BV TWENTSCHE KABELFABRIEK

UNIVERSITEIT TWENTE.

Aligning employee competences with organizational innovation strategy

A case study at B.V. Twentsche Kabelfabriek.

B.J.G.Hartjes
S0038822
Master thesis Business Administration, track HRM
University of Twente, Enschede
March 26th, 2010

Supervisors:
Dr. M.J.T. van Velzen
Ir. A.A.R. Veenendaal
Drs. J. Diepenmaat (TKF)
W.M.M. Bank (TKF)

Summary

As part of the project 'competences for innovation', a question was posed by B.V. Twentsche Kabelfabriek (TKF) aimed at studying if and how the competences of production workers should be realigned with the innovation strategy. TKF strives to become a customer-oriented solutions provider. A change has to be made from a more commodity-based organization towards a provider of cable solutions for niche markets. To outperform competitors and to deliver high-quality innovative solutions, innovation of processes, products and organisation is required. The central question of this research is which competences production workers (i.e. machine-operators) should possess in order to contribute to organizational innovativeness. And to what extent are these competences possessed by the current machine-operators?

Theory suggests that employees should display innovative work behaviour (IWB) to increase organizational innovativeness. IWB consists of four stages: opportunity exploration, idea generation, championing and application. All stages should be fulfilled to transform an idea into an innovation. A literature review provided various factors that stimulate IWB. The factors that I studied are individual factors and organizational factors. The individual factors can be divided in three categories: task-related (role-orientation production knowledge, challenging job), cognitive competence (educational level) and action competence (taking initiative). The organizational factors include leadership (delegating, support for innovation and providing resources) and innovation-enhancing organizational climate (support for innovation).

In order to determine the innovativeness of the current machine-operators, I developed a questionnaire based on the constructs that could be derived from the literature review. This questionnaire was handed out to the machine-operators. The answers were anonymous. The response-rate was 88%, which is remarkably high and provides a solid base for data analysis. Additional data were gathered by observing machine-operators and shift leaders while they were working, and by informal interviews with the respondents. Based on these data the actual situation was determined. It turned out that machine-operators find themselves to rarely or sometimes engage in innovative behaviour. The generation of ideas occurs more regularly, while championing and application of ideas scores quite low. Regarding their production-related skills (task-related competence) and the willingness to take initiative (action competence), machine-operators are relatively positive. The group of respondents scores quite low on educational level (cognitive competence). They find their work challenging and are relatively positive regarding the leadership aimed at support for innovation and delegating responsibilities. Providing resources for innovative ideas scores somewhat lower. The most striking result is the low score on (self-rated) innovative work behaviour.

To indicate what the desired situation would be if competences were aligned with the organizational strategy, managers filled out the questionnaire as well. One stating the expected current situation and a second version concerning the desired situation. It turned out that managers' perception of the current situation differed from machine-operators. In fact, managers tend to underestimate what machine-operators think they are capable of.

Based on the theoretical framework regarding factors that enhance IWB, some recommendations can be formulated. TKF should start by informing employees about the importance of innovation and the role of the employee in this. Moreover, employees report that they are willing to take initiative. Combining this with the perceived unutilized potential of machine-operators, a chance would be to increase the responsibilities of these employees. This can be done by delegating responsibilities by shift leaders or by departments such as R&D and process and technology. This will further challenge the employee and enhance innovative work behaviour. Besides, providing resources for innovative ideas might enhance the championing and application of ideas. Furthermore, upgrading employees' cognitive competences or recruiting new highly-educated proactive individuals might increase organizational innovativeness. A slightly different, but crucial recommendation that I suggest to improve the current situation, is to enhance the communication throughout the different levels of the organization. Informing shift leaders regarding crucial strategic choices and other decisions that affect the employees within Operations is important. The shift leaders work directly with the machine-operators on a daily basis. When striving for a change on the shop floor, shift leaders are key persons. TKF should inform about, organize and facilitate for, stimulate and implement innovative ideas.

Preface

This report represents the final part of my master programme in Business Administration, track HRM. The process started when I decided that the topic of my thesis would be the relation between organizational innovation and competences of employees. My desire to do research within a company was strong. Fortunately, B.V. Twentsche Kabelfabriek (TKF) participated in the project 'competences for innovation' and decided to recruit me to determine how the competences of their production workers could be realigned with the renewed strategy.

The dynamics that are created when combining scientific research with practical issues and implications were interesting and at times challenging. During my internship at TKF a reorganization was announced, stating that the plant situated in Lochem would be closed down and fifty jobs would be cut. This mainly affected the employees working within the department of operations. This lead to unrest on the shop floor. The data that I used for this research, based on questionnaires handed out to machine-operators, were collected in the period after the announcement, but before there was any clarity about which employees would be dismissed. I was worried that this might decrease the response. However, no less than 88% of the respondents filled out the questionnaire. This remarkable outcome has further improved my research results.

Several people have guided, helped and encouraged me during this project, which helped me to carry out this research. First of all, I would like to thank the employees of TKF for their help. Special thanks go to the HR department for providing me with a place to work and for the great time I had at the department. Furthermore, all shift leaders were more than willing to help me collect my data and provide insights regarding the work organization on the shop floor. Crucial during this project were the machine-operators, who showed remarkable willingness to cooperate in order to help me with my project. As mentioned earlier, a response-rate of 88% was the extraordinary result.

I would like to thank my supervisors Martijn van Velzen and André Veenendaal for their guidance during the project. Helping me to define, redefine and hold on to the focus of the research, structured the process and helped realize the time-span that was determined. Their enthusiasm about my progress and the results was encouraging.

Last but not least, I would like to thank my family and friends for their support and encouragement during the last eight months.

This project was an adventure, with some challenging and many interesting and pleasant aspects.

Enschede, March 2010

Contents

Chapter 1 Introduction 7
1.1 Introduction 7
1.2 Problem statement 7
1.3 Strategy TKF 8
1.3.1. Defining the Strategy 8
1.3.2. Exploring and Classifying the Strategy 9
1.3.3. Importance of Innovation in Realizing the Strategy 10
1.4 Structure of report 11
Chapter 2 Competences for Innovation: A Conceptual Framework 12
2.1 Competences 12
2.1.1. A definition 12
2.1.2. Types of competences 12
2.1.3. Determining employee competence 13
2.2 Innovation by employees 13
2.2.1. Understanding strategic goals and direction 13
2.2.2. Task-related competences: “Getting the job done” 14
2.2.3. Employees and Innovation: How can they contribute? 14
2.2.4. Stimulating IWB: The employee and its job 16
2.2.5. Stimulating IWB: Beyond the Employee – Organizational climate and support 17
2.2.6. Concluding 18
2.3 Methodology 19
2.3.1. Research Design 19
2.3.2. Research Methods 20
2.3.3. Research Sample 21
Chapter 3 Literature Review: Operationalized Conceptual Framework 22
3.1 Operationalization of concepts 22
3.1.1 Task-related competence 22
3.1.2. Cognitive competence 23
3.1.3. Action competence 23
3.1.4. Employee and Innovation: Innovative Behaviour 24
3.1.5. Organizational factors: Leadership 25
3.1.6. Organizational factors: Climate 26
3.1.7. Concluding: the constructs and their relatedness 26
3.2 Limitations literature 30

3.3 Data collection 30
3.3.1. The questionnaire: Design and Disseminating 30
3.3.2. The Questionnaire: Reliability and Validity 31
3.4 Limitations regarding constructs of questionnaire 31
Chapter 4 Results: Description and Analysis 33
4.1 Data Description 33
4.1.1. Research Sample and Response rates 33
4.1.2. Descriptive statistics respondents 34
4.2 Data analysis 34
4.2.1. Validity of the results 34
4.2.2. Diagnosing: the Desired Situation 34
4.2.3. Diagnosing: The Current Situation at TKF 35
4.2.4. Correlation: Relations between Constructs 39
4.2.5. Concluding 43
Chapter 5 Conclusions & Recommendations 45
5.1 Conclusion and Recommendations 45
5.2 Discussion and Implications 49
Reference List 50
Appendices 52
Appendix A Constructs 53
Appendix B Questionnaire including accompanying letter 58
Appendix C Descriptive Statistics Respondents 64
Appendix D Missing values and Mean scores (ITEMS) 65
Appendix E Mean scores (CONSTRUCTS) 66
Appendix F Personal Goals 69

Chapter 1 Introduction

1.1 Introduction

"Competences" seems to be a popular and broadly discussed term, not merely in scientific literature (Prahalad & Hamel, 1990; Pfeffer, 1995; McClelland, 1973) but in everyday life as well. However, what exactly are we referring to when we talk about 'competences'? And which role do competences play within an organization? More specifically: how can competences contribute to organizational performance? Which competences are desired or even required to outperform competitors? How can competences improve organizational innovativeness? With this last question a second popular, frequently used term is introduced: innovation. Companies need to innovate to realize sustained competitive advantage (see e.g. Becheikh et al, 2006). Especially in times of economic recession innovation is required in order to survive as a company. However, innovation often requires high, risky investments without guarantees for success. In times of economic downturn, organizations tend to be occupied with minimizing and cutting costs, which might hinder innovation. However, to increase chances of survival, innovation might be helpful. Distinguishing oneself from one's competitors by introducing new products or technologies might result in increased market share, while other organizations are dealing with a downturn in demand. Though, how can companies increase their innovativeness? Which competences are needed?

The university of Twente initiated a project called 'competences for innovation', a regional project aimed at studying and improving the innovative capabilities of manufacturing organizations located in the eastern part of the Netherlands (regions Twente and the Achterhoek). This project focuses on three types of competences: employee competences, organizational competences and competences regarding external orientation. One of the companies participating in this project is B.V. Twentsche Kabelfabriek (TKF), situated in Haaksbergen and Lochem. TKF, founded in 1930, is part of the TKH-group, with TKH being the holding. TKH-group consists of approximately sixty subsidiaries. TKF develops, produces and supplies cable solutions for a reliable infrastructure for Telecom, Building and Industrial segments[1]. After some reorganizations during the last decade, TKF currently employs approximately 450 fte. Until the beginning of this century, TKF was a commodity-producer. Cables were produced and sold, realizing enough turnover to make profit. However, since 2000 this strategy was not viable any longer. TKF started cutting costs and reorganizing. In 2004 a strategic shift was initiated. Besides producing commodity products, TKF has been focusing on more customized cables and the so-called 'cable solutions'. Recently the organization decided to cease investments in commodities and focus solely on the customer-oriented solutions approach.

TKF has been a partner in the project, 'competences for innovation', since 2005. During that year an innovation scan was conducted to determine the extent of innovativeness related to the three types of competences. After some stagnation, the project was resumed in 2008. A second innovation scan was completed and compared to the results of 2005 and the outcomes of other companies participating in this project[2]. The subsequent discussion of these results led to several interesting issues. One of these issues was the relatively weak alignment of the (development of) competences of employees with the business strategy of TKF. One of the most urgent matters that was identified during meetings with several managers, is the perceived gap between strategy on the one hand and organizational structure and competences on the other.

1.2 Problem statement

As stated earlier, the idea for this research originated from the results of the innovation scan carried out at TKF regarding competences for innovation. Eight managers and directors filled out the questionnaire. One of the questions posed was whether the (development of) competences of employees are aligned with TKF's strategy. According to the respondents this was not really the case. The score on this item was 2.2 (out of 5), while the score in 2005 was 3.8. Some interesting issues need to be discussed. The first issue that I find interesting is the perceived decrease in alignment of competences of employees with the strategy since 2005. Several possible causes for this result can be identified. First of all, I want to draw attention to the respondents. Since the sample of respondents is quite small, minor changes in the composition of this sample might result in significant differences in the results. For example, if the respondents of 2005 are not the same as those in 2008, a different score can be the result. As mentioned before, several managers differ in their view about what the strategy of TKF is. Consequently, different ideas will exist about which competences are required as well.

[1] http://www.tkf.nl/OVERTKF/Missie/tabid/84/language/en-US/Default.aspx

[2] For an overview of the participating companies and more information regarding this project, see: www.competentiesvoorinnovatie.nl (the website is mainly in Dutch)

A second issue concerns the scope of the question. The question was not specified for certain groups, but referred to all employees. There might be differences between various groups (horizontally or vertically) of employees and their competences related to the strategy.

One of the initiatives that has been taken by the MD to align employees' competences with TKF's customer-oriented solutions strategy is targeted at sales people. They are being trained to become more focused on customer intimacy and selling solutions instead of merely cables. According to some managers the competences of production workers should be redefined and upgraded as well.

My task is to explore which competences are needed by employees to contribute to TKF's strategy. Although managers might perceive a gap between the current competences of employees and the competences required for innovation, this has to be verified first. I will start by exploring TKF's strategy and the place of innovation within this strategy. Secondly, I will study the literature on employee competences that help realize this strategy. Subsequently, I will determine which competences the current workforce possesses. The final step of this research comprises the comparison of the IST and SOLL situation. If a gap between the IST and SOLL situation exists, I will explore ways of diminishing it.

The scope of this research will be limited to production workers, consisting of the machine-operators. Several reasons for this decision can be identified. First of all, TKF is a factory-based organization, with a major part of its employees working in the factory. Secondly, the MD is currently focusing on sales employees and the alignment of their competences with the strategy. However, it is crucial to have production workers that can produce the innovative solutions that are sold by the salespeople. Moreover, the attitude of, often older, production workers regarding change and innovation is a controversial topic in social and scientific debates. Besides, studying machine-operators' contribution to organizational innovativeness is a relatively new subject in scientific research. Therefore, this research fulfils a scientific purpose as well. The research question that I formulated for this study is the following:

"How can the competences of employees be realigned with the organizational strategy?"

In order to answer this research question, I formulated four sub questions that will help study the current and desired situation and identify steps to enhance innovative competences of employees:

1. *What is TKF's organizational strategy and how is innovation embedded in this strategy?*
2. *Which competences do production workers need to enhance organizational innovativeness?*
3. *To what extent do the production workers currently possess these competences?*
4. *Which steps can be taken to (further) enhance innovative competences of these production workers?*

The next section will answer the first sub-question by exploring TKF's strategy and strategic objectives. Since the origin of this study can be found in the project 'competences for innovation', the focus regarding the strategic objectives will be on innovation as well.

1.3 Strategy TKF

1.3.1. Defining the Strategy

As mentioned earlier, TKF is located in the eastern part of the Netherlands, which has been at the centre of the textile industry. Due to high competition of developing countries with lower labour costs, this industry collapsed during the 1960's. During the increasing globalisation of the last decades, many production facilities within all sorts of industry have been moved overseas to these countries where labour costs are extremely low. Due to the relatively high wages in the Netherlands, combined with the relatively small size of the company, it is impossible for TKF to be the cheapest cable producer on the market. Instead, competitive advantage has been realized by high quality and time to market. Due to the high speed of technological development in telecom, TKF was forced to innovate in order to survive. Nowadays, innovation is required in order to remain a market player as a cable producer in the Telecom-market and other market segments as well. Therefore, TKF redefined its strategy in 2004, making innovation a core element of its overall business strategy.

In order to find out which competences employees should possess in order to contribute to the fulfilment of strategic goals, it is essential to accurately comprehend the strategy of TKF. In the process of identifying and typifying TKF's strategy, I experienced that formulating and pursuing a strategy is desirable in theory, but sometimes poorly translated into practice. After exploring the strategic plan[3] of TKF, I did not fully comprehend

[3] Strategisch plan TKF 2009-2013

where TKF wants to be in five or ten years from now. Some issues that TKF seems to want to focus on according to the strategic plan, is becoming a solution provider and being innovative. However, I could not help but question whether these strategic issues were directly copied from the strategy of the TKH-group or that it was actually incorporated and envisioned by TKF itself. To clarify this, I interviewed some managers and directors and asked them what the overall strategy of TKF is. Depending on the person I spoke to, the answers varied. The perception and idea of the strategy was coloured by that person's vision and ideas. This situation is very intriguing although not very surprising. Strategy is meant as a guideline for organizational activities for the long-term. However, simultaneously, interpretation, operationalization and implementation of strategy can be seen as an iterative process. The overall strategy statement should be agreed upon and known by higher management levels. All departments and organizational units should contribute to the realization of strategic goals, which requires comprehension of the strategy. If managers and directors do not share the same vision on the overall strategy, then to what extent do employees comprehend and act in accordance with the strategic goals? While these differences in perception of the strategy might not be desirable in terms of shared vision throughout the organization, it was helpful in increasing my comprehension of the strategic intent. When combining the outcomes of the interviews with the information of the strategic plan, the following strategic statement can be formulated:

To develop, produce and supply innovative, high-quality cable solutions for the segments Telecom, Building and Industrial. The specific and tailored solutions will improve the profit and loss account of our customers and will be aimed at niches. To create sustained competitive advantage, TKF focuses on the development of innovative concepts.

The strategy of TKF consists of several elements. The next step will be to typify the strategy of TKF according to categorizations of strategy in the literature. Subsequently, this will provide a starting point for the exploration of the competences and HR practices needed to help realize this strategy.

1.3.2. Exploring and Classifying the Strategy

Numerous books and scientific articles are written about strategy. Strategy and all its aspects have been researched widely from different angles such as Miles and Snow's (1978) strategy types, Porter's (1980) competitive strategies, Hambrick and Fredrickson's (2001) strategy diamond and Treacy and Wiersema's (1995) value disciplines for market leaders. Then, how does TKF's strategy relate to these theories?

One of the most comprehensive overviews of identifying elements of strategy, is that of Hambrick and Fredrickson (2001). They propose a strategy diamond consisting of five major questions that have to be answered (see Figure 1.1): Where will we be active (arena)? How will we get there (vehicle)? How will we win (differentiators)? What will be our speed and sequence of moves (staging)? How will we obtain our returns (economic logic)?

Applying this diamond to TKF, the following picture can be drawn. The *arena* of TKF consists of the development, production, supply, installation and after-sales service of cable solutions (copper, fibre, glass) applied in telecom, building and industry in the market segments Energy, Marine & Offshore, Rail Infra, Installation, Broadband and Industry all over the world. TKF searches for existing niches and tries to create new niches to market its cables through solutions.

The *vehicle* TKF uses to enter the arena is primarily based on internal development and strategic partnerships. In order to be able to deliver solutions, TKF is in the middle of a reorganization process toward a more customer-oriented organization. Furthermore, strategic partnerships are established with TKH-subsidiaries and other suppliers for instance for the delivery of components for the cable not produced by TKF itself. TKH-group regularly engages in acquisitions of new subsidiaries to increase and strengthen its arena.

The *differentiator* that will make TKF outperform its competitors is based on providing solutions. TKF no longer merely produces and delivers standardized cables. Instead, it has shifted toward more customized cables. Furthermore, TKF offers a complete 'solution', including the development, production, delivery, installation and after-sales service of the cable-project. All necessary supplements required for this project will be arranged by TKF as well, even if not produced in-house.

Some supplements might be provided by TKH-subsidiaries, or by other independent organizations. These customer-oriented solutions can be divided in three categories. First of all there are the turnkey projects, which entail the projects where TKF develops, produces, supplies and installs the cable. All the customer has to do is turn the key and TKF takes care of everything. The second possibility adds an extra dimension to the turnkey solution. Besides delivering the cable, TKF tries to optimise the logistics of the customer, for example minimizing the customer's stock by optimising the delivery time of the product. A third category within the offered solutions is yet

to be developed and entails additional after-sales services like maintenance of the product during the rest of its life cycle. These three categories mainly differ from each other in the extent of service included in the 'solution' offered by TKF. Thus the customized solutions approach provides TKF's differentiator. However, in trying to stay ahead of one's competitors it is crucial to continuously improve and innovate the products and processes (internal as well as external) aimed at innovating 'solutions'. To reinforce this, TKF formulated several strategic goals, one of them being that 15% of the total revenues should be generated from innovations. Innovations include those that were newly introduced to the market during the last two years. Product innovation is therefore explicitly strived for as a strategic goal and can be said to be a crucial element in TKF's desire to become a solutions provider.

TKF's *staging* of products differs across the six market segments. Where Installation mainly focuses on the Dutch market, Industry targets the global market. However, since the repositioning from commodity to solutions, rapid expansion of market share is no longer the main focus. Instead, TKF values customer intimacy and prefers to build a reputation based on qualitative and innovative solutions targeted at selected customers.

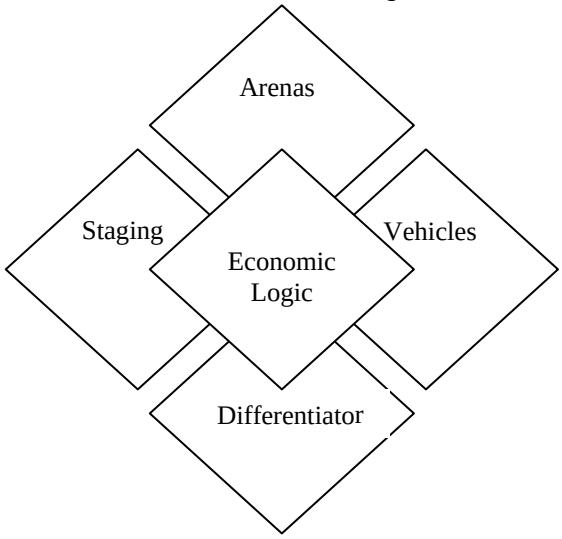

Figure 1.1: Strategy diamond by Hambrick & Fredrickson (2001, p51).

The last element of Hambrick and Fredrickson's strategy diamond comprises the *economic logic* of the strategy. As discussed earlier, TKF is not the cheapest supplier in the market. It differentiates itself from its competition by offering high-quality, innovative solutions. In return, customers are willing to pay a higher price for the convenience of having to deal with one instead of several suppliers.

Hambrick and Fredrickson's differentiator part of the diamond is in line with Porter's framework of competitive advantage. TKF's strategy corresponds closely to Porter's '*focused differentiation*', which is defined as a strategy 'that seeks to provide high perceived product/service benefits justifying a substantial price premium, usually to a selected market segment (niche)' (Porter 1980, cited in Johnson, Scholes & Whittington, 2006, p251).

Additionally, Treacy and Wiersema's model corresponds closely to the differentiator part of Hambrick and Fredrickson's strategy diamond. Their discipline '*customer intimacy*' (1995) matches TKF's desire to be a solution provider. According to Treacy and Wiersema (1995) organizations have to make a strategic choice to excel in one specific discipline in order to become and maintain market leader. They identify three different disciplines: operational excellence, product leadership and customer intimacy. Treacy and Wiersema further argue that organizations should excel in one discipline, while maintaining threshold values for the other two (Treacy & Wiersema, 1995).

1.3.3. Importance of Innovation in Realizing the Strategy

Concluding, the strategy of TKF can be summarized as striving to be a solution-provider, by developing, producing and supplying high-quality, innovative concepts. In order to differentiate from and outperform its competitors, TKF needs to develop and deliver high-quality, innovative solutions. Innovation is therefore required to develop innovative solutions (differentiator) and to explore, create and serve niche markets (arena). Organizational innovativeness is crucial in the development of new products and improve processes to decrease time to market. Innovation has a clearly defined share in the strategy: 15% of the revenues should come from innovations. This is one of the strategic objectives that has been clearly formulated and is known by all managers. However, this

merely includes product innovations. Process innovation is strived for as well, yet more indirectly by objectives as minimizing waste and increasing throughput by enhancing efficiency of primary processes.

1.4 Structure of report

As stated earlier, this research will be limited to organizational innovativeness as a strategic goal, instead of the overall strategy of TKF. Moreover, the research population will be restricted to machine-operators (production workers). Besides the restricted time available for this project, another reason for this focus is the relevance. It can be expected that production workers can actually contribute to this part of the strategy (through process and product innovation, radical as well as incremental).

In order to answer the other three sub questions presented in section 1.2, I will conduct a conceptual exploration and a literature review followed by data collection within the five plants. Thus, chapter two of this report will provide a theoretical exploration around concepts regarding competences in general and, more specifically, competences that enhance organizational innovativeness. These findings will be translated into a conceptual framework of competences that production workers should possess in order to contribute to the strategic goals. This will be operationalized by a literature review (chapter three), providing content for a questionnaire. This questionnaire will be used to determine the current situation. Chapter four presents the results of these data. The current and desired situation will be compared to each other. Conclusions and recommendations regarding the (further) stimulation of innovative behaviour of employees will be presented in the final chapter of this report, in order to answer the last sub question.

Chapter 2 Competences for Innovation: A Conceptual Framework

In this chapter I will explore which competences are needed for innovation. I will start with an elaboration of the concept 'competence'. Subsequently, competences related to innovation will be outlined. This chapter will conclude with a conceptual framework of competences that enhance organizational innovativeness.

2.1 Competences

2.1.1. A definition

As argued in the introduction, 'competences' is a widely used term applied in all sorts of different settings. Distinction can be made between different types of competences, for instance the core competence (Prahalad & Hamel, 1990), organizational competence (Lado & Wilson, 1994), employee competence, individual competence, firm-specific and profession-specific competences (Fairtlough, 1994), distinctive competence (Penrose, 1959) and occupational competence (McClelland, 1973). Besides, competences of employees are described as human capital as well (e.g. Wu et al, 2008; Becker, 1964; Subramaniam & Youndt, 2005).

Besides the variety of competences studied and labelled, the definition of what a competence is and what it entails is subject to discussion as well. In order to find out which competences enhance organizational innovativeness, a definition of the term is required. As stated earlier, this research focuses on employee competences. Therefore, this section merely presents definitions of competences in this context. One definition is that a competence entails the declarative and procedural knowledge required for a certain ability[4]. Spencer and Spencer (2008) argue that there are five types of competences: motives, traits, self-concept, knowledge and skills. Bassi and Russ-Eft (1997) distinguish three characteristics of competences: (1) operant or respondent traits (for example, motives, self-concepts, attitudes, values, or occupational preference), (2) declarative knowledge (e.g. know *that*), or (3) procedural skills (e.g. know *how*) (Bassi & Russ-Eft, 1997 p7.) Furthermore, competences are described as consisting of skills, knowledge, attitude and traits[5]. These definitions all focus on competences on an individual level, such as employee, or group competences. They all have some elements in common regarding the definition of competences: knowledge, skills and attitude. Therefore, the definition I will use in this report is the following: *competences consist of knowledge, skills and attitude of an individual or a group of individuals*. Attitude includes the motivation, traits and behaviour of an individual. More specifically, in this research I will study competences of production workers, so the knowledge, skills and attitudes of production workers.

2.1.2. Types of competences

Competences can be formulated for different levels of analysis, such as individuals, groups, plants and firm. Individual competences can be identified for all sorts of skills, knowledge and attitudes, ranging from leadership to motivation. Several organizations and consultancy firms have created lists with competences. For instance, Berenschot HRM proposes four different types of competences: person-related, task-related, environment-oriented and organization-oriented competences[6]. Nieuwenhuis (2008) identified 29 competences, divided into six clusters. He distinguishes managerial/organizational competence, social/communicative competence, intellectual competence, emotional competence, task-related competence and competence development. Furthermore, PiCompany distinguishes six clusters as well: management and leadership, entrepreneurship, analysis and decision-making, communication, personal behaviour and motivation. They elaborated these clusters into 43 competences. These overviews of competences are developed in practice, and are not based on scientific research, although some of the competences mentioned can be found in the literature as well (see e.g. De Jong, 2007; Talke et al, 2006; Lado & Wilson, 1994). Despite the lack of theoretical funding of these competence-lists, the resemblance between the competences presented is large. This suggests that there are a number of competences that has been agreed upon to be important.

---

[4] http://www.f-ektief.nl/index.php?option=com_content&view=article&id=147:talenten-en-competenties&catid=37&Itemid=74

[5] ARVO http://www.leerplek.be/leerplek/NL/PDF/ARVODeel1Aa%20.pdf

[6] Berenschot HRM cited in Parra, B. de la; Slotman, R.; Tillema, H.; Spannenburg, T. (2000) *Managen van competenties in organisaties*

2.1.3. Determining employee competence

There are different levels and different types of competences. The next step is to identify how competence of an employee can be assessed. Dreyfus and Dreyfus (1980) proposed a step-by-step classification of five levels to assess an individual's or group's competence:

- Novice (Rule based behaviour, strongly limited and inflexible)
- Experienced Beginner (Incorporates aspects of the situation)
- Practitioner (Acting consciously from long term goals and plans)
- Knowledgeable practitioner (Sees the situation as a whole and acts from personal conviction)
- Expert (Has an intuitive understanding of the situation and zooms in on the central aspects)

An individual starts as a novice when performing a new task and grows to higher levels as he[7] becomes more experienced (due to time of performing the task, training etc). This system helps assessing the competence of an employee based on the expertise of performing a task, assuming that every employee is capable of growing into an 'expert'.

A different view on employee competences is presented by Sandberg (2000) who studied competences from an interpretative approach. His research results show that the 'conception' of employees of their work influences the competences that are being developed and maintained. By conception he means 'people's ways of experiencing or making sense of their world' (Sandberg, 2000 p12). He found three different conceptions of the task to produce a car engine when conducting interviews with production workers. The first group of employees interpreted the task of consisting of several separate elements. The second group had a more comprehensive view of the task and focused on the relation between the different parts of the engine. The third group was found to be the most comprehensive in its approach toward solving the task and included the customer's expectations of the engine while using the car (Sandberg, 2000). Sandberg argues that employees are more competent when their 'conception' of their tasks is higher in the hierarchy of comprehensiveness than when their conception is less comprehensive. According to the conception of his work, the employee develops and uses particular competences in accordance with this conception.

The theory of Sandberg (2000) and Dreyfus and Dreyfus (1980) show resemblance to some extent with regards to the different 'categories' they defined. Both theories propose that the more comprehensive an employee perceives and carries out his task, the more competent he is (higher in the hierarchy of competency). Applying that to production workers, there is a difference between those that are merely capable of following the instructions that are part of their formal job description, whereas others understand the broader manufacturing principles valued by the organization and acts in accordance with this. A general distinction can be made between assistant machine-operators (novice – experienced beginner), machine-operators (practitioner) and all round machine-operators (knowledgeable practitioner – expert). The higher an individual gets in this hierarchy of machine-operator, the more competent he should be.

2.2 Innovation by employees

Now that the different types and levels of competences are discussed, I will examine which competences promote innovation. As stated before, all types of innovation will be included. The goal is to improve organizational innovativeness. This can be accomplished through product innovation by marketing new products, or by process innovation which might improve delivery times. However, innovation of work or workplace might increase efficiency as well. Furthermore, both incremental and radical innovation contributes to TKF's innovativeness. Thus, this research will be aimed at determining which employee competences will increase TKF's innovativeness.

2.2.1. Understanding strategic goals and direction

TKF highly values innovation, especially aimed at increasing customer intimacy. As a solutions provider TKF needs to be able to respond to and, ideally, shape customer demand, now and in the future. Instead of merely producing cables, TKF develops and delivers concepts, so-called 'solutions'. More importantly, the organization wants to offer high-quality and innovative solutions. Ulrich states that competences need to be aligned with the business strategy to provide focus and energy (Ulrich, 1999, cited in Cortada & Woods, 1999). This provides opportunities for and expects results of and input from (production) workers. Because of their technical knowledge of and daily working with the products manufactured, they can contribute to the improvement of products or processes. In order to be able to help change for the better and not for the worse, employees need to understand what the long-term goals,

[7] In order to increase readability I will refer to the employee as 'he'. However, for every 'he' written in this report, 'he/she' should be read.

objectives and vision of the organization are. They should understand which manufacturing principles are valued by the organization. It would be detrimental to strive for quantity over quality when quality is the most important differentiator of the organization.

Thus, in order to contribute to the organization's innovativeness, employees should know what the organizational strategic goals and objectives are. Boswell et al (2006) discuss the importance of line of sight (LOS). LOS is defined as 'an employee's understanding of the organization's goals and what actions are necessary to contribute to those objectives' (Boswell et al, 2006:500). Employees should take initiative and use their full potential of skills and knowledge to enhance realization of organizational strategic goals and objectives. Therefore it is important that employees understand which behaviours and actions will contribute to the achievement of these goals (Boswell et al, 2006). Employees should comprehend that, and how, they can individually contribute to organizational success. In order to align competences with the strategic goals, the organization should make sure that employees' conception of their tasks and role within the organization are accurate. In the case of TKF, when striving for innovation aimed at customer intimacy, employees should perceive their tasks as crucial for the innovative capacity of TKF. They should be made aware of what they can contribute by focusing on improvements in products and processes. Besides, understanding strategic goals is found to enhance continuous improvement (CI) (Bessant & Caffyn, 1997).

2.2.2. Task-related competences: "Getting the job done"

Goal of this research is to identify which competences production workers need in order to contribute to the organization's innovativeness. As stated before, the term competence is defined here as the skills, knowledge and attitude of an employee. What is it a factory worker needs to know to be innovative (knowledge)? What does he need to be able to do (skills)? And which behaviour is needed; how does one need to act to enhance the organization's innovation (attitude)?

First of all, the employees should possess the skills and knowledge required to successfully execute their tasks. Machine operators should have technical knowledge to operate at the lines, which includes knowledge about producing cables. Talke refers to this competence as *task-related competence* consisting of *strategic* and *operational* know-how and ability for a specific task based on experience, education and training (Talke et al, 2006). Parker et al (1997) discuss task-related requirements as well in their research on flexible role-orientation by employees. They introduce three concepts: strategic orientation and two types of role-orientation (production ownership and importance of production knowledge). In the light of this study, the second type of role-orientation, importance of production knowledge seems most relevant. It is defined as a scale to assess 'whether employees recognize the importance for their effective performance of a broad range of skills, knowledge and behaviour' (Parker et al, 1997:906). The acknowledgement of employee competency and the recognition by the subject itself is crucial when striving for improvement. The production ownership-related role orientation entails the extent to which employees feel responsible for problems occurring. If employees do not feel responsible, and consequently, will not take responsibility for problems and solving these, this will have a negative impact on the production process, and productivity. Strategic orientation measures the extent to which the employee comprehends priorities and strategic importance of production-related issues, such as preventive problem solving, flexibility and JIT (Parker et al, 1997). This relates to the concept discussed in the previous section on comprehension of strategic goals and objectives of the organization.

Summing up, employees should possess the skills, knowledge and attitude to carry out the tasks that are part of their daily job. They should be able to produce the cable. However, they should also be able to solve problems and understand the origin and the consequences of these problems. It is crucial that employees comprehend which skills, knowledge and behaviour enhance the achievement of strategic goals such as short delivery times and high quality.

2.2.3. Employees and Innovation: How can they contribute?

When striving for innovation, more skills and a different attitude are required beyond the basic requirements to carry out the formally defined tasks. An extensive body of research has tried to determine the effect of employee competences on innovation. Employee behaviour and attitude and its effect on innovation have been widely explored (e.g. Kleysen & Street, 2001; Scott & Bruce, 1994; Crant, 2000; Janssen, 2000; De Jong, 2007). Most of the researchers have studied one specific part of the innovation process. Innovation has been identified to consist of several stages, which can mainly be divided in two main phases: initiation and implementation (e.g. De Jong, 2007). Initiation entails the creative process of the exploration and generation of an idea, whereas implementation comprises the championing, application or implementation of the idea. These different stages require different skills. Employee creativity literature focuses on the first phase (Oldham & Cummings, 1996; Zhou & George, 2001;

Talke et al, 2006), while literature on proactive work behaviour (e.g. Crant, 2000) tends to focus on the second phase. Simultaneously, proactive behaviour is found to enhance the initiation (e.g. Parker et al, 2006) An attempt to combine both phases can be found in literature on 'innovative work behaviour' (De Jong, 2007; Janssen, 2000; Ramamoorthy et al, 2005; Huiskamp et al, 2008). Innovative work behaviour is defined by De Jong as being *'individuals' behaviours directed towards the initiation and intentional introduction (within a work role, group or organization) of new and useful ideas, processes, products or procedures'* (De Jong, 2007:19). Thus, innovative work behaviour (IWB) would enhance organizational innovativeness. Figure 2.1 gives an overview of the different stages of innovation.

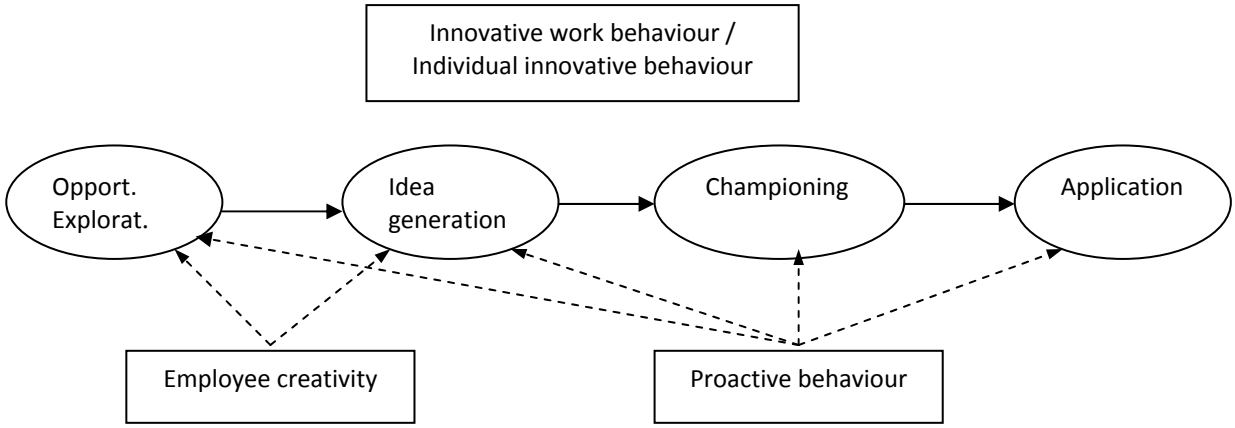

Figure 2.1: Stages and phases of individual innovative work behaviour

As can be seen in Figure 2.1, the concepts (phases and stages) are closely interrelated. Innovative work behaviour is not the only employee-related construct that has been found to increase organization's innovativeness. Research has been done on innovation-enhancing knowledge, skills and attitudes. For example, Bessant and Caffyn (1997) discuss the importance of Continuous Improvement (CI) on incremental organization-wide innovation. The main difference between CI and IWB, is that IWB is based on incremental as well as radical innovation, whereas CI aims at continuous improvement organization-wide with existing resources. Thus, how processes can be optimised through minor changes that can be applied in the existing infrastructure. Bessant & Caffyn (1997) identified a list of behaviours that enhance CI. The most relevant behaviours have been listed in table 2.1. Despite the difference in organizing for CI and IWB, some similarities in desired behaviour can be found. For example, ensuring that employees understand strategic goals is proposed as being important in both theories. An interesting addition of desired behaviour for CI is customer-oriented behaviour. This is of crucial importance for TKF as well. As discussed in the previous chapter, TKF wants to be a solutions provider and strives for customer intimacy. To improve responsiveness to customer demand and help shape customer demand, customer-oriented behaviour of all employees within the organization is required. Furthermore, Bessant & Caffyn (1997) propose that sharing knowledge of CI activities is important. This can be enhanced by letting employees work across divisions, or in this case, plants.

That knowledge should be shared in order to increase its value is argued by Subramaniam and Youndt (2005) as well. They argue that the interaction of human and social capital is positively related to an organization's radical innovative capability. Human capital (individual competences) in itself will hardly contribute to an organization's innovative capability unless it is networked and shared with others in the organization (social capital) (Subramaniam & Youndt, 2005). Moreover, social capital is found to influence the incremental innovative capability of an organization as well. This implies that interpersonal and networking skills of employees are highly important for the innovative capability of the organization. Thus, in order to benefit from employees' skills and knowledge, they should interact with each other. Therefore, employees should possess the interpersonal, communicative and networking skills necessary to facilitate this transfer and exchange of knowledge.

A last theory on the contribution of employees in enhancing organizational innovativeness that I will briefly discuss, is based on the research by Schuler and Jackson (1987). They identified role behaviours for employees that are required to contribute to the fulfilment of strategic goals and objectives. For innovation-related strategy they defined eight behaviours. Those applicable to TKF's situation are presented in table 2.1. One of the behaviours that was deliberately excluded from the list is 'a moderate concern for quality', since one of TKF's differentiators is providing high-quality products and solutions.

Table 2.1 outlines different concepts regarding employee behaviour that promote innovation as discussed in this section. I will focus on IWB as the desired employee outcome, or behaviour, to enhance organizational

innovativeness. IWB clearly defines several phases in the process from idea generation to implementation. Moreover, it includes both incremental and radical innovation, as opposed to CI, which only regards incremental innovation. Furthermore, IWB emphasizes the importance of individual competence. Every employee can make a difference and enhance innovation, whereas the theory of Subramaniam and Youndt (2005) stresses that sharing human capital to create social capital is required to boost organizational innovation. Finally, the employee role behaviours for innovation suggested by Schuler and Jackson (1987), provide a solid base for desired behaviours by employees. However, this theory might no longer be sufficient for today's modern manufacturing, where innovation needs to be combined with high-quality and short delivery times.

Employees and Innovation	Author	Competences
Innovative work behaviour (IWB)	Huiskamp et al (2008)	▪ Proactive behaviour ▪ Employee creativity
Human capital – social capital	Subramaniam & Youndt (2005)	▪ Interpersonal and networking skills to share human capital
Continuous Improvement (CI) - behaviours	Bessant & Caffyn (1997)	▪ Alignment of CI activities with strategic goals ▪ Understanding strategic goals ▪ Responding to improvement ideas ▪ Sharing of learning from CI activities ▪ Seek opportunities for training and development ▪ Worker participation in CI ▪ Incorporation of learning into work processes ▪ Customer oriented behaviour ▪ Explaining failures without blaming individuals ▪ Working across divisions
Employee role behaviours for innovation	Schuler & Jackson, (1987:210)	▪ High degree of creative behaviour ▪ Longer-term focus ▪ A greater degree of risk taking ▪ High tolerance of ambiguity and unpredictability

Table 2.1: Competences (skills, knowledge, attitudes) for innovation

Now that I have determined that the theory on IWB is most appropriate for my research, the next step is to identify which factors influence and positively affect IWB. If IWB enhances organizational innovativeness, then what is needed to stimulate IWB?

2.2.4. Stimulating IWB: The employee and its job

In order to encourage innovative behaviour, an organization should employ individuals that are capable of and open to innovation, change and improvement. As stated in the previous section, successful innovation is a result of several stages, starting with exploring opportunities, generating an idea, subsequently searching for support and enthusiasm of key people in the organization and finally implementing the idea into an innovation. The exploration of opportunities and generation of the idea desire employee creativity. The championing and application of this idea relies on proactive behaviour of employees, a so-called 'hands-on' mentality to help implement the idea. Proactive behaviour enhances initiation as well, through the stimulation of taking initiative. The mere fact that this process towards innovation consists of several phases, implies that different competences are needed to successfully complete these phases. Thus, some employees might be better suited to initiate ideas, whereas others possess the competences required to implement the idea.

Which competences do employees need in order to enhance organizational innovativeness? IWB is a continuous state of behaviour. Employees should be occupied with innovation of work, group or organization at all times. To enhance IWB, an employee should display proactive behaviour and self-efficacy (Huiskamp et al, 2008).

Talke argues that in order for innovation to emerge, initiation is crucial, which depends on three types of competences: action-competence, task-related competence and cognitive competence (Talke et al, 2006). By

initiating innovation is meant the 'impulse, stimulating activities that lead to new or improved products, processes or services' (Talke et al, 2006, p 373). Task-related competence has already been discussed in the section on production competence. *Cognitive competence* consists of a *creative* and *analytical* cognitive part. This implies the potential to recognize a problem or a chance as well as the worthiness of changing the situation (Talke et al, 2006, p377). The third competence is *action competence* which entails the will to take action, make decisions and take risks, including the motivation and commitment. It can be *intrinsic* and *extrinsic*. This closely resembles Huiskamp et al's (2008) taking initiative. The employee should be willing and able to initiate actions, taking the lead in trying to improve or innovate things (products, processes, work practices). Without initiation, innovation will not occur. However, mere initiation of ideas is not sufficient. All phases have to be fulfilled in order for an idea to be successfully implemented and turn into an innovation. Crant (2000) discusses that innovation can be seen as a proactive behaviour and proposes that individual differences and contextual factors influence proactive behaviours. Applying this to TKF one could argue that the organization-related contextual factors proposed by Crant (2000) can be said to be quite similar for all production workers. This implies that individual differences become more crucial in explaining proactive behaviour. Four main constructs of proactive behaviour have been identified: proactive personality; personal initiative; role breadth self-efficacy; and taking charge. Taking charge shows some resemblance with the construct 'taking initiative' (Huiskamp et al, 2008) and the action-competence (Talke et al, 2006). *Taking charge* comprises 'constructive efforts by employees to affect functional change with respect to how work is executed' (Crant, 2000:443). In order to take charge, an employee should feel confident of his skills. Crant (2000) argues that *role breadth self-efficacy* is needed to stimulate employees to display extra-role behaviour by executing proactive tasks that stretch beyond the formal tasks. These two constructs change with situational circumstances. Two other constructs that also influence innovation are dispositional: *proactive personality* (identifying opportunities and taking initiative to act upon these opportunities) and *personal initiative* (initiating extra-role behaviour) (Crant, 2000). Thus, an employee should be able to, but also willing to take initiative and engage in fulfilling tasks that are beyond his formal job description. Moreover, it is the way of handling problems that occur that influences IWB as well. Just 'getting rid' of the problem by fixing it temporarily or trying to search for the root cause of these problems are different ways of coping with problems. Evidently the latter is to be preferred in most cases. Exploring and comprehending the root cause of problems might lead to a solution that improves or innovates work methods, processes or products.

Other factors such as job autonomy influence IWB as well. The more an employee is expected and allowed to decide how to do his job, the more he is triggered to think about his tasks, work practices and work environment. These responsibilities and knowledge broadens an employee's insight in issues beyond his own tasks. Subsequently, a challenging job enhances IWB as well (Huiskamp et al, 2008), since employees are triggered during their daily work.

A final interesting finding regarding employee-related factors influencing innovative work behaviour, comes from the research conducted by Janssen (2000). He found that 'higher educated workers (…) perform higher levels of innovative work behaviour' (Janssen, 2000:293). This suggests that educational level influences the degree of innovative work behaviour.

Summing up, in order to enhance IWB, an organization should employ individuals that are creative, proactive, willing and able to display extra-role behaviour and take initiative (action competence). Furthermore, the higher the educational level of employees (cognitive competence), the higher the level of IWB. Besides, tasks should be challenging the employee and he should have some job autonomy to trigger creative thinking and problem-solving.

2.2.5. Stimulating IWB: Beyond the Employee – Organizational climate and support

In the previous section I discussed the importance of employee competence and job design in enhancing IWB, and subsequently promoting the organization's innovativeness. However, research advocates that an organization should openly support and strive for innovation to motivate employees to behave innovatively. Building and maintaining an organizational climate that emphasizes and pursues innovation and carries out the importance of innovation to all employees within the organization. How to build an innovation-enhancing climate?

According to Siegel and Kaemmerer (1978) it is crucial to enhance employees' perception of support for innovation by the organization. It is not so merely the actual support for innovation that matters, but the perception of this support by employees. The scale developed by Siegel and Kaemmerer (1978) is aimed at measuring organizational climate and identifies three factors: support of creativity, tolerance of differences and personal commitment. The Siegel Scale of Support for Innovation (SSSI) exists of 61 items on five dimensions: leadership, ownership, norms for diversity, continuous development and consistency. Scott & Bruce (1994) adapted this scale to measure the 'support for innovation'. They defined this as 'the degree to which individuals

view the organization as open to change, supportive of new ideas from members, and tolerant of member diversity' (Scott & Bruce, 1994:592). The authors found a positive relation between support for innovation and innovative behaviour, which confirms the importance of support for innovation for IWB.

De Jong (2007) argues that support for innovation is one of the behaviours that should be displayed by leaders to enhance IWB. He defines 'support for innovation' as the enthusiasm, reliability and concern of a leader towards its subordinates. A slightly different construct is 'supportive supervision' (Parker et al, 2006) which focuses on stimulation of IWB in employees by the leader. If an organization strives for innovation as a strategic objective, it is crucial to facilitate for innovation as well. According to De Jong, leaders should provide resources for innovation, besides offering support. He found that 'providing resources' positively affect IWB. Scott and Bruce (1994) studied a closely related construct 'resource supply', but found no relation with IWB, which is remarkable. Their findings suggests that when leaders provide their employees with time and money to innovate, IWB does not increase. One explanation given by the authors themselves, is that the research sample consisted of employees working at the R&D department, where these supplies can be assumed to be readily available. Since my study focuses on production workers, the provision of resources may positively affect IWB.

Another type of leader behaviour that is found to positively influence IWB is delegating responsibilities to employees (De Jong, 2007). This closely relates to job autonomy, which was discussed in the previous section. Leadership is also represented as a dimension in the SSSI, and thus seen to contribute to perceived support for innovation in the organization (Siegel and Kaemmerer, 1978).

A somewhat different construct that helps building a climate for innovation, is 'change orientation', which entails that the organization holds an 'active orientation toward change and a positive approach toward errors' (Parker et al, 2006:638). Openness to change might encourage employees to embrace and strive for change as well. The dimension 'continuous development' by Siegel and Kaemmerer (1978) triggers the same behaviour and attitude in employees as Parker et al's change orientation. When striving for innovation, an organization should openly value change and development of (everything in) the organization.

So, creating and maintaining an innovation-enhancing climate is crucial in order to stimulate IWB. To realize this, employees should perceive that the organization as a whole, and their leader in particular, supports and encourages innovation and is willing and able to provide resources for (implementation of) new ideas.

2.2.6. Concluding

As determined earlier, the focus of this research is on innovative competences of production workers. In order to behave innovatively, employees should at least possess the technical competences required to execute their tasks (task-related competence). Moreover, cognitive problem-solving skills are needed to handle and understand the problems that occur and come up with solutions (cognitive competence). This can be realized by making (training and development of current employees) or buying (recruiting new skilled employees) task-related competence.

Beyond the basic requirements of carrying out one's tasks, employees need to be proactive, creative and motivated to behave innovatively (action competence). In order to trigger employees to display IWB, an organization needs to design challenging tasks and provide the employees with job autonomy. In order to realize this, the organization should design jobs that allow for innovation.

Finally, an organizational climate should be created and maintained that strives for, encourages and enhances innovation. Crucial in this is employees' perception of support for innovation by the organization and its leaders. Herein lies an important role for HR to encourage leaders to display behaviour that promotes innovative behaviour throughout the entire organization (leadership).

Figure 2.2 outlines a conceptual framework embedded in the broader framework of organizational strategy, HRM and organizational performance. The red box highlights the focus of this research. Organizational strategy is a given and has been labelled 'innovation' for TKF. The link between HRM outcome (innovative workforce) and organizational outcome (innovation) will not be studied. The assumption is made that innovative output of employees will increase organizational innovativeness. The HR practices that are proposed to enhance innovative competences of employees are training & development; recruitment & selection; job design and leadership.

Training and development comprises the development of current or new employees to increase their task-related and innovative competences. When the current workforce is not sufficient to build an innovative shop floor, new machine-operators can be recruited. According to the theory, these employees should be proactive, creative, possess cognitive problem-solving skills and have completed higher forms of education. Simultaneously, the organization's architecture should provide opportunities for innovative behaviour of employees. Jobs should be designed to challenge the employee, for instance by providing variety, autonomy and responsibilities. Furthermore, leaders should display behaviour that evokes innovative work behaviour of their subordinates. Thus,

leaders should be trained to or selected for their leadership skills. Finally, to reinforce the desired behaviour, the organization as a whole and its leaders in particular should articulate and carry out the strategic objectives of the organization and act upon it.

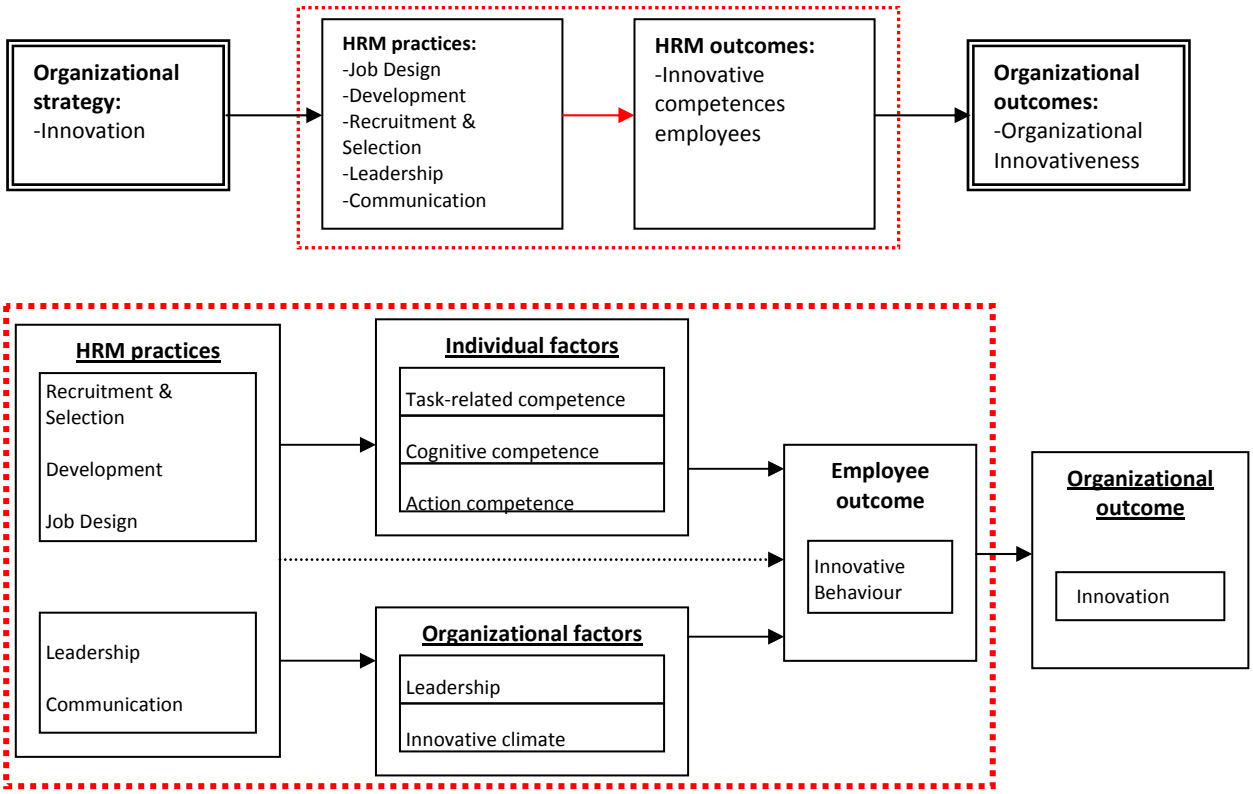

Figure 2.2: Conceptual framework including scope of research (adapted from Guest (1997) and De Leede and Looise (2005)).

2.3 Methodology

2.3.1. Research Design

The previous section presented the conceptual framework of this research. In order to test this model, the concepts should be operationalized into measurable constructs. These constructs are generated in chapter three through a literature review of the concepts and their relatedness. The questions that need to be answered were formulated in the introduction. For the purpose of readability, I will recapitulate the questions:

"How can the competences of employees be realigned with the organizational strategy?"

1. *What is TKF's organizational strategy and how is innovation embedded in this strategy?*
2. *Which competences do production workers need to enhance organizational innovativeness?*
3. *To what extent do the production workers currently possess these competences?*
4. *Which steps can be taken to (further) enhance innovative competences of these production workers?*

The first sub question was answered in the previous chapter. TKF's strategy was explored and typified according to the strategy diamond by Hambrick and Fredrickson (2001). Innovation is very important for TKF as a crucial means in developing, producing and supplying innovative solutions.

The second question will be answered by operationalizing the conceptual framework that was presented in the previous section. The concepts will be operationalized into measurable construct. This will be realized through a literature review on the relevant concepts and their relatedness (chapter three).

To determine the current situation at TKF, a questionnaire is developed based on the theoretical framework. This questionnaire will be handed out to production workers, to gather data on the extent to which innovative competences are currently possessed by the production workers. Besides, some interviews are held and observations made that are used to further complete and interpret the data. These three methods of data collection are used to determine the current situation, which answers sub question three.

In order to answer the last question, similarities and differences between the IST and SOLL situation are described. Subsequently, recommendations and implications are formulated on how to (further) improve the innovativeness of production workers.

2.3.2. Research Methods

In the introduction I mentioned that this research is part of a broader project, called 'competences for innovation'. Within the boundaries of this project, my research can be seen as a case study. My research will focus merely on TKF. The research population is limited to production workers employed at TKF. However, this research could be replicated for the other companies that are part of this project 'competences for innovation'.

Since the research population concerns a large group of machine-operators, some choices had to be made regarding the sample and methods to use. In order to select an appropriate sample size, it is important to know that the total population of production workers at TKF consists of 186 employees. These are divided over five production plants. All of them are machine-operators. However, three different levels of machine-operators can be distinguished: assistant, machine-operator and all-rounder (which differ in the amount of experience and task-related competence). This leads to a total of fifteen subgroups of employees, with an average of slightly more than twelve employees per group. It would be possible to randomly select two or three employees per group. However, the reason for not choosing this method was twofold. The first reason is related to the nature of this research. One objective is to diagnose the current situation at TKF regarding innovation at the shop floor. To determine this, several factors had to be measured, leading to a quite extensive number of questions. The most appropriate method to get these questions answered, is by conducting a survey with all respondents filling out a questionnaire, which is less time-consuming than conducting interviews. This time can instead be spent on handing out questionnaires to the whole population, which in the end increases the reliability of the results as well. A second, though very crucial, reason for including all production workers, is to prevent organizational unrest. During my research a reorganization was announced, stating that fifty jobs would disappear. To avoid further commotion within the organization, it seemed right to include all employees, instead of a sample. Even though every precaution was taken to assure employees that this research was unrelated to the reorganization, the timing of it all remained suspicious and somewhat awkward. Excluding some of the employees from the research might then further stimulate suspicions of employees. Moreover, an additional benefit of increasing the sample is that the response (in absolute numbers) probably increases as well. The questionnaire included some space for remarks and comments as well, giving employees the opportunity to add their opinion regarding issues related to the content of the questionnaire. These answers can be used to clarify results.

Besides this questionnaire, other research methods are used as well. As mentioned earlier, in order to design a questionnaire, an extensive literature review regarding all relevant concepts is crucial. This literature review is presented in chapter three. An exploration of theory regarding factors influencing innovative behaviour of employees and employees' contribution to organizational innovativeness led to a conceptual framework, presented earlier in this chapter. However, in order to determine the situation at TKF, these concepts have to be operationalized into measurable construct. Therefore, the goal of the literature research is to provide constructs with validated and relevant items. Besides, the focus is on constructs that are found to (indirectly) enhance innovative behaviour of employees. Thus, the literature review explores constructs that are related to innovation by employees. It will provide a theoretical framework which helps to determine the innovativeness of the production workers currently employed at TKF.

Data regarding the current situation will be collected by the questionnaires. However, additional information is acquired by interviews and observations. Interviews were held with several managers and some shift leaders. These interviews consisted of open questions regarding innovation at TKF. Different managers were asked to describe the role of innovation at TKF. The interviews were unstructured, meant as an exploratory means to determine how managers from different departments view innovation as a concept and innovation at TKF. Data from these interviews are used to interpret the research results and help make choices during the process.

A last source of information regarding the situation at TKF, is based on observations and conservations during my stay at the organization. Naturally, observations are made when confronted with the daily operations at the organization. Having conversations with several people within the organization further enhances in providing an accurate view of the organization and its employees. However, I decided that it would be useful and interesting to see the production workers doing their job. Therefore, I accompanied two different shift leaders during their evening shift. During this shift, I spoke with the shift leader and the employees about several work-related topics, such as the nature of the tasks, innovation within TKF, their view on the reorganization that was recently announced. Besides, I took this opportunity to observe machine-operators and shift leaders in their own work

environment. These observations and information from informal conversations are used to further interpret results and help formulate recommendations.

Thus, several methods are combined to answer the research questions that were formulated. Theoretical input comes from a literature review, leading to a questionnaire. The completed questionnaires provide a solid base of quantitative data. These are completed by more qualitative data from interviews with managers, shift leaders and machine-operators, as well as observations during the several months I stayed at TKF.

2.3.3. Research Sample

This research is meant to study employee competences that enhance innovation. The employees targeted in this research are production workers, so-called machine-operators. They are the employees working at the line, producing (part of) a cable. At TKF three levels of machine-operators can be identified: assistant, machine-operator and all-rounder. An assistant is either helping a machine-operator, or can independently operate one of the machines. A machine-operator is able to operate one or a few machines independently. An all-rounder is a machine-operator who is able to operate (almost) all of the machines. In some cases an all-rounder is a substitute shift-leader in the absence of a shift-leader. So there is a clear hierarchy within the machine-operators. This hierarchy corresponds with the classification of competence by Dreyfus and Dreyfus (1980) and Sandberg (2000). All machine-operators employed at TKF will be included in this research. This study includes these three types of operators in all five plants, which comprises a total of 186 employees.

Chapter 3 Literature Review: Operationalized Conceptual Framework

In this chapter the literature regarding employees' innovativeness is reviewed to develop an instrument to measure the current situation at TKF. The concepts that have been found to enhance innovative behaviour of employees, as presented in the previous chapter, are explored and reviewed for relevant constructs with measurable items. The literature is reviewed to provide these constructs. The output of this chapter is an overview with relevant, operationalized constructs that are used to build a questionnaire. This chapter will conclude with the limitations arising from the literature and from the use of the questionnaire.

3.1 Operationalization of concepts

Chapter two identified several concepts that were found to relate with innovativeness of employees. Some of these concepts have been studied by different researchers. To prevent overlap and eliminate irrelevant or redundant items in the questionnaire, I evaluate the different constructs and subsequently decide which one to use. In general I strive for constructs that comprise merely a few items. However, they should still be comprehensive and valid (Cronbach's Alpha >.70). To maintain the validity of the constructs, I will not remove or recombine items. Thus, merely complete constructs will be included in the questionnaire. In order to increase the response rate, the questionnaire can not be too lengthy or too time-consuming. Moreover, to further increase the comfort for respondents, I will merely use closed-ended items with Likert-scales. Besides, this substantially decreases the processing time of the data.

For the sake of readability the conceptual framework that was developed in chapter two and that will be operationalized in measurable constructs in this chapter, is displayed in figure 3.1. The three individual factors that will be explored, are the task-related, action and cognitive competence. Besides, the organizational factors such as leadership and climate will be operationalized. Moreover, a literature review regarding innovative behaviour of employees is conducted in this chapter as well.

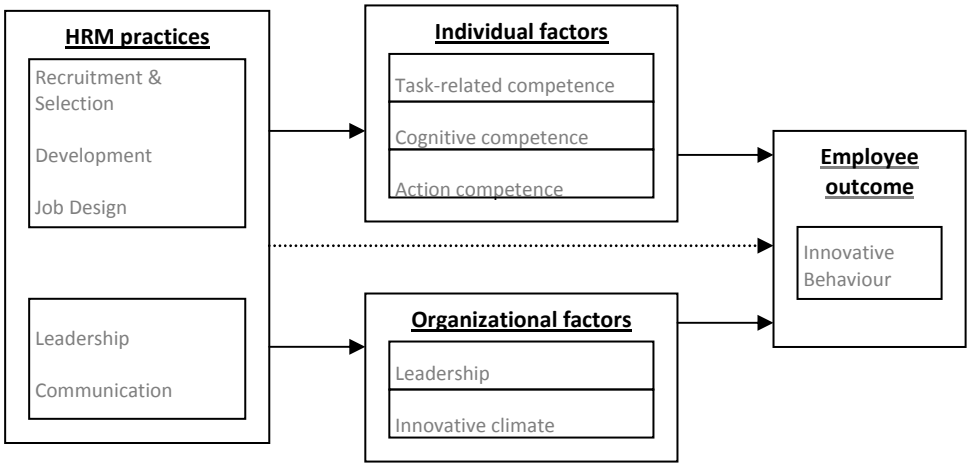

Figure 3.1: Conceptual framework of Innovative Behaviour and related concepts

The next sections present the different concepts as presented in Figure 3.1. and discuss different constructs from the literature that aim to measure these concepts. An overview of all the constructs that are discussed, can be found in Appendix A, including all the original items.

3.1.1 Task-related competence

With respect to production- and task-related competences, Parker et al (1997) developed three constructs which measure flexible role-orientation. One of these constructs is *the importance of production knowledge*. This consists of fifteen items and has an alpha of .93, which is really high. The construct contains five dimensions: cognitive production knowledge (e.g. 'knowing the root causes of production problems that occur'), effective team working, knowing local production requirements (e.g. 'knowing the priorities of work in your area'), understanding of wider manufacturing (e.g. 'knowing the overall objectives of the company') and self-direction. It aims to measure how important these different dimensions are for the job of the respondent. However, the goal of this research is not to find out whether these dimensions are important, but whether the production worker is capable of this. All dimensions can be considered to be relevant for a production worker at TKF. It is important that an employee

understands the problems that (might) arise and is able to identify the cause and find a solution. Being able to self-direct in the way of taking initiative is very important as well. Moreover, understanding what is valued by the company and the customer is relevant for employees at TKF, since TKF strives for 'customer intimacy'. This makes a slightly altered version of *role orientation: the importance of production knowledge* useful for this research.

A second construct by Parker et al (1997) is *strategic orientation* (α.79), which would also enhance flexible role-orientation. Strategic orientation is a ten-item scale that measures what the employees think the strategic objectives and manufacturing principles of the company are. The principles included in these items are: inflexibility, preventive problem solving, inventory control, JIT and employee performance (e.g. 'fixing problems as they arise is more efficient than trying to prevent them', 'in a production department, time spent not producing is time wasted'). Although it is important for employees to understand strategic objectives (LOS), it is not the main topic of this research. Besides, three items of the construct *role orientation: the importance of production knowledge* are related to organizational strategy as well. To avoid redundancy, I will not include the construct *strategic orientation* in my questionnaire, but instead include ***role orientation: the importance of production knowledge***, which is more relevant and comprehensive.

Besides the production-related constructs, other factors regarding the job and job design of employees are found to influence innovative behaviour in employees as well. The first construct is whether an employee finds his job challenging, which is measured by Huiskamp et al's (2008) ***challenging job*** (α .89). This construct identifies whether the employee feels challenged by his tasks in a creative and developing way. It exists of four short and clearly defined items (e.g. 'my work is versatile', 'my job requires me to learn new things') and is found to positively relate to IWB. Therefore this construct will be included in the questionnaire.

A second job-related factor is the autonomy or control over one's job. I will present two constructs that measure the extent to which an employee is free in deciding how to do his job. The first one is *individual method control* (α. 78) by Jackson, Wall, Martin and Davids (1993) which consists of six items (e.g. 'can you choose the methods to use in carrying out your work', 'can you control how much you produce') . The items are clearly and generally formulated and can therefore be applied to all sorts of employees. The second construct is *job autonomy* by Parker et al (2006). The nature of this construct is somewhat different from the previous one. It is more targeted at team leaders, regarding questions such as managing budget, training people and monitoring performance. These are tasks that are too far beyond the job requirements of machine-operators. When deciding between these two constructs, the first one (individual method control) is more suitable for my research population. However, another construct *delegating*, which will be discussed in section 3.1.5. is more appropriate for my research, since it consists of fewer items, but is still comprehensive and relevant. Therefore, *job autonomy* will not be included in the questionnaire.

3.1.2. Cognitive competence

Two other individual factors have been identified to influence IWB: cognitive and action competence. When reviewing the literature regarding cognitive competence, two factors were found to be interesting. The first factor is the construct *problem-solving demand* (α .83) introduced by Jackson, Wall, Martin and Davids (1993), which measures the extent to which employees have to deal with different sorts of problems and problem-solving. Even though it is crucial for a machine operator to have extensive problem-solving skills, this construct merely determines whether employees come across these situations, not whether they are able to solve the problems. Transforming these items in such a way that they measure the problem-solving skills of employees, some overlap with the first three items of *role-orientation: importance of production knowledge* is created. Therefore, I will not add this construct (*problem-solving demand*) to my questionnaire.

A second factor that influences employees' cognitive competence is ***educational background***. Educational level is found to influence IWB (Janssen, 2000). There is no need for a complete construct to measure educational level. Merely a multiple-choice question asking for the respondent's educational level will be sufficient.

3.1.3. Action competence

Action competence has been researched by different authors as well. Several constructs were found that measure individuals' willingness to take action such as *pro-active personality*, *taking charge* and *role-breadth self-efficacy*. The first one I will discuss is the construct *proactive personality* (α. 89) by Bateman and Crant (1993). It contains seventeen items and aims at determining the willingness and ability of an employee to act upon opportunities that are created (e.g. 'I love to challenge the status-quo', 'I enjoy facing and overcoming obstacles to my ideas'). There are some disadvantages to this construct. First of all, it is quite lengthy, which is detrimental for my desire to develop a short, though comprehensive questionnaire. Secondly, some items are represented by earlier constructs, such as the different phases of IWB. Finally, the items are quite general. This is mainly caused by the

nature of the construct. It is based on a personality-type, which goes beyond pro-active behaviour displayed at work (e.g. 'I feel driven to make a difference in my community, and maybe the world') Therefore, this construct will not be included in the questionnaire.

A second factor that is found to influence IWB is *taking initiative* or *taking charge*. Huiskamp et al (2008) present a four-item construct *taking initiative* (α. 80), with short, clearly formulated items (e.g. 'in my job I regularly introduce new plans'). The second construct is provided by Morrison and Phelps (1999) and incorporates ten items (α. 95). Besides its extensive length, the content is partly not relevant (e.g. 'this person often tries to implement solutions to pressing organizational problems'). Machine-operators are not (and should not be) occupied with changing organizational rules or policies, or eliminating faulty procedures. ***Taking initiative*** (Huiskamp et al, 2008) contains fewer items, which are more relevant and clearly stated. Therefore, this construct will be included in the questionnaire.

A last action-related factor that I will discuss is *role-breadth self-efficacy*. Parker (1998) presents a ten-item construct (α. 96) to measure the extent to which an employee feels confident enough to engage in activities that are not part of his formal job description. Some of the items show some overlap with items presented before (e.g. 'designing new procedures for your work area'). Other items are less relevant for machine-operators, for instance: 'contacting people outside the company to discuss problems' and 'contributing to discussions about the company's strategy'. This construct will not increase the value of my questionnaire and will therefore not be included.

3.1.4. Employee and Innovation: Innovative Behaviour

Task-related, action and cognitive competences of an individual are found to enhance IWB. The next step is to determine how to measure innovative behaviour. In order to diagnose the innovativeness of the machine-operators currently working at TKF, constructs that measure innovative behaviour are required. What behaviour leads to innovation? As mentioned earlier in this report, IWB consists of several stages: *Opportunity exploration*, *idea generation, championing and application*.

The first stage of the IWB-model is *opportunity exploration*. Kleysen and Street (2001) and De Jong (2007) developed constructs. The former included three items (e.g. 'look for opportunities to improve an existing process, technology, product, service or work relationship'), clearly defined, but with relatively low validity (.719). De Jong presents a construct containing two short items (e.g. 'pay attention to issues that are no part of his daily work'), with high validity (.88). However, these items are less far-reaching. Despite the lower score on validity of the construct of Kleysen and Street, I find it more suitable for this research, because of its comprehensiveness. Thus, Kleysen and Street's (2001) ***opportunity exploration*** will be included in the questionnaire.

For *idea generation* I found three interesting constructs: *generation and testing of ideas* (Krause, 2004); *idea generation* (De Jong, 2007) and *generativity* (Kleysen & Street, 2001). The construct of Krause consists of four items, which vary from the generation of an idea to approaching others for help (e.g. 'I invested time and energy to find better variants'. The second construct applies the activity of *generating ideas* to specific situations, which simultaneously increases specificity of the items, as well as broadening the concept of 'innovation' (e.g. 'find new approaches to execute tasks'). The last construct by Kleysen and Street (2001) comprises merely two items and uses 'problems' as an initiator for new ideas (e.g. 'generate ideas or solutions to address problems'). Moreover, the construct validity is not that high for *generativity*. The construct that is most suitable for this research, is that of De Jong (2007): ***idea generation***, which is most comprehensive. Furthermore, this construct scores highest on validity as well.

The third stage of innovative behaviour, is *championing* of the idea, which entails encouraging and convincing others (key people) of the usefulness of the idea. Two constructs regarding championing were found in the literature. Kleysen and Street (2001) provided a three-item construct (α .893) including the persuasion of others, the promotion and support of ideas (e.g. 'try to persuade others of the importance of a new idea or solution'). De Jong (2007) introduces a two-item construct emphasizing behaviour to get other people in the organization on board in supporting innovative ideas (α .95). The two constructs are quite similar. The second construct has a higher validity and fewer items, which is beneficial for the validity and length of the questionnaire. Therefore I will add the construct ***championing*** by De Jong (2007) to the questionnaire.

Finally, the last stage of IWB, which is implementing the idea, has been researched as well. I found three interesting constructs regarding this stage. The first one is by Krause (2004) and is named *implementation* (α .81). It consists of three items and focuses on the contribution of the subject during one specific innovation process (e.g. 'I implemented the project idea in my area of work'). The second construct is *application*, which entails three items and has a high validity (α .93 ; De Jong, 2007). This construct aims to determine the extent to which an employee implements ideas (e.g. 'contribute to the implementation of new ideas'). The last construct by Kleysen and Street

(2001) consists of three items (α.796) which closely resemble the items of De Jong. However, these items are more complex in their formulation (e.g. 'incorporate new ideas for improving an existing process, technology, product or service into daily routines'). Therefore, I will choose the construct by De Jong ***application*** to add to the questionnaire.

All stages have been discussed now and constructs have been chosen to measure these concepts. However, there is one additional construct that I would like to discuss: *innovative behaviour* as a whole. This concept determines the extent of innovative behaviour an employee displays. Three constructs were found to measure innovative behaviour. The first one is *innovative output* by De Jong (2007), which entails six items. Besides the generation and development of innovation in products and processes, this construct determines the extent to which the employee contributes to improvement of work practices and the acquirement of new knowledge (e.g. 'actively contribute to developing new products and services', 'suggest acquiring new knowledge'). Thus, it broadens the concept of innovation beyond product innovation. A disadvantage of this construct is that the validity is not known. However, the other constructs that were used by De Jong in his research all scored high on validity. Therefore, I feel confident that this construct will be valid as well. The second construct is developed by Scott and Bruce (1994) and is named *innovative behaviour* (α .89). The six items of this construct closely resemble the stages of IWB as discussed earlier (e.g. 'generates creative ideas', 'promotes and champions ideas to others'). Since all stages are represented in the questionnaire, this construct by Scott and Bruce would mainly provide redundant and therefore irrelevant items. The last construct was provided by Huiskamp et al (2008): *innovative capability* (α. 89). This construct aims to determine the consequences of employee's innovative behaviour, for instance whether this leads to an increase of efficiency or a decrease in costs (e.g. 'I actively contribute to increasing the efficiency of our work processes', 'I actively contribute to decreasing the costs of the work processes in my organization'). This would be interesting to study, in order to further confirm the importance of innovative behaviour of employees in enhancing organizational objectives. However, since the respondents are machine-operators, it might be difficult to assess the consequences of their contribution to efficiency and costs of work processes through the innovative ideas they generated or implemented. When comparing the three constructs, the first one, ***innovative output***, would be most comprehensive and relevant. Still, it is important to take into account that the validity is not known and should therefore be calculated once the data are collected. If it appears to lack validity, this construct will be excluded from further analysis.

3.1.5. Organizational factors: Leadership

The last group of factors, influencing employees to behave innovatively, that I will include in my research are the organizational factors. First of all, I will discuss constructs that measure the extent of innovation-enhancing leadership displayed by the shift leaders at TKF (rated by the machine-operators).

Support for innovation by leaders has been studied by several authors and was found to positively enhance innovative behaviour in employees. The first one is provided by De Jong (2007) and is called *support for innovation* (α. 82) and is found to be leader behaviour that positively relates to IWB. The construct consists of four short and clearly formulated items on support and interest (e.g. 'my leader shows sincere interest whenever I come up with an idea', 'my leader supports me when I want to improve things'. The second construct is named *supportive supervision* (α. 93) and is introduced by Parker et al (2006) and comprises the encouragement by the leader of its subordinates regarding team-related issues (e.g. 'encourages us to expect a lot from ourselves', 'encourages us to set targets for our team performance'). Although the validity of this construct is rather high, its main purpose is to promote team performance and effectiveness. Since production workers at TKF do not really work in teams, encouraging individuals seems more relevant in this case. Moreover, the goal is to enhance innovative work behaviour, which finds its basis in individual behaviour. Therefore, stimulating team-related skills is lower in rank regarding relevance for this research. The last construct is *leadership* (Siegel and Kaemmerer, 1978). It provides nineteen items, aiming at determining the type of leadership and the position of leaders in the organization (e.g. 'our ability to function creatively is respected by the leadership', 'the role of the leader here is to encourage and support individual members' development'). This construct is quite comprehensive. However, several items are somewhat redundant and interdependent, since they are formulated upright as well as reversed. This causes the number of items to be relatively high. Besides, the validity of this construct is unknown. Overall, the first construct seems to be most suitable for this research, and fulfils the requirements of a low number of items and a high validity. Therefore I will include ***support for innovation*** by De Jong (2007) into the questionnaire.

A construct to determine whether leaders support innovation has been identified. This is merely a first step to enhancing IWB. In order for employees to contribute to innovation, resources have to be made available. Two constructs were found to be measuring the provision of resources. The first one is by Scott and Bruce (1994): *resource supply* (α. 77). It measures the extent to which time and financial resources are made available for the

development of new ideas. The construct consists of six items (e.g. 'assistance in developing new ideas is readily available', 'there is adequate time available to pursue creative ideas here'). However, as mentioned earlier in this report, this construct *resource supply* was found to have no relation with innovation. The explanation given by the authors is that the research sample consisted of employees working at the R&D department. Since this department's goal is to develop and improve, and thus innovate, resources can be assumed to be readily available at all times. Therefore, *resource supply* is not found to influence innovative behaviour. The second construct ***providing resources*** (α. 81) by De Jong (2007) consists of three items that measure leader behaviour with regards to providing resources (e.g. 'my leader provides me with time to work out ideas'). This construct is found to positively relate with IWB. Combined with the higher validity and the lower number of items, this construct is found to be more relevant for this research than the construct by Scott and Bruce (1994).

A slightly different construct that measures the effect of leadership on IWB is *delegating* (De Jong, 2007). This closely resembles the constructs that were introduced before, regarding *job autonomy* and *individual method control*. However, this construct views autonomy as being the result of the freedom provided by the leader instead of that evoked by job design (e.g. 'my leader allows me to decide myself how I do my work'). In general, the job description of a production worker is not known for its degree of autonomy. However, a (shift) leader can encourage and allow employees to behave more autonomously. Therefore, in order to measure the perceived autonomy of employees, ***delegating*** will be added to the questionnaire, whereas *job autonomy* and *individual method control* will not.

3.1.6. Organizational factors: Climate

A final factor that I will study is the *organizational climate*. Does the organization value and strive for innovation? Is change advocated or avoided? I found four constructs that attempt to measure organizational climate and culture for innovation. The first one is by Scott and Bruce (1994) and measures the support for innovation by the organization as a whole (α. 92). Sixteen items have been identified, although some of them are redundant (e.g. 'creativity is encouraged here', 'this organization is open and responsive to change'). This makes this construct somewhat less desirable to include in the questionnaire. The second construct is *change orientation* (α. 74) by Parker et al (2006). It consists of five items that measure whether someone finds change a necessity or views change as an impediment (e.g. 'tried and tested ways of doing things are usually the best', 'too often work practices are changed just for the sake of change'). A major disadvantage of this construct is that all items are formulated in such a way that change is presented as an impediment rather than a condition for an innovation-enhancing climate. For this reason I will not include this construct into the questionnaire. A third construct is *continuous development* as an organizational orientation by Siegel and Kaemmerer (1978), which measures the perceived organizational climate. Ten items are formulated to determine whether the organization is open to change and encourages new ideas (e.g. 'this organization is always moving toward the development of new answers', 'there is little room for change here). Unfortunately, the validity of this construct remains unknown. A good alternative to this construct is that by Malik and Wilson (1995), which is derived from Siegel and Kaemmerer's scale to measure support for innovation throughout the organization (e.g. 'this organization can be described as flexible and continually adapting to change', 'creativity is encouraged here'). This fourth construct contains five items with a high validity (α. 87) and includes the most relevant issues such as organizational orientation towards change, creativity and taking risks. Besides, the items are positively formulated and the number of items is low, while still maintaining comprehensiveness of the construct. Therefore I will add ***support for innovation (climate)*** to the questionnaire.

3.1.7. Concluding: the constructs and their relatedness

Twelve constructs have been found to be relevant for this research and shall therefore be included into the questionnaire. These constructs measure three different concepts: individual and organizational factors as well as innovative behaviour. To enhance readability, the constructs are presented per group of factors in this section. Appendix A provides an overview of all constructs that were discussed in the previous section. This section introduces some hypotheses regarding the relations between several constructs and innovative behaviour of employees. These hypotheses are based on theoretical findings by others researchers.

The constructs were found in literature on the contribution of employees to innovation within the organization. When striving for organizational innovativeness, an organization should employ individuals that possess certain competences. First of all, employees should be able to successfully carry out the production-related tasks that are part of their job (*role-orientation*). In order to be innovative, an employee should understand what happens and is required in his work area to produce a cable. If an employee comprehends what causes

production problems, he might be able think about a solution that will improve the production process. Thus, I would propose that employees that score high on *role-orientation*, score high on IWB-related constructs as well.

H1: The higher an employee scores on role-orientation, the higher he scores on IWB-related constructs and innovative output

Role Orientation: the importance of production knowledge	*How important are the following skills and knowledge for you to do your job effectively?* Knowing the root causes of production problems that occur Being able to measure and analyze problems in the production process Being able to anticipate and prevent production problems Being able to make decisions as part of a group Being able to involve and motivate people Being able to understand other people's point of view Understanding how work flows in your work area Knowing what skills everyone in your work area has Knowing the priorities of work in your area Knowing the requirements of your end customer Knowing the overall objectives of the company Knowing what is different about the products made in this company compared to those made by competitors Being willing to challenge and question the way things are done Being willing to take on and accept new responsibilities Being able to work out what to do when instructions are vague	.93	Parker et al (1997)
Challenging job	My work is versatile My job requires me to learn new things My job requires creativity My job is challenging	.89	Huiskamp et al (2008)
Taking initiative	In my job I regularly introduce new plans I take initiative right away, even if my colleagues don't Usually I do more than what is asked of me If something goes wrong at work, I immediately start looking for a solution	.80	Huiskamp et al (2008)

Table 3.1 constructs that measure the individual task-related and action competences and factors.

Another task-related construct is whether the employee perceives his tasks as being challenging and versatile. Huiskamp et al (2008) found that *challenging job* and *innovative behaviour* are positively related to each other. He found a significant Pearson correlation of .50 between the two constructs. When an employee feels that his job requires creativity, he might be triggered to think creatively about his daily tasks as well, searching for new ways to his job or to solve problems. Following Huiskamp et al, I expect that the more an employee perceives his job as challenging, the higher he scores on *innovative behaviour*.

H2: The higher an employee scores on challenging job, the higher the scores on IWB-related constructs and innovative output

A cognitive factor that has been found to influence innovative behaviour is *educational level* (Janssen, 2000). Although *educational level* is not included in the questionnaire as a construct, it will be determined for each respondent by asking for the highest completed education. I propose that the higher the *educational level* of a respondent is, the more he contributes to innovation within the organization.

H3: The higher the educational level of a respondent, the higher he scores on innovative output and the other IWB-related constructs.

Taking initiative represents the action competence of an individual and will most likely be related to some of the constructs of IWB as well. Some theories argue that initiating comprises the first two stages of the IWB-model (Talke et al, 2006), whereas others suggest that *taking initiative* can be found to correspond with a proactive

attitude (Huiskamp et al, 2008). If the latter is the case, this construct can be proposed to relate to the last two stages of the IWB-model (Crant, 2000). Huiskamp studied the effect of proactive attitude on innovative work behaviour and found a Pearson correlation of .49. Proactive attitude includes items of *taking initiative* and self-development (Huiskamp et al, 2008). Based on these results, I hypothesize that respondents that score high on *taking initiative* will score high on IWB-constructs as well.

H4: The higher a respondent scores on taking initiative, the higher he will score on the IWB-constructs and innovative output

Opportunity exploration	Look for opportunities to improve an existing process, technology, product, service or work relationship Recognize opportunities to make a positive difference in your work, department, organization or with customers Pay attention to non-routine issues in your work, department, organization or the market place	.719	Kleysen & Street (2001)
Idea generation	*How often does this employee* Search out new work methods, techniques or instruments Generate original solutions to problems Find new approaches to execute tasks	.90	De Jong (2007)
Championing	*How often does this employee* Encourage key organization members to be enthusiastic about innovative ideas Attempt to convince people to support an innovative idea	.95	De Jong (2007)
Application	*How often does this employee* Systematically introduce innovative ideas into work practices Contribute to the implementation of new ideas Put effort into the development of new things	.93	De Jong (2007)
Innovative output	*In your job, how often do you* Suggest improving current products or services Suggest improving current work practices Suggest acquiring new knowledge Actively contribute to developing new products or services Actively contribute to acquiring new customers Actively contribute to changing the work situation	---	De Jong (2007)

Table 3.2 constructs that measure individual innovative behaviour: IWB and innovative output

Four stages of IWB are presented in table 3.2: *opportunity exploration, idea generation, championing* and *application*. As these constructs are all part of IWB, they would probably all relate to each other. Furthermore, a relation between these constructs and innovative output can be expected as well, since this construct summarizes the different parts of IWB.

H5: The higher a respondent scores on an IWB-construct, the higher he will score on innovative output

The last group of factors that is found to promote innovative behaviour in employees, are the organization-related constructs. Three types of leadership behaviour have been included in the questionnaire: delegating, support for innovation and providing resources (De Jong, 2007). These three leader behaviours have been found to significantly positively correlate with innovative work behaviour (resp. .18; .16; .15, significant on $p<0.001$). Giving employees the freedom to solve problems or do their tasks their own way, enhances the willingness to behave innovatively. Encouragement of ideas and providing time and financial resources for deployment of ideas by leaders promote innovative behaviour in employees as well. Additional insights by De Jong and Den Hartog (2007) suggest that delegating and support for innovation as leader behaviours positively relate to both idea generation and application, whereas providing resources merely relates to application. Several hypotheses can be formulated. First of all, I propose all three types of leader behaviours to positively relate to innovative output. Secondly, *delegating* and *support for innovation* positively relate to all four IWB-constructs. Finally, *providing resources* positively relates to *application*.

Delegating	*My leader* Allows me to decide myself how I do my work Gives me considerable independence and freedom Allows me to determine my own time planning	.84	De Jong (2007)
Support for innovation	*My leader* Shows sincere interest whenever I come up with an idea Reacts enthusiastically to my creative thoughts Supports me when I want to improve things Is someone you can count on, even when you initiate something unsuccessful	.82	De Jong (2007)
Providing resources	*My leader* Provides me with time to work out ideas Provides me with the means necessary for innovation Is willing to invest time and money in innovative efforts	.81	De Jong (2007)
Support for innovation (climate)	This organization is always moving toward the development of new answers This organization can be described as flexible and continually adapting to change People in this organization are always searching for fresh, new ways of looking at problems Creativity is encouraged here This organization seems to place a high value on taking risks, even if there are occasional mistakes	.87	Malik & Wilson (1995)

Table 3.3 constructs that measure organizational factors: support for innovation throughout the organization

H6: The more a respondent perceives that his leader delegates, supports innovation and provides resources, the higher that respondent scores on innovative output

H7: The higher a respondent scores his leader to be delegating and showing support for innovation, the higher that respondent scores on idea generation and application

H8: The higher a respondent scores his leader to be providing resources for innovation, the higher that respondent scores on application

A final construct that has been found to be relevant for this research concerns the organizational climate that should be innovation-enhancing to stimulate IWB. The construct that has been chosen to determine whether the organizational climate is one that enhances innovative work behaviour in employees, is *support for innovation (climate)* by Malik and Wilson (1995). The difference with the construct *support for innovation*, is that *support for innovation (climate)* is not a leader behaviour, but the orientation and vision of the organization as a whole. If an organization strives for innovation as a strategy, this should be articulated into operational objectives and should be carried out by managers and employees throughout all layers of the organization. Employees will be constantly confronted with the importance of innovation and might be triggered to contribute as well. Therefore, I hypothesize a positive relation between the perceived *support for innovation (climate)* on the one hand and *innovative output* and IWB-related constructs on the other.

H9: The more a respondent feels that the organizational climate is characterized by support for innovation, the higher he scores on innovative output and IWB-related constructs

The relations that can be expected between the constructs according to the literature have been discussed in this chapter. Hypotheses regarding the different constructs in relation to IWB have been formulated. This chapter started out with a conceptual framework that highlights the focus of this research. These concepts have been operationalized into measurable constructs that have been found to positively influence innovative work behaviour. This more detailed version of the theoretical framework, including the hypothesized relations between the constructs, is displayed in Figure 3.2

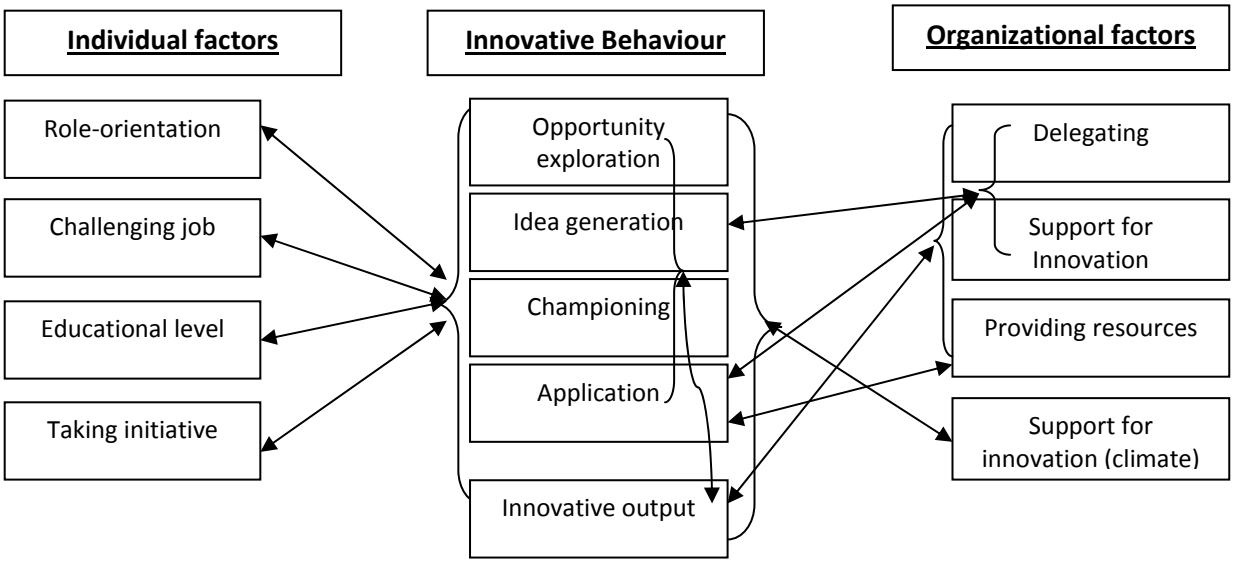

Figure 3.2: Theoretical framework regarding constructs and hypothesized relations

3.2 Limitations literature

The relation between individual employees and organizational innovation has been studied, which has lead to the creation of the constructs discussed in the previous section. However, research on innovative competences of merely production competences was not found. The constructs that I included in my questionnaire, were developed by other researchers. Their population samples differed from the research population of this research. De Jong focused on knowledge workers across different organizations (De Jong, 2007; De Jong & Den Hartog, 2007), while Malik and Wilson studied professional engineers and engineering technicians (Malik & Wilson, 1995). Other samples included a variety of job positions across several organizations (Kleysen & Street, 2001; Huiskamp et al, 2008). This research focuses on machine-operators (merely production workers) employed at TKF (case-study). Since the nature of the tasks and the work environment of machine-operators differ from knowledge workers or managers, the interpretation and relevance of the questionnaire-items may vary. As a result of this difference in perception, relations between constructs may be affected.

3.3 Data collection

3.3.1. The questionnaire: Design and Disseminating

One of the goals of this research is to diagnose the current situation at TKF regarding employee competences for innovation. To find out what production workers are dealing with in their daily work, I developed a questionnaire to be filled out by these employees. As was previously discussed, three main concepts are represented in this questionnaire: individual competences, innovative work behaviour and organizational factors. The first two parts involve self-rating questions. The questions are short closed-ended items with 5-point Likert-scales (i.e. 'never - always' resp. 'totally disagree – totally agree'). All scales have and added option 'don't know'. The third part, the climate for innovation, aims at identifying the perceived leader behaviours carried out by the line managers. Additionally, this construct measures employees' perception of support for innovation of TKF as an organization as well. Again, items and scales were designed in accordance with the other two groups of constructs. However, these did not entail self-rating, but ratings of one's superior and the organization.

The questionnaire contains 55 items. Moreover, seven additional questions were posed, in order to categorize the respondent. These questions concern *job position held*, *type of contract*, *job status, years employed at TKF, age of respondent*, *plant* and *educational background*. Subsequently, at the end of the questionnaire, I included some space for questions and remarks, in case the respondent would have any.

The questionnaire was accompanied by an introductory letter (see Appendix B), which explains the background, purpose and approach of the questionnaire and this research. By emphasizing the anonymity of the respondents (no name or employee-number had to be filled out), I hoped to enhance the response rate as well as the honesty of the respondents. Besides, an envelope was attached to the questionnaire, to enhance the

perception of anonymity. By putting the questionnaire in the envelope and then into a box, no other person than me, the researcher, would see the answers.

To further enhance the response rate, I personally handed out the questionnaire. From personal and others' experience I know that being requested to fill out a questionnaire for someone you do not know or haven't seen before, might result in non-response. I scheduled meetings with all shift leaders from all five departments (within a time period of four days). Except for two out of thirteen shifts, the shift leader and I would talk to the production workers during their shift and personally explain the request. The shift leaders agreed to allow the respondents to take 10 to 15 minutes during their shift to fill out the questionnaires. The employees in the two other shifts were handed a questionnaire by the shift leader without me being present.

Furthermore, in two plants (Energie & Telecom II) I accompanied the shift leader during the entire evening shift. The reason for doing this is twofold. First of all, I think it is crucial to experience the environment and atmosphere in a plant and to get some insight in the daily tasks of shift leaders and production workers to be able to interpret the results of this research. Secondly, I expected that the response rate would increase (and results would be more honest) if I showed some interest in their work and opinions. Besides, in case the respondents would have any questions, they could approach me immediately.

Within each shift of production workers merely one moment was planned to hand out the questionnaires. If an employee happens to be absent during that day (due to leave or sickness), he was excluded from participation. The reason for this was that the respondents were asked to complete the questionnaire during their shift so the data collection would be completed by the end of each shift.

3.3.2. The Questionnaire: Reliability and Validity

To enhance validity, face validity was checked by a critical review of the questionnaire by several people, such as my supervisors (two of them working at TKF and the other two researchers at the UT), the vice-president of the works council, the shift-leaders and two production workers from other industrial organizations.

The questionnaire was composed of items that were part of internally consistent constructs. These constructs were developed and tested in previous scientific research and scored sufficiently high (>.70) on internal consistency (Cronbach's alpha).

3.4 Limitations regarding constructs of questionnaire

Although the constructs have been selected carefully, there might be some limitations regarding the use of these constructs for this research.

The questionnaire that I used to collect the data for this research, comprises twelve constructs, and provides a total of fifty-five items. These items were developed by other researchers in previous studies on enhancing and measuring innovative behaviour of employees. The constructs were carefully selected to be relevant for this research as well.

Some items were originally formulated in English, whereas other items were formulated in Dutch. Since the population of this study consists of production workers who might not be fluent in English, the questionnaire had to be in Dutch. This meant that some of the items had to be translated into Dutch. This often incorporates translation-issues, when dealing with professional terminology. Besides, the items had to be formulated in such a way that all respondents would be able to understand them. Therefore, some terms had to be replaced with more simple descriptions. The risk arising is that the interpretation of the items might slightly deviate from the original meaning of the item. To ensure that the construct is still valid, internal consistency has to be calculated for the translated items.

A second issue that might influence the validity of the constructs, is that the scales of the constructs were altered. To increase the easiness of filling out the questionnaire, I strived for aligning scales as much as possible. However, all constructs had different scales. Moreover, some of the constructs were meant for supervisors to evaluate their subordinates. In these cases, the items were altered to self-rating items for the respondents. The adjustments that were made to the constructs are presented in Table 3.4. One adjustment that was made to almost every construct was the addition of the option 'don't know' to the scales. This was done to prevent that respondents would select the middle option (neutral, or not agree, nor disagree) when an item was not applicable or the answer was unknown. Selecting the middle option would influence the values. The disadvantage of adding this 'don't know'-option, is that people might be more easily tempted to choose this option instead of being forced to have and express their opinions. However, it was decided that striving for 'pure values' was more important.

Finally, a limitation of the study might be based on social desirability. Most of the constructs involve self-rating items. Other constructs are based on the respondents perception which is subjective. Therefore, the data of this research might be influenced by social desirable answers. Furthermore, at the time of data collection a

reorganization was announced by the board of TKF. This might have created unique circumstances influences the data. However, it is hard to predict which effect this would have had, if it had any. It could be that employees are tempted to provide more positive answers on self-rating questions, while possible be more negative regarding their leaders' behaviour and the behaviour of others in the organization.

The complete Dutch questionnaire can be found in Appendix B. The accompanying letter that was handed out to the respondents is included as well.

Name of construct	Adjustment to constructs
Role Orientation: Production Knowledge	▪ Question altered from 'how important are the following skills and knowledge for you to do your effectively' to 'to which extent'. Instead of the relevance of these skills and knowledge, I want to determine to which extent a respondent possesses these competences. ▪ Scale adjusted from 1: not at all important – 5: extremely important, to 1: never – 5: always. Besides, option 6: 'don't know' was added to the scale. ▪ Items were translated from English to Dutch
Challenging Job	▪ Scale altered from 1: most certainly not – 5: most certainly, to 1: strongly disagree – 5: strongly agree. Option 6 'don't know' was already included in the original scale. ▪ Construct was originally in Dutch, no translation needed
Taking Initiative	▪ Scale altered from 1: most certainly not – 5: most certainly, to 1: strongly disagree – 5: strongly agree. Option 6 'don't know' was already included in the original scale. ▪ Construct was originally in Dutch, no translation needed
Opportunity Exploration	▪ Scale slightly altered from 1: never – 6: always, into 1: never – 5: always, 6: 'don't know'. ▪ Items were translated from English to Dutch
Idea Generation	▪ Question altered from 'how often would this employee' to 'how often do you'. ▪ Scale adapted by adding 6: 'don't know' ▪ Construct was originally in Dutch, no translation needed
Championing	▪ Question altered from 'how often would this employee' to 'how often do you'. ▪ Scale adapted by adding 6: 'don't know' ▪ Construct was originally in Dutch, no translation needed
Application	▪ Question altered from 'how often would this employee' to 'how often do you'. ▪ Scale adapted by adding 6: 'don't know' ▪ Construct was originally in Dutch, no translation needed
Innovative Output	▪ Scale adapted by adding 6: 'don't know' ▪ Construct was originally in Dutch, no translation needed
Delegating	▪ Scale adapted by adding 6: 'don't know' ▪ Construct was originally in Dutch, no translation needed
Support for Innovation	▪ Scale adapted by adding 6: 'don't know' ▪ Construct was originally in Dutch, no translation needed
Providing Resources	▪ Scale adapted by adding 6: 'don't know' ▪ Construct was originally in Dutch, no translation needed
Support for Innovation (Climate)	▪ Scale adapted from 1: strongly disagree – 7: strongly agree, to 1: strongly disagree – 5: strongly agree. Option 6 'don't know' added ▪ Items were translated from English to Dutch

Table 3.4: Adjustments made to the constructs before adding them to the final questionnaire

Chapter 4 Results: Description and Analysis

In this chapter I present the data that I collected. In order to be able to derive conclusions based on the data, the program SPSS[8] will be used. This chapter will present some descriptive analyses, including the response rates and different characteristics of the group of respondents. Besides, the current situation regarding innovative competences of employees is described. A missing value analysis will be conducted to determine whether there are any other interesting issues regarding the perception of innovation by employees. Furthermore, relations between different constructs will be measured in order to test the hypotheses that were formulated in the previous chapter.

4.1 Data Description

4.1.1. Research Sample and Response rates

Table 4.1 presents the sample with corresponding response rates. The population size differs somewhat from the number of questionnaires that were handed out. For every shift of workers merely one moment was planned to hand out the questionnaires. If an employee happened to be absent (due to sickness or leave), they would not have to fill in the form. Fortunately, merely 5.9% of the employees was absent. The last column outlines the response rates. The percentages are calculated based on the questionnaires actually handed out. As can be observed, the response rate is extraordinarily high, with more than three plants scoring a response of more than 90%. The total response rate comes down to 88%, which is beneficial for the reliability of the research results.

Plant	Population size (#)	Handed out (#)	Response (# / %)
Draad & Geleider	15	15	14 (**93.3**)
Telecom I	24	21	19 (**90.5**)
Telecom II	31	28	25 (**89.3**)
Energie	51	50	48 (**96.0**)
Lochem	65	61	47 (**77.0**)
Plant unknown			1
Total	**186**	**175**	**154 (88.0)**

Table 4.1: Research population and response rates

Several factors can be identified that might have stimulated the respondents to fill out the questionnaires. The most obvious reason would be the willingness of the respondents to cooperate and participate in my research. A second factor would be the personal approach of data collection. By disseminating the questionnaires personally, the employees might be more triggered to fill out the form. A third factor could be the enthusiasm of the shift leaders and the encouragement by them to complete the form. Additionally, the fact that shift leaders agreed to allow employees to complete the questionnaire during their shift, might have further enhanced the response.

When observing the results presented in Table 4.1 the relatively 'low' response of the plant 'Lochem' can be noticed. Although a response rate of 77% is remarkably high, compared to the other plants, Lochems score stands out. I think this is not caused by any of the factors that I mentioned earlier which influenced the high response rate. Other issues might explain this difference. First of all, during my internship at TKF, a reorganization was announced, which would entail closing down the plant in Lochem. At the time of disseminating my questionnaires in Lochem, the negotiations between the board of TKF and the unions were ongoing. Despite my attempt to assure them that my research was not related to this reorganization at all, some employees were not reassured. They started questioning the anonymity of the answers. This might have led to some production workers not completing the questionnaire. Furthermore, the questionnaires that were completed, might be biased by the circumstances as well. However, it is unclear what kind of effect this would have. On the one hand, machine-operators might be more positive (regarding their own performance) because they think the outcomes will affect whether they will be dismissed. On the other hand, the employees might be angry or frustrated with the organization and be more negatively biased in their answers (regarding the questions that concern the performance of others than themselves). The third option is that it does not have any influence, because the employees with suspicions did not fill out the questionnaire. Regardless of suspicious timing of data collection,

[8] SPSS: Statistical Package for Social Sciences www.spss.com

77% of the respondents ended up completing the questionnaire, which proves employees' willingness to cooperate.

4.1.2. Descriptive statistics respondents

As stated in the previous chapter, the research population includes machine-operators from five plants. Some descriptive statistics regarding educational level, job position held, type of contract, years employed and age of respondent are presented in Appendix C.

The educational level of the group of respondents is dominated by lower vocational education (42.2%) and intermediate vocational education (37.7%), which can be expected in an organization which is based on a large group of factory workers.

Most respondents are machine-operator (38.3%) or all-rounder (42.9%). One remark has to be made. There might be some confusion regarding the job position held by the employee. According to the organization's administration, half of the employees working at Draad & Geleider are assistant machine-operator (which is stated on their pay check as well). However, none of the respondents stated that he was an assistant. The team leader of Draad & Geleider informed me that new employees are named machine-operator from the beginning. However, when asking about the tasks and responsibilities of a new employee, it became clear that in fact they are assistant machine-operator. Therefore, drawing conclusions based on job position might be somewhat complicated.

The majority has been working at TKF for more than ten years, although 18.8% has been employed for 1-4 years. The latter is caused by the previous reorganizations that included dismissals, which was followed by a period of recovery that led to the hiring of new employees. The high percentage of employees that have been employed at TKF for more than ten years corresponds to the relative seniority in job position. In order to get promoted in the hierarchy of machine-operators, experience as a machine-operator is required.

Almost all respondents have a permanent contract (87.7%) and work fulltime (95.5%). Most respondents are between 35 and 54 years old (35-44: 39.6%; 45-54: 39.0%). These findings are not very uncommon for manufacturing organizations.

4.2 Data analysis

The descriptive statistics of the group of respondents have been presented in the previous section. The next step is to discuss the different constructs. First of all, the validity of the constructs has to be checked. The scores of the different constructs will be presented. Subsequently, the relations between the different constructs will be discussed, testing the hypotheses that were formulated in the previous chapter. Furthermore, throughout this section the results will be interpreted and explained.

4.2.1. Validity of the results

A high response rate is important to increase the reliability of the results. It is safe to say that the results can be inferred for all production workers at TKF. However, it is important to check the validity of the constructs as well. Although all original constructs were found to be internal consistent ($\alpha > .70$), most items had to be translated and slightly altered. Besides, some scales were adapted to align the scales in the questionnaire. This might have influenced the validity. Table 4.2 shows the Cronbach's alpha's for all the constructs included in the questionnaire. All constructs, except for *idea generation* which scores slightly below .70, are found to be valid. Some constructs have lower alpha's than in previous research (see last columns), whereas others score higher after I altered the construct. All constructs are valid enough to include in my research.

4.2.2. Diagnosing: the Desired Situation

All constructs that were studied in this research were formulated in such a way that the higher an employee scores an item, the better it is (in the end increasing organizational innovativeness). However, some items might be more relevant than others for machine-operators. For instance, it is more important for them to generate ideas to improve products than to actively contribute to acquiring new customers. Nevertheless, the constructs included in the questionnaire were selected on their relevance and suitability for this research population. Therefore, it can be claimed that high scores (higher than four) are desirable for all constructs. To assess the importance of the items for TKF, several managers completed the questionnaire indicating the desired situation aligned with the strategic objectives of the organization. The individual factors (role-orientation, challenging job and taking initiative) should

Construct Name	Alpha NEW	Valid cases #	(%)	Items #	Original Author	Alpha OLD
Role-orientation	.833	122	(79.2%)	15	Parker et al (1997)	.93
Challenging Job	.761	146	(94.8%)	4	Huiskamp et al (2008)	.89
Taking Initiative	.703	146	(94.8%)	4	Huiskamp et al (2008)	.80
Opportunity Exploration	.726	131	(85.1%)	3	Kleysen & Street (2001)	.719
Idea Generation	.692	149	(96.8%)	3	De Jong (2007)	.90
Championing	.789	138	(89.6%)	2	De Jong (2007)	.95
Application	.805	137	(89.0%)	3	De Jong (2007)	.93
Innovative Output	.797	136	(88.3%)	6	De Jong (2007)	----
Delegating	.799	147	(95.5%)	3	De Jong (2007)	.84
Support for Innovation	.873	138	(89.6%)	4	De Jong (2007)	.82
Providing Resources	.833	135	(87.7%)	3	De Jong (2007)	.81
Support for Innovation (climate)	.840	124	(80.5%)	5	Malik & Wilson (1995)	.87

Table 4.2: Cronbach's Alpha Constructs

ideally score four on average. The desired score for innovative behaviour is determined to be between 3.5-4 for most items. Management filled out that support for innovation as leadership should score higher than 4.5, while delegating should score merely three and providing resources approximately four. The organizational climate should be scored slightly higher than four points regarding innovation-enhancing orientation. In the next section these desired scores will be compared with the actual scores and with management's perception regarding the actual situation.

4.2.3. Diagnosing: The Current Situation at TKF

Missing Values

In order to diagnose the current situation regarding innovativeness of machine-operators at TKF, it is crucial to provide some insight in the missing values of the data. Appendix D presents the items that displayed more than 5% of the values as so-called 'missing values'. Missing values include the 'non-response' option, in which case the respondent did not answer the question, and the 'don't know' option, which was part of the scale of all items. Most of the items that contain relatively many missing values, are part of constructs that measure *IWB* and organizational factors.

Apparently, several employees were not able to indicate to which extent they engage in certain behaviours such as 'actively contributing to acquiring new customers' (*innovative output*), 'systematically introducing innovative ideas into work practices' (*application*) and 'encourage key organization members to be enthusiastic about innovative ideas' (*championing*). Besides, employees find it hard to evaluate the support by their leaders and the organization as a whole regarding *innovative behaviour*. *Providing resources*, *support for innovation* by the leader as well as the organization (*climate)* are widely represented in the list of missing values. These findings indicate that the perception of employees regarding innovation is questionable. It seems that employees are not always aware of their contribution to innovation, if there is any. This might be because they do not understand what innovation is, or they are not able to evaluate the consequences of their actions (contribution to innovation). It might be that machine-operators do contribute to innovation by small improvements, but that they do not perceive this as innovation.

Another issue that may cause these missing values, is that these particular items are not applicable to the machine-operator's situation. For instance, actively contributing to acquiring new customers (*innovative output*) might seem somewhat irrelevant and unrealistic for an (assistant) machine-operator.

The relatively large share of organizational-related items in the 'missing values' overview, indicate that machine-operators are not able to evaluate or recognize the behaviour of their leader as enhancing innovation. Besides, this might implicate that they are unaware of the organizational strategic tendency towards innovation. They either did not perceive behaviour or organizational climate that stimulates innovation, or they are unable to evaluate the behaviour by their leaders as innovation-enhancing. Furthermore, if they are not acquainted with the organizational strategic objectives, it might be hard to identify corresponding or detrimental behaviour and climate.

The items that scored highest on missing values are part of the constructs: *opportunity exploration, championing, application, innovative output, support for innovation, providing resources* and *support for innovation (climate).* This may implicate that respondents that did score these items, might have chosen lower scores. For example, when asked how often one 'actively contributes to acquiring new customers' (*innovative output*), a machine-operator might either choose option one (never), or option six (don't know/ not applicable)

when he feels this never happens (1) or is not applicable to his situation (6). Therefore, it is important to keep in mind that the constructs with a high share of missing values might have lower mean scores as well. For a complete overview of all items including the share of missing values, see Appendix D.

Mean scores constructs

The scores range from 1 (low: 'totally disagree' resp 'never') to 5 (high: 'totally agree' resp 'always'). Option six 'don't know' was entered as being a missing value, so it would not influence the mean scores. Table 4.3 presents the mean scores per construct. Several things can be observed. As can be seen, these mean scores vary between 2.23 (*championing*) and 3.77 (*challenging job*). The scores for the IWB-related constructs tend to be low, with mean values below three (which indicates that an employee perceives himself to rarely or sometimes engage in this 'behaviour'). *Idea generation* scores somewhat higher (3.28) indicating that employees generate ideas sometimes or regularly. Besides, *taking initiative* scores higher as well (3.76), with employees perceiving that they regularly take initiative. Thus, when it comes to innovative work behaviour, employees find themselves to be willing to take initiative and come up with ideas, while they rarely or occasionally explore opportunities, further champion or apply the idea. This causes the perception of *innovative output* to be quite low (2.54). The respondents perceives themselves as being able to execute their tasks and understand the broader issues that affect their daily work (*role-orientation*: 3.74). The respondents find their work quite challenging (*challenging job*: 3.77). Considering that their job involves producing a cable, this outcome might be seen as remarkable. However, an all-rounder has several responsibilities and operates different machines. Moreover, manufacturing a fibre cable requires knowledge of more sophisticated technology. This might explain why some employees perceive their work as challenging, which increases the mean value of the construct.

Name of construct	Mean Value (1-5)	Scale Used
Role-orientation	3.74	1: never – 5: always
Challenging Job	3.77	1: strongly disagree – 5: strongly agree
Taking Initiative	3.76	1: strongly disagree – 5: strongly agree
Opportunity Exploration	2.73	1: never – 5: always
Idea Generation	3.28	1: never – 5: always
Championing	2.23	1: never – 5: always
Application	2.48	1: never – 5: always
Innovative Output	2.54	1: never – 5: always
Delegating	3.71	1: strongly disagree – 5: strongly agree
Support for Innovation	3.61	1: strongly disagree – 5: strongly agree
Providing Resources	3.19	1: strongly disagree – 5: strongly agree
Support for Innovation (climate)	3.45	1: strongly disagree – 5: strongly agree

Table 4.3. Mean values for constructs (1 is lowest score, 5 is highest)

The organizational factors that were studied all score above three, which indicates a slightly positive perception by employees. *Delegating* (3.71) scores relatively high compared to the other leader behaviours and more broader *support for innovation (climate)* (3.45). The relatively low score on *providing resources* (3.19) is interesting. The corresponding answer to this value would be slightly positively ahead of neutral (3: neutral, 4: agree). Overall can be said that the scores are not extremely high (the highest score being 3.77 for *challenging job*). The lowest scores are related to innovative employee behaviour and *providing resources* by the leader. Thus employees perceive that they occasionally contribute to several phases of the IWB-model on the one hand, and perceive some lack in the provision of resources by their leader on the other hand. They feel quite confident in their task-related competences and the extent to which they perceive themselves to take initiative.

The fact that employees perceive themselves to contribute more to *idea generation* than to the other IWB-related construct is intriguing. This suggests that machine-operators generate innovative ideas, yet the further processing from an idea to an implementation is hindered. One explanation could be found in the so-called suggestion box. TKF uses the concept of a suggestion box for ideas generated by employees. The procedure is as follows: an employee posts an idea into the box. This box is checked regularly. Then, the idea is run by a committee that evaluates the idea regarding usefulness. Subsequently, the possible cost savings of implementing this idea are calculated. At the end, the decision on whether the idea will be implemented is communicated to the idea generator. However, the time between the moment of submitting the idea till the moment of communicating the verdict can vary between several months or sometimes even more than a year. The employee may feel that the ideas that he generates are not acted upon because of this time span. This is confirmed by information that I

gathered through the interviews ('It feels like they don't do anything with the ideas', 'Sometimes you don't even receive feedback on the ideas that you submitted'). However, it is important to note that four out of five IWB-related constructs scored high on missing values as well, which might indicate a lower mean score since employees feel this does not apply to their situation or they do not know the answer to that question.

Comparing managements perception with machine-operators' perception

This section compares managements perception with machine-operators' perception regarding all constructs. Managers and board members were requested to fill out the same questionnaire as the machine-operators. They were asked to fill it out twice, once to write down what they expected that the current situation was and then what they believe is desirable when looking at the new solutions strategy.

The most striking result was found on the task-related and action competences. Management's expectation of the extent to which machine-operators possess these competences was lower than the actual situation based on the scores that machine-operators reported. This suggests that higher management underestimates what machine-operators perceive they can do. Besides, the desired situation (in line with the strategy) did not differ that much from the actual situation (reported by machine-operators) for these competences. *Taking initiative* should be improved somewhat, as well as *knowledge of wider production principles*. Overall though, it seems that machine-operators' self-rated competences (task-related and action) closely resemble the desired competences determined by management in line with the strategy. Intriguing is that management's perception of these actual competences is lower than machine-operators' perception. This implies that managers underestimate employees' task-related and action competences. This is confirmed by the machine-operators, who state that they feel that they 'are deliberately kept dumb'. Employees feel underappreciated, which is a major threat for their willingness to cooperate and engage in extra-role behaviour. Therefore, management should adjust its perception and attitude towards machine-operators.

Regarding *innovative work behaviour*, management's expectations closely resemble the actual situation. Management expected somewhat more display of *championing* and *application*-related behaviour than was reported by the machine-operators. The desired situation regarding *innovative behaviour* deviates from the actual and expected situation. When aiming at aligning employees' behaviour with organizational strategy, innovative behaviour should be increased. Crucial is to note that the construct *innovative output* was found to contain some less relevant items. 'Actively contribute to acquiring new customers' scored low for both the actual and desired situation, which is not remarkable, since it is hard for machine-operators to acquire new customers when they merely work within a plant and do not meet customers.

The last part of the questionnaire represents the organizational factors, comprised of leadership and organizational climate. Machine-operators tend to be more positive regarding the leadership and climate than was expected by the managers. Interesting is that the desired situation regarding *delegating* leader behaviour is lower than the actual situation perceived by the respondents. The managers explained that they do think that machine-operators have some freedom in deciding how to do their job, but within a clearly defined framework to make sure that the actual task is carried out appropriately. *Providing resources* for innovative ideas is scored lower than *support for innovation*. An obvious reason for this would be that providing time and money for ideas, increases the costs for that department, without any guarantees for success. As can be expected of managers of a profit-organization increasing costs of a production plant by *providing resources* for new ideas is controversial. The gap between desired and actual supportive leadership asks for a more stimulating and encouraging role of shift leaders.

So far the results have been discussed for the complete group of respondents. The next section discusses the differences and similarities between different subgroups of respondents (e.g. divided by plant, age or educational level).

Comparing subgroups

In order to compare construct scores between different subgroups of respondents, Appendix E provides three overviews with the mean scores per construct for the different independent variables (i.e. plant, age, educational level, job position, years employed). The highest score is highlighted in green and the lowest in orange.

First of all, respondents are categorized according to the plant they work at. Mainly small differences exist between plants. The largest difference is found for *providing resources*, where Telecom I scores low (2.76) and Draad & Geleider relatively higher (3.67). Thus, machine-operators at Telecom I find that their leaders do not provide sufficient resources to facilitate innovative ideas. Besides, Telecom I respondents seem to have a slightly more negative perception regarding several other constructs as well, compared to the other plants. This might

have several reasons, one being that the machine-operators are more critical in evaluating their own and others' performance, which is confirmed by one of the shift leaders of that plant. Draad & Geleider and Telecom II tend to have more positive perceptions regarding organizational-related support respectively task-related factors. One explanation for the relative optimism at Draad & Geleider might be related to the nature of the group of employees. It consists of fifteen employees, working in two shifts. Since the group is small and there are merely two shifts, all employees know each other. Besides, the physical area of Draad & Geleider is relatively small which increases the interaction between the employees. Moreover, the two shift leaders are called 'team-leaders' (which is slightly lower in hierarchy than shift leader) and the plant has its own department manager (lower in rank than the plant manager). The team leaders are found to work along with the machine-operators to some extent. This all contributes to a so-called 'team-feeling'. Moreover, the fact that newcomers are not called 'assistants' but machine-operators, further decreases the feeling of hierarchy. This team-based character of Draad & Geleider might have positively affected the scores of these respondents. One of the team leaders tends to agree with this suggestion. Despite the more positive tendency, this plant scores negative (lower than three) on *opportunity exploration, championing, application* and *innovative output*, which is in accordance with all other plants.

When comparing respondents based on current job position, it becomes clear that assistant machine operators tend to score lower on most constructs than machine-operators and all-rounders. So the higher in the hierarchy of machine-operator, the more the employee perceives himself to possess task-related skills and engage in innovative activities. This is in accordance with the theory of Dreyfus and Dreyfus (1980) and Sandberg (2000), stating that the more experienced an employee is, the more comprehensive his conception and therefore competence is. The organizational factors that influence IWB show slightly different results. For instance, machine-operators tend to be most negative about their leaders' behaviour regarding *delegating* and *support for innovation*. However, as stated earlier in this report, due to some obscurities regarding the name of the job position of machine-operators, the results might be somewhat unclear. This is the case for Draad & Geleider. Furthermore, Lochem-respondents might have experienced a similar problem. Almost all machine-operators working at Lochem have unique job titles. When asked to select the current job position held, it is possible that they selected the wrong option. For this reason, comparing the scores based on job position is complicated.

A third comparison between subgroups of respondents can be made based on *educational level*. Several issues can be noticed. For instance, respondents that belong to the categories 'Higher vocational education' and 'other' seem to be slightly more negative in their perception regarding most of the constructs. On the other hand, respondents with merely primary education seem to be relatively positive compared to most of their colleagues. It is important to note that merely a small portion of the respondents belong to these categories (1.3% resp. 4.5% resp. 3.9%), which increases the chances of an extreme outcome. Respondents with intermediate vocational educational background seem to outperform the others when it comes to *innovative work behaviour*. Thus, when looking at the three largest groups (secondary school, lower vocational education and intermediate vocational education), it seems that higher education leads to more innovative work behaviour. There are hardly any differences in the competence regarding *role-orientation* or the perception on the organizational *support for innovation* (leader behaviour as well as organizational climate).

The group of respondents can be divided into subgroups based on age as well. The subgroup that consists of respondents younger than 25 years old, tends to score slightly lower than all other groups regarding most constructs. It is important to note that this group consists of merely 3.2% of the total group of respondents, which allows for more extreme values. When focusing on the other four subgroups, it seems to be that the older a respondent, the lower he scores on most of the constructs. So, younger employees seem to be more positive in their perceived innovative work behaviour as well as their perception regarding their leader's behaviour.

A last comparison of subgroups that will be made, concerns the number of years a respondent has been employed at TKF. Merely small differences can be observed between the various subgroups. The group of employees that has been employed less than one year (3.9%) presents a somewhat different trend than the other subgroups. The most remarkable difference is found in the relatively 'high' scores on *championing* and *application*. This is intriguing, since this group of employees has been working at TKF for a short period of time but apparently were able to *champion* or *apply* innovative ideas within this time. Moreover, an additional interesting issue is that some of these respondents are temp-agency workers. In the case of TKF, some of the temp-agency workers that were hired during the time of data collection have been employed at TKF earlier. Therefore, some of them might be considered as being more experienced than employees who have been working at TKF for some years. However, crucial to state is that this group of respondents entails merely 3.9% of the total group of respondents. The other groups of respondents show merely small differences in scores on constructs. In general, the group of employees that have been working at TKF between five and nine years seem to be most positive, whereas employees who have been employed for more than thirty years seem most negative. This seems to correspond with the results of different ages of respondents.

This section compared different subgroups of respondents to explore whether these independent factors influence IWB. The next step is to look for relations between the constructs.

Extreme scores items

The different constructs have been discussed now. For the sake of comprehension, I will shortly state some additional matters regarding the individual items. In Appendix D all individual items are displayed including the mean scores (and the share of missing values). The items that score relatively high (>3.9) are highlighted in green, whereas the items that scored low (<3.0) are highlighted in orange. Some things can be observed. First of all, the items that are scored relatively high are all part of the group of 'individual competence and factors', which include *role-orientation*, *challenging job* (task-related) and *taking initiative* (action competence). Machine-operators find themselves especially competent in 'knowing the priorities in your work area (4.08; knowing local production requirements: *role-orientation*)' and 'being willing to take on and accept new responsibilities (4.09; self-direction: *role-orientation*)'. The high score on the former can be explained by TOC that is implemented at TKF, a system where orders get different colours which correspond with the priority of that order. The latter shows that machine-operators find themselves to be willing to take on new responsibilities when asked to.

The items with the lowest scores (<3) are found in constructs regarding innovative behaviour, except for one. One item that scores low (2.71) is 'knowing what is different about the products made in this company compared to those made by competitors (understanding wider manufacturing principles: *role-orientation*)'. Employees seem to lack understanding of what distinguishes TKF's cables from other cables. Here lies a task for the leaders of TKF, to inform its employees about this difference and what it is that makes TKF-cables unique. Other items that score extremely low are 'encourage key organization members to be enthusiastic about innovative ideas (1.98; *championing*)', 'actively contribute to acquiring new customers (1.25; *innovative output*)', 'actively contribute to changing the work organization (1.72; *innovative output*)'. These three items have relatively many missing values as well, which might indicate that these items are found to be not applicable to machine-operators. The first item can be related to the suggestion box-system. Employees need to convince others (their leader and the committee) that an idea has potential, which seems to fail often. As mentioned earlier, the relevance of machine-operators contributing to acquiring new customers can be questioned. This is confirmed by the low scores of management's perception regarding the desired situation for this item. The latter item is somewhat more relevant. It might be that employees were confused by the phrasing of the items. Three out of six items of *innovative output* include the words 'actively contributing', which might have lead to lower scores. As proposed earlier, items that have a high percentage of missing values might have lower mean scores as well. This seems to be the case for most of the items that score lower than three.

4.2.4. Correlation: Relations between Constructs

In order to determine which method to use to measure the correlation between the constructs, the data have to be checked for normality. None of the constructs, except for *role orientation*, is found to be normally distributed. Therefore, Spearman's rank correlation coefficient is used to determine the correlation between the constructs.

This section refers to the hypotheses that were formulated in chapter three regarding correlations between different constructs based on previous research on innovation and employee behaviour. An overview of the hypotheses can be found in Table 4.4. Hypotheses are accepted or rejected based on the correlations presented in Table 4.5. Merely significant correlations are shown. Correlations higher than .4 are considered to be moderately strong relations.

Hypothesis H1 can be accepted. The relation between *role-orientation* and the *IWB-constructs* (H1) is found to be moderately strong. The better an employee is able to do his job and understand the production process as well as the related issues occurring in his work environment and the organization, the more innovative behaviour he displays. When looking at the diversity of items of *role-orientation,* it becomes clear that some of the items closely resemble items of other constructs. For instance, 'being able to involve and motivate people' relates to the items of *championing*. The willingness and capability of questioning things tends to show some resemblance with the construct *opportunity exploration*. Since *role-orientation* comprises several different topics (i.e. cognitive production knowledge, effective teamwork, knowing local production requirements, understanding wider manufacturing principles and self-direction) it tends to relate to other constructs. In fact, according to Table 4.5, this construct correlates with all other constructs. Despite some inter-item relatedness, *role-orientation* is found to be a crucial factor when striving for *innovative behaviour*. Thus, in order to increase *IWB* of employees, TKF should assure that its employees possess the production knowledge on the one hand and willingness and ability to display extra-role behaviour on the other hand. Furthermore, *role-orientation* is found to correlate with all three types of leader behaviour (*delegating, support for innovation and providing resources*) and with innovation-enhancing

H1: The higher an employee scores on ***role-orientation***, the higher he scores on ***IWB-related constructs*** and ***innovative output***

H2: The higher an employee scores on ***challenging job***, the higher the scores on ***IWB-related constructs*** and ***innovative output***

H3: The higher the ***educational level*** of a respondent, the higher he scores on ***innovative output*** and the other ***IWB-related constructs***.

H4: The higher a respondent scores on ***taking initiative***, the higher he will score on the ***IWB-constructs*** and ***innovative output***

H5: The higher a respondent scores on an ***IWB-construct***, the higher he will score on ***innovative output***

H6: The more a respondent perceives that his leader ***delegates***, ***supports innovation*** and ***provides resources***, the higher that respondent scores on ***innovative output***

H7: The higher a respondent scores his leader to be ***delegating*** and showing ***support for innovation***, the higher that respondent scores on ***idea generation*** and ***application***

H8: The higher a respondent scores his leader to be ***providing resources*** for innovation, the higher that respondent scores on ***application***

H9: The more a respondent feels that the ***organizational climate*** is characterized by support for innovation, the higher he scores on ***innovative output*** and ***IWB-related constructs***

Table 4.4: Hypotheses

organizational climate (*support for innovation, climate*). If employees feel encouraged and supported by their leaders and the organization, they might be more willing to engage in extra-role behaviour and make an effort in contributing to the fulfilment of organizational goals and objectives. The keyword in all this is employees' perception. If employees feel that the organization and its leaders acknowledge and value individual contribution in attaining organizational or departmental goals, commitment on the part of the employee will increase.

The **second hypothesis (H2**) concerns the relation between the extent to which an employee finds his *job challenging* and the degree of *innovative behaviour* displayed (*challenging job* vs *opportunity exploration, idea generation, championing, application* and *innovative output*). All these correlations were **confirmed** by my research results. *Challenging job* is found to positively correlate with *innovative output*, *opportunity exploration* and *championing* (p=0.01), as well as with *idea generation* and *application* (p=0.05). Although the correlations are statistically significant, they are not that strong. However, the values are all positive, indicating that the more a task is perceived to be *challenging*, the more a respondent will display *innovative behaviour*.

According to table 4.5, **H3 has to be rejected**. *Educational level* is found to have no significant relation with any of the dependent variables. However, when comparing the scores of the different subgroups (based on educational background), there seems to appear a pattern. When examining the three largest subgroups (secondary school, lower vocational education and intermediate vocational education), the hypothesis seems to be valid: the higher the *educational level* of a respondent, the more *innovative behaviour* he displays. I expected that the method I applied for calculating the correlation coefficient might be deficient in this situation. As stated earlier, Spearman's rank correlation had to be used instead of Pearson's correlation. However, Spearman's rank correlation does not distinguish between large and small groups of respondents. More specifically, whether a subgroup consists of two or two hundred respondents is not taken into account when calculating the correlations. This leads to overrepresentation of the small groups of respondents, while the larger groups are underrepresented, so-called disproportionality. In the case of educational level, this has serious consequences. The groups 'higher vocational education' (1.3%) and 'other' (4.5%) score relatively low compared to the other

	Job position respondent	Years of employment	Age respondent	Educational level	Role-orientation	Challenging Job	Opportunity Exploration	Idea Generation	Championing	Application	Innovative Output	Taking Initiative	Delegating	Support for innovation	Providing resources
Job position respondent	1														
Years of employment	.323**	1													
Age respondent		.558**	1												
Educational level		-.385**	-.394**	1											
Role-orientation	.320**				1										
Challenging Job	.229**				.414**	1									
Opportunity Exploration					.462**	.218**	1								
Idea Generation	.283**				.401**	.177*	.468**	1							
Championing	.235**				.360**	.262**	.562**	.327**	1						
Application	.228**				.425**	.205*	.546**	.365**	.546**	1					
Innovative Output	.212**		-.206*		.429**	.313**	.651**	.536**	.622**	.605**	1				
Taking Initiative	.165*		-.202*		.435**	.466**	.406**	.350**	.322**	.372**	.437**	1			
Delegating					.305**	.230**	.188*	.273**	.167*			.212**	1		
Support for innovation					.293**	.376**	.262**	.217**	.256**	.191*	.290**	.352**	.367**	1	
Providing resources	.183*	-.175*			.271**	.292**	.301**	.364**	.281**	.308**	.342**	.306**	.326**	.625**	1
Support for innovation					.266**	.471**	.175*		.249**			.208*		.321**	.426**

** Correlation is significant at the .01 level (2-tailed)

* Correlation is significant at the .05 level (2-tailed)

Table 4.5: Spearman's rank correlation

subgroups which consists of respondents with lower *educational background*. Besides, the category 'other' consists of different kinds of educational programmes which are lower than higher vocational education, but higher than primary school.Moreover, the group of respondents that finished primary school (3.9%) tend to score relatively high. These three groups of respondents represent less than ten percent of the total group. However, Spearman's rank correlation treats all six categories as being equally important. In an attempt to further clarify the outcomes, I decided to recalculate the correlations. The first time I entered the categories 'higher vocational education' and 'other' to be missing values. For the second calculation I added 'primary school' to the missing values as well. The results can be found in table 4.6. As was expected, when excluding the minorities in the group of respondents, significant correlations can be found between *educational level* on the one hand and *IWB-constructs* and *taking initiative* on the other hand. Based on the correlations presented in Table 4.6, **H3 can be accepted**. For the sake of comprehensiveness it is important to state that this change in missing values for the factor *educational level* did not influence the correlations with other constructs.

Spearman's Rank Correlations	Educational Level (all included)	Educational level (without 5, 6 [a])	Educational level (without 1,5,6[b])
Opportunity Exploration	.069 (ns)	.181*	.205*
Idea Generation	.149 (ns)	.243**	.241**
Championing	.120 (ns)	.232**	.228**
Application	.076 (ns)	.193*	.209*
Innovative Output	.154 (ns)	.264**	.263**
Taking Initiative	.048 (ns)	.157 (ns)	.171*

****** Correlation is significant at the .01 level (2-tailed); ***** Correlation is significant at the .05 level (2-tailed); **(ns)** Correlation is not significant **a**: Educational Level, excluding 'Higher Vocational Education' and 'other' (5.8% of respondents) **b**: Educational Level, excluding 'Primary School', 'Higher Vocational Education' and 'other' (9.7% of respondents)

Table 4.6: Spearman's Rank Correlations Educational Level

The **fourth hypothesis (H4) is accepted**. According to the literature, *taking initiative* would enhance *innovative work behaviour*. My findings confirm this. Employees' perception of the extent to which they *take initiative* is related to their perception regarding their own *innovative behaviour*. Moderately strong correlations are found with *innovative output* and *opportunity exploration*. Besides, somewhat weaker relations are found with *idea generation*, *championing* and *application*. These findings suggests that when striving for *innovative behaviour* in employees, employees' willingness to *take initiative* is crucial, particularly for the initiation of innovative ideas. In order to increase *innovative behaviour*, it is important to employ individuals that are proactive and willing to *take initiative*, thus possess action competences.

Hypothesis five (H5) was confirmed by my data as well. This result might not be surprising, since the items of the construct *innovative output* show some resemblance with the four *IWB-constructs* (*opportunity exploration*, *idea generation*, *championing* and *application*). All five constructs were either developed to measure *individual innovative behaviour*, or to measure individual contribution to one phase of the innovation process. The correlations are found to be relatively strong.

H6, H7 and are partly accepted. H6 presumes a relation between three types of leader behaviour and *innovative output* and is merely partly accepted. Two out of three behaviours (*support for innovation* and *providing resources*) were found to positively relate to *innovative output*. *Delegating* is not found to significantly correlate with *innovative output*. This might be caused by the fact that *delegating* is not found to correlate with *application* (H7), which is partly represented in *innovative output* as well. These findings imply that in order to increase *innovative output*, leaders should display supportive behaviour and *provide resources* for innovation. *Support for innovation* is found to relate to *idea generation* and *application* as well (H7). *Delegating* is found to positively correlate with *idea generation*. Thus, *providing resources* and *support for innovation* are found to enhance *innovative output* as well as *idea generation* and *application* (H8). In order to further stimulate *idea generation*, *delegating* behaviour by leaders is beneficial. Thus, the research findings partly confirmed the hypotheses H6 and H7. Besides, **H8 can be confirmed** as well (*providing resources* correlates with *application)*, since *providing resources* is found to enhance all *IWB-related* behaviour.

The last hypothesis that was formulated, concerns the relation between *organizational support for innovation (climate*) and *IWB*. This hypothesis **(H9) has to be partly rejected**. My data show no significant correlation between *support for innovation (climate*) and *idea generation*, *application* and *innovative output*. However, a positive correlation is found between *support for innovation (climate)* and *opportunity exploration* and *championing*. Despite the findings of different studies (e.g. Malik & Wilson, 1995; Siegel & Kaemmerer, 1978; West, 1990) suggesting that *organizational climate* is crucial in reinforcing *innovative behaviour* of employees, this study proves otherwise. The correlations that were found between *organizational climate* and *innovative work behaviour*

(*opportunity exploration* and *championing*) are significant, but have low coefficients. One explanation might be that most production workers are not acquainted with the organizational values or climate. This is confirmed by the relatively high share of missing values for this construct. Besides, some machine-operators stated that they do not know what is happening outside of their own department ('I have no idea what is going on outside this plant'). This might imply that organizational values and vision are either not communicated well enough throughout the organization, or that machine-operators do not pay attention to these issues that stretch beyond their direct work environment.

Concluding, most hypotheses can be accepted. Some can be partly accepted. This study has confirmed earlier research results regarding the relation between individual and organizational factors on the one hand and *innovative work behaviour* on the other. The most striking result of this research is that employees perceive themselves to hardly contribute to *championing* or *application* of innovative ideas. Employee innovative behaviour is stated to influence organizational innovativeness. Since TKF strives to deliver high-quality innovative solutions to its customers, organizational innovativeness is crucial. In order to increase this, TKF should employ intermediate or higher educated individuals (cognitive competence) that score high on *role-orientation* (task-related competence) and are willing to *take initiative* (action competence). Besides, the job of machine-operator should be designed to *challenge* the employee. Furthermore, TKF and its leaders should be openly striving for and stimulate innovation. More specifically, leaders should *delegate* responsibilities to machine-operators to increase the *generation of ideas*, should be supportive towards new ideas and, last but not least, *provide resources* for the exploration and implementation of these ideas. Stimulating the *generation of ideas* is important, however, when these ideas are not implemented, innovation does not occur.

4.2.5. Concluding

This chapter has presented and discussed the data. A high response rate combined with sufficiently high alpha's have lead to valid and reliable data. As stated earlier, the theoretical desired situation would be that all constructs were scored as high as possible. In order to increase the practical usefulness for TKF, I decided to specify the desired situation according to management's own perception aligned with the newly defined strategy. The current situation has turned out to deviate from this ideal. The actual scores on the constructs were quite moderate. The highest score was 3.77 for *challenging job*, which is not extremely high. Constructs that scored on the higher end were the individual factors, including *role-orientation*, *challenging job* and *taking initiative.* Besides, organizational factors were scored slightly lower, but still higher than three. The most striking outcome concerns the low scores on innovative work behaviour-constructs. Four out of five scored lower than three (on average!). This is far below the desired score. The only IWB-construct that scored higher than three is *idea generation* (3.28). Thus, employees tend to perceive themselves to *generate ideas* more often than *exploring opportunities*, *championing* and *implementing ideas*. One of the explanations that is based on interviews with managers and machine-operators concentrates around the lacking procedure of the suggestion-box.

In earlier sections several relations between different concepts were hypothesized. A group of individual factors were hypothesized to enhance innovative behaviour in employees. Moreover, a group of organizational factors was claimed to have this influence as well. Nine hypotheses were formulated and tested during this research. Five hypotheses were accepted. Three were partly accepted and partly rejected. One hypothesis (H3) was first rejected, but could be accepted when the data were filtered. Figure 4.1 shows the hypotheses that were found between the constructs. The solid lines represented the confirmed relations, whereas the dotted lines display the partly accepted relations.

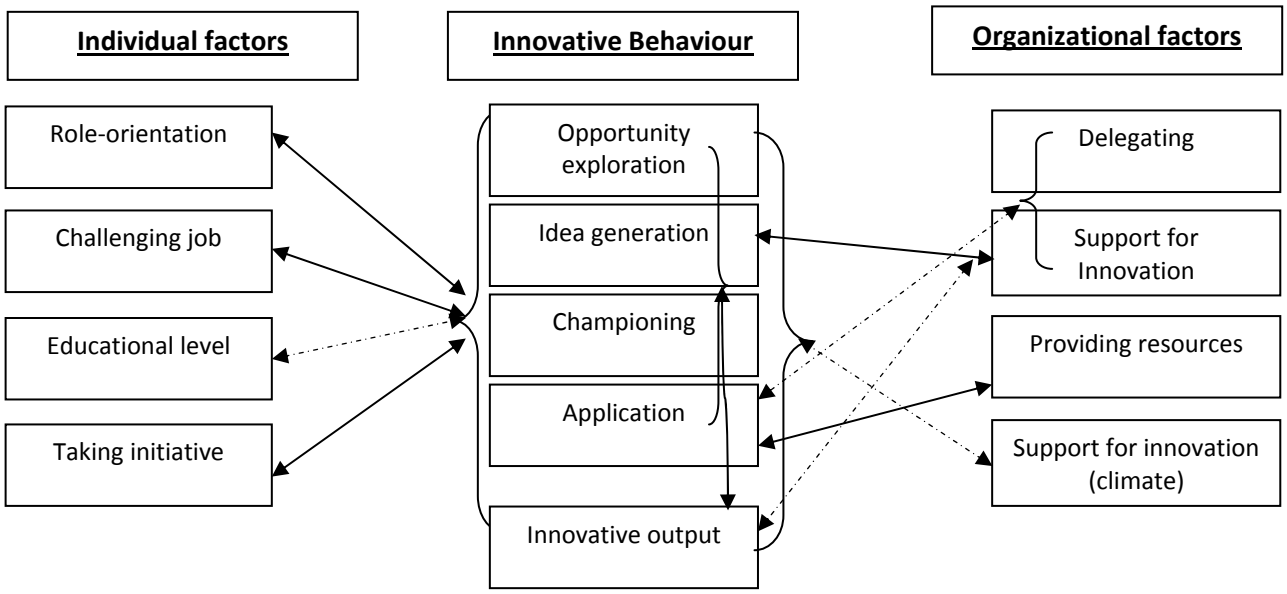

Figure 4.1: Confirmed (line) and partly confirmed (dotted line) relations between the constructs

Following the relations found between the constructs, enhancing *innovative work behaviour* can be done in several ways. First of all, individual factors are (strongly) related to *IWB*. Thus, to enhance *IWB*, the task-related, cognitive and action competence of employees should be increased, either by developing the current employees (make) or by recruiting new competent employees (buy). However, *IWB* can be stimulated by the right type of leadership and climate as well. Supporting innovative ideas and *providing resources* for the exploration and implementation of these ideas stimulates all IWB-related behaviours. Besides, *opportunity exploration* and *championing* can be further stimulated by *delegating* and developing an *innovation-supporting climate*. *Delegating* is found to enhance *idea generation* as well. The final chapter presents some more specified recommendations on how to enhance these behaviours and competences.

Chapter 5 Conclusions & Recommendations

After having discussed theory and literature on competences for innovation, presenting and discussing the results, the last step is to provide an answer to the research questions that were formulated in chapter one. Furthermore, some recommendations and implications of this research will be discussed.

5.1 Conclusion and Recommendations

In the first introductory chapter the problem statement was described and some research questions were formulated. The question that my research intended to answer is posed below, followed by four sub questions that will help answer this main question:

"How can the competences of employees be realigned with the organizational strategy?"

1. *What is TKF's organizational strategy and how is innovation embedded in this strategy?*
2. *Which competences do production workers need to enhance organizational innovativeness?*
3. *To what extent do the production workers currently possess these competences?*
4. *Which steps can be taken to (further) enhance innovative competences of these production workers?*

First of all I intended to identify the strategy of TKF, in order to figure out which role innovation plays in realizing strategic goals. After conducting several interviews and reading some documents regarding the strategic objectives of TKF, the strategy could be summarized to be the following: TKF wants to be a solutions provider. The goal is to develop, produce and supply high-quality innovative solutions. In order to realize this strategy, TKF focuses on customer intimacy on niche-markets. Innovation is crucial for the development, production and supply of the solutions. Innovation that is needed includes product, process en organizational innovation, as well as incremental and radical innovations. In order to outperform its competitors TKF needs to enhance its organizational innovativeness. Thus, innovation is crucial in realizing the repositioned strategy towards becoming a niche-player aiming for customer-intimacy.

To enhance organizational innovativeness, all employees should be inspired and motivated to behave innovatively. Then, what it is what employees need to behave innovatively? In order to answer this question, I explored the theory regarding the relation between employee competences and innovation. Several competences and factors were identified. After reviewing these theories, I decided that the concept 'innovative work behaviour' would be most appropriate for production workers. A literature review resulted in some constructs to measure IWB. IWB consists of four clearly defined stages: *opportunity exploration, idea generation, championing* and *application*. An additional construct, *innovative output*, was added to broaden the concept. In order to contribute to organizational innovativeness, employees should display behaviour that corresponds with those defined as *innovative work behaviour*. Literature provided some operationalized constructs regarding factors and competences that are found to enhance IWB. Two kinds of factors were identified: individual and organizational factors. The competences that production workers should possess to enhance innovation were found to be the following: willingness to *take initiative* (action competence), *technical production skills* (task-related competence) and proper *educational background* (cognitive competence). The organizational factors that were included in this research were leadership and organizational climate aimed at enhancing innovation. Three types of leader behaviour were measured: *support for innovation*, *providing resources* and *delegating.* The constructs derived from existing literature on innovative behaviour of employees were slightly adapted and included in the questionnaire that was disseminated to 175 machine-operators at TKF. According to the literature, the higher the items are scored, the better. However, to determine the relevance of the items, higher management and board members of TKF filled out the questionnaire to indicate the desired situation taking into account the organization that is needed to realize the newly defined strategy.

The data collected through these questionnaires were used to determine the innovative competences of the current workforce. The majority of the respondents completed lower or intermediate vocational education (cognitive competence). The respondents perceive their task-related skills to be sufficient in most cases (task-related competence). Employees find themselves to *take initiative* quite regularly (action competence). This fact is further confirmed by the high response-rate (88%), indicate a willingness to cooperate and take action. Thus, the task-related and action competences seem to attain an acceptable level. Intriguing is that the desired situation, according to the managers, does not deviate that much from the actual situation. However, management's expectation of the actual situation is lower than machine-operators' perception. Thus, managers seem to underestimate the task-related and action competences of their machine-operators. This implies a gap between management's perception and machine-operators' perception regarding their competences and performance. It is of utmost importance to

diminish this gap. Herein lies a challenge for managers to enhance their insights of the work environment of machine-operators.

Regarding innovative behaviour, a more negative outcome arises. It turns out that the machine-operators rarely find themselves to display *innovative work behaviour*. Machine-operators do tend to *generate ideas* from time to time, but the *championing* or *application* of these ideas happens rarely. Besides, *innovative output* is fairly low. The low score on *innovative output* is found to be less relevant than the low scores on *championing* and *application*. The former includes items that are not applicable to machine-operators. However, the latter two constructs are crucial in turning an innovative idea into an innovation. Two related reasons for the low score on *championing* and *application* were introduced. First of all, the lacking procedure of the suggestion-box system and secondly the limited *provision of resources* for innovative ideas by leaders. Besides, *supporting innovative ideas* could be enhanced as well. Another related and remarkable matter is the high percentage of missing values regarding the IWB-constructs and the organizational factors. This indicates that machine-operators might have a poor perception of the broad concept of innovation and the organizational attitude towards innovation. If higher management decides that innovation should be strived for by all employees, then this should be communicated and stimulated throughout the organization as well. If machine-operators are not acquainted with how which they can and are expected to contribute to innovation, innovative behaviour is not encouraged. The articulation of strategic choices and values from higher management to machine-operators should be improved. The most effective and appropriate way to realize this, is through the shift leaders. Machine-operators turn to their shift leader for all kinds of issues, ideas and questions. Therefore it is crucial that shift leaders are well informed in order to answer these questions, evaluate these ideas and handle these issues in line with the organizational strategic objectives and values.

Thus, the task-related and action competence tend to score positively, while innovative behaviour and cognitive competence deviates from the desired situation. The last sub question intends to identify ways to diminish the gap between the desired and current situation. Several steps can be taken to increase innovative competences of employees. Several recommendations can be formulated that will help TKF increase innovative behaviour of its employees. Following from the presentation and interpretations of the results and the testing of theoretical hypotheses, some recommendations can be formulated. The conclusions and recommendations are divided into five categories: Information, Organization, Facilitation, Stimulation and Implementation. All categories are focused on communication as well. One of the most crucial elements in this research was ‘perception’. Employees need to perceive that they are appreciated, involved and facilitated. Therefore communication is crucial at all times. Every section ends with a specified recommendation and a corresponding HR-practice, as was discussed in chapter two. These recommendations arise from the theory and are applied to the practical situation. Before implementing these recommendations, further (practical) research is necessary to determine the implications.

Information & Communication

In order to align employees competences with the organizational strategy, the strategy should be clearly stated and operationalized. Currently the employees seem to slightly agree with the idea that the organizational climate is aimed at innovation. However, several employees are not acquainted with the organizational values and vision. In order to improve this, communication throughout different layers within the organization concerning strategy, vision and values is required. Strategic goals and objectives should be set for all departments. More specifically, innovation should be operationalized into goals throughout the whole organizations. All departments should contribute to organizational innovativeness. Targets for plants, teams and individuals should be aimed at innovation. By informing employees about the ways they can contribute to organizational innovativeness and the importance of this to the organization, innovation-enhancing organizational climate will be build. In realizing this, shift leaders are key persons. Therefore, informing shift leaders about strategic choices and values is crucial.

Spreading information top-down is important to align goals and behaviour with the desired strategy. However, communication bottom-up is an issue as well. The remarkable outcome that managers appear to underestimate the task-related and action competences of machine-operators is intriguing. It implies that the ‘thick wall between shop floor and higher management’ exists. This corresponds with the feeling that machine-operators have about being underappreciated by higher management. This is a threat for the organization. Machine-operators state that they are willing to take initiative and cooperate, which is an opportunity for TKF, if stimulated in the right way. First of all, higher management should aim at enhancing their insights regarding the work environment and competences of machine-operators. Again, shift leaders are crucial in this attempt to ‘break down the wall between the shop floor and higher management’.

- **Communicate and operationalize strategic goals into objectives for plants, teams and individuals (Communication)**

- **Improve managers' perception of the work environment and competences of machine-operators, by stimulating bottom-up communication (Communication, Empowerment)**

Organization & Communication

The extent to which an employee perceives his tasks to be challenging is positively related to the extent of innovative behaviour that is displayed. Therefore, to enhance IWB, employees' jobs need to be challenging. The respondents found their work to be quite challenging (3.77). To further enhance this, machine-operators could be given more responsibility in solving problems that occur while working at the machines. Within the current organizational structure, responsibility for the maintenance and repairs of the production process are organized in a separate department (Process & Technology). Currently the machine-operators are not using their full potential, because they are not responsible for these activities. An additional disadvantage of this organizational structure is that the machines are running in three shifts, while the technical assistance department mainly work in during regular office hours. If a machine brakes down in the late evening or night, machine-operators have to wait until the next morning before the machine can be repaired, which delays the process and increases costs. Restructuring the organization by organizing this responsibility directly around the primary production process, would be beneficial for two reasons. First of all, shorter communication lines will decrease processing time. Besides, giving (all-round) machine-operators this responsibility increases the perception of challenging work. An implication that arises is that machine-operators should possess the competences to cope with this responsibility.

Using the full potential of technical knowledge and skills of machine-operators, increases machine-operators' responsibilities. This can decrease the number of technical responsibilities of the shift leader. Currently the shift leaders are mostly occupied with the technical aspects of the job and less with the social aspects. When striving to shorten and improve the communication lines in the organization, their leadership skills become more important. Shift leaders are the key persons between the shop floor and higher management. As long as the machine-operators possess the technical competences that are needed for that department, shift leaders can focus on the leader-role. They should engage in supportive behaviour and encourage innovative ideas. Shift leaders should be selected for their leadership skills, and be able to operate in the technical environment.

- **Design challenging jobs by giving machine-operators more responsibilities (Job Design)**

- **Restructure the organization horizontally and vertically to diminish hierarchy and overhead, to decrease processing times and increase speed to market (Organizational Design)**

- **Make shift leaders key persons in the communication between machine-operators and higher management (and vice versa). Enhance leadership skills of shift leaders (Leadership; Training & Development; Job Design)**

Facilitation & Communication

Organizing for innovation is not sufficient. This merely builds an architecture. TKF should facilitate for innovation as well. Providing resources enhances IWB (De Jong, 2007). When striving for more innovative output by employees, TKF's leaders should behave supportive regarding innovative ideas and provide resources to explore and implement these ideas. Providing resources should be encouraged by higher management, for instance by providing budget for new ideas (providing financial resources). Furthermore, leaders should allow employees to work out ideas (providing time). Crucial is the clear communication regarding the choices concerning the provision of resources. If a leader decides that an idea does not have potential to succeed, he should communicate this to the initiator of the idea.

- **Provide resources (time and money) for innovative ideas of employees (Leadership)**

Stimulation & Communication

After building an organizational climate and structure that creates facilities for innovation, the employees should be stimulated to behave innovatively. The machine-operators are found to be willing to cooperate (e.g. high response rate) and take initiative (action competence), which is an opportunity for TKF that needs to be acted upon. Otherwise, it will turn into a threat of demotivated and distant employees. Stimulating these employees to behave innovatively more often, can be realized by having leaders delegate responsibilities to their subordinates. Delegating leads to more challenging jobs, which increases idea generation. However, to stimulate the subsequent phases of the innovation process, the suggestion box procedure should be improved. Response-time should be significantly decreased, so employees feel heard. Besides, employees may be stimulated to behave innovatively if they are rewarded for innovative efforts. There are several ways to realize this. Recognizing an innovative effort by praising or awarding an employee can be helpful. Financial rewarding by bonuses is possible as well, although this may diminish the intrinsic motivation of the employee to be innovative.

- **Delegate responsibilities to employees (Leadership)**
- **Improve suggestion box system (Communication)**
- **Reward innovative efforts (Rewarding & Recognition)**

Implementation & Communication

The last part in this process would be implementation of these recommendations. In order to create a workforce that is capable of innovative behaviour, employees should possess task-related and problem-solving skills, be creative and proactive and have a certain educational level (cognitive and action competence). Increasing task-related skills of the workforce can be realized by developing (make) the current workforce (through training, communication and stimulation) or by recruiting new employees (buy: recruitment & selection) that possess these competences. Furthermore, when selecting new applicants, it is important to assess for a proactive attitude, a so-called 'hands-on mentality', in order to employ individuals that take initiative (action competence).

Timing of implementation of this 'new, innovative way of working' is crucial. Considering the upcoming changes planned for this year regarding plant-integration and relocating machine-operators, it would be beneficial to use this change to introduce a new way of working. Machine-operators will be working in different teams (or shifts) and possibly on different machines. Employees need to get used to their new work environment. Encouraging them from the start to come up with suggestions for improvements regarding products, processes or organization, will enhance future innovative behaviour. Communication is important in these processes. Having leaders articulate and carry out the strategic objectives and employees' role in achieving these is important to increase organizational innovativeness.

A last recommendation that I would like to add, is to encourage job-rotation across machines and plants. This increases the skills of the machine-operators, while it simultaneously enhances the challenge of the job. Besides, the interaction between the different machine-operators across the plants will be increased, which helps in building an organizational identity.

- **Upgrade the task-related skills of the current workforce (Training & Development)**
- **Recruit new employees that possess task-related and innovative competences, are proactive and creative and have a relatively high level of former education to increase problem-solving skills (Recruitment & Selection)**
- **Start implementing 'new, innovative way of working' while integrating the plants**
- **Job rotation across plants (Development; Job Design)**

Several recommendations have been suggested in this section in order to increase innovative behaviour of employees. In the realization of these steps lies a challenge for HR. As mentioned in chapter two, some HR practices are found to enhance individual as well as organizational competences. The model that was presented is replicated below in Figure 5.1. The box of HR practices has been completed with some additional practices (organizational design; rewarding & recognizing) that will help implement the recommendations to enhance innovative work behaviour.

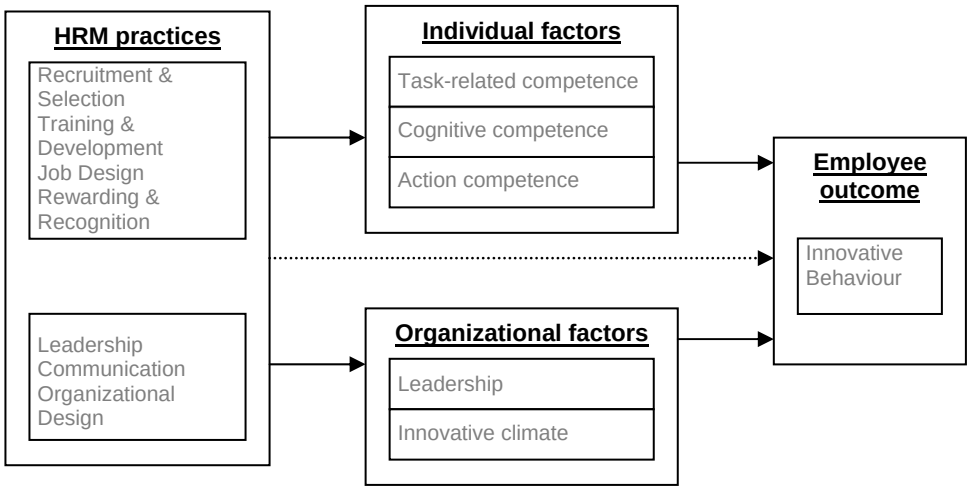

Figure 5.1. HR practices that enhance individual and organizational factors that in turn enhance IWB (based on De Leede & Looise, 2005)

5.2 Discussion and Implications

This research aimed at providing some insight into the perception of production workers regarding their task-related competences, innovative work behaviour and organizational support for innovation. However, this study is merely a first step in identifying the role of production workers in enhancing organizational innovativeness.

The data are based on a case-study within one organization. In order to generalize the findings, further research is needed to provide a more detailed insight. The machine-operators at TKF are a specific category in the broader group of production workers. It would be interesting to replicate this study with production workers in different sectors, or even with organizations within the same sector.

Furthermore, designing constructs regarding innovative behaviour with items that are all applicable to the respondents situation would be interesting as well. The constructs that I used were developed for different groups of respondents. This might have influenced the scores on these constructs. The share of missing values was relatively high for these IWB-constructs, and the mean scores relatively low. Using constructs that can be more easily translated into situation of the daily tasks of a machine-operator might provide better insights regarding innovative behaviour of these employees.

Although this study was aimed at production workers, it could be applied to different departments of organizations as well. It would be interesting to study the perception of employees throughout the organization regarding their own competences and their contribution to attaining organizational goals, more specifically, innovation. It might be interesting to use this tool to provide data for a benchmark across departments, organizations, sectors, regions or even countries.

This research is based on perception of the employee of his own performance and the performance of his leader. Additional data could be collected by asking leaders to evaluate their subordinates' innovative behaviour and competences. An extra dimension was added by requesting higher management and board members to fill out the same questionnaire. The results provided an intriguing outcome. To some extent the managers were able to accurately judge the situation compared to the respondents' results. The most striking result was the underestimation by the managers of the task-related and action competences of machine-operators. A common quote often stated by employees working at relatively lower job position across different types of organizations, is that higher management 'doesn't know what happens here'. This so-called 'wall between the shop floor and higher management' is not uncommon. The challenge is to have committed and socially strong leaders on key positions to link these different layers of employees. TKF wants to reposition itself from a commodity-producer towards a more service-oriented solutions provider, which is a major change for the organization. The question that arises is whether an organization that has been a commodity producer for almost eighty years can be transformed in such an extreme way. This strategic decision has been made by the management team, and was initiated by the holding (TKH-group). Taken into account that higher management might not have a fully accurate perception of the situation on the shop floor, it might be hard to evaluate whether the workforce is qualified to realize this transformation. Recruiting new employees that do possess these skills is possible. However, dismissing the current employees implicates a major loss of production and product knowledge that was build over the years. I would suggest that TKF starts with diminishing this 'wall', by empowering and informing shift leaders. A more accurate view of which competences are present in the company can be build. This is helpful in created plans to come from the current to the desired situation. Besides, if TKF decides that this redefined strategy will be pursued, underestimating the competences of production workers is fatal. Thus, TKF has a long way to go towards becoming a solutions provider.

Reference List

Bassi, L.J. and Russ-Eft, D. (1997) *What works: Assessment, development and measurement*. American Society for Training & Development

Becheikh, N., Landry, R. and Amara, N. (2006) Lessons from innovation empirical studies in the manufacturing sector: A systematic review of the literature from 1993-2003, *Technovation* 26 (5-6), pp. 644-664

Becker, G. (1964), *Human Capital*, Chicago: The University of Chicago Press.

Bessant, J. and Caffyn, S. (1997) High involvement innovation through continuous improvement, *International Journal of Technology Management,* 14 (1)

Boswell, W.R., Bingham, J.B. and Colvin, A.J.S. (2006) Aligning employees through "line of sight", *Business Horizons,* 49, pp. 499-509

Cortada, J.W. and Woods, J.A. (1999) *The knowledge management yearbook 1999-2000.* Woburn: Butterworth-Heinemann

Crant, J.M. (2000) Proactive behavior in organizations, *Journal of Management*, 26 (3), pp. 435-462

Dreyfus, S. E. and Dreyfus, H.L. (1980), *A Five-Stage Model of the Mental Activities Involved in Directed Skill Acquisition*, Storming Media

Fairtlough, G. (1994) Organizing for innovation: compartments, competences and networks, *Long Range Planning* 27 (3), pp. 88-97

Guest, D.E. (1997) Human resource management and performance: a review and research agenda, *International Journal of Human Resource Management,* 8: 263-276

Hambrick, D.C. and Fredrickson, J.W. (2001) Are you sure you have a strategy?, *Academy of Management Executive* 15 (4), pp. 48-59

Huiskamp, R., Jong, T. de, and Hoedt, M. den (2008) HRM en innovatie: gooi de vensters open, *Tijdschrift voor HRM*, 2008 (3) pp. 56-69 (In Dutch)

Janssen, O. (2000) Job demands, perceptions of effort-reward fairness and innovative work behaviour, *Journal of Occupational and Organizational Psychology,* 73 (3), pp. 287-302

Jong, J.P.J. de (2007) *Individual Innovation: The connection between leadership and employees' innovative work behavior*, Phd Thesis, EIM: Zoetermeer.

Jong, J.P.J. De and Hartog, D.N. Den (2007) How leaders influence employees' innovative behaviour, *European Journal of Innovation Management*, 10 (1), pp. 41-64.

Kleysen, R.F. and Street, C.T. (2001) Toward a multi-dimensional measure of individual innovative behavior, *Journal of Intellectual Capital,* 2 (3), pp. 284-296

Lado. A.A. and Wilson, M.C. (1994) Human resource systems and sustained competitive advantage: a competency-based perspective, *Academy of Management Review,* 19 (4), pp.699-727

Leede, J. de and Looise, J.C. (2005) Innovation and HRM: towards an integrated framework, *Creativity and Innovation Management,* 14 (2), pp. 108-117

McClelland, D.C. (1973) Testing for competence rather than for "Intelligence", *American Psychologist* January pp.1-14

Miles, R.E. and Snow, C.C. (1978) *Organizational strategy, structure and process.* New York: McGraw-Hill.

Nieuwenhuis, M.A. (2008) The art of Management (the-art.nl) ISBN-13: 978-90-806665-1-1 (In Dutch)

Oldham, G.R. and Cummings, A. (1996) Employee creativity: personal and contextual factors at work, *Academy of Management Journal,* 39 (3), pp. 607-634

Parker, S. K., Wall, T. D., & Jackson, P. R. (1997). "That's not my job": Developing flexible employee work orientations. *Academy of Management Journal,* 40, pp. 899–929.

Parker, S.K., Williams, H.M. and Turner, N. (2006) Modeling the antecedents of proactive behavior at work, *Journal of Applied Psychology,* 91 (3), pp. 636-652

Parra, B. De la, Slotman, R.H., Tillema, H.H., and Spannenburg, T., (2000) *Competentiegerichte leeromgevingen*, Utrecht, Lemma.

Penrose, E. T. (1959). *The Theory of the Growth of the Firm*. New York: John Wiley.

Pfeffer, J. (1995), Producing sustainable competitive advantage through the effective management of people, *Academy of Management Executive,* 9:55-69

Porter, M.E. (1980) *Competitive strategy.* New York: The Free Press

Prahalad, C.K. and Hamel, G. (1990) The core competence and the corporation, *Harvard Business Review*, May-June, pp. 71-91

Ramamoorthy, N., Flood, P.C., Slattery, T. and Sardessai, R. (2005) Determinants of innovative work behaviour: development and test of an integrated model, *Creativity and Innovation Management,* 14 (2), pp. 142-150

Sandberg, J. (2000) Understanding human competence at work: an interpretative approach, *The Academy of Management Journal,* 43 (1), pp. 9-25

Schuler, R.S. and Jackson, S.E. (1987) Linking competitive strategies with human resource management practices, *The Academy of Management Executive* 1 (3), pp. 207-219

Scott, S. and Bruce, R. (1994) Determinants of innovative behavior: a path model of individual innovation in the workplace, *Academy of Management Journal,* 37 (3), pp. 580-607

Siegel, S.M. and Kaemmerer, W.F. (1978) Measuring the perceived support for innovation in organizations, *Journal of Applied Psychology,* 63 (5), pp. 553-562

Spencer, L.M. and Spencer, S.M. (2008) *Competence at work models for superior performance.* Wiley India Pvt.Ltd.

Subramaniam, M. and Youndt, M.A. (2005) The influence of intellectual capital on the types of innovative capabilities, *Academy of Management Journal* 48 (3), pp. 450-463

Talke, K., Salomo, S. and Mensel, N. (2006) A competence-based model of initiatives for innovations, *Creativity and Innovation Management* 15 (4), pp. 373-384

Treacy, M. and Wiersema, F. (1995) *The discipline of market leaders*, Perseus Books, Reading, Massachusetts.

Wu, W., Chang, M. And Chen, C. (2008) Promoting innovation through the accumulation of intellectual capital, social capital, and entrepreneurial orientation, *R&D Management* 38 (3), pp. 265-277

Zhou, J. and George, J.M. (2001) When job dissatisfaction leads to creativity: encouraging the expression of voice, *Academy of Management Journal,* 44 (4), pp. 682-69

Appendices

A. Constructs
B. Questionnaire with accompanying letter
C. Descriptive statistics of respondents
D. Missing values and mean scores (Items)
E. Mean scores (constructs)
F. Personal goals

Appendix A Constructs

Role orientation: the importance of production knowledge	How important are the following skills and knowledge for you to do your job effectively? knowing the root causes of production problems that occur being able to measure and analyze problems in the production process being able to anticipate and prevent production problems being able to make decisions as part of a group being able to involve and motivate people being able to understand other people's points of view understanding how work flows in your work area knowing what skills everyone in your work area has knowing the priorities of work in your area knowing the requirements of your end customer knowing the overall objectives of the company knowing what is different about the products made in this company compared to those made by competitors being willing to challenge and question the way things are done being willing to take on and accept new responsibilities being able to work out what to do when instructions are vague	.93	Parker et al (1997)
Strategic orientation	Please state whether you agree or disagree with the following statements about work. in the long run, production is more efficient if people stick to what they already know rather than learning new things efficient workers get on with what they've been told rather than questioning things fixing problems as they arise is more efficient than trying to prevent them when an organization is running smoothly, there's no need to think about changing things it is important to keep making products, even if they go into stock rather than directly to customers in a production department, time spent not producing is time wasted the most important goal of a production department is to keep producing no matter what when I see lots of work on the shop floor waiting to be finished, I feel confident of this company's future if I know what to do and how to do it, I am not concerned about why it is not my job to make important decisions about my work	.79	Parker et al (1997)
Challenging job	My work is versatile My job requires me to learn new things My job requires creativity My job is challenging	.89	Huiskamp et al (2008)
Individual method control	Can you control how much you produce Can you vary how you do your work Do you plan your own work Can you control the quality of what you produce Can you decide how to go about getting your job done Can you choose the methods to use in carrying out your work	.78	Jackson, Wall, Martin & Davids (1993)
Job autonomy	Extent that you: help to decide how much work your team will do help to allocate jobs among team members get involved in the selection of new team members arrange cover for people get involved in improvement teams help to monitor your team's overall performance train other people get involved in the discipline of other team members help to manage the budget for your team	.85	Parker et al (2006)
Problem-solving demand	do you have to solve problems which have no obvious correct answer do the problems you deal with require a thorough knowledge of the production process in your area do you come across problems in your job you have not met before	.83	Jackson, Wall, Martin & Davids (1993)

Table A.1: Task-related competences and factors

Proactive personality	I am constantly on the lookout for new ways to improve my life I feel driven to make a difference in my community, and maybe the world I tend to let others take the initiative to start new projects Wherever I have been, I have been a powerful force for constructive change I enjoy facing and overcoming obstacles to my ideas Nothing is more exciting than seeing my ideas turn into reality If I see something I don't like, I fix it No matter what the odds, if I believe in something I will make it happen I love being a champion for my ideas, even against others' opposition I excel at identifying opportunities I am always looking for better ways to do things If I believe in an idea, no obstacle will prevent me from making it happen I love to challenge the status quo When I have a problem, I tackle it head-on I am great at turning problems into opportunities I can spot a good opportunity long before others can If I see someone in trouble, I help out in any way I can	.89	Bateman & Crant (1993)
Taking initiative	In my job I regularly introduce new plans I take initiative right away, even if my colleagues don't Usually I do more than what is asked of me If something goes wrong at work, I immediately start looking for a solution	.80	Huiskamp et al (2008)
Taking charge	This person often tries to adopt improved procedures for doing his or her job This person often tries to change how his or her job is executed in order to be more effective. This person often tries to bring about improved procedures for the work unit or department. This person often tries to institute new work methods that are more effective for the company. This person often tries to change organizational rules or policies that are nonproductive or counterproductive. This person often makes constructive suggestions for improving how things operate within the organization. This person often tries to correct a faulty procedure or practice. This person often tries to eliminate redundant or unnecessary procedures. This person often tries to implement solutions to pressing organizational problems. This person often tries to introduce new structures, technologies, or approaches to improve efficiency.	.95	Morrison & Phelps (1999)
Role breadth self-efficacy	How confident would you feel: analyzing a long-term problem to find a solution representing your work area in meetings with senior management designing new procedures for your work area making suggestions to management about ways to improve the working of your section contributing to discussions about the company's strategy writing a proposal to spend money in your work area helping to set targets/goals in your work area contacting people outside the company (e.g., suppliers, customers) to discuss problems presenting information to a group of colleagues visiting people from other departments to suggest doing things differently	.96	Parker (1998)

Table A.2: Action competences

Generation and testing of ideas	During the process of innovation: I invested time and energy to find better variants I was also willing to take a risk I talked about the problem with others (e.g. experts) to develop something new I spared no effort to approach my boss to find solutions	.78	Krause (2004)
Idea generation	How often does this employee search out new working methods, techniques or instruments generate original solutions to problems find new approaches to execute tasks	.90	De Jong (2007)
Generativity	generate ideas or solutions to address problems define problems more broadly in order to gain greater insight into them	.719	Kleysen & Street (2001)
Opportunity exploration	look for opportunities to improve an existing process, technology, product, service or work relationship recognize opportunities to make a positive difference in your work, department, organization or with customers pay attention to non-routine issues in your work, department, organization or the market place	.719	Kleysen & Street (2001)
Opportunity exploration	How often does this employee pay attention to issues that are no part of his daily work wonder how things can be improved	.88	De Jong (2007)
Formative investigation	experiment with new ideas and solutions test-out ideas or solutions to address unmet needs evaluate the strengths and weaknesses of new ideas	.802	Kleysen & Street (2001)
Championing	try to persuade others of the importance of a new idea or solution push ideas forward so that they can have a chance to become implemented take the risk to support new ideas	.893	Kleysen & Street (2001)
Championing	How often does this employee encourage key organization members to be enthusiastic about innovative ideas attempt to convince people to support an innovative idea	.95	De Jong (2007)
Implementation	The result of the innovation process is that: I used the innovation myself I implemented the project idea in my area of work I completely carried out the decisions that had been made	.81	Krause (2004)
Application	How often does this employee systematically introduce innovative ideas into work practices contribute to the implementation of new ideas put effort into the development of new things	.93	De Jong (2007)
Application	implement changes that seem to be beneficial work the bugs out of new approaches when applying them to an existing process, technology, product or incorporate new ideas for improving an existing process, technology, product or service into daily routines	.796	Kleysen & Street (2001)
Innovative output	In your job, how often do you: suggest improving current products or services suggest improving current work practices suggest acquiring new knowledge actively contribute to developing new products or services actively contribute to acquiring new customers actively contribute to changing the work organization	xxx	De Jong (2007)
Innovative behavior	Please rate each of your subordinates on the extent to which he or she: searches out new technologies, processes, techniques, and/or product ideas generates creative ideas promotes and champions ideas to others investigates and secures funds needed to implement new ideas develops adequate plans and schedules for the implementation of new ideas is innovative	.89	Scott & Bruce (1994)
Innovative capability	In my job I regularly participate in assignments that challenge my skills I actively contribute to the invention of new products and services for my organization I actively contribute to decreasing the costs of the workprocesses in my organization I actively contribute to increasing the efficiency of our workprocesses I actively contribute to regularly improving the products and services of my organization	.89	Huiskamp et al (2008)

Table A.3: Innovative work behaviour and innovative output

Support for innovation	My leader shows sincere interest whenever I come up with an idea reacts enthusiastically to my creative thoughts supports me when I want to improve things is someone you can count on, even when you initiate something unsuccessful	.82	De Jong (2007)
Supportive supervision	Extent that team leader/supervisor encourages us to expect a lot from ourselves encourages us to set targets for our team performance encourages us to praise each other for doing a good job encourages us to be aware of our level of performance	.93	Parker et al (2006)
Leadership	Our ability to function creatively is respected by the leadership The people in charge around here usually get the credit for others' ideas There is one person or group here who assumes the role of telling others what to do The role of the leader in this organization can best be described as supportive Persons at the top have much more power than persons lower in this organization The leadership acts as if we are not very creative Most people here find themselves at the bottom of the totem pole Assistance in developing new ideas is readily available New ideas can come from anywhere in this organization and be equally well received People in this organization are encouraged to develop their own interests, even when they deviate from those of the organization Members of this organization feel encouraged by their superiors to express their opinions and ideas My ability to come up with original ideas and ways of doing things is respected by those at the top The role of the leader here is to encourage and support individual members' development Individual independence is encouraged in this organization One individual is usually the originator of ideas and policies in this organization In this organization, the power of final decision can always be traced to the same few people Others in our organization always seem to make the decisions The leader's pets are in a better position to get their ideas adopted than most others The main function of members in this organization is to follow orders that come down through channels		Siegel & Kaemmerer (1978)
Resource supply	assistance in developing new ideas is readily available there are adequate resources devoted to innovation in this organization there is adequate time available to pursue creative ideas here lack of funding to investigate creative ideas is a problem in this organization personnel shortages inhibit innovation in this organization this organization gives me free time to pursue creative ideas during the workday	.77	Scott & Bruce (1994)
Providing resources	My leader: provides me with time to work out ideas provides me with the means necessary for innovation is willing to invest time and money in innovative efforts	.81	De Jong (2007)
Delegating	My leader: allows me to decide myself how I do my work gives me considerable independence and freedom allows me to determine my own time planning	.84	De Jong (2007)

Table A.4: Organizational factors: leadership

Support for innovation	creativity is encouraged here our ability to function creatively is respected by the leadership around here people are allowed to try to solve the same problems in different ways the main function of members in this organization is to follow orders which come down through channels around here, a person can get in a lot of trouble by being different this organization can be described as flexible and continually adapting to change a person can't do things that are too different around here without provoking anger the best way to get along in this organization is to think the way the rest of the group does people around here are expected to deal with problems in the same way this organization is open and responsive to change the people in charge around here usually get credit for others' ideas in this organization, we tend to stick to tried and true ways this place seems to be more concerned with the status quo than with change the reward system here encourages innovation this organization publicly recognizes those who are innovative the reward system here benefits mainly those who don't rock the boat	.92	Scott & Bruce (1994)
Change orientation	What is your opinion on these statements tried and tested ways of doing things are usually the best when an organization is running smoothly, there is no need to think about changing things the goal of this job is to produce output, not to do things like fill out charts and think about targets in the long run, this job is done more efficiently if people stick to what they already know, rather than too often work practices are changed just for the sake of change	.74	Parker et al (2006)
Continuous development	This organization is always moving toward the development of new answers This organization can be described as flexible and continually adapting to change In this organization, we sometimes reexamine our most basic assumptions People in this organization are always searching for fresh, new ways of looking at problems We're always trying out new ideas Members of this organization realize that in dealing with new problems and tasks, frustration is inevitable; therefore it is handled constructively This organization is open and responsive to change This place seems to be more concerned with the status quo than with change Once this organization develops a solution to a particular problem, that solution becomes a permanent one There is little room for change here		Siegel & Kaemmerer (1978)
Support for innovation (climate)	This organization is always moving toward the development of new answers. This organization can be described as flexible and continually adapting to change. People in this organization are always searching for fresh, new ways of looking at problems Creativity is encouraged here. mistakes.	.87	Malik & Wilson (1995)

Table A.5: Organizational factors: climate

Appendix B Questionnaire including accompanying letter

Beste TKF-medewerker,

Als onderdeel van mijn studie Bedrijfskunde aan de Universiteit Twente (UT) in Enschede, ben ik bezig met mijn afstudeerstage bij TKF. Eind juni ben ik begonnen met een onderzoek naar competenties voor innovatie. TKF en de UT werken al enkele jaren samen op dit onderwerp. In mijn opdracht kijk ik specifiek naar productiemedewerkers. Hoe kunnen machinevoerders ervoor zorgen dat TKF innovatiever wordt en daardoor beter aan de vraag van de klant kan voldoen.

Een van de doelen van TKF is dat 15% van de opbrengsten uit innovaties (bijv. nieuwe producten) moet komen. Hoe en in welke mate kunnen machinevoerders bijdragen aan vernieuwing op allerlei gebieden (in producten, processen, maar ook in bijvoorbeeld manier van werken enz.) Na een paar maanden veel boeken en artikelen lezen, heb ik enkele dingen gevonden. Om vast te stellen hoe de situatie op dit moment is bij TKF, heb ik een vragenlijst ontwikkeld. Alle machinevoerders (ook assistent-machinevoerders en allrounders) krijgen dezelfde vragenlijst om in te vullen. Het doel van de vragenlijst is om te kijken hoe het in de praktijk gesteld is met innovatie op de werkvloer.

De vragen gaan over je dagelijkse werkzaamheden als machinevoerder. Ook zijn er vragen over zogenaamd ‘innovatief werkgedrag’. Dus in hoeverre machinevoerders bijdragen aan het innovatiesucces van TKF. Tot slot zijn er nog een aantal vragen over de ruimte en ondersteuning die TKF biedt aan machinevoerders om vernieuwend of innovatief gedrag te vertonen. Aan het einde van de vragenlijst is er ruimte voor eventuele opmerkingen en vragen. Mocht je nog wat toe te voegen hebben, dan kun je dat daar kwijt.

Ik wil je vragen om deze vragenlijst vandaag tijdens je dienst in te vullen en na afloop in de envelop te stoppen. Je kunt de envelop bij je ploegleider inleveren of in de doos stoppen die bij het klokapparaat staat. Mocht je er vandaag geen tijd voor hebben, dan vraag ik je om het morgen te doen. Het invullen van de vragenlijst kost slechts 15 minuten. Mocht je vragen hebben, dan kun je deze stellen aan je ploegleider of direct aan mij.

Je hoeft geen naam of personeelsnummer in te vullen. Hierdoor blijven jouw antwoorden anoniem. Ik vraag je daarom ook om alle vragen zo eerlijk mogelijk te beantwoorden. Ik zal alle antwoorden vertrouwelijk behandelen. Is een vraag niet van toepassing op jouw situatie of weet je het antwoord niet, vul dan gewoon ‘weet niet’ in.

De resultaten van mijn onderzoek zullen gepresenteerd worden aan de leidinggevenden. Een samenvatting van de resultaten zal op de infoborden in de hal worden gepresenteerd. De resultaten worden niet gebruikt voor de reorganisatie. Het is onderdeel van een op zichzelf staand project voor innovatie tussen de UT en TKF.

Alvast bedankt voor je medewerking!

Vriendelijke groet,
Bianca Hartjes
Stagiaire P&O
Student Universiteit Twente
b.hartjes@tkf.nl

Voordat de vragenlijst begint, wil ik je vragen om wat algemene informatie. Kruis aan wat op jou van toepassing is.

Functie:
- ❑ Assistent machinevoerder
- ❑ Machinevoerder
- ❑ Allround machinevoerder
- ❑ Anders, nl _____

Dienstverband:
- ❑ Vaste aanstelling
- ❑ Contract bepaalde tijd

Dienstverband; uren:
- ❑ Fulltime (36-40 uur p/week)
- ❑ Parttime (minder dan 36 uur p/week)

Aantal jaren in dienst:
- ❑ Korter dan 1 jaar
- ❑ 1-4 jaren
- ❑ 5-9 jaren
- ❑ 10-19 jaren
- ❑ 20-29 jaren
- ❑ 30 jaar of langer

Leeftijd:
- ❑ 15-24
- ❑ 25-34
- ❑ 35-44
- ❑ 45-54
- ❑ 55+

Afdeling:
- ❑ Draad & Geleider
- ❑ Energie
- ❑ Telecom I
- ❑ Telecom II
- ❑ Lochem

Hoogst afgeronde opleiding:
- ❑ Basisschool
- ❑ VBO/VMBO
- ❑ LBO/LTS
- ❑ MBO/MTS
- ❑ HBO/HTS
- ❑ Anders, nl:_____

Nu begint de vragenlijst. Let op: de vragenlijst bestaat uit 55 korte, gesloten vragen. Beantwoord ze aub allemaal! De volgende vragen gaan over jouw functie en je dagelijkse werkzaamheden als machinevoerder. Omcirkel het juiste antwoord. Is de vraag niet van toepassing op jou of weet je het antwoord niet, omcirkel dan 'weet niet'.

De volgende vragen gaan over jouw functie als machinevoerder. In hoeverre:		Zeker niet/ nooit	Nauwelijks	Enigszins	Wel	Zeker wel/ altijd	Weet niet
1.	ken jij de hoofdoorzaak van de productieproblemen die optreden	1	2	3	4	5	6
2.	ben jij in staat de problemen in het productieproces te meten en analyseren	1	2	3	4	5	6
3.	ben jij in staat productieproblemen te voorzien en voorkomen	1	2	3	4	5	6
4.	ben jij in staat beslissingen te nemen in een groep	1	2	3	4	5	6
5.	ben jij in staat om mensen te motiveren en erbij te betrekken	1	2	3	4	5	6
6.	begrijp jij andermans standpunten	1	2	3	4	5	6
7.	begrijp jij hoe werk georganiseerd is in jouw werkgebied	1	2	3	4	5	6
8.	weet jij welke vaardigheden iedereen in jouw werkgebied heeft	1	2	3	4	5	6
9.	ken jij de prioriteiten van werk in jouw werkgebied	1	2	3	4	5	6
10.	ben jij bekend met de eisen van de klant of eindgebruiker van de kabel	1	2	3	4	5	6
11.	ben jij bekend met de algemene doelen van TKF	1	2	3	4	5	6
12.	weet jij wat het verschil is in producten gemaakt door TKF en producten van concurrenten	1	2	3	4	5	6
13.	ben jij bereid om de manier waarop dingen gedaan worden in twijfel te trekken	1	2	3	4	5	6
14.	ben jij bereid om nieuwe verantwoordelijkheden te accepteren en te nemen	1	2	3	4	5	6
15.	ben jij in staat om uit te werken wat te doen als de instructies vaag zijn	1	2	3	4	5	6

Nu volgt er een aantal stellingen. Deze gaan over jouw dagelijkse werkzaamheden, je functie en over innovatief werkgedrag. Dus, in hoeverre draag jij bij aan verbeteringen en vernieuwingen (innovaties) binnen TKF. Geef aan of je het eens of oneens bent met de stelling door het antwoord te omcirkelen. Is een vraag niet van toepassing op jouw situatie, antwoord dan 'weet niet'.

Geef aub aan of je het hier mee eens of oneens bent.		Zeer mee oneens	Mee oneens	Neutraal	Mee eens	Zeer mee eens	Weet niet
16.	mijn werk is gevarieerd	1	2	3	4	5	6
17.	mijn baan vereist dat ik nieuwe dingen leer	1	2	3	4	5	6
18.	mijn baan vereist creativiteit	1	2	3	4	5	6
19.	mijn werk is uitdagend	1	2	3	4	5	6
20.	ik neem meteen initiatief, zelfs als collega's dat niet doen	1	2	3	4	5	6
21.	in mijn werk kom ik regelmatig met nieuwe plannen	1	2	3	4	5	6
22.	als er iets misgaat op mijn werk, zoek ik meteen naar een oplossing	1	2	3	4	5	6
23.	meestal doe ik meer dan dat er van mij gevraagd wordt	1	2	3	4	5	6

De volgende stellingen gaan over verschillende manieren om bij te dragen aan vernieuwingen en verbeteringen binnen TKF. Geef aub aan hoe vaak er bij jou sprake is van deze dingen.

De volgende stellingen gaan over innovatief werkgedrag. **Hoe vaak:**		Nooit	Zelden	Soms	Regelmatig	(Vrijwel) altijd	Weet niet
24.	vraag jij je openlijk af hoe dingen beter zouden kunnen	1	2	3	4	5	6
25.	besteed jij aandacht aan zaken die niet tot jouw directe taak behoren	1	2	3	4	5	6
26.	doe jij suggesties om bestaande producten of diensten te verbeteren	1	2	3	4	5	6
27.	doe jij suggesties om werkmethoden te verbeteren	1	2	3	4	5	6
28.	stel jij nieuwe werkwijzen, technieken of methoden voor	1	2	3	4	5	6
29.	zoek jij naar mogelijkheden om een bestaand proces, technologie, product, service of werkrelatie te verbeteren	1	2	3	4	5	6
30.	doe jij suggesties om nieuwe kennis op te doen	1	2	3	4	5	6
31.	herken jij mogelijkheden om een positief verschil te maken in je werk, afdeling, TKF of met klanten	1	2	3	4	5	6

De volgende stellingen gaan over innovatief werkgedrag. Hoe vaak:		Nooit	Zelden	Soms	Regelmatig	(Vrijwel) altijd	Weet niet
32.	draag jij actief bij aan de ontwikkeling van nieuwe producten of diensten	1	2	3	4	5	6
33.	draag jij actief bij aan de werving van nieuwe klantgroepen	1	2	3	4	5	6
34.	draag jij actief bij aan veranderingen in de organisatie van het werk	1	2	3	4	5	6
35.	maak jij sleutelfiguren enthousiast voor vernieuwingen	1	2	3	4	5	6
36.	probeer jij mensen over de streep te trekken om vernieuwingen te steunen	1	2	3	4	5	6
37.	besteed jij aandacht aan niet-routine dingen in je werk, afdeling, TKF of de markt	1	2	3	4	5	6
38.	voer jij vernieuwingen planmatig in	1	2	3	4	5	6
39.	lever jij een bijdrage aan de invoeringen van vernieuwingen	1	2	3	4	5	6
40.	span jij je in om vernieuwingen gerealiseerd te krijgen	1	2	3	4	5	6

De volgende stellingen gaan over jouw leidinggevende. Deze vragen richten zich op de mate waarin leidinggevenden jou de ruimte bieden en stimuleren om te komen met vernieuwingen en verbeteringen in producten, processen en werk. Geef aan in hoeverre je het eens of oneens bent met onderstaande stellingen. Let op: alle vragen beginnen met: " Mijn leidinggevende….". Als een vraag niet van toepassing is op jouw situatie, vul dan 'weet niet' in.

Geef aan of je het eens of oneens bent met de volgende stellingen. Mijn leidinggevende:		Zeer mee oneens	Mee oneens	Neutraal	Mee eens	Zeer mee eens	Weet niet
41.	laat mij zelf beslissen hoe ik mijn werk aanpak	1	2	3	4	5	6
42.	laat me onafhankelijk en vrij te werk gaan	1	2	3	4	5	6
43.	geeft mij zeggenschap over de indeling van mijn tijd	1	2	3	4	5	6
44.	toont interesse als ik met een idee kom	1	2	3	4	5	6
45.	vindt het leuk als ik vernieuwende ideeën heb	1	2	3	4	5	6
46.	geeft mij de steun die nodig is om zaken te kunnen verbeteren	1	2	3	4	5	6
47.	is iemand waar je op kunt rekenen, ook als je iets onderneemt dat minder succesvol is	1	2	3	4	5	6

Geef aan of je het eens of oneens bent met de volgende stellingen. **Mijn leidinggevende:**		Zeer mee oneens	Mee oneens	Neutraal	Mee eens	Zeer mee eens	Weet niet
48.	geeft me de tijd om ideeën uit te werken	1	2	3	4	5	6
49.	verschaft mij de middelen die nodig zijn voor innovatie	1	2	3	4	5	6
50.	heeft tijd en geld over voor vernieuwende inspanningen van mij	1	2	3	4	5	6

Tot slot nog enkele stellingen over TKF en innovatie. Geef aub aan of je het hier mee eens of oneens bent.

Geef aub aan of je het hier mee eens of oneens bent.		Zeer mee oneens	Mee oneens	Neutraal	Mee eens	Zeer mee eens	Weet niet
51.	TKF is altijd bezig met het ontwikkelen van nieuwe oplossingen	1	2	3	4	5	6
52.	TKF kan worden beschreven als flexibel en continu aanpassend aan verandering	1	2	3	4	5	6
53.	medewerkers van TKF zijn altijd op zoek naar nieuwe manieren om met problemen om te gaan	1	2	3	4	5	6
54.	creativiteit wordt gestimuleerd bij TKF	1	2	3	4	5	6
55.	TKF staat positief tegenover risico's nemen, zelfs als daardoor af en toe dingen fout gaan	1	2	3	4	5	6

Dit is het einde van deze vragenlijst. Fijn dat je de tijd hebt genomen om deze vragenlijst in te vullen. Check aub even of je alle 55 vragen hebt ingevuld. Mocht je nog aanvullingen, opmerkingen of vragen hebben, dan kun je die hier onder kwijt.

Nogmaals hartelijk bedankt voor je medewerking!

Vriendelijke groet,
Bianca Hartjes

Ruimte voor opmerkingen en vragen:

Appendix C Descriptive Statistics Respondents

Respondent Statistics	Frequency (Percentage)	Respondent Statistics	Frequency (Percentage)
Educational Level		**Years Employed**	
Primary school	6 (3.9)	Less than one year	6 (3.9)
Secondary school	13 (8.4)	1-4 year	29 (18.8)
Lower vocational education	65 (42.2)	5-9 year	10 (6.5)
Intermediate vocational education	58 (37.7)	10-19 year	52 (33.8)
Higher vocational education	2 (1.3)	20-29 year	36 (23.4)
Other	7 (4.5)	30 year or longer	17 (11.0)
Total	*151 (98.1)*	*Total*	*150 (97.4)*
Non-response	3 (1.9)	Non-response	4 (2.6)
Job Position respondent		**Age Respondent**	
Assistant machine-operator	13 (8.4)	15-24	5 (3.2)
Machine-operator	59 (38.3)	25-34	13 (8.4)
All-round machine-operator	66 (42.9)	35-44	61 (39.6)
Other	10 (6.5)	45-54	60 (39.0)
Total	*148 (96.1)*	55+	13 (8.4)
Non-response	6 (3.9)	*Total*	*152 (98.7)*
Type of contract		Non-response	2 (1.3)
Permanent	135 (87.7)	**Job Status**	
Fixed term	15 (9.7)	Fulltime (36-40h)	147 (95.5)
Temp agency worker	2 (1.3)	Part-time (<36h)	4 (2.6)
Total	*152 (98.7)*	*Total*	*151 (98.1)*
Non-response	2 (1.3)	Non-response	3 (1.9)

Table C.1: Descriptive statistics of respondents

Appendix D Missing values and Mean scores (ITEMS)

Code Construct	Question	Mean (1-5)	Missing values (%)
Prodknw1	knowing the root causes of production problems that occur	3.99	2,6
Prodknw2	being able to measure and analyze problems in the production process	3.85	2,6
Prodknw3	being able to anticipate and prevent production problems	3.70	3,9
Teamw1	being able to make decisions as part of a group	3.85	2,6
Teamw2	being able to involve and motivate people	3.97	3,9
Teamw3	being able to understand other people's points of view	3.99	3,9
ProdReq1	understanding how work flows in your work area	3.91	4,5
ProdReq2	knowing what skills everyone in your work area has	3.86	2,6
ProdReq3	knowing the priorities of work in your area	4.08	1,9
Extrarole1	knowing the requirements of your end customer	3.27	1,9
Extrarole2	knowing the overall objectives of the company	3.46	1,9
Extrarole3	knowing what is different about the products made in this company compared to those made by competitors	2.71	7,1
Selfdir1	being willing to challenge and question the way things are done	3.57	7,1
Selfdir2	being willing to take on and accept new responsibilities	4.09	2,6
Selfdir3	being able to work out what to do when instructions are vague	3.73	2,6
Challwork1	my work is versatile	3.95	,6
Challwork2	my job requires me to learn new things	3.61	2,6
Challwork3	my job requires creativity	3.92	,6
Challwork4	my job is challenging	3.60	1,9
TakeInit1	in my job I regularly introduce new plans	3.78	,6
TakeInit2	I take initiative right away, even if my colleagues don't	3.28	3,9
TakeInit3	usually I do more than what is asked of me	3.99	,0
TakeInit4	if something goes wrong at work, I immediately start looking for a solution	3.97	,6
Oppexp1	look for opportunities to improve an existing process, technology, product, service or work relationship	3.05	1,3
Oppexp2	recognize opportunities to make a positive difference in your work, department, organization or with customers	2.83	9,1
Oppexp3	pay attention to non-routine issues in your work, department, organization or the market place	2.28	10,4
Ideagen1	search out new working methods, techniques or instruments	3.75	,0
Ideagen2	generate original solutions to problems	3.17	,6
Ideagen3	find new approaches to execute tasks	2.91	2,6
Champ1	encourage key organization members to be enthusiastic about innovative ideas	1.98	8,4
Champ2	attempt to convince people to support an innovative idea	2.47	8,4
Appl1	systematically introduce innovative ideas into work practices	2.09	10,4
Appl2	contribute to the implementation of new ideas	2.44	7,1
Appl3	put effort into the development of new things	2.84	5,2
Innovout1	suggest improving current products or services	3.32	,6
Innovout2	suggest improving current work practices	3.37	,0
Innovout3	suggest acquiring new knowledge	3.05	1,3
Innovout4	actively contribute to developing new products or services	2.29	1,9
Innovout5	actively contribute to acquiring new customers	1.25	7,8
Innovout6	actively contribute to changing the work organization	1.72	8,4
Deleg1	allows me to decide myself how I do my work	3.76	1,3
Deleg2	gives me considerable independence and freedom	3.87	1,9
Deleg3	allows me to determine my own time planning	3.47	3,9
Suppinn1	shows sincere interest whenever I come up with an idea	3.66	2,6
Suppinn2	reacts enthusiastically to my creative thoughts	3.70	5,8
Suppinn3	supports me when I want to improve things	3.73	5,2
Suppinn4	is someone you can count on, even when you initiate something unsuccessful	3.42	6,5
Provres1	provides me with time to work out ideas	3.42	5,8
Provres2	provides me with the means necessary for innovation	3.27	7,8
Provres3	is willing to invest time and money in innovative efforts	2.88	11,0
SuppClima1	this organization is always moving toward the development of new answers.	3.64	8,4
SuppClima2	this organization can be described as flexible and continually adapting to change.	3.60	7,1
SuppClima3	people in this organization are always searching for fresh, new ways of looking at problems	3.45	7,8
SuppClima4	creativity is encouraged here.	3.24	9,1
SuppClima5	this organization seems to place a high value on taking risks, even if there are occasional mistakes.	3.34	8,4

Appendix E Mean scores (CONSTRUCTS)

		Role-orientation		Challenging work		Taking Initiative	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Plant	Draad & Geleider	3.61	.59	3.78	.71	3.80	.60
	Energie	3.66	.44	3.64	.70	3.72	.53
	Telecom I	3.67	.36	3.66	.71	3.61	.64
	Telecom II	3.86	.50	3.91	.57	3.74	.75
	Lochem	3.82	.49	3.87	.61	3.85	.47
Job position respondent	Assistant machine operator	3.40	.36	3.62	.63	3.49	.43
	Machine operator	3.65	.47	3.63	.63	3.72	.59
	All-round machine operator	3.82	.44	3.88	.64	3.84	.59
	Other	4.11	.55	4.10	.63	3.75	.37
Age of respondent	15-24	3.60	.18	3.17	.82	3.45	.72
	25-34	3.75	.47	3.87	.40	4.06	.58
	35-44	3.83	.48	3.92	.65	3.84	.63
	45-54	3.66	.50	3.73	.62	3.68	.49
	55+	3.73	.38	3.54	.69	3.55	.47
Educational level	Primary school	3.94	.43	3.79	.73	3.86	.67
	Secondary school	3.65	.34	3.49	.46	3.56	.29
	Lower vocational education	3.72	.46	3.84	.62	3.79	.46
	Intermediate vocat. education	3.81	.51	3.84	.68	3.85	.63
	Higher vocational education	2.86	.20	3.00		2.75	.35
	Other	3.60	.41	3.54	.60	3.24	.94
Years employed	< 1 year	3.58	.40	3.39	.66	3.25	.92
	1-4 year	3.59	.41	3.74	.55	3.76	.60
	5-9 year	3.87	.45	3.98	.48	3.93	.38
	10-19 year	3.83	.52	3.88	.68	3.86	.58
	20-29 year	3.74	.48	3.78	.67	3.78	.49
	> 30 years	3.68	.30	3.56	.58	3.43	.39

Table E.1: Mean scores constructs task-related factors and action competence

		Opportunity Exploration		Idea Generation		Championing		Application		Innovative output	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Plant	Draad & Geleider	2.94	.89	3.17	.70	2.81	1.07	2.68	.80	2.68	.69
	Energie	2.71	.71	3.19	.61	2.14	.95	2.45	.96	2.46	.62
	Telecom I	2.58	.95	3.16	.76	2.19	.96	2.18	.91	2.38	.68
	Telecom II	2.87	1.01	3.60	.76	2.26	1.17	2.72	1.12	2.63	.85
	Lochem	2.68	.78	3.28	.59	2.17	1.02	2.47	.97	2.62	.64
Job position respondent	Assistant machine operator	2.21	.83	3.00	.64	1.58	.97	1.87	1.00	2.09	.50
	Machine operator	2.70	.81	3.08	.63	2.16	1.10	2.39	.97	2.46	.65
	All-round machine operator	2.82	.76	3.45	.66	2.30	.95	2.65	.89	2.66	.69
	Other	2.87	.97	3.53	.77	2.83	.83	2.63	1.01	2.70	.75
Age of respondent	15-24	2.53	.77	3.20	.56	1.90	1.75	1.53	.69	2.73	.73
	25-34	3.18	1.08	3.41	.53	2.54	1.25	2.85	1.11	2.94	.66
	35-44	2.78	.88	3.36	.70	2.42	1.03	2.60	1.08	2.61	.78
	45-54	2.62	.75	3.20	.68	2.03	.90	2.40	.84	2.39	.56
	55+	2.56	.60	3.08	.60	2.13	.96	2.22	.67	2.47	.60
Educational level	Primary school	2.78	.69	3.11	.58	1.90	1.02	2.50	.96	2.33	.45
	Secondary school	2.64	.55	3.15	.50	1.77	.73	2.41	.81	2.16	.49
	Lower vocational education	2.59	.71	3.18	.63	2.16	.85	2.31	.84	2.50	.61
	Intermediate vocat. education	3.01	.94	3.48	.67	2.59	1.17	2.81	1.08	2.77	.75
	Higher vocational education	1.67	.94	2.50	.71	1.00		2.00	1.41	1.50	.71
	Other	2.14	.81	3.05	.93	1.57	1.02	1.71	.65	2.21	.57
Years employed	< 1 year	2.81	1.29	2.94	.61	3.25	1.55	3.22	1.46	2.97	.81
	1-4 year	2.74	.85	3.22	.54	2.17	1.09	2.24	.98	2.42	.69
	5-9 year	3.03	1.00	3.47	.65	2.55	1.12	2.87	.88	2.63	.68
	10-19 year	2.79	.77	3.37	.75	2.27	1.09	2.56	1.06	2.64	.71
	20-29 year	2.63	.83	3.31	.63	2.08	.75	2.35	.77	2.55	.68
	> 30 years	2.51	.60	2.97	.65	2.16	1.03	2.37	.68	2.30	.40

Table E.2: Mean scores individual-related IWB constructs

		Delegating (leadership)		Support for innovation (climate)		Providing resources (leadership)		Support for innovation (leadership)	
		Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation	Mean	Standard Deviation
Plant	Draad & Geleider	4.00	.74	3.77	.69	3.67	.68	3.96	.61
	Energie	3.79	.68	3.40	.81	3.14	.67	3.65	.76
	Telecom I	3.49	1.01	3.18	.63	2.76	.69	3.48	1.07
	Telecom II	3.73	.70	3.45	.58	3.25	.79	3.45	.93
	Lochem	3.63	.76	3.51	.66	3.26	.85	3.62	.90
Job position respondent	Assistant machine operator	3.71	.84	3.51	.70	2.87	.53	3.60	.86
	Machine operator	3.53	.76	3.39	.70	3.09	.83	3.42	.98
	All-round machine operator	3.81	.76	3.50	.74	3.26	.73	3.70	.80
	Other	3.95	.69	3.48	.52	3.55	.92	3.97	.45
Age of respondent	15-24	2.93	.76	3.61	.93	2.80	.45	2.85	.99
	25-34	3.79	.32	3.58	.53	3.38	.78	4.00	.71
	35-44	3.75	.84	3.45	.82	3.27	.87	3.71	.91
	45-54	3.73	.77	3.45	.63	3.16	.69	3.54	.78
	55+	3.67	.60	3.35	.59	3.00	.82	3.39	1.02
Educational level	Primary school	3.94	.74	3.53	.60	3.58	.49	3.85	.55
	Secondary school	3.56	1.03	3.42	.42	2.94	.83	3.50	.79
	Lower vocational education	3.74	.73	3.47	.77	3.19	.70	3.62	.85
	Intermediate vocat. education	3.66	.75	3.52	.69	3.31	.85	3.69	.92
	Higher vocational education	3.75	.35	3.00				4.00	.00
	Other	3.86	.98	3.00	.66	2.62	.71	2.79	.89
Years employed	< 1 year	3.47	.34	3.67	.85	3.47	.65	3.71	.64
	1-4 year	3.80	.80	3.47	.51	3.23	.60	3.76	.97
	5-9 year	3.53	1.09	3.80	.62	3.33	1.07	3.48	1.11
	10-19 year	3.86	.62	3.45	.77	3.29	.85	3.66	.79
	20-29 year	3.44	.87	3.37	.81	3.09	.76	3.59	.90
	> 30 years	3.77	.65	3.35	.52	2.85	.67	3.26	.81

Table E.3: Mean scores organizational factors

Appendix F Personal Goals

This project is the final part of my master programme in Business Administration, track HRM. Besides the academic reasons for this thesis, some personal goals were formulated as well. First of all, I would like to conduct research within a company in order to apply my knowledge into a practical situation. Furthermore, during the project I would like to perceive the role and activities of HR-professionals working at the company, to experience the position of an HR-department within an industrial organization. Conducting research relatively independently and within a reasonable period of time is the final goal that I set.

- Applying theoretical knowledge in practice
- Experience HR-role and activities within an industrial organization
- Independently carry out a research within an acceptable time period

By choosing a project that was initiated by TKF, my desire to pursue research with a major practical relevance was realized. Simultaneously, this research had scientific relevance as well. Studying the innovative contribution of production workers is a relatively new topic in the literature regarding employee innovativeness. Applying the theoretical knowledge regarding the management of organizations, and more specifically, human resources, combined with the new knowledge on innovative behaviour of employees was found to be useful during my project. Understanding organizational processes helps in comprehending and evaluating business decisions. This project enhanced my understanding of organizational processes and the practical implications that arise in a profit organization. The challenge was to diagnose the actual situation according to a theoretical, ideal situation. Merely formulating recommendations based on theoretical findings would not be sufficient in practice. Therefore I integrated my knowledge based on theory with the knowledge of TKF that I gained during the project, to come up with more operationalized recommendations. This practical experience helps me to critically process new research findings.

The second goal that I set for myself was to experience the role and activities of HR-employees in an industrial organization. During my stay at TKF, a flexible workplace was provided for me, which entailed two different workplaces both situated in a room with HR-advisor. Therefore I was able to observe the activities of a HR-advisor within TKF. Besides, it helped me understand the dynamic position between employees and board-members that typifies the work environment of HR-employees. Unfortunately, the HR-activities regarding the reorganization were confidential. Therefore, observing these activities and this process was limited. Though, it was very useful in experiencing the dynamics of such a process. This project confirmed that studying HRM was the right choice for me.

The last goal that I defined concerns the relative independence of carrying out my research project within an acceptable time span. I think that this goal was achieved to a large extent. My supervisors from the university guided me during the process to make sure that I maintained the right focus. This really helped to define a clear scope for this research. In turn this positively influenced the progress. The total project took about eight months to complete, which I consider to be a reasonable period of time. The beginning of the process took relatively long, since trying to define the strategy was complicated. I struggled with the theoretical chapter for a while as well. After some clear guidance by my supervisors, I got back on track. The guidance that I received from my supervisors was mainly focused on structure and scope. This created considerable freedom for me to determine the content. The supervision of the external supervisors was limited. This forced me towards even more independence. Evaluating the process, I think I succeeded in successfully carrying out this research relatively independently.