when elaborating something on one’s own, it often provides a greater sense of ownership, which results in that one invests more energy in the work.

“It has been more newsworthiness in the ones that I have come up with alone. (...) It can be that I am more committed to those ideas. If you are three or four individuals, it is easy to start something and then sit back and relax.”

5.3.1.1. Prerequisites of favourable collaboration

The respondents who claimed that collaboration is vital to innovative performance of individuals, stated that certain conditions must be prevalent therein in order for this positive influence to be valid. The commonly mentioned factors were shared elementary knowledge, clear communication, unified attitudes, common vision and shared goals and suitable team structure.

Shared elementary knowledge

A certain level of shared elementary knowledge of the related field was commonly mentioned as a clear prerequisite of favourable collaboration. It was stated as particularly vital to aspects of communication, as shared elementary knowledge facilitates efficient interpersonal communication through securing that all participants speak the same technical language. Thereby, shared elementary knowledge further ensures favourable collaboration, as it opens up for value adding discussions.

"It is often much more difficult to collaborate if everyone does not have the same background, or at least a common denominator."

"It can really be very spread in terms of background. Nevertheless, you have to speak the same language."

Clear communication

Both clear individual communication and effective interpersonal communication were stated as critical to favourable collaboration. Individual communication was connected to the importance of daring to explicitly express one's opinions, if the individual in question possesses as stock of alternative feasible ideas that may strengthen the resulting innovations. The respondents commonly said that interpersonal communication is vital in order to avoid value-destroying misunderstandings between the participants. Several respondents claimed that misunderstandings are more inclined to occur when the degree of particularly undetectable diversity is relatively high or when the very collaboration is cross-functional, according to their own experience. These respondents explained that this phenomenon is due to differences in background, in expertise and in communication patterns, which thus may imply different initial approaches to the very problem.

"If you overcome the difficulty of getting individuals to communicate with each other and collaborate, then I think you will get your efforts back in the form of an increased number of innovations."

Unified attitudes

A clear majority of the respondents explicitly claimed the importance of unified attitudes in order for the collaboration to attain innovative success, within all designs of collaboration apart from networks (see 5.3.1.3). The critical significance of personal chemistry was frequently emphasised. If not in place, many respondents claimed that it has significant impeding effects on the general results of the very collaboration. The respondents mentioned that the participants essentially should share the same attitudes towards and the same enjoyable devotion to the work tasks. Preferably, they should also share the same level of ambition. Moreover, a certain level of interpersonal dynamics, as a result of the participating personalities, must be in place. If so, great synergistic effects may arise, which many respondents testified to as favourable to the overall innovative performance of the participants.

"It is about finding individuals who think it is fun. It is those individuals whom one work well with."

“The personal chemistry has to work, otherwise it is ‘bye bye’.”

Common vision and shared goals

Many respondents explicitly stated the importance of sharing a common vision among all participants, within all designs of collaboration apart from networks (see 5.3.1.3). They explained that a shared vision ensures that all participants commonly know where to aim at and that their work is aligned with the very purpose of the collaboration, simultaneously as it inspires and dynamically enhances and unites the participants.

“There are no doubts it has a great impact. We must know where we are heading and where we want to go.”

A small number of respondents claimed that clearly defined goals should be set within all designs of collaboration apart from networks, as a guiding tool of how to attain the overall vision. They explained that when participants elaborate solutions to a certain problem together, everyone must share the same perceptions and agree on what results to work for, in order to secure a common direction and thus efficient work. The goals should reflect the deliverables of the team, along with their expectations. Some respondents emphasised that clearly defined goals must be set by the participants themselves and not by any external part, in order to enhance their anchorage and thus benefit from their favourable effects.

“It was an important factor. (...) Our goal was to be the best in the world.”

“If you do not have any set goals that reflect an expressed desire, then you would not be dedicatedly working towards fulfilling it.”

Several respondents linked the aspect of common vision and shared goals to the aspects of challenge.

“I am driven by challenges and use both visions and clear goals as a way to create a challenge of where we should head.”

Suitable collaboration structure

Several respondents claimed the necessity of a consciously adapted and suitable structure of the given collaboration, in order to enhance its potential for strong innovative performance of its participants. They discussed internal structures, e.g. collaboration within their own teams, as well as external structures inside or outside Scania, e.g. cross-functional collaboration or networks.

“Collaboration is super important, but you must have a structure for when and how to apply it.”

A number of respondents claimed the importance of a balanced number of participants within all designs of collaboration except networks (see 5.3.1.3) in order to favour innovative performance. The number of participants must reflect and be adapted to the very purpose of and the context of the collaboration. These respondents explained that a reduced number of participants allow everyone to express their ideas and opinions. Hence, it capitalises on every participant's

competencies, as it favours broad thinking and ensures that all feasible ideas are surfaced and evaluated. A larger group was also said to be too “noisy” and less focused.

5.3.1.2. Favourable implications of collaboration

Several implications of successful collaboration that are favourable to innovative performance of individuals emerged throughout the interviews. The most frequently mentioned were knowledge sharing, favourable diversity, favourable dissensions and mutual inspiration.

5.3.1.2.1. Knowledge sharing

Many respondents claimed that one of the main reasons for entering into collaborative contexts is the degree of favourable knowledge sharing. It often occurs spontaneously, due to gained perspectives through informal discussions of actual problems and of possible solutions. Respondents often described that they bandy ideas on a daily basis with their colleagues, during spontaneous conditions.

“It starts to become really interesting first when you can discuss freely with people.”

“When you discuss with others; that is when the solutions appears (...). If you are not willing to collaborate and only sit by yourself, then you do not have... You have to bandy ideas. That is quite an important part of the generation of innovations in general, I think.”

Several respondents described how they often set off with an initial original idea. When discussing with colleagues and acquiring new knowledge and new outlooks, the idea develops and strengthens in accordance with this complementary input. Through the benefit of a couple of extra observing eyes, all aspects do not necessarily have to be covered and well thought-out from the very beginning, as colleagues help to identify gaps within the original idea.

“Many ideas come up in discussions with others. Someone says something, and then you develop it. You might end up with a completely different idea than what you started talking about, but the collaboration was what led to this product idea. I think that is very important.”

5.3.1.2.2. Favourable diversity

When the respondents were asked to account for their experience of favourably diversified teams within Scania, the received answers varied to a relatively great extent.

A large share of the respondents claimed to have minimal experience of even working in diversified teams; they had only worked in homogeneous teams during their career within Scania. Among the respondents who actually had worked in diversified teams, a great majority had experienced only undetectable diversity. They had mainly experienced it through differences in personalities and in academic and professional background; i.e. various expertise, functional competencies and experience. Hardly any respondent accounted for any experience of detectable diversity. Those who actually did and mentioned differences in age, sex and nationalities, said that they work within areas that are not as narrow technically oriented as the majority of the functional fields within Scania.

The respondents who had experienced undetectable diversity testified to its favourable effects on innovative performance.

“Every time one (...) increases the diversity, the level of innovation tends to increase.”

“I almost think that it is a must in the world we live in. (...) Through collaboration and through different knowledge and backgrounds, you complement each other. If I explain something to someone within my group, then maybe that individual has another coloured view and notices aspects that I have missed.”

Only one respondent testified to clear favourable impacts of detectable diversity on innovative performance, even if more respondents had experienced this sort of diversity. These respondents were rather indifferent to the potential presence of detectable diversity. They said that it does not exert any influence on innovative performance; rather, they claimed that the technical focus and the complexity of the innovations are favoured by undetectable diversity.

The respondents who accounted for favourable experience of undetectable diversity claimed that complementary competencies and complementary personalities are its most important benefits.

Complementary competencies

Complementary competencies, foremost in terms of complementary skills and diversified expertise, were said to provide variously different perspectives along with novel input. Such a broad range of perspectives ensures profounder understanding of the whole, which was stated as beneficial to innovative performance.

“You complete each other, you really do.”

“My view of it is that innovations arise on the borderland of novel technologies or where novel technologies appear. If you ought to manage the borderland between two or more areas of technology; then you need two or more competencies. And it is of rare occurrence that an individual possesses more than two of these competencies.”

Novel and additional input in the form of diversified expertise was described to be vital to elaboration of innovations, as it provides inspiration along with concrete knowledge. Several respondents described that it assists in thinking outside the box and in getting out of old ruts.

“It is very much about background as well. A Scania individual is indoctrinated to Scania’s way of working and to the solutions that are commonly reused within Scania. If you come from outside, then you have radically different chances to enable yourself to think outside the box. That is what it takes to be innovative over time.”

Many respondents expressed favourable experience of complementary competencies in terms of innovative performance, through different combinations of competencies. Several respondents described the combination of generalists and specialists, where generalists contribute with the helicopter view of the problem, while specialists contribute with focused deep expertise. Other respondents described the combination of theoretical individuals and practical individuals. The

theoretical individuals enable procurement of theoretically strong ideas, meanwhile the more practical individuals secure that they are feasible and possible to implement.

“I think that the impact that it has exerted... The composition of an effective group involves in the idea of having both a certain theoretical level and a certain practical level.”

Complementary personalities

Several respondents described complementary personalities as beneficial to innovative performance of individuals in collaborative contexts, as this factor was stated to provide significantly enhanced dynamics within the collaboration. To combine introvert individuals with more extrovert ones were said to be generally favourable. One respondent also mentioned the combination of analytically strong individuals and individuals of outgoing driving nature. In the latter one, according to the given explanation, analytical individuals are more inclined to focus on exchange of ideas and on solution-focused discussions; meanwhile the outgoing individuals force the pace and ensure final deliverables.

...is not always favourable?

Far from all respondents claimed to have experienced diversity as favourable to their innovative performance in collaborative contexts. Some respondents even stated the contrary; they said that homogenous teams often exert larger positive influence on innovative performance, compared to diversified teams.

“The best solutions... Then the team has consisted of individuals who work within the same areas and the personalities have been similar as well. (...) When everyone is more or less the same type of person; that is when I think that the best solutions will arise.”

Some of the respondents explained that there is no need for diversity within teams under certain circumstances. When the functional area is particularly specialised or when the work focuses on a specific detail in the vehicle; that is a situation when diversity will not bring any benefits and thus will not enhance innovative performance, according to these respondents. Complementary competencies or other potentially favourable implications of diversity will not be beneficial, as the scope of the work field is so narrow. Some respondents even stated that an innovation will often become of a even higher level of inventive step under such circumstances, if the team only consists of specialist engineers within the specific technical field.

Facilitated communication and enhanced information sharing were two commonly mentioned benefits of homogeneous teams. The respondents described that these benefits are due to the team members' similarities in their modes of thinking, along with their aligned working processes.

“It often facilitates communication; individuals think alike. Especially if you have been working together for a long time; then you will share some sort of pattern of how to work.”

Several respondents also claimed that homogeneity in personalities may entail the effect that individuals enjoy each other's company to a relatively greater extent, which may exert positive influence on the team climate along with its internal communication and its executed work.

5.3.1.2.3. Favourable dissensions

A slight majority of the respondents confirmed that they have experienced dissensions that have been favourable to their overall innovative performance. The great majority of these favourable dissensions were stated as related to the very work task; e.g. identifying the most feasible solution to a certain problem.

"The best solutions, i.e. final concepts or ennobled products so to speak, have often emerged in situations when someone has not agreed."

"Dissensions can actually be due to the fact that a problem may have more than one feasible solution."

"It is in these conflict situations that you really are put to the test. Then you are really forced to think; to find a solution. And that very solution often becomes quite innovative."

The respondents stated combination and optimisation of ideas along with enhanced level of energy as the most essential benefits of dissensions.

However, several respondents stated that they never have experienced any dissensions that exert any positive influence at all. Some of these respondents demonstrated clear aversion to dissensions, through an active will of not encountering any such inconveniences. Others said that they never have experienced any dissensions at all within Scania.

Combination and optimisation of ideas

Most respondents who stated to have experienced that dissensions may exert positive influence on their innovative performance, said that the first benefit is the chance of ending up with a stronger solution than if the dissension would not have occurred. It is due to that a dissension may lead to that the prevailing suggested solution is questioned. Consequently, the final solution has the valuable potential to end up as the most optimal combination of different proposed approaches. Some respondents explicitly emphasised this synergistic potential.

"Many times, it has resulted in a synergistic mix between the aired ideas. Then, the dissensions have been favourable, as something has been created that is stronger than the two different points of views. Through combination, you have got something that is more feasible than the separate versions of them. (...) It often results in that you come up with even better solutions to problems."

Many respondents also explained that dissensions offer the opportunity to perfect one's ideas and to motivate one's choices, as someone else questions and challenges them. Consequently, the solution that the innovator initially had in mind may not end up as the most feasible one, as other better solutions may arise.

“At times, you have harshly criticised a solution yourself, or vice versa. And along this persuasion process, the innovation itself has emerged. When the concerned innovator, who sometimes has been me as well, is about to pitch the idea, it forces that individual to think a little further. And then this embryo of an idea grows into something great.”

“It becomes an intellectual fight; you talk, you refine your arguments... This drives our business to a large extent; the fact that we constantly have to justify what we do. So you have to practise your thinking and explaining. (...) Then it is really dissensions that drive solutions and thus provide innovations.”

One respondent even regarded the presence of dissensions within a team as a prerequisite of innovative performance of individuals therein. He described the circumstance of collaboration in total absence of dissensions as a situation where input and reflections never rise to the surface. He explained that dissensions lead to nourishing discussions of solutions; and without dissensions, there would not be any discussions.

Enhanced level of energy

Some respondents explicitly expressed that they find dissensions triggering, as something that gives them inspiration and energy in their innovative work. They described this circumstance to derive from a need of proving themselves as capable; either through proving the feasibility of a certain questioned solution or through proving that the dissident is wrong.

“Dissensions; absolutely! (...) It gives me energy. Consensus is boring.”

“I can (...) imagine that there are individuals who can trigger me as well; e.g. that someone comes in and says that ‘You need to do this’, and thereby triggers something within me. That has probably happened as well; that someone has said that ‘This is the way it is’, even if it is just not possible for it to be so. And if the individual does not give in, then I have to prove it.’

Efficient solving of dissensions

Many respondents stated that in order for a dissension to be favourable, it must be efficiently solved. Moreover, they commonly described how dissensions preferably should be solved. First, the very dissension must be acknowledged, followed by related discussions. Second, several respondents described that they pursue with action plans, which contain common goals. By committing to these goals, the participants agree on solving the dissension; and they feel that their opinion have been listened to and they can move on from there.

“If it is little more extreme situations, you can sit down in a room for two hours and discuss. If even worse; write down five things we need to improve by this week. Then you do it; you solve four out of these and then you will advance.”

5.3.1.2.4. Mutual inspiration

Favourable teamwork was explained to have inspirational effects in two different ways. First, it contributes to making the work task more fun and enjoyable. Moreover, the respondents said that their colleagues trigger them and provide them with additional inspirational energy.

“In a properly functioning and effective group, it is much more enjoyable to work. It implies that you spur each other to push additionally forward; simply, you get more energy in the development phase. That is my opinion and experience, after all.”

5.3.1.3. Favourable designs of collaboration

When asked to account for their experience of different favourable designs of collaboration along with their impact on innovative performance, the respondents expressed a broad scope of preferences. The most commonly discussed designs of collaboration that were considered vital to innovative performance of individuals were networks, skunk works, internal teamwork, cross-functional work and workshops.

Networks

A clear majority of the respondents stated that they recurrent benefit from networks when elaborating innovations. Almost all of them stated that they only use internal networks within Scania. However, a few respondents said that they also capitalise on external networks, but to various extent. The first benefit of networks was commonly stated as the valuable access to rich sources of information and thus new valuable input, complementary expertise and diverse perspectives.

“I use my networks every day, especially within Scania, in order to solve various tasks or to gather information.”

Regarding internal networks within Scania, the respondents said that they mainly use their personal networks, foremost in a very spontaneous manner. They described how they recurrent contact individuals whom they know possess the specifically required expertise, or how they randomly pop into a colleague in the corridor and start to discuss certain solutions. Some respondents emphasised the great importance of recurrent informal exchange of ideas with different individuals in order to get different points of view. They described how they often reflect on problems with various colleagues over a cup of coffee.

“One should not underestimate the importance of taking a cup of coffee at a new table. (...) Normally, I sit at a table where I have another errand, and then you start talking about an interesting technical discussion. This may lead to an innovative solution.”

The respondents mentioned two forms of external networks that they commonly apply. First, they accounted for external networks in terms of exchange of information and of ideas with universities, with authorities and with related institutes. These were said to provide input of strong theoretical height, due to the access to advanced research and to unique expertise and competencies. A majority of the respondents within Pre-Development claimed that they use this form of external networks. Moreover, several respondents discussed external networks that provide a more practical form of input and also of feedback; e.g. through established active collaboration with suppliers and with customers. This latter practical form was described to have several separate benefits. First, it helps to ensure that the elaborated innovations are applicable, due to its close contact with customers. Moreover, it provides profound and necessary knowledge of the used components, due to its collaboration with suppliers. The respondents

described these two aspects as particularly critical when elaborating innovations, as it enables them to fully grasp all dimensions. The respondents within Continuous Introduction and within Product Follow-Up more frequently mentioned the application of this form of external networks.

“In the discussions with the suppliers, many ideas have been born. (...) I think that it is due to their provision of different angles of approaches, different outlooks. (...) The suppliers work with only one specific part of the truck, whereas we have a much more complex situation. They do not have the full picture, so they can say one thing, e.g. a thing about component that I do not know anything about. (...) That is why it is a pretty good symbiosis, as I obtain that knowledge.”

Skunk works

Several respondents discussed informal temporary compositions of teams as a circumstance that often results in innovations. They described it in terms of skunk works. If a specific problem arises, a number of individuals spontaneously decide to immediately sit down and together think freely and elaborate a solution to the problem. Normally, skunk works last for only a couple of hours or maximum a workday, according to the respondents.

“When aiming at solving a specific problem, when reflecting on my delivered innovations within Scania, this is the most well-functioning approach that I have experienced. When you sit down together (...), a group that temporarily works together and thus has scrapped the whole formal team concept; to just sit tight and work with them, that is amazingly productive.”

The respondents foremost claimed that the benefits of skunk works to their innovative performance are its focused work along with the broad range of available required competencies that it gathers, as a skunk works team is uniquely designed for each occurrence; i.e. for each unique problem. Several respondents described that the temporary team normally sits in a sparse room, separately from their ordinary areas and that they simply do not leave that room before the problem is solved and a solution is elaborated.

Two prerequisites of successful skunk works were mentioned; shared goals that are clearly defined and a climate that involves indifference to prestige. Shared goals ensure that everyone works towards the same purpose, in the same direction, as everyone shares the same perception. A climate that is permeated by indifference to prestige entails a common willingness to unbiasedly share and discuss ideas and thereby also to help each other, with the best possible innovative solution in mind.

“To have a climate (...) where you can help each other, where you share ideas, quite indifferently to prestige. This means that you can hop into a room and start reflecting on novel ideas or start solving someone else’s problem.”

Internal teamwork

Nearly all respondents said that they collaborate internally within their team on a daily basis. Hence, they described it as an inherent constituent of their ordinary manner of working. All respondents who claimed to collaborate internally did also testify to the favourable effects on

their innovative performance, as long as the above-mentioned prerequisites are in place. They described the spontaneous bandying of ideas as the most favourable element of internal teamwork.

Cross-functional work

Almost all respondents claimed that they work within cross-functional teams, to various frequency and to different extent. Many respondents stated that cross-functional work is an inherent constituent of their everyday work within Scania, while some others said that it happens more seldom. Some claimed that they mostly collaborate with other groups within the same section; while others said that they stretch their collaboration far beyond that.

The respondents commonly agreed on the most important benefit of cross-functional work. Cross-functional teamwork provides a broad scope of competencies and of expertise; i.e. it provides those pinpointed skills that are required in order to solve the actual problem. Thereby, cross-functional work enables individuals to elaborate innovative solutions that would not have been possible otherwise.

“We often work cross-functionally... You are definitely dependent on others to find a solution. You discuss with other individuals outside your own team in order to find the required competencies.”

Workshops

Several respondents claimed that workshops are particularly favourable to their innovative performance. They commonly described workshops as scheduled gatherings with focused discussions; some respondents compared it to a very structured form of skunk works. According to the respondents, workshops can be either cross-functional or strictly held within the internal team. Their main purpose is to identify a scope of feasible solutions to a certain presented problem. The respondents described several favourable workshops that had resulted in innovations. Some had been executed internally within their teams, but an equal number had been of more cross-functional character.

The benefits of workshops are many, according to these respondents. As they throw light upon certain problems, workshops also brings focus to these problems and thus allows a certain allocation of time. Workshops are also a forum where individuals may present their own experienced problems or issues and thus ask for their colleagues' ideas and opinions. Some respondents expressed that workshops allow beneficial capitalisation on existing expertise and existing experience within Scania. They stated that their purpose of participating in workshops often is directly related to their need for certain input to a specific problem. Such provided directly related input, along with the provision of general inspiration, were other mentioned aspects that are favourable to the generation of innovations.

One respondent mentioned a structured way of working in cross-functional workshops, which he called a *“beehive”*. It was described as recurrent meetings every other week for individuals within the same field of technology, but from different teams.

5.3.2. Managerial practices

A significant majority of the respondents claimed that their innovative performance is affected by their manager, to some extent. The managerial fields that were stated as relatively important to innovative performance were different areas of managerial responsibility along with different managerial styles.

5.3.2.1. Areas of managerial responsibility

The respondents were asked to reflect on the importance of various areas that are of managerial responsibility. The most frequently mentioned areas were adequate work tasks, managerial encouragement and managerial recognition and team features.

Adequate work tasks

Some respondents stated that their manager's ability to continuously provide them with adequate work tasks exerts influence on their innovative performance, if not through an immediate manner. Indicatively and above all, such work tasks primarily should comprise some sort of innovation potential in order to even offer feasible opportunities for innovations (see 5.2.4), according to these respondents. Moreover, several respondents claimed that adequate work tasks should entail a certain degree of challenge; they should be relatively *"tricky"* or *"hard"* in themselves. From experience, these respondents explained that such work tasks keep them favourably alert to arising ideas, research and patterns, simultaneously as they activate their mindset and thus prevent them from getting too comfortable and stuck in old ruts and routines.

"It is hard to come up with novel innovations if there are no challenges involved, no possibilities of innovations..."

"Challenges lead to the requirement of starting to think outside the box. If there are no inherently involved challenges, then there is no reason to be innovative. Because then you can just trot around as you always have done..."

Several respondents mentioned that adequate work tasks also should imply a certain degree of autonomy. They explained that autonomy enables free work simultaneously as it provides a strong sense of ownership of and responsibility for the assigned work tasks, which they declared are generally favourable to innovative performance.

A few respondents discussed some prerequisites of ensuring that adequate work tasks actually exert that desirable favourable influence on innovative performance. Foremost, the work tasks must neither drain energy nor be too challenging in character.

Managerial encouragement and managerial recognition

Some respondents explicitly stated that immediate encouragement and direct recognition from their manager are of utmost importance, as these aspects heavily affect their innovative performance. However, other respondents said that they prefer to receive encouragement and recognition from their colleagues rather than from their manager.

For those who identified managerial encouragement or managerial recognition as favourable to their innovative performance, the most commonly declared reasons were that such measures

create a purpose for the job, that they provide a sense of appreciation and that they throw light upon work efforts that are related to innovative work. The respondents said that these mentioned reasons lead to enhanced level of energy at work. Some respondents related managerial encouragement to the aspect of feedback, but only in terms of positively constructive feedback.

“It is a positive feeling; that if I come up with an idea, it is always considered positive. It is encouraged and you get a kick out of the fact that you actually get feedback on it.”

“I want acknowledgement from my manager. (...) So, for example, when we are told that we are good at applying for patents and that it is good that we are in the forefront; it makes you continue with these activities.”

Several respondents did not see any connections between overall managerial encouragement and managerial recognition and their level of innovative performance. Yet, these respondents claimed that they are indifferent to such means; they emphasised that such different signs of appreciation neither exert any positive influence nor any negative influence on their innovative performance.

A few respondents testified to an experienced constant significant lack of managerial encouragement and of managerial recognition. One respondent mentioned how he used this evident lack of signs of appreciation to refute and thereby elaborate even more innovations.

5.3.2.2. Managerial styles

The respondents were asked to discuss different managerial styles, in accordance with a provided matrix that was thoroughly explained to the respondents throughout the interviews (see 4.3.2.2). Its vertical axis represents the degree of managerial proactive intervention in the individuals' work tasks, while its horizontal axis represents the degree of managerial functional knowledge in relation to the individuals.

5.3.2.2.1. Applied managerial styles within Scania

The respondents were asked to set out their closest manager during the years of 2009, 2010 and 2011 in the matrix; i.e. the applied managerial style of this managers. The answers are presented in Figure 25. As it indicates, the scope of the given answers was relatively broad. However, a majority of the answers were placed in the two lower quadrants of the matrix.

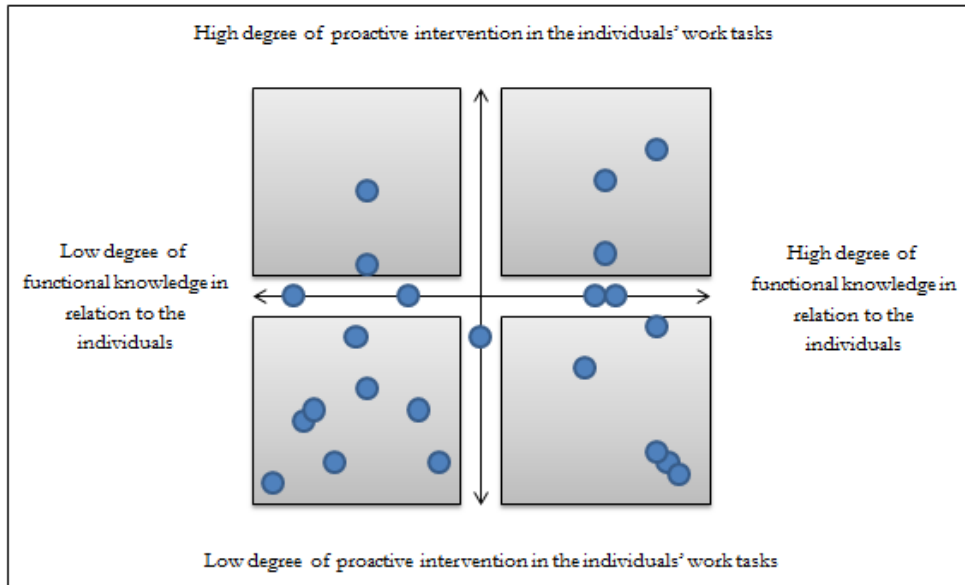


Figure 25: Applied managerial styles within Scania (Möller & Wahlqvist, 2012f)

5.3.2.2.2. Requested managerial styles within Scania

As an attendant question, the respondents were asked to set out in the same matrix their requested managerial style of their closest manager, in order to enhance their innovative performance as much as possible. The answers are presented in Figure 26. Once again, the scope of the provided answers was broad. Approximately half of the respondents placed their requested managerial style in the same quadrant as they placed their manager during the years of 2009, 2010 and 2011 in. This trend was equally divided throughout the four quadrants of the matrix. Those respondents who placed the two managerial styles in different quadrants did also place them equally divided across the quadrants.

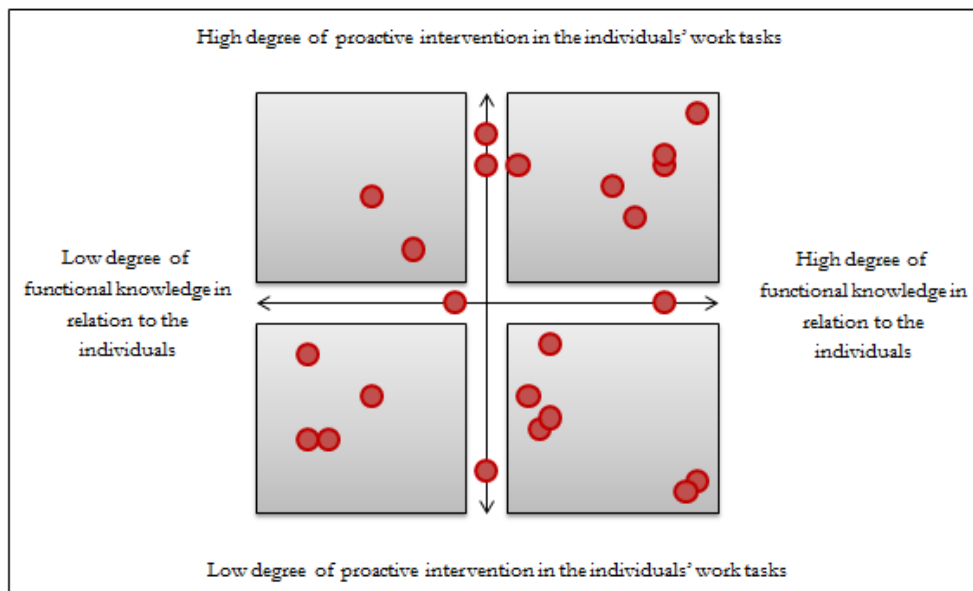


Figure 26: Requested managerial styles within Scania (Möller & Wahlqvist, 2012f)

Degree of managerial proactive intervention

Some respondents stated that a high degree of managerial proactive intervention in their work tasks has beneficial impact on their innovative performance. However, an equal number of respondents stated that a lower degree of managerial proactive intervention is more favourable. A few respondents said that it has no impact whether the manager applies a high or a low degree of proactive intervention in their work tasks.

The respondents who claimed that a high degree of managerial proactive intervention is beneficial to their innovative performance explained that they regard it as a sign of managerial encouragement and of managerial share in their work tasks, which they find utterly stimulating. A few of these respondents also related it to time, as managers in general have limited accessible time to devote to non-scheduled discussions of innovative work. Reactive discussion thus can be difficult to arrange when needed, whereas managerial proactive intervention as a measure can function as an efficient substitute.

I think it contributes to that you (...) feel more appreciated at work and enjoy work; and you get to see the use in what you are doing. It can be tough if you constantly have to run to your manager and say that 'Now, I have come up with this'. It is much more fun if he or she approaches you and asks 'How is it going with this?'"

"I think it is good when the manager intervenes frequently. It stimulates me further to (...) find the right path."

The respondents who find a lower degree of managerial proactive intervention more favourable to their innovative performance related it to the aspect of freedom. They regard a high degree of managerial proactive intervention as a sort of managerial strategy, with the purpose of controlling them and of focusing on details. On the contrary, a lower degree of managerial proactive intervention is a sign of managerial trust, according to these respondents. A few respondents expressed that such a manager permits them to test boundaries, to experiment and to go their own way when working, which they stated as favourable to their innovative performance. However, a majority of this group of respondents still claimed that it is crucial to have the manager's explicit support, in order to both strengthen and nourish their innovative performance.

"There are many individuals who want to control; who feel that they have a responsibility and thus want to be involved in every single detail. I think it is good to have the ability to understand individuals' mindset and a bit up in the hierarchy; to have a helicopter view. But not be too (...) in control of the details."

"I want a manager who supports me; someone who does not micromanage everything I do. He or she may intervene if I do something wrong, but otherwise I prefer to test the limits myself; challenge..."

A small number of respondents did not see any links between the degree of managerial proactive intervention and their innovative performance.

Degree of managerial functional knowledge

Some respondents stated that a high degree of managerial functional knowledge is relatively important to innovative performance of individuals within their functional field, whereas other respondents claimed that a lower degree is more favourable. However, many respondents explicitly declared that the degree of managerial functional knowledge does not have any impact at all on the innovative performance of individuals within their function.

The respondents who preferred a higher degree of managerial functional knowledge explained it as a prerequisite in order to be able to have favourable discussions of current problems and of feasible solutions with their closest manager. A small number of respondents said that a high degree of managerial functional knowledge increases their confidence in their manager. One respondent claimed that it *“would be fun”* to be able to sit down and discuss present topics and problems with his manager.

“It is good to be able to discuss the issues or the solutions with the manager; which requires a certain level of specific knowledge.”

Some respondents stated another benefit of a higher degree of managerial functional knowledge. Accordingly, they said that it ensures that the manager provides its individuals with appropriate and relevant work tasks, which in turn eliminates waste of time on non-pertinent matters and thus provides more focused time for value adding work tasks.

“A team manager goes to meetings with other functional units of the organisation and often brings work tasks back to the team from these gatherings. A manager who possesses functional knowledge is more inclined to bring the pertinent work tasks back. An individual who (...) is not as acquainted may bring back a lot of work tasks that are not relevant and thereby wastes my time.”

The respondents who claimed to prefer a lower degree of managerial functional knowledge commonly emphasised that a manager first of all must focus on being a competent manager. Generally, functional knowledge should rather be possessed by individuals throughout Scania, while the managers should take on a more leading and supportive role, according to these respondents. Therein, the focus of a manager should rather be on securing access to required resources and on dealing with individual-related matters and more organisational prospects. The respondents claimed that such managerial support exert more influence on their innovative performance, compared to the managerial degree of functional knowledge. When they are in need of certain information or wish to bandy ideas, they expressed that they rather discuss with some of their expert colleagues within their personal network. However, some respondents said that a manager must possess a basic level of elementary functional knowledge, in order to possess a general understanding of the work tasks of the team.

“It is probably good if the manager has a lot of knowledge of what we are doing, but I think there are other managerial qualities that are far more important. The need for functional knowledge can always be solved through some sort of technical expert who works beside the manager.”

Some respondents surfaced another aspect; there is a risk of having a manager with a high degree of functional knowledge, as he or she may focus too much on details and hence be too controlling and interfering in everyday work tasks. Such behaviour may imply that the manager tries to be an active and executing part of ongoing projects and thus risks losing focus on the leadership role itself.

“I think that a manager does not have to be an expert, as many managers try to be here. If one tries to be the expert, it may to some extent take the focus from practicing (...) efficient leadership. This is due to the fact that such managers usually want to be involved in the projects and do the job so to speak; and perhaps even ‘steal’ fun projects and keep them for themselves.”

Several respondents claimed that they do not consider the degree of managerial functional knowledge relevant to their innovative performance; they do not see any connections of influence. Some of these respondents expressed that the main priority is that the actual team as a whole possesses the required expertise or that this expertise exists easily accessible somewhere else within Scania. Hence, whether the manager is one of them who possesses this expertise or not does not make any difference, in terms of innovative performance. Other respondents said that the degree of managerial functional knowledge has no impact, as it is not within the areas of responsibility of a manager to possess deep functional knowledge.

“The manager's main role is not to be my technical sounding board, but to lead and assign the work tasks within the group and to ensure that we work with what is actually important to the business.”

6. Analysis

This chapter aims at thoroughly analysing the empirical data, which were presented in the empirical chapter. The analysis considers the pertinent general contents along with identified clear patterns and particularly interesting details. The analysis of the empirical data follows the structure of the empirical framework, which was presented in the empirical chapter. As mentioned, it originally emerged from the presented theoretical framework.

As mentioned, established relevant theory and existing pertinent research within the field of critical success factors for innovative performance of individuals are relatively vague and ambiguous in character. This circumstance indicates that conclusions may not be entirely transferable across various contexts and diverse settings. Accordingly, the theoretical framework of this master thesis (see Figure 8) has functioned only as support to the gathering of empirical data, which resulted in the presented empirical framework (see Figure 13). Due to the discussed ambiguity of the theoretical framework, no comparative analysis of the presented theory and of the empirical data will be executed in this master thesis. Hence, only the gathered empirical data are subjects of analysis (see Figure 27).

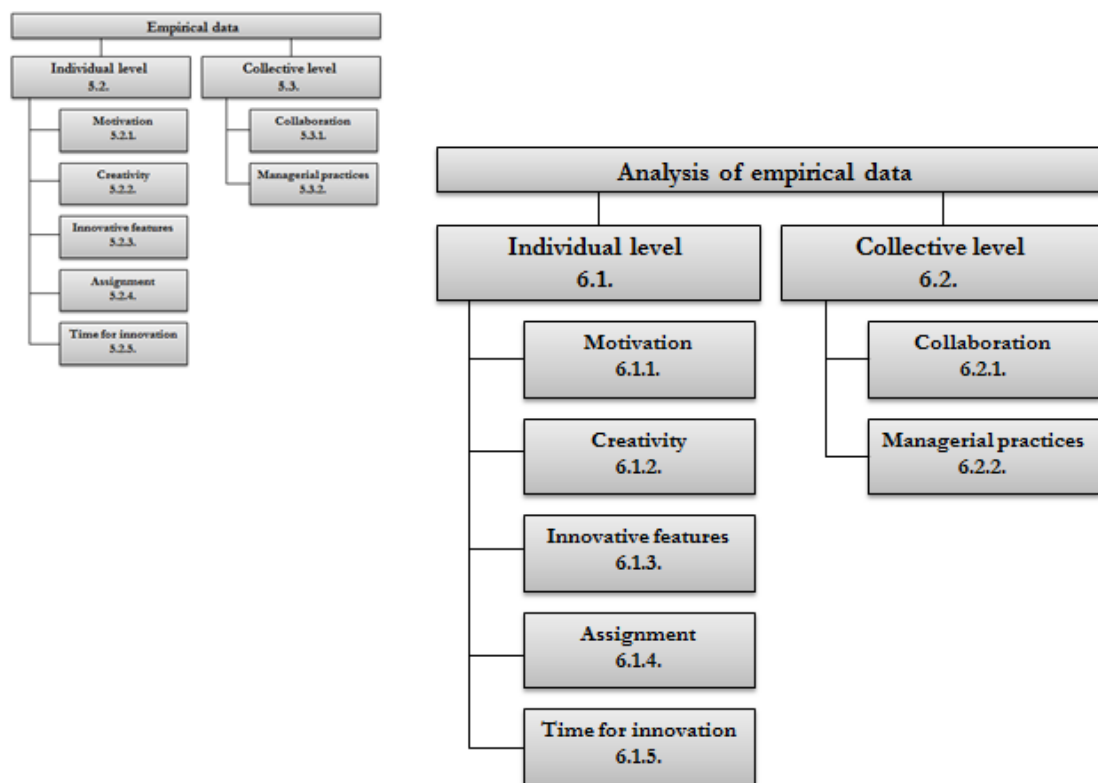


Figure 27: Analysis of empirical framework (Möller & Wahlqvist, 2012d)

Throughout this chapter, each pertinent area is separately analysed, in accordance with the presented numbered structure of the empirical framework (see Figure 27).

It is important to keep in mind that the pertinence of each area is analysed in accordance with the frequency of the given answers, which is in line with the chosen argumentation techniques of this master thesis (see 3.6.7). All answers are equally analysed, without any weighting of the number

of registered invention submissions of each respondent. I.e. all answers are considered of equal importance.

6.1. Individual level

This subchapter separately analyses the empirical data of the pertinent areas of motivation, creativity, innovative features, assignment and time for innovation (see Figure 28).

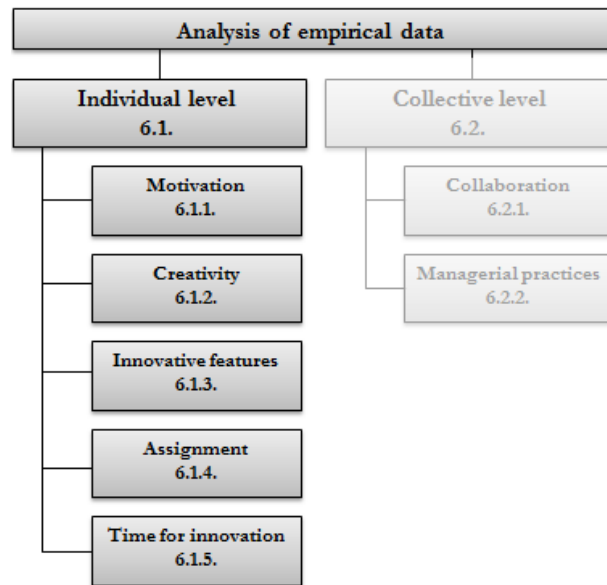


Figure 28: Analysis of empirical framework at individual level (Möller & Wahlqvist, 2012d)

6.1.1. Motivation

A distinct pattern that has been identified throughout this master thesis project is the critical presence of general motivation within individuals, in order to enable innovative performance. Intrinsic motivation appears to constitute its very basis and thus must be securely in place in order to render possible enduring innovative performance of individuals. Extrinsic motivation appears to be of almost equal importance, but seems to be effective only if intrinsic motivation is present. A balanced mix of intrinsic motivators and extrinsic motivators thus appears critical in order to optimise individuals' experienced level of general motivation and thus pave the way for their innovative performance.

The respondents pinpointed a great variety of different motivators as critical to their innovative performance; both intrinsic ones and extrinsic ones. This scope of identified motivators foremost indicates the importance of acquiring a thorough understanding of every individual and of their personal preferences. Nevertheless, it is possible to distinguish several clear patterns across individuals of common critical motivators.

Every each of the accounted intrinsic motivators (see 5.2.1.1.1) appears indispensable to the presence of intrinsic motivation for a majority of the respondents. Pertinent interest, sense of challenge, sense of autonomy, enjoyment and satisfaction all clearly seem to be critical intrinsic motivators, but to various extent for various respondents in various situations and contexts.

Throughout the interviews, it also became evident that many intrinsic motivators are synergistically interlinked, even if not explicitly stated by the respondents. Sense of freedom appears to strengthen the dimension of sense of challenge, whereas pertinent interest may entail a greater degree of joy. Yet, even if intrinsic motivators always rest within the individual, they must evidently be stimulated in order to be effective and thus deliver their motivational effects. Throughout the interviews, it became clear that many extrinsic motivators possess this leverage; all accounted extrinsic motivators, with the exception of monetary remuneration, were all claimed to be of synergistic character. Other extrinsic motivators may not have as strong leverage and thus as considerable synergistic potential, but yet are important to the innovative performance of the respondents. Some extrinsic motivators stand out as particularly critical.

Recognition and encouragement, particularly from managers but also from the overall organisation of Scania, stand out as an especially fundamental extrinsic motivator. These two forms of recognition and of encouragement appear to synergistically strengthen the intrinsic motivator of joy, as managerial input and organisational feedback often add a positive sense to the working climate. However, it is clear that these forms of recognition and of encouragement must be properly applied in order to deliver any motivational effects at all; and spontaneity seems to be the key. The most efficient manner to apply this extrinsic motivator, in order to fully capitalise on its motivational potential, appears to be through continuous informal manifestation of explicit signs of appreciation whenever it is suitable, rather than through more seldom application of formal selective measures. Similarly, organisational recognition and organisational encouragement appear to be more efficient when continuously applied through more spontaneous everyday contexts, instead of through sparse patent parties and through other physical selective recognitions. Hence, formal and non-spontaneous signs of appreciation do not seem to exert any greater influence of the respondents' level of motivation, as the indifference to such measures appears to be commonly established.

To be granted access to an adequate level of time to freely dedicate to elaboration of innovations appears to be the most common vital extrinsic motivator throughout all work fields within Scania. However, it seems to exert positive influence only if the allocation of time is relatively balanced. Its motivational effects foremost appear to be founded in two aspects. To begin with, as all respondents functionally belong to Scania R&D and thus ought to possess some sort of interest in technology, it is evidently synergistically motivating to be allowed to spend extra time on innovative work within this specific area of interest. But an equally important aspect is the experienced high degree of recognition and encouragement; managerial as well as organisational, as a liberal allocation of time can be regarded as sign of managerial or organisation appreciation and trust.

The character of the assignment seems to be a major critical extrinsic motivator, especially for those respondents who mainly belong to the work field of Pre-Development. Its key prerequisite in order to enhance motivation appears to be the degree of innovation potential within the very assignment. This extrinsic motivator appears to have synergistic effects on several other motivators. First, as different work fields are exposed to different expectations of innovative performance, it may strengthen the dimension of managerial expectations and of organisational expectations for individuals within Pre-Development. Its testified leverage of certain intrinsic

motivators renders this extrinsic motivator even more important. It appears to have potential to strengthen the experienced sense of challenge, if the degree of novelty is sufficiently high. Moreover, it seems to efficiently stimulate the intrinsic motivators of pertinent interest and of time resources. This may occur on conditions that the character of the assignment allows individuals to devote a fair amount of time to work tasks that are directly related to their areas of pertinent interest. The intrinsic motivator of sense of freedom may also be enhanced, if individuals are granted mandate and explicit responsibility through the character of the assignment. Furthermore, a continuous change of assignment appears to add an extra motivational effect to this extrinsic motivator. However, this lever is probably most effective if it involves a relatively significant change in functional contents, in order to capitalise on the stimulating benefits of accelerating learning curves. However, minor changes within the existing assignment should have motivational potential as well.

Yet another extrinsic motivator that stands out as effective, particularly in terms of its leverage of intrinsic motivators, is external competition. To actively take external competition into account appears to function as a sort of benchmark, which set out the direction of where to head. The method of picturing specific competitors to beat in order to trigger innovative thinking appears particularly efficient. Simultaneously, external competition seems to synergistically lever the intrinsic motivator of sense of challenge, as it provides an extra competitive dimension to the actual work tasks.

Another interesting finding emerged throughout the interviews; monetary remuneration does not appear to exert nearly any motivational influence on the respondents' level of innovative performance. This extrinsic motivator does not seem to be present throughout the work process where ideas are elaborated into innovations. Rather, monetary remuneration appears to play a crucial role far from the very creation of the innovations. Its motivational effect seems to enter when the very innovation already is accomplished; i.e. when Scania's internal patent application process potentially begins. Here, monetary remuneration appears to be critical for the propensity to actually submit invention submissions and thus set off the internal patent application process.

6.1.2. Creativity

Another pattern that has been identified throughout this master thesis project is the critical role of creativity to the propensity to elaborate innovations. Creativity appears to be nothing but a prerequisite of the respondents' innovative performance. Therein, the very presence of all three components of creativity; i.e. creativity skills, task motivation and expertise, seems to be fundamental in order to ensure durable creativity over time, at least to a certain extent. Nevertheless, the two components of creativity skills and of task motivation stand out as of superior importance (see Figure 23), while the component of expertise seems to be of lower importance. Even though creativity arises from a mix of all three components, individuals must not be equally strong in every dimension. The components appear to be relatively mutually connected in the form of a continuous interplay, as they seem to have the ability to both compensate for and strengthen each other over time.

Creativity skills clearly stand out as the most important component of creativity. At least a moderate set of such skills seems to be absolutely necessary in order to enable significant

elaboration of creative solutions that may result in innovations. Moreover, the fact that strong creativity skills appear to favourably compensate for significantly weaker dimensions of both expertise and task motivation evidently increases the importance of this component of creativity. Cognitive skills stand out as the most critical subcomponent of creativity skills. They seem to be the critical tool that renders possible efficiently creative capitalisation on existing knowledge and on organisational experience, in combination with novel ideas and additional outer inspiration. It seems to be clearly possible to develop cognitive skills over time, through acquisition of different techniques along with greater awareness of how thoughts actually should be thought. Possibly, cognitive skills may also be strengthened through acquisition of a broader scope of expertise, as such a scope provides a larger range of feasible ideas to connect and to combine into novel ones. All accounted personality characteristics (see 5.2.2.1.2) appear to exert influence on the component of creativity skills. However, as personality characteristics are inherent in the personality of individuals, individuals are probably often relatively unconscious of them and thus may find it hard to develop the necessary characteristics in order to enhance their creativity skills. Yet, two personality characteristics stand out as particularly practically developable, if actively working on them over time; perseverance and application of work methods. Perseverance appears to be a key personality characteristic to creativity skills, particularly in terms of work capacity and of the attitude to always pursue and accomplish. Application of work methods is yet another personality characteristic, which individuals relatively easily should be able to purposefully develop in order to strengthen their creativity skills.

Task motivation appears to be an almost equally important component of creativity as the component of creativity skills, in the form of a force that pushes forward towards new solutions. The component of task motivation seems to be critical to many respondents; if their task motivation is not in place, they seem almost completely powerless to act and think creatively. However, even if not preferable, it appears to be possible to generate creative solutions without any presence of task motivation during a limited period of time, if the components of creativity skills and of expertise are particularly strong.

Expertise may generally be regarded as the less vital component of creativity, which most probably is due to its non-exclusiveness. Every individual must possess a certain level of expertise in order to ensure a certain level of creativity. However, a moderate lack of expertise clearly can be compensated for. Individuals who at times do not possess required expertise seem to capitalise on their networking skills in order to acquire it, through the use of internal and external experts and networks. Evidently, these individuals know when to search for expertise and where to search for it, which thus seem to be two important abilities in order to enable innovative performance. The circumstance that two thirds of the respondents have worked less than ten years within Scania may further indicate the relatively lower degree of importance of the component of expertise. However, expertise is still important. Partly as it appears to support individuals to get in touch with novel technologies, partly as it ensures technical height of and feasibility of the elaborated solutions. Moreover, the component of expertise seems to guarantee a certain level of technical understanding. But maybe most importantly, expertise appears to support the component of creativity skills and its inherent ability of combining and of connecting ideas, through providing knowledge of what already has been explored and discovered within the particular actual field. Finally and most interestingly, experience appears to be a significantly

efficient lever for expertise. This circumstance must be regarded as relatively favourable, or at least conveniently, as experience comes automatically through the course of a career without any particular additional efforts. However, the degree of leverage that experience may exert most probably depends on the quality of the very experience; it should not only entail passed time or routinely executed work tasks. This further indicates that individuals who wish to rapidly gain expertise actively should expose themselves to intense periods of high-qualitative work.

6.1.3. Innovative features

It has become indisputably clear that several innovative features exert important influence on innovative performance of individuals. Yet, it is hard to distinguish any definitive patterns of the most critical ones. The individual answers throughout the interviews were numerous and widely spread (see 5.2.3) where no respondents claimed to possess exactly the same set of innovative features. However, it is still possible to elucidate a web of innovative features that all appear to be indispensable to innovative performance of individuals, but to various extent for various individuals. Indicatively, individuals must not possess every single innovative feature that is ranked as vital in order to demonstrate considerable innovative performance. Rather, it appears to be considerably favourable to occupy a particularly strong set of some exceptionally developed innovative features; preferably a mix of innovative features of each of the three subcategories of personality traits, practical approach and intellectual skills, as they complement each other in a beneficial manner.

All stated subordinated innovative features of personality traits (see 5.2.3.1) seem to be of great importance to innovative performance. Perseverance, indifference to prestige, risk propensity, curiosity in technology and working capacity all appears to be beneficial. However, perseverance, indifference to prestige and risk propensity stood out as particularly critical throughout the interviews. Perseverance seems to be the vital innovative feature that ensures that the process from the identification of incipient ideas to the elaboration of feasible innovations is fully accomplished, without any waning spirits. If obstacles come across, perseverance appears to be the engine that secures the continuation of the process beyond them. Perseverance thus may provide a form of continuous learning, where individuals learn from such experienced obstacles. I.e. the individuals learn how to overcome the obstacles or even how to avoid them, which consequently can be applied further on in other contexts. Indifference to prestige appears to be utmost important in several contexts of innovative work, of which many are connected to perseverance. First, it helps individuals to pursue with ideas that may be questioned or regarded as non-feasible by others. Indifference to prestige is also a prerequisite of effective collaboration. Partly as it ensures the ability to acknowledge the ideas of others if these ideas are perceived to be better, but also as it brings the aspect of not being afraid of being wrong and of protecting one's reputation. Moreover, indifference to prestige appears to be indispensable in contexts of networking and of acquisition of information through human sources, as it prevents individuals from being afraid of asking for complementary input. It seems to be particularly important in informal contexts, on an everyday basis in spontaneous discussions with colleagues. Risk propensity appears to be important throughout the very early stages of the creation of innovations, as it renders individuals more inclined to freely think and experiment without constraints and thus potentially find new paths of solutions. Due to this circumstance, risk

propensity seems to assist individuals in avoiding to get caught in old thinking patterns and in practical routines. However, risk propensity must not be exaggerated, in order to not put too much at stake. As an extra interesting matter, the level of risk propensity appears to increase with increased experience. It should indicate that risk propensity can be learnt over time.

Similarly, all specified subordinated innovative features of practical approach (see 5.2.3.2) appear to be relatively vital to innovative performance. I.e. acquisition of information, networking skills, application of work methods, focus on solutions, clearly defined goals and customer focus are all generally desirable. However, acquisition of information and networking skills were discerned as particularly important. Acquisition of information appears to be a fundamental innovative feature. It secures access to additional input and to complementary expertise and thereby potentially ensures technical height of and feasibility of the elaborated innovations. At times, it also seems to provide pure sources of inspiration. An interesting finding is how both described forms of acquisition of information, i.e. through technical sources and through human sources, can be feasibly exploited along projects. As they supply different sorts of information that are requested at different stages, the combination of them should be favourable in order to maximise the input. A strong set of networking skills seems to be a vital innovative feature, due to several reasons. First, it lays the basis for qualitative acquisition of information, particularly through human sources, as it assures that individuals dare to go out and actively ask for input. Moreover, a strong set of networking skills appears to ensure a more efficient execution of work tasks and accomplishment of ideas, as its capitalisation on prevailing expertise and on existing experience prevent individuals from constantly doing everything from scratch. Application of work methods was not as frequently mentioned as the former two innovative features, but yet is interesting. As it implies a firm tool of how to approach problems, it is certainly a measure that individuals within Scania commonly could develop over time and recurrently apply, without any larger difficulties or efforts.

None of the accounted subordinated innovative features of intellectual skills appears to be irrelevant to innovative performance. Hence, analytical skills, critical mindset, association skills and observation skills all can be considered critical. However, the former three ones seem to be of comparably greater pertinence. A considerable set of analytical skills enables individuals to efficiently both understand the underlying drivers of complex problems and solve them. Therein, it appears to support the elaboration of feasible work methods to apply. A critical mindset seems to be a sort of starting point of the very process that may result in innovations, due to its strong propensity to question prevalent patterns and challenge prevailing circumstances and existing opinions. A critical mindset enables individuals to get out of existing intellectual ruts and organisational routines, through not simply just accepting prevalent conditions as they currently are, without any improvement potential. The utmost importance of association skills appears to be in their indispensable ability to capitalise on available information along with new information, through varying combinations and different connections. Without any particular presence of such skills, it is hard to imagine how innovative solutions would be elaborated.

Throughout this master thesis project, two perspectives of how to perceive the development potential of innovative features have emerged. The first perspective entails innovative features as inherently intangible constituents that individuals are born with, which only can be restrictively

acquired throughout life. It thus implies that if companies wish to engage particularly innovative individuals, they must search for individuals who already possess the required innovative features. The second perspective entails innovative features as developable over time. I.e. they can be actively strengthened and developed, by individuals or through a hybrid that also includes the active participation of the actual organisation. Hence, it is possible to undertake focused efforts in order to purposefully enhance and develop particular innovative features of individuals. Both perspectives appear to be applicable, depending on the very nature of each innovative feature. The subordinated innovative features of personality traits are relatively intangible and subtle, as they are inherent constituents of individually different personalities. Consequently, it may be more difficult for organisations to strengthen these innovative features of their individuals over time, as it may be hard for them to really get hold of the very features. Therefore, it may be more feasible for individuals to strengthen these features themselves, through conscious work. However, it should require a great measure of self-awareness. Several examples of such enhancement arose throughout the interviews, which thus indicates that it is far from impossible. The subordinated innovative features of practical approach seem to be more tangible in character, as they relate to how individuals approach both incipient ideas and existing problems. Moreover, as these innovative features are of a comparatively practical nature, they are not extremely inherently fortified. This circumstance renders it practicable for organisations or for individuals themselves to actively work with the enhancement of these innovative features. Consequently, practical approach is probably the most feasible and also the easiest subcategory to consciously develop and purposefully strengthen, even also over a relatively short period of time. The subordinated innovative features of intellectual skills appear to be a balance of tangible features and intangible features. As these innovative features are related to how individuals perceive and reflect on things, they may be relatively hard to influence externally, i.e. through organisational means. Clearly, the enhancement of these innovative features demands active efforts from the individuals. Such focused efforts must be founded in a high level of self-consciousness and of awareness of the significance of these features to innovative performance. Some intellectual skills appear to be more developable than others. Indicatively, association skills appear to be practically approachable to enhance; partly due to their links to strengthening dimensions like curiosity in technology and general interest, partly as they entail several practical approaches of how to actually apply and thereby develop them.

6.1.4. Assignment

The assigned work field and its inherent work tasks indisputably appear to exert considerable influence on innovative performance of individuals, with the degree of innovation potential as key parameter. The influence of the assignment is separated from and goes beyond individual skills, personality and experience. Consequently, it cannot be directly controlled nor easily influenced by individuals themselves.

Naturally, the work fields of Pre-Development, of Continuous Introduction and of Product Follow-Up generally offer different basic conditions in terms of innovations. Accordingly, the assigned work field seems to determine the overall degree of innovation potential along with the degree of exposure to radically novel technologies and to new information. It also determines the approximate amount of time that individuals are allowed to allocate to free creative thinking and

to overall innovation activities. Hence, the assigned work field should lay the general basis for the approximate number of innovations that individuals therein will elaborate. It thus seems to potentially pave the way for strong innovative performance of individuals, through its offered climate for and opportunities of innovations.

If the work field sets out the general direction, the focus of its inherent work tasks appears to bring the ultimately crucial conditions that enable individuals to elaborate innovations. Work tasks within the same work field seem to differ widely in terms of innovation potential. This difference seems to be frequent within all work fields, but appears to be particularly large within Continuous Development and within Product Follow-Up. Even if related to series development, certain functional areas therein appear to entail approximately the same degree of radical novelty and of exposure to novel technologies as counterparts within Pre-Development; thereby offering nearly the same opportunities for innovations. Yet, the different conditions of time allocation between the three work fields appear to be the limiting factor. Even if Continuous Development or Product Follow-Up may present certain areas that offer a relatively higher degree of radical novelty, their foremost focus is on series development with its adherent tight deadlines and clear deliverables, which not always seem to be compatible with dedication of time to innovation.

6.1.5. Time for innovation

Throughout this master thesis project, one particularly pertinent factor commonly has emerged as ultimately indispensable to innovative performance; time for innovation. To securely be granted time for innovative work through a certain level of organisational slack appears to be a crucial factor in order to enable innovative performance of individuals throughout the organisation of Scania. Time for innovation seems to be a relatively prevailing condition within Pre-Development, at least to a certain extent, while absent within Continuous Development and within Product Follow-Up.

Organisational slack in itself does not seem to be particularly favourable to innovative performance. Indicatively, it should fulfil certain criteria in order to be value adding. First, it appears that organisational slack should be clearly balanced instead of implying a constant abundance of free time. It is most probably a question of adaption, where a recurrent excess of time accustoms individuals to that level of available hours and thus renders them increasingly less time efficient. Moreover, it seems that organisational slack should be flexible in character. It should imply a certain stretch in the calendar that accordingly offers an assured degree of spontaneity whenever an activity requires it, instead of entailing one or a few predetermined scheduled hours per week. Such recurrent incorporated flexibility appears to be much more favourable to innovative performance, as it renders possible for individuals to independently devote time to a certain activity when it is actually needed. When these two criteria are fulfilled, yet another criterion seems to remain; individuals must manage their granted organisational slack properly and efficiently, in order for it to be beneficial to their innovative performance. It demands a certain purposefulness of the individuals in their free work, which should derive from an awareness of time as a valuable resource along with a high level of professional ambition.

As Continuous Development and Product Follow-Up work with tight deadlines and clear deliverables, certain key performance indicators for innovations appear to be an efficient tool to

apply in order to ensure that time actually is devoted also to innovative work; as such key performance indicators dictate what to deliver in terms of innovations. If totally aligned with concerned managers, innovation-related key performance indicators should be able to have a strongly supportive function and thus enable individuals to set off valuable time. However, such goals must be calibrated with existing key performance indicators within series development, in order to not entail any additional workload and thus undermine their potentially favourable effects on innovative performance of individuals.

6.2. Collective level

This subchapter separately analyses the empirical data of the pertinent areas of collaboration and managerial practices (see Figure 29).

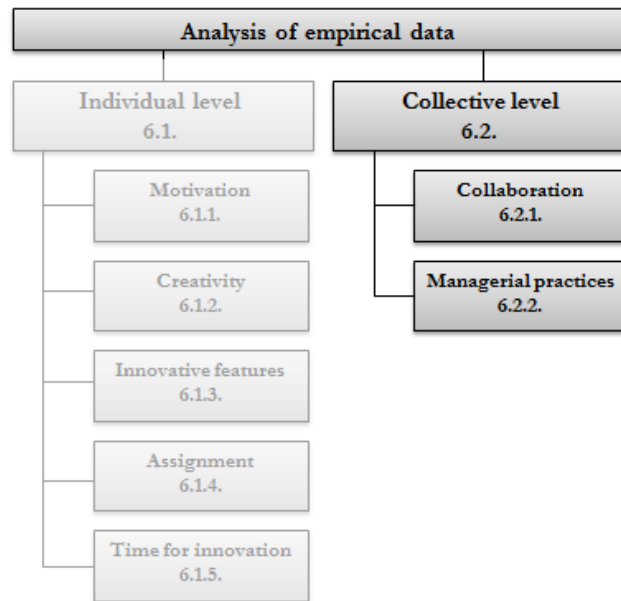


Figure 29: Analysis of empirical framework at collective level (Möller & Wahlqvist, 2012d)

6.2.1. Collaboration

Throughout this master thesis project, it has become clear that the area of collaboration is the most ambivalent one of the seven pertinent areas. While collaboration in general appears to be pertinent to innovative performance of individuals, there yet are indicators that imply that it may not simply be always directly favourable in itself.

As seen, a common pattern of critical prerequisites of collaboration, in order for it to be favourable to innovative performance of individuals, emerged throughout the interviews. Without these specified prerequisites (see 5.3.1.1) in place, the potential gains of collaboration appear to vanish as it runs the risk of failing. The ambivalent attitudes towards collaboration may be due to that the concerned individuals not have experienced any contexts where these prerequisites have been fulfilled. Out of this identified pattern of prerequisites, the factors of shared elementary knowledge, clear communication and unified attitudes stand out as the three most pertinent prerequisites. Shared elementary knowledge appears to lay the basis for favourable collaboration. Preferably, it should be organisationally assured, as it requires a holistic perspective to incorporate it. Shared elementary knowledge ensures that all participants can participate in technical discussions to a certain extent, while it also may facilitate spontaneous discussions of technical character. Indicatively, the prerequisites of shared elementary knowledge and of clear communication are correlated. As a common certain level of knowledge secures that the participants share the same basis and thus the same technical language, it is of particular importance also to clear communication. The latter one appears to be critical to the procurement of and to the refinement of ideas within collaborative contexts, at various levels of application.

First, all participants individually should embrace clear communication, as it assists them in explicitly expressing their reflections and thus contributing with their ideas. Moreover, clear communication should be in place between participating individuals, as it prevents inefficient misunderstandings and thus wastefulness of valuable input. Consequently, clear communication potentially may be particularly important within collaborative contexts that entail undetectable diversity, as such diversity often implies different problem approaches and thus may be more inclined to give rise to misunderstandings. Preferably, clear communication should probably be assured by the actual individuals themselves, as an inherently ongoing interpersonal constituent within collaboration. The factor of unified attitudes appears to be strongly related to personal chemistry. Favourable personal chemistry seems to enable different individuals to efficiently collaborate, as it may bring certain internal dynamics. Moreover, unified attitudes seem to entail shared levels of ambition, which consequently ensures a common direction of where to head and thus certainly enhances the individual will to collaborate of all participants.

The fact that collaboration entails implications that are favourable to innovative performance seems to be indisputable. Knowledge sharing and undetectable diversity appear to be significantly critical implications. Also, favourable dissensions stand out as relatively surprisingly pertinent. Knowledge sharing appears to constitute the basis of all collaborative activities and thus can be considered the most fundamental implication. Optimally, it ensures that all current sources of input are efficiently capitalised on and that all incipient ideas are uncovered. Moreover, it functions in various contexts; from spontaneous discussions to formal requests for certain input. Undetectable diversity appears to be favourable as it directly implies constant provision of heterogeneous input and outlooks. Complementary competencies seem to be its principal benefit in terms of innovative performance, as their broad scope of various expertise and diverse skills enables a continuous supply of new perspectives and new outlooks. Hence, e.g. to mix generalists with specialists and theoretical individuals with more practical ones appear to exert favourable influence on innovative performance. Complementary personalities are yet another main benefit of undetectable diversity that seems to be of importance to innovative performance. Optimally, this benefit should bring individuals with complementary personalities together, of whom many may contain desired intangible innovative features that are hard to acquire or to develop from scratch. Yet, such measures require total insights in the personalities of all potential participants. However, not all respondents seem to have experienced predominant benefits of detectably diversified teams. Throughout the interviews, it became clear that homogenous teams are considered more favourable at times; foremost due to similar knowledge bases, facilitated communication and enhanced personal chemistry. As these aspects correspond with the prerequisites of successful collaboration (see 5.3.1.1), it clearly implies that these prerequisites must be present within teams in order for their team members to securely experience undetectable diversity as favourable. As detectable diversity hardly has been empirically experienced within Scania, nothing can clearly be said of this generic form of diversity. However, general diversity appears to be more pertinent in contexts that stretch beyond relatively narrow technical fields, i.e. within areas that also comprise comparatively softer factors. This finding should be valid for undetectable diversity as well as for detectable diversity. When the technical field is relatively narrow and based on practical research and on tangible theory, the potential presence of diversity may not exert any larger influence on the actual results. However, when the

scope of the problem area is broader and less directed by established facts, totally diverse input that may derive from differences e.g. in expertise, background, ages and sexes most probably has significantly greater effects on the final results. Dissensions seem to exert positive influence on innovative performance of individuals in collaborative contexts, under certain conditions. First, only dissensions that can be categorised as cognitive ones appear to be favourable. As dissensions bring up disunited ideas to discussion, they may lead to novel combinations of ideas and to improved and refined solutions that often are better than the former ones. However, dissensions will only be critical for those individuals who dare to bring them up to the surface and who are not afraid of encountering them. Moreover, it is clear that dissensions must be actively acknowledged and solved, in order to imply significantly positive effects to the propensity to elaborate innovations.

Several designs of collaboration seem to be commonly applied within Scania. Internal teamwork, cross-functional work and workshops all appears to be recurrently incorporated constituents, as inherent elements of Scania's organisational manner of working. However, networks stand out as a form of collaboration that individuals themselves freely can initiate and engage in; and the most innovative individuals appear to do so. Their demonstrated go-ahead spirit along with their explicit will to actively search for complementary expertise and for new information seem to be a particularly important driving factor for their innovative performance. As networks offer nearly unlimited access to additional expertise and to rich related experience, they are critical sources that should be derived advantage from. Consequently, networks have the valuable ability to complete individuals' existing stock of knowledge, through continuous provision of required input. Hence, networks may be extra beneficial to individuals with a relatively low level of expertise. Moreover, networks ensure that existing expertise and organisational experience are fully exploited and capitalised on; i.e. they ensure a sort of knowledge efficiency that prevent duplication of work. This circumstance may in turn enhance the organisational learning of Scania, due to facilitated and more efficient knowledge sharing. Currently within Scania, exploitation of internal networks can be distinguished as particularly commonly applied. To informally and spontaneously capitalise on internal sources of information appears to not only bring pertinent input, but also to provide some sort of valuable inspiration for future innovative actions. However, the use of external networks appears to be equally important to innovative performance. In particular, the combination of the two forms of external networks along the different stages of the elaboration seems to be favourable, as it helps to ensure both inventive step and feasibility of the actual innovations. From here arises yet another critical aspect of general networks; the benefit of that the degree of exploitation of networks can be adjusted. I.e. networks can be used through various manners, depending on the very purpose of the initiatives. In addition to networks and apart from structured collaboration, skunk works appear to be critical to innovative performance of individuals, as commonly spontaneously initiated without any managerial imperative. Their strong focus on only one specific problem along with their purposefully composed set of required competencies are factors that seem to drive innovative performance. As skunk work teams are spontaneously put together in accordance with the encountered problems or the incipient ideas, the team constellations are uniquely formed for and adapted to each occurrence and thus should enjoy the best conditions in order to elaborate the most feasible solutions. As the members of skunk work teams often do not work together

otherwise, shared clearly defined goals seem to be critical for beneficial and efficient skunk works. Such goals assure that every participant is on the same track and aims at the same deliverables. Moreover, as skunk works are executed during a very short period of time that often implies only a few hours, shared clearly defined goals assists in further strengthening the very temporary focus of the work.

6.2.2. Managerial practices

The fact that managers exert influence on innovative performance of individuals has clearly emerged throughout this master thesis project. However, to which extent and through which means are not as commonly clear. Principally, it appears that managerial influence on innovative performance is much more indirect than direct in influencing character.

Indicatively, two areas of managerial responsibility appear to exert indirect managerial influence that is favourable to innovative performance; provision of adequate work tasks along with managerial encouragement and managerial recognition. Commonly throughout the interviews and as previously discussed, adequate work tasks appear to be of great importance to innovative performance of individuals. Not only as their innovation potential lays the basis for future innovations, but also as adequate work tasks appear to render individuals particularly alert to incipient ideas, to novel research and to arising patterns. However, the innovation potential of the assigned work tasks or the possibility to provide radically different work tasks may often be out of managerial control, which is why this influence can be considered of indirect character. Yet, managers can probably do more within the degree of autonomy of the assigned work tasks. Managers are pertinently responsible for providing a balanced degree of autonomy within work tasks, in order to ensure that the positive effects of adequate work tasks are further incorporated. The factor of managerial encouragement and managerial recognition appears to be relatively important to innovative performance, but to very various extents for various individuals. It seems to be fundamental to some individuals, while others are indifferent to this specific sort of encouragement and recognition and rather prefer to receive it from surrounding colleagues. However, the potential influence of the factor of managerial encouragement and of managerial recognition does not appear to imply any impeding effects on innovative performance of any individual, as the indifferent individuals simply seem to be just indifferent. Through which means managerial encouragement and managerial recognition optimally should be applied cannot be definitely stipulated or standardised, as the individual perceptions of it vary considerably. Hence, it should be of utmost importance to understand the preferences of each individual and adapt the means accordingly.

The applied managerial styles within Scania during the years of 2009, 2010 and 2011 appear to differ considerably. Similarly, individual perceptions of which sort of managerial style that is the most favourable to innovative performance vary. However, as the latter one was expressed as a wish throughout the interviews, one must be aware of that the provided answers are based on a mix of personal experience and pure speculations and thus are not entirely empirically fortified. Due to the relatively divergent range of provided answers, no clear patterns of the most favourable managerial style to innovative performance of individuals can be clearly distinguished. Within the aspect of managerial styles, it is difficult to distinguish any clear pattern of which

degree of managerial proactive intervention in individuals' work tasks that is the most favourable to innovative performance, due to fundamentally diverse individual perceptions. However, it can be established that the degree of managerial proactive intervention exerts some influence on innovative performance, but without any clear identified pattern of preferable degree. Some individuals seem to regard it as a sign of encouragement, while others look upon it as nothing but an act of control. Yet, managerial proactive intervention is pertinent to have in mind when considering innovative performance, as it only depends on the behaviours of managers. I.e. it should be relatively easy for managers to adapt their degree of proactive intervention to individual preferences and constantly adjust it accordingly. However, such flexible application of managerial proactive intervention most probably requires clear and open communication between managers and individuals, in order to clarify expectations, prerequisites and preferences. Similarly, it is equally difficult to elucidate any distinct pattern of which degree of managerial functional knowledge in relation to their subordinated individuals that is most beneficial to innovative performance. However, it cannot even be established whether the degree of managerial functional knowledge actually exert any influence at all on innovative performance of individuals.

7. Conclusions

This chapter aims at presenting the most pertinent conclusions of this master thesis project, which have derived from the executed analysis of the empirical data in accordance with the structure of the presented empirical framework. The MCLATC framework for individual innovative profile is introduced; it is elaborated by the authors and summarises the concluded critical success factors for innovative performance of individuals within Scania. It should be remembered that these conclusions have emerged in accordance with the interpretations of the authors.

Throughout this master thesis project, 24 top innovators within Scania have been interviewed in order to identify critical success factors for innovative performance of individuals within Scania specifically. The interviews generically followed the structure of the presented theoretical framework of the six pertinent areas that research identifies as critical to innovative performance (see Figure 8). Yet, due to the discussed ambiguity of established relevant theory and of existing pertinent research within the field of critical success factors for innovative performance of individuals, the theoretical framework was only used as a support to the gathering of empirical data. Through analysis of the pertinent areas of the empirical framework that emerged throughout the interviews (see Figure 13), seven pertinent main conclusions that represent the principal findings of this master thesis project have been drawn.

7.1. Concluded critical success factors

Six principal critical success factors for innovative performance of individuals within Scania have emerged from this master thesis project; five factors on individual level and one factor on collective level (see Figure 30). These six identified critical success factors are motivation, creativity, innovative features, assignment, time for innovation and collaboration. Hence, the factor of managerial practices has not been identified as a critical success factor for innovative performance within Scania.

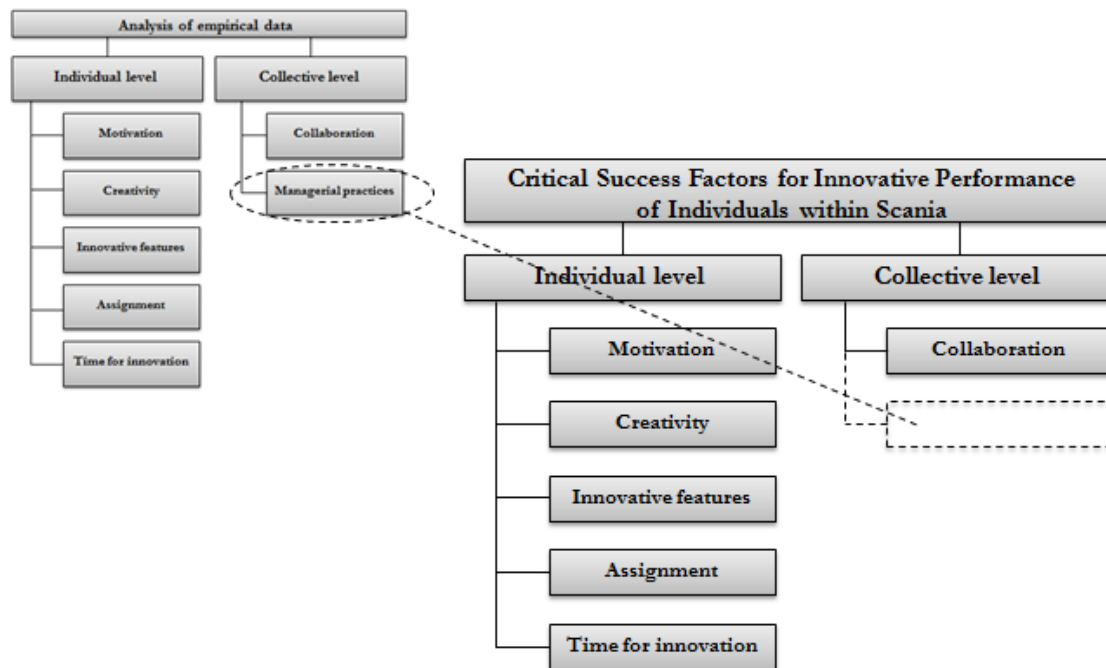


Figure 30: Critical success factors for innovative performance of individuals within Scania (Möller & Wahlqvist, 2012d)

Motivation is concluded to be a critical success factor for innovative performance of individuals within Scania. As a fundamental condition of the presence of general motivation, intrinsic motivators must be present within all individuals. Moreover, a balanced mix of commonly valid extrinsic motivators must be secured. Optimally, such a mix should comprise a broad range of synergistic extrinsic motivators, in order to efficiently optimise its motivational yield. Hence, intrinsic motivators will be directly stimulated simultaneously as the incorporated extrinsic motivators also exert immediate motivational influence on the actual individual. Recurrent recognition and continuous encouragement from managers and from the overall organisation of Scania, adequate level of time resources, character of assignment and external competition are the most commonly valid synergistic extrinsic motivators. Notably, monetary remuneration does not exert motivational influence to any significant extent.

Creativity is concluded to be a critical success factor for innovative performance of individuals within Scania. All of its three components, i.e. creativity skills, task motivation and expertise, must be in place within individuals in order to secure their durable creativity. However, it is fully possible to be stronger in one component and weaker in another and still be creative, as the components partly compensate for each other. Expertise is the least critical component of creativity, as it always can be compensated for through various external means, to some extent. Hence, sufficient expertise must be present and easily accessible within Scania, whereas individuals do not have to be experts themselves in order to be successfully creative; as long as they know when and how to search for required expertise. Creativity skills are the most critical component of creativity; in themselves, but also due to their strong compensating effects. Cognitive skills are their most important subcomponent of creativity skills and can be actively developed over time.

Innovative features are concluded to be a critical success factor for innovative performance of individuals within Scania. Different individuals possess various sets of innovative features and are differently strong in various ones. I.e. no single innovative feature is distinguished as utterly critical to innovative performance. However, it is critical that such sets represent a balanced mix of innovative features from each of the three subcategories of personality traits, practical approach and intellectual skills, due to their complementary functionalities. Preferably, individuals must be particularly strong in at least one innovative feature of each subcategory. Innovative features can be strengthened over time through individual actions or in symbiosis with the organisation of Scania, in accordance with the feasibility of each subcategory. The innovative features of practical approach are the easiest to strengthen over a limited period of time, preferably through a balance of individual efforts and organisational efforts. On the contrary, the development of the innovative features of personality traits and of intellectual skills respectively requires high level of self-knowledge along with demonstrated ownership and significant stakes of individuals.

Assignment is concluded to be a critical success factor for innovative performance of individuals within Scania. As constituted of an assigned principal work field and its inherent work tasks, its influence is mainly in organisational hands and relatively beyond the direct control of individuals. The assigned work field, e.g. Pre-Development, Continuous Introduction or Product Follow-Up within Scania R&D, determines the general degree of innovation potential and thus lays the basis for actual opportunities of innovations. Yet, it is the assigned work tasks therein that are utterly critical to innovative performance, through their degree of novelty and thus through their degree of innovation potential. It is particularly critical for innovative performance within Continuous Introduction and within Product Follow-Up, due to their predominant focus on series development and on incremental improvements.

Time for innovation is concluded to be a critical success factor for innovative performance of individuals within Scania. A certain degree of incorporated organisational slack throughout the organisation of Scania is indispensable, on condition that the three prerequisites that secure its significantly positive influence on innovative performance of individuals are considered. First, organisational slack must be carefully balanced, instead of offering constant access to an excess of time resources. Moreover, it must be flexible in character and possible to take advantage of when required, rather than to occur as recurrent scheduled activities. Yet, organisational slack will never be critical to innovative performance of individuals within Scania, if individuals do not manage it properly and efficiently and thus ensure its value adding stakes. At times, individuals must be assisted in freeing up time for innovation; especially within Continuous Development and within Product Follow-Up where time resources are particularly scarce. Innovation-related key performance indicators that reflect organisational expectations of innovations are an efficient measure in order to assure that some time actually is used also for long-term innovative work and not only for daily ad hoc issues within these work fields.

Collaboration is concluded to be a critical success factor for innovative performance of individuals within Scania. However, it is only critical on condition that certain utterly fundamental prerequisites are in place; i.e. shared elementary knowledge, clear communication, unified attitudes, common vision and shared goals and suitable collaboration structure. The three

first are the most important prerequisites, where shared elementary knowledge must be exclusively secured by the organisation of Scania meanwhile clear communication must be secured by its individuals. However, all prerequisites must be fulfilled to some extent within all designs of collaboration except networks, for which only the two first prerequisites are valid. Networks and skunk works are the applied designs of collaboration within Scania that are the most favourable to innovative performance. Significantly, the recurrent purposeful application of networks and skunk works on a voluntary basis clearly distinguishes particularly innovative individuals from the multitude within Scania.

Managerial practices are not concluded to be a critical success factor for innovative performance of individuals within Scania. Clearly, the two specified adherent areas of managerial practices, i.e. areas of managerial responsibility and managerial styles, partially exert influence on innovative performance of individuals; but not to any critically large extent. Moreover, the influence of managerial practices on innovative performance of individuals is indirect rather than direct in character. Hence, the ambiguity of the primordial primary sources of the exerted managerial influence is relatively large. Yet, managerial practices and their significance to innovative performance and innovative achievements must not be neglected. E.g. even if managerial encouragement and managerial recognition, as a subset of areas of managerial responsibility, does not exert any critical influence on innovative performance of individuals, these aspects still are identified as favourable.

7.2. MCIATC framework for individual innovative profile

In order to facilitate the practical application of the six identified critical success factors for innovative performance of individuals within Scania and thus enhance their value adding potential, the authors have summarised the factors through the elaboration of an applicable framework (see Figure 31). The authors name this framework the *MCIATC framework for individual innovative profile*. I.e. its name is an abbreviation of the initial letters of each of the six concluded critical success factors.

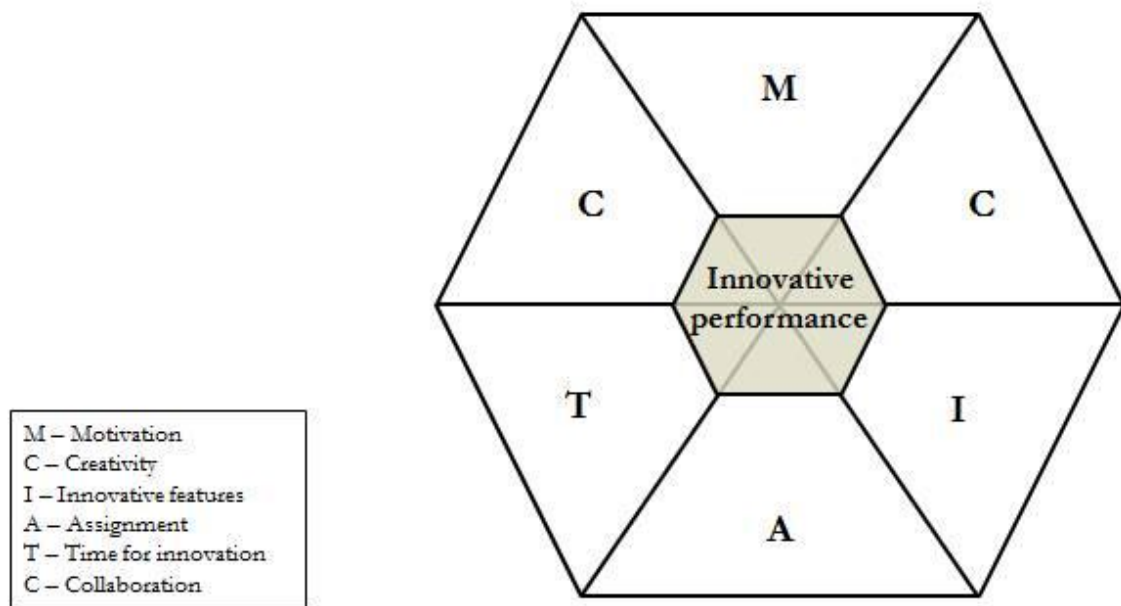


Figure 31: *MCIATC framework for individual innovative profile* (Möller & Wahlqvist, 2012d)

The purpose of the *MCIATC framework for individual innovative profile* is to function as a guiding profile of the optimally innovative individual, through the reflection of its six critical dimensions; i.e. the six identified critical success factors for innovative performance of individuals within Scania. Each individual has its own unique innovative profile, as the degree of how well each dimension is developed varies from individual to individual. The *MCIATC framework for individual innovative profile* may support both the organisation of Scania and its individuals for the purpose of enhancing innovative performance. The organisation of Scania may apply it as a selection basis for identification of new candidates, along with continuous evaluation of innovative performance of existing employees. The individuals within Scania may benefit from it as a tool in order to evaluate themselves along each dimension and thus potentially identify areas to improve, for enhanced innovative performance. Hence, the authors are confident of that the *MCIATC framework for individual innovative profile* will support the enhancement of the overall innovative performance of individuals throughout Scania.

8. Recommendations of Further Work

This closing chapter aims at presenting the recommendations of further work. These recommendations have arisen from the general conclusions of this master thesis project; i.e. the identified critical success factors for innovative performance of individuals within Scania. First, recommendations of appropriate actions in order to capitalise on these identified critical success factors are presented. Thereafter, the trustworthiness and the authenticity of the conclusions of this master thesis project are discussed. An account of the contribution of this master thesis project concludes this chapter and also this master thesis.

8.1. Recommendations of appropriate actions

The recommendations of appropriate actions to undertake, in line with the concluded critical success factors for innovative performance of individuals within Scania, can be divided into two subcategories. The first subcategory treats recommendations to the organisation of Scania, while the second one treats recommendations to the individuals within Scania. A summary of these two subcategories, with their adherent areas of recommendations, is presented in Table 3.

Table 3: Subcategories of areas of recommendations (Möller & Wahlqvist, 2012g)

| Area of recommendations | Organisation of Scania | Individuals within Scania |
|-------------------------|------------------------|---------------------------|
| Motivation | X | X |
| Creativity | X | X |
| Innovative features | X | X |
| Assignment | X | |
| Time for innovation | X | X |
| Collaboration | X | X |

8.1.1. Recommendations to the organisation of Scania

- Secure the incorporation of a balanced mix of extrinsic motivators throughout Scania. In particular, include and focus on synergistic extrinsic motivators, in order to capitalise on their immediate positive effects on intrinsic motivators. Optimally, endeavour to understand the motivational preferences of different individuals, for the purpose of applying the most pertinent extrinsic motivators.
- Ensure that all three components of creativity are well founded within all individuals. Focus foremost on the components of creativity skills and of task motivation. Within the component of creativity skills, foremost focus on cognitive skills and throw light upon their importance to creativity. Therein, actively assist individuals in developing their cognitive skills through incorporation of purposeful workshops along with recurrent exercises in cognitive problem solving. Ensure the component of task motivation

through the incorporation of the above-mentioned mix of synergistic extrinsic motivators. Put across to individuals that expertise is not of utmost significant importance to innovative performance; and hence encourage and inspire them to take on creative challenges, even if they do not possess the highest level of required expertise. Therein, thoroughly inform individuals of through which means and wherefrom to procure certain expertise when required. Finally, if aiming at employing creative individuals; have in mind to evaluate their creativity skills along the recruitment process, instead of only focusing on their level of pertinent expertise.

- Draw the attention of individuals to the significance of innovative features to innovative performance, through pointing out the pattern of the necessary trinity of subcategories. Actively support individuals in their development of practical approach, through encouraging them to develop their own appropriate toolbox. Potentially along recruitment processes, search for individuals who possess this critical trinity of innovative features.
- Guarantee that all work tasks within Continuous Introduction and within Product Follow-Up entail some degree of innovation potential and thus a certain amount of time for free reflection and opportunities of innovations. Hence, grant all individuals with the possibility to be exposed to novel technologies and to devote at least a small share of their working hours to work tasks that are more related to the explorative character of Pre-Development.
- Ensure the incorporation of a balanced and flexible form of organisational slack throughout Scania. Establish key performance indicators for innovative performance within Continuous Development and within Product Follow-Up, in order to facilitate allocation of time to activities related to innovation, beyond their daily work tasks. Implement follow-up systems that secure that this allocated time is value adding to innovative performance. Regard allocation of time as a sign of recognition.
- Secure that the critical prerequisites of favourable collaboration constantly are in place throughout Scania; the organisation is particularly responsible for the prerequisite of shared elementary knowledge. Render individuals aware of the favourable effects of networks and of skunk works and encourage them to continuously apply these spontaneous designs of collaboration. Therein, facilitate for the application of networks and of skunk works through the establishment of an easily accessible organisational structure that demonstrates individuals with various expertise throughout Scania.

8.1.2. Recommendations to individuals within Scania

- Reflect on and specify the motivators that are particularly critical to your innovative performance; intrinsic ones as well as extrinsic ones. Communicate them to your manager.

- Take on the responsibility for the continuous development of your component of creativity skills and endeavour to actively strengthen them in order to enhance your creativity, simultaneously as you apply them within Scania. Consider your set of cognitive skills and acknowledge the specific actions that you must undertake in order to significantly enhance it. Thoroughly reflect on your personality characteristics and scrutinise which ones that must be strengthened. Take charge of your component of task motivation, through communicating your motivational preferences to your closest manager.
- Secure that you have some particularly strong skills within all three subcategories of innovative features. Reflect on your level of the specified important innovative features and actively take on the responsibility for their purposeful development. Benefit from the applicability of the innovative features of practical approach. Scrutinise yourself and your level of self-knowledge. Pay extra attention to the innovative features of personality traits and of intellectual skills, as only you can enable their fortification.
- As the particular resource of time exerts significant influence on innovative performance; acknowledge time as an invaluable scarce resource and treat it accordingly. Ensure that you efficiently manage the time that you have been granted; the ordinary one as well as the potential extra one. Take on the responsibility for your own time and recognise that your management of time influences the amount of available time left.
- Acknowledge your share of responsibility for securing the presence of the critical prerequisites of favourable collaboration; in particular the prerequisite of clear communication. Endeavour to spontaneously initiate and engage in both networks and skunk works on a continuous basis and recognise your part in the realisation of their recurrent occurrence.

8.2. Trustworthiness and authenticity

The presented established research methodology has been the main tread throughout this master thesis project. It has functioned as an utterly supportive framework and has been followed without any deviations. Hence, the authors are confident of that the presented conclusions are trustworthy and authentic, but also useful and valuable to Scania. However, one must be aware of that the application of a system approach in combination with mainly qualitative research method and qualitative data analysis inherently renders the conclusions slightly more subjective. Yet, it is the conviction of the authors that critical success factors for innovative performance cannot be entirely quantitatively and thus exclusively objectively analysed. After all, which factors that critically influence individuals to excel largely lie in their subjective perceptions of the reality. Hence, the authors have had and still have confidence in the carefully considered choice of research methodology.

The reliability of the presented conclusions of this master thesis project ought to be regarded as strong. The presented conclusions can be considered thoroughly supported, through strong authenticity in data gathering and in executed analyses. The applied research methodology has been thoroughly described in detail. As mentioned, no deviations have occurred. Hence, it enables potential readers to entirely grasp the methodology approach, simultaneously as it renders scrutiny of this master thesis relatively easy. Moreover, the traceability of this master thesis is of a high level, as all used sources have been clearly stated. Even the internal sources that derive from informal or from classified sources within Scania have been stated to the largest possible extent. However, the sources of the empirical data have not been stated in detail, due to the use of a system approach. Yet, a compilation of all respondents can be found in Appendix E. The choice of sampling frame, i.e. Scania's internal patent database, was thoroughly selected, in accordance with the patent-intense character of the automotive industry (see 2.4). Yet, as the sample was selected in accordance with the criterion of selection of number of registered invention submissions (see 3.3.7), some innovative individuals potentially have not been covered; those individuals who may have elaborated innovations that have not been filed for patent applications. Moreover, innovative individuals who have not worked with innovation-related work tasks during the years of 2009, 2010 and 2011 neither have been covered through the actual sample. The interview template was elaborated in accordance with the findings of the studied theory. This presented theory has been put together from a variety of well-judged sources, in order to provide the largest possible coverage. As the interviews also allowed digressions, they should have covered all areas that potentially can be considered critical to innovative performance, of individuals within the scope of the delimitations of this master thesis project (see 1.3.1). Every single interview has been transcribed word-for-word, in order to minimise the risk of gaps, of misunderstandings and of misinterpretations along the account of the empirical data. From all these depicted circumstances, one can infer that the presented conclusions of this master thesis project are reliable.

The validity of the presented conclusions of this master thesis project ought to be of considerable height. As only the immediate sources of the invention submissions, i.e. the top innovators, have been interviewed, there have not been any intermediaries between the studied objects and what

actually has been studied. Hence, the empirical findings and thus the derived presented conclusions represent the studied top innovators as objectively as possible. The described appropriate methods for data gathering (see 3.4.9) have been consistently applied and followed without deviations throughout this master thesis project, which further enhances the validity. Specifically, all respondents have been exposed to exactly the same interview template and thus exactly the same questions. However, due to the semi-structured character of the interviews, the focus slightly varied in accordance with the individual experience of every respondent. In order to ensure the provision of primary data and thus secure the connection of the studied object and what actually is studied, all respondents were explicitly asked in the very beginning of the interviews to only express their own lived experience. Hence, nearly all empirical data were of primary character, as based on lived experience and not on any speculations; a circumstance that further enhances the validity of the presented conclusions. Moreover, there have been no attempts to force the presentation of, and thus use of, theoretical frameworks throughout this master thesis project. Rather, the theoretical chapter has been elaborated in accordance with the purpose of this master thesis project (see 1.3). Since this circumstance clearly has influenced the interviews, it consequently should imply stronger validity. In order to further increase the validity, triangulation has been applied throughout this master thesis project. It has been used for methods for data gathering as well as for methods for data analysis. Data have been gathered through a variety of different data gathering techniques (see 3.4.9). The gathered data have been of qualitative character mixed with data of quantitative character, simultaneously as the gathered data have derived from both primary sources and secondary sources (see 3.6.7). From all these depicted circumstances, one can infer that the presented conclusions of this master thesis project are valid.

The degree of transferability of the presented conclusions of this master thesis project is relatively subtle. In order to enable qualitative generalisation of the conclusions on a larger scale, 24 interviews are not enough. Moreover, as the case study and thus also the gathering of the empirical data have occurred exclusively within Scania, the conclusions can be considered relatively Scania-specific. However, as the areas of the interview template were formulated in accordance with generally applicable theory and the research context and the delimitations (see 1.3.1) have been explicitly described, it should be possible to transfer the presented conclusions across contexts and organisational settings that are very similar to those of Scania; i.e. other knowledge-intensive manufacturing companies on mature markets. Hence, the transferability of the presented conclusions can be considered to be of relatively moderate height.

The representativity of the presented conclusions ought to be fairly low, as this master thesis project foremost is based on a case study of a specific company. Hence, the presented conclusions cannot be generalised.

The trustworthiness and the authenticity of all sources used throughout this master thesis project have been critically evaluated and scrutinised on a continuous basis. The aim has been to apply a broad range of only authentic sources, in order to obtain a correct representation of information. Throughout the desk studies, foremost academic literature and academic articles of scientific journals that apply peer-review have been used. The majority are of relatively recent date. Through applying a variety of cited sources that implicate and point towards the same sort of

trends and results, the authors have been confident in the provision of a correct theoretical representation. No theory has been built on ambivalent existing theory or on vague research. The applied sources have derived from well-judged academic origins. Moreover, the originators of the sources have been thoroughly scrutinised, in order to secure the academic height and the academic standing of these authors. Throughout the survey, all used data were directly taken from Scania's internal patent database. As described, these data of registered invention submissions precede the data of registered patents, which in turn are officially available outside Scania. Hence, the level of trustworthiness and of authenticity ought to be extremely high, due to the unlikely probability of false information. Throughout the case study, 24 top innovators were interviewed in order to avoid far too narrow empirical data. The utmost majority of the provided data were of primary character and based on lived experience of the respondents. Hence, one must presuppose that the respondents answered all questions in accordance with the truth.

8.3. Contribution of this master thesis project

The explanative research ambition (see 3.2.6) of this master thesis project has been fulfilled, as Scania has been provided with six specific critical success factors for innovative performance of individuals. Therein, connections and interactions between the identified critical success factors have been revealed and explained, which further ought to enhance the corporate understanding of and the practical implications of this contribution. Moreover, Scania and its individuals have been provided with related recommendations of appropriate actions to undertake in order to enhance innovative performance of individuals throughout the organisation. Hence, the overall purpose of this master thesis project has been fulfilled, through the secure attainment of both its primary objective and its secondary objective.

Yet, this master thesis project has not only provided Scania with their requested critical success factors for innovative performance of individuals along with adherent recommendations. Beyond these objectives, this master thesis project has also contributed to rendering the overall perception of innovative performance of individuals more complex and also more difficult. As this master thesis demonstrates clear interlinks between and strong interdependency of different critical success factors and their underlying constituents, it clearly indicates that the complexity of innovative performance of individuals cannot and ought not be entirely simplified.

In addition to providing a more veracious representation, this master thesis project has also contributed with a number of novel discoveries related to critical success factors for innovative performance of individuals within Scania. First, it has discovered one entirely novel critical success factor that not appeared in theory; i.e. the factor of assignment. Moreover, this master thesis has provided a more nuanced representation of the necessity of time to innovative performance. It has revealed that time is a strong synergistic extrinsic motivator, but it has foremost demonstrated that time in itself is the only resource that is a direct critical success factor for innovative performance of individuals. Therein, this master thesis project has heavily emphasised that time is a critical success factor only on condition that certain criteria of the allocation are fulfilled. Further, it has discovered that the factor of collaboration is a critical success factor for innovative performance of individuals only if certain prerequisites are securely in place throughout the collaborative context. Moreover, this master thesis project has provided a more unified and categorised representation of critical innovative features, which complement existing theory that is relatively motley in character. Therein, it has demonstrated the importance of possessing a balanced set of particular innovative features. Finally, this master thesis project has discovered that managerial practices not are utterly critical to innovative performance of individuals within Scania, through providing a more nuanced representation of their influence.

In addition to these achievements, another significant contribution has been accomplished. The authors have provided a directly applicable specific profile of particularly innovative individuals; the *MCLATC framework for individual innovative profile* (see Figure 31). Thereby, the authors have granted Scania and its individuals an efficient tool, both in order to recruit particularly innovative individuals to Scania and in order to enhance overall innovative performance of individuals throughout Scania. Such a framework has not been identified in the studied theory. The authors are confident of that it will support individuals within Scania, for a more innovative Scania.

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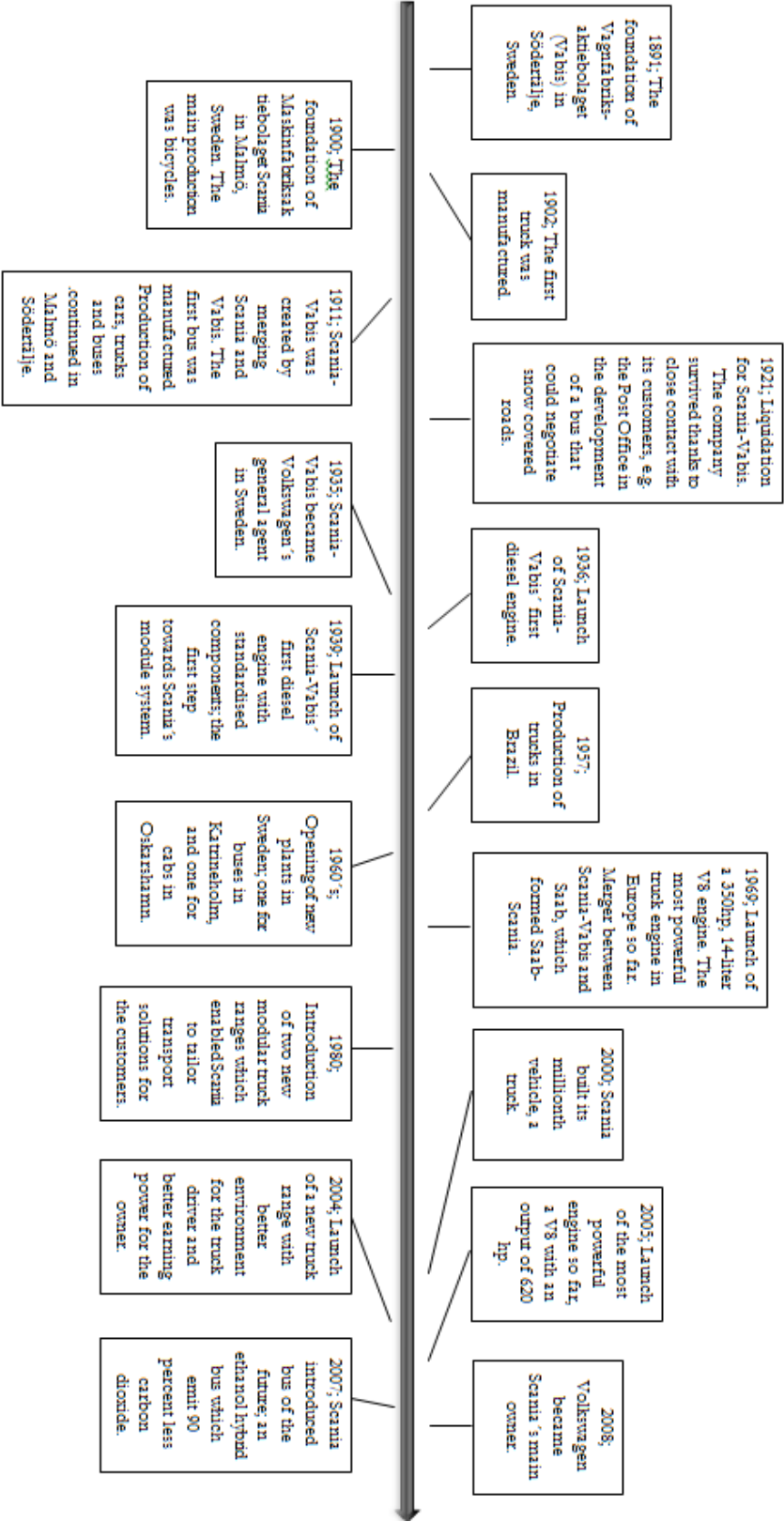
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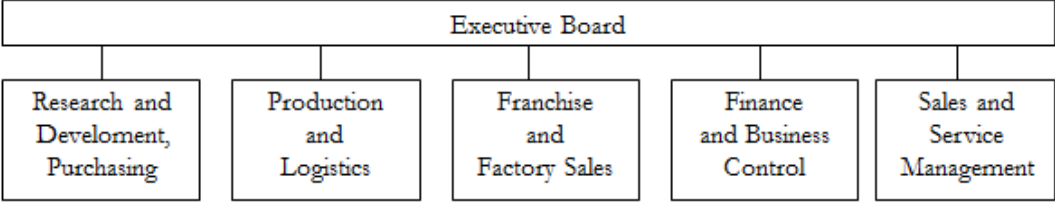
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Appendix A: Timeline of the history of Scania



(Scania, 2012b)

Appendix B: Organisational structure of Scania



(Scania, 2012h)

Appendix C: Core values of Scania

- **Customer first**

“Through good knowledge of its customers’ business operations and conditions, Scania delivers solutions that contribute to customer profitability by means of high earning capacity and low operating costs, while promoting a sustainable environment. The customer’s operations are at the centre of the entire value chain: from research and development via procurement and production, to sales, financing and delivery of services.”

- **Respect for the individual**

“Respect for the individual means recognising and utilising each employee’s knowledge, experience and ambition in order to continuously improve and develop working methods. Inspiration and new ideas are born out of day-to-day operations. This helps ensure higher quality, efficiency and job satisfaction.”

- **Quality**

“High profitability for the customer throughout the product life cycle depends on delivery of high-quality solutions from Scania. Through good knowledge of customers’ needs, Scania can continuously improve the quality of its products and services. Elimination of all forms of waste is the way Scania can ensure that all deliveries meet the expectations of demanding customers. Deviations from targets and standards are used as a valuable source of continuous improvement in Scania’s processes.”

(Scania, 2012f)

Appendix D: Scania R&D Factory

Scania R&D Factory is elaborated in order to fulfil the corporate objective of Scania R&D (see 2.3). It is an elaborated structural framework that describes how individuals within Scania R&D's should approach novel problems and continuous work tasks. If the corporate objective describes what Scania R&D should develop, Scania R&D Factory explains how individuals should think and proceed in the Product Development process (see 2.3.2). Scania R&D Factory is heavily flow-oriented and provides guiding principles and work methods that are required within the Product Development process and throughout the working flow, in order to deliver products and services of considerable level of inventive step. The overall purpose of Scania R&D Factory thus is to generate value for Scania's customers, mainly through the development of knowledge and through the elimination of waste. Scania R&D Factory is internally named 'the House' due to its explanative appearance. It is physically present everywhere throughout the corporate working area of Scania R&D.

Building blocks of Scania R&D Factory

Scania R&D Factory is constituted of four separate building blocks, which are illustrated through 'the House'. These constituents are core values, guidelines, principles and priorities.

- Core values

The core values are obviously the same for Scania R&D as for Scania as a whole (see 2.1.3 and Appendix C). However, the third core value of Scania, *Quality*, is slightly modified to *Elimination of waste* in the context of Scania R&D. *Elimination of waste* is considered a subset of *Quality*. The core values reflect the overall corporate culture of Scania and more specifically lay the foundation to the development work within Scania R&D and within Scania R&D Factory.

- Guidelines

The guidelines entail *Leadership*, *Competence* and *Creativity*. *Leadership* represents a culture of responsibility where individuals collaborate and take ownership of their actions. *Competence* and *Creativity* interact in order to elaborate products and services of considerable level of inventive step and are considered the most important underlying factors of Scania R&D Factory.

- Principles

The principles provide a guiding way of thinking throughout the working flow. They consist of *Demand driven flow*, *Normal situation – Flow orientation*, *Right from me* and *Continuous improvement*. *Demand driven flow* permeates Scania R&D. The demands derive from Scania R&D's internal customers for increased knowledge or refined information. Hence, they drive the R&D flow. These demands determine what deliverables that should be developed and when these deliverables should be delivered. *Normal situation – Flow orientation* describes how the work within Scania R&D should be executed. It includes standardised methods, modularisation, CEPPSS (Continuous Improvement Properties Planned in Small Steps), cross-functional and parallel work methods,

visualisation and balancing. *Right from me* functions as a quality assurance to avoid deviations and focuses on having the right conditions and the necessary attitude to do right. Direct feedback is an important adherent part of this principle. *Continuous improvement* helps individuals and their applied processes to continuously become more efficient. This principle is about maintaining, challenging and improving the normal situation as well as resolving deviations so that they do not arise again.

- **Priorities**

The priorities consist of four levels; *Health and environment, Quality, Delivery precision* and *Cost*. They assist the individuals of Scania R&D in focusing on the right things in their daily work tasks.

(Scania, 2012i)

Appendix E: List of respondents

| Name | Title | Total number of innovations |
|--------------|--------------------------|-----------------------------|
| Respondent1 | Group Manager | 55 |
| Respondent2 | Senior Engineer | 42 |
| Respondent3 | Team Manager | 37 |
| Respondent4 | Technical Manager | 36 |
| Respondent5 | Development Engineer | 33 |
| Respondent6 | Section Manager | 33 |
| Respondent7 | Senior Engineer | 31 |
| Respondent8 | Technical Manager | 31 |
| Respondent9 | Senior Engineer | 29 |
| Respondent10 | Senior Technical Advisor | 28 |
| Respondent11 | PhD Student | 24 |
| Respondent12 | Group Manager | 24 |
| Respondent13 | Project Manager | 24 |
| Respondent14 | Development Engineer | 24 |
| Respondent15 | Senior Engineer | 20 |
| Respondent16 | Group Manager | 19 |
| Respondent17 | Senior Engineer | 19 |
| Respondent18 | Senior Engineer | 18 |
| Respondent19 | Expert Engineer | 18 |
| Respondent20 | Senior Engineer | 18 |
| Respondent21 | Group Manager | 18 |
| Respondent22 | Senior Designer | 16 |
| Respondent23 | PhD Student | 15 |
| Respondent24 | Development Engineer | 15 |

Appendix F: Interview template

This interview template will be used throughout all interviews. It consists of seven prepared main questions with adherent subquestions. The six first questions focus on the six identified pertinent areas of theory, while the seventh question has a more open and additive approach. Each main question has a clear and elaborated purpose, which is adjacently presented. However, these purposes will never be presented to the respondents during the interviews.

As described in the methodology chapter, the interviews will be of semi-structured character. This interview template thus contains both open questions and closed questions. All closed questions will be formulated in exactly the same manner and will be put in the same order throughout all interviews. The open questions will invite the respondents to develop their points.

| Respondent name | Title | Date |
|-----------------|-------|------|
| | | |

The information presented below will be presented to the respondents prior to the actual start of the interviews:

- This master thesis project constitutes the final part of our Master of Science in Industrial Engineering and Management at Lund University. It is performed in cooperation with Scania.
- The purpose of this master thesis projects is to identify critical success factors for innovative performance of individuals within Scania. The interview objects have been identified through a quantitative survey of the number of invention submissions that were registered during the years of 2009, 2010 and 2011.
- The final version of this master thesis will be officially published and will thus be accessible to public. All quotes will be kept anonymous and no information or specific answers will be linked to specific individual respondents. The recording that is made during the interview will also be confidentially treated.*
- The interview will last for about one hour, and includes both open and closed questions; you are encouraged to develop your answers. Please respond based on your personal experiences and your own opinions, rather than based on what you believe is the general opinion at Scania.

*All respondents will be asked to approve the recording. If they do not approve it, no recording will be made

Character of respondents

| | X |
|--|---|
| Gender | |
| Male | |
| Female | |
| | |
| Work specific information | |
| Estimated time devoted to Pre-Development (percent) | |
| | |
| Age | |
| <30 | |
| 30-39 | |
| 40-49 | |
| 50-59 | |
| 60+ | |
| | |
| Total number of years of employment within Scania | |
| 0-5 | |
| 5-9 | |
| 10-14 | |
| 15+ | |
| | |
| Other | |
| Truck/Bus driving license | |

1. Motivation

- a) Has your personal drive affected your innovative performance? If yes; how?
- b) Have any motivational incentives affected your innovative performance? If yes; how?
- c) Theory claims that it exists intrinsic motivators and extrinsic motivators. We will now explain them and their functionalities. (...) If you think back to times when you have generated innovations; what types of motivators were important to your demonstrated innovative performance?

Purpose: Theory claims that intrinsic motivators should be combined with specific synergistic extrinsic motivators in order to optimise innovative performance. The question aims at exploring this further.

| a) | Yes | No | Comments |
|----|-----|----|----------|
| | | | |
| b) | Yes | No | Comments |
| | | | |

| c) | X | Comments |
|---------------------------------|---|----------|
| Intrinsic motivators | | |
| Pertinent interest | | |
| Sense of challenge | | |
| Sense of autonomy | | |
| Enjoyment | | |
| Satisfaction | | |
| Other | | |
| Extrinsic motivators | | |
| Monetary remuneration | | |
| Recognition | | |
| Particular rewards | | |
| Deadlines | | |
| Clearly defined goals | | |
| Constructive feedback | | |
| Competition (internal/external) | | |
| Other | | |

2. Innovative features

- a) When you elaborate innovative solutions to problems; does your personality affects how you eventually identify and accomplish the solution? If yes; how?
- b) If you think back at times when you have generated innovations; in what way has your personality assisted and supported you? Please answer as specifically as possible and do not hesitate to provide examples.

Purpose: Theory claims that certain innovative features are primordial to innovative performance. The question aims at understanding which innovative features that actually exert influence on innovative performance and to which extent.

| a) | Yes | No | Comments |
|----|-----|----|----------|
| | | | |

| b) |
|----|
| |

3. Collaboration

- a) When elaborating innovations; have you collaborated with other individuals to any specific extent? Please develop your answer.
- b) Do you think that collaboration generally helps you to generate innovations? If yes; in what manner and through which means?
- c) It exists several designs of collaboration that may be applied various contexts. We will now explain these designs. (...) Have you ever worked with any of these designs of collaboration designs when elaborating innovations? If yes; please tell us about your particular experience from these designs?
- d) If yes on question 3a: The composition of individuals with whom you have collaborated when elaborating innovations; has it been diversified?
- e) Can you please describe the composition of the group that you described in question 3d? What impact do you think that this composition had on the final innovative outcomes of the group?
- f) If yes on question 3a: Within collaborative contexts; have you ever experienced that dissensions have exerted positive influence on your innovative performance? If yes; how?
- g) If yes on question 3f; can you please describe and characterise these favourable dissensions? E.g. why they did occur and what did they concern?
- h) In the case of dissensions; how have you and your colleagues solved them?
- i) Addition question if enough time: Can you please tell us about a collaborative context in which you have experienced extra favourable collaboration?

Purpose: Theory claims that collaboration exerts positive influence on innovative performance, through various designs. It also states the importance of present favourable diversity within collaborative contexts. Moreover, theory claims that dissensions may be favourable to innovative performance. The question aims at understanding whether collaboration is critical to innovative performance and if yes; for which reasons and through which particular designs. Moreover, it aims at scrutinising the potential favourable effects of diversity along with favourable forms of diversity. The question also aims at providing insights of potentially favourable dissensions.

| a) | Yes | No | Comments |
|----|-----|----|----------|
| | | | |

| b) | Yes | No | Comments |
|----|-----|----|----------|
| | | | |

| c) | Yes | No | Comments |
|-------------|-----|----|----------|
| Networks | | | |
| Skunk works | | | |

| | | | |
|-----------------------|--|--|--|
| Internal teamwork | | | |
| Cross-functional work | | | |
| Workshops | | | |
| Other forms | | | |

| d) | Yes | No | Comments |
|-----------|------------|-----------|-----------------|
| | | | |

| e) |
|-----------|
| |

| f) | Yes | No | Comments |
|-----------|------------|-----------|-----------------|
| | | | |

| g) |
|-----------|
| |

| h) |
|-----------|
| |

| i) |
|-----------|
| |

4. Allocation of resources

- a) Have allocation of resources affected your innovative performance? If yes; what types of resources are particularly pertinent?
- b) If yes on question 4a; please explain how the allocation of these particular resources exert influence on your innovative performance?

Purpose: Theory claims that general allocation of resources is vital to innovative performance. The question aims at understanding which specific resources that are particularly critical along with how and to what extent these resources influence innovative performance.

| a) | Yes | No | Comments |
|----|-----|----|----------|
| | | | |

| b) |
|----|
| |

5. Managerial practices

- a) We will now focus on areas that your manager can be responsible for. (...) Do these presented areas affect your innovative performance? If yes; how?
- b) Managerial styles can be described through this matrix (see Appendix G) that we will explain in detail. (...) Can you please place your closest manager during the years of 2009, 2010 and 2011 in the matrix? Please comment.
- c) Where in the same matrix would you place the manager that you perceive as optimal, in order to enhance your innovative performance as much as possible? Please explain your thoughts and your opinions.

Purpose: Theory claims that there are two areas of managerial practices that particularly influence innovative performance; areas of managerial responsibility and managerial styles. The question aims at investigating to how and to what extent these areas of managerial practices influence innovative performance. Moreover, the question aims at mapping current managerial styles within Scania along with preferred managerial styles for enhanced innovative performance.

| a) | Yes | No | Comment |
|---|-----|----|---------|
| Adequate work tasks | | | |
| Managerial encouragement and managerial recognition | | | |
| Others | | | |

| b) |
|----|
| |

| c) |
|----|
| |

6. Creativity

- a) Do you consider yourself creative? If yes; how has your creativity assisted you when elaborating innovations?
- b) Theory claims that creativity is constituted of three components. We will now explain them to you. (...) Do you recognise these components as important to your individual creativity?
- c) Which one of these three components has exerted largest influence on your creative efforts? Please rank the components from 1 to 3, where 1 represents the most important component. Please feel free to think out loud while ranking.

Purpose: Theory claims that creativity is critical to innovative performance. Moreover, it states that creativity is constituted of three components. The question aims at exploring the overall importance of creativity along with importance of each component in order to leverage creativity.

| a) | Yes | No | Comments |
|----|-----|----|----------|
| | | | |

| b) | Yes | No | Comments |
|----|-----|----|----------|
| | | | |

| c) | 1 | 2 | 3 | Comments |
|-------------------|---|---|---|----------|
| Creativity skills | | | | |
| Task motivation | | | | |
| Expertise | | | | |

7. Concluding question

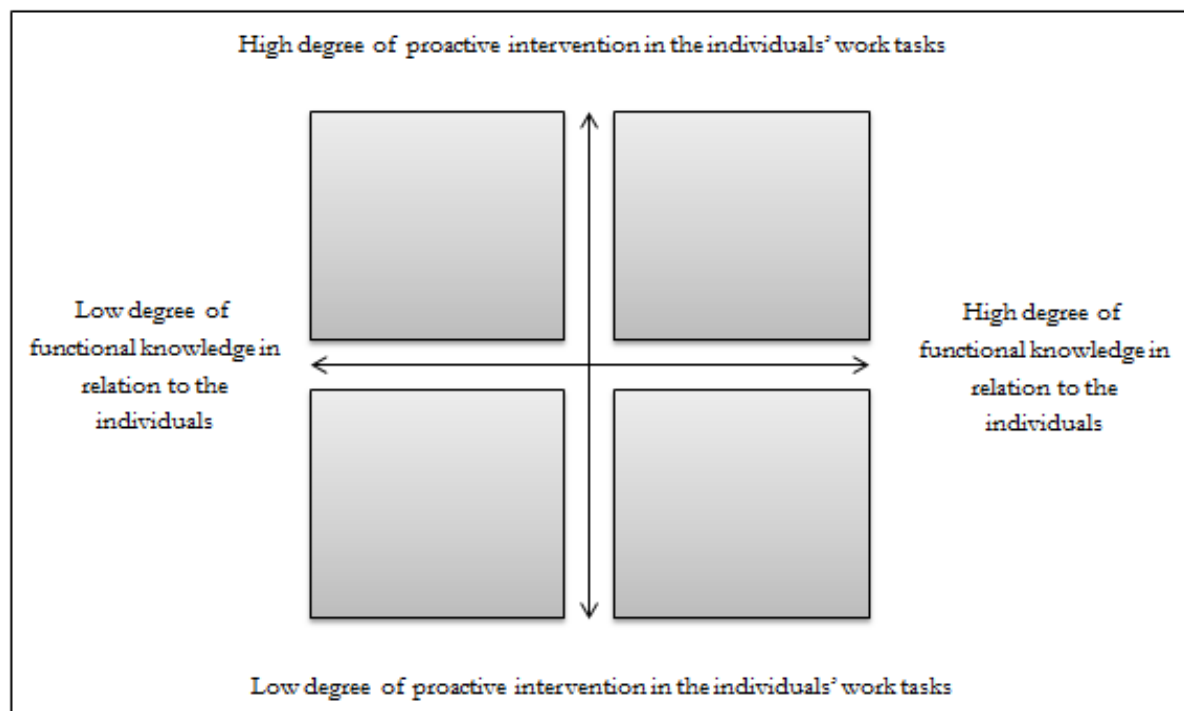
- a) We have now reached the concluding question of the interview. Are there any other aspects that have affected your innovative performance that we have yet not discussed? If yes; please elaborate.
- b) If you would pinpoint one factor that has helped you the most in when elaborating innovations within Scania; which factor would that be?

Purpose: The question aims at scrutinising other areas of influence on innovative performance that have not appeared in existing theory, in order to ensure full coverage.

| |
|-----------|
| a) |
| |

| |
|-----------|
| b) |
| |

Appendix G: Attachment to Appendix F



(VINNOVA & Stiftelsen IMIT, 2012c)