Nijmegen School of Management
Master thesis Business Administration

‘’Innovation facilitating HPWS HRM-practices: a mixed methods study’’

The relationship of HPWS HRM-practices with product and technological process innovation

Shahla Abdullayeva (s3036405)
Radboud University, Nijmegen School of Management

Supervisor **Mr. Dr. Ligthart, P.E.M.**
Second reviewer **Mr. Dr. Vaessen, P.**
March 28th, 2017

Radboud University Nijmegen

‘’Innovation facilitating HPWS HRM-practices: a mixed methods study’’

The relationship of HPWS HRM-practices with product and technological process innovation

Name	Shahla Abdullayeva (s3036405)
Faculty	Nijmegen School of Management
Master	Business administration, International Management
Supervisor	Mr. Dr. Ligthart, P.E.M
Second reviewer	Mr. Dr. Vaessen, P.
Date	March 28th, 2017

I, S. Abdullayeva, declare that this master thesis has been, entirely, elaborated and written by me. I have acknowledged all the sources that I have used in this paper.

ABSTRACT

With increasing worldwide competition and the rapidly changing environment, the ability of firms to innovate has become even more crucial for their survival and sustainable competitive advantage (Koberg, Detienne, & Heppard, 2003). Even though the role of Human Resource Management (HRM) as an important contributor of sustainable innovation is recognized by many, there is still a knowledge gap in the literature on their relationship (Becker & Huselid, 1998). Thus, current study examines (1) which HPWS HRM-practices are supportive for technological innovation within manufacturing firms and, (2a) how they are implemented and (2b) received in the workplace. By addressing this question the study aims to explore which HRM-practices are contributing to technological innovation and if there is an added-value when the practices are combined as HPWS. Another goal is to find out how these relationships and possible added value occurs, by opening the 'black-box'. To examine the concepts and their inter-concept relations, a literature study was done and followed by an empirical research. With regard to the first question, quantitative data gained through European Manufacturing Survey (EMS) has been analyzed by examining the statistical effect(s) of HRM-practices and (squared)HWPS (configuration of HRM practices) on both product and technological process innovation (N=302-325). Regarding the second question, a qualitative research was conducted by means of semi-structured interviews (N=3) and analyzed with theory-guided coding.

The results from the quantitative analyses reveal a significant positive relation between overall HRM-practices and technological process innovation. This relationship is not found for product innovation. Regarding individual HRM-practices, appraisal has a significant positive impact on product innovation, whereas training and planning show a significant relation with technological process innovation. No significant single effects of other HRM-practices on both innovations are found. On the other hand, HRM-practices combined as HPWS show a positive significant relationship with product as well as process innovation. However, for the relationship between squared-HPWS and both innovations, no significant outcomes are found. Regarding part (a) of question two, qualitative outcomes reveal that, even though variations in the intensity and scope exist, all HPWS HRM-practices included in this study are implemented within the firms. The development of HRM-practices follows in general the following sequence; set up a general HRM-policy, and design and implement HRM-practices, derived from the HRM-policy. Since employees are closely involved with HRM, the universality and generalizability of the HRM-policy are rather challenging points for a HRM-department. For this reason, customization of the actual HRM-practices to the situation of individual employee is part of this process. The findings for question (2b) show that perceptions of employees towards HRM are often measured by work-satisfaction surveys, whereas behavioral reactions are often discussed during appraisal sessions or in other individual conversations. Based on this measurement and other observations, firms state that employees are in general neutral to positive towards HRM. However, there are also negative instances and feedback from employees is considered a crucial factor in this process. Thus, it is rather an iterative-process in which HRM affects employees and their feedback leads to possible changes within HRM, until the aimed goals are achieved.

Based on the quantitative outcomes, it can be concluded that HRM-practices affect both innovations. However, different practices are important for each innovation and in general, some practices are more important for technological innovations than others. Further, the impact of the configuration of HRM-practices as a HPWS has an added value above their single effects. The higher the number of the practices included in HPWS, the greater their impact. However, this increase in their impact is not exponentially. Concerning qualitative outcomes, it is concluded that all the practices examined in present study are considered important and implemented in cooperation with the employees. Thus, the relationship between HRM and innovation is rather dynamic, reciprocal and highly influenced by employees. Based on this research, theoretical as well as practical implications are discussed and recommendations are made.

TABLE OF CONTENTS

CHAPTER PAGE

CHAPTER 1 - INTRODUCTION

1.1. Introduction

With increasing worldwide competition and the rapidly changing environment, an organization's ability to innovate has become even more crucial for its survival and sustainable competitive advantage (Koberg, Detienne, & Heppard, 2003). Thus, an innovation strategy is an inseparable part of organizations and in particular of those within the manufacturing sector. Based on the outcomes of previous studies, Human Resource Management (HRM) is considered one of the crucial contributors of sustainable innovation (Becker & Huselid, 1998). Apart from other factors, organizations that fail to innovate carry the risk of losing to other players in the field, being inefficient or losing their key personnel (Montes, Moreno, & Fernandez, 2004). Therefore, along with responding to present trends, organization should foresee and prepare for future demands by innovating. This will allow them to anticipate quickly and efficiently to future situations and trends (Sarkar, 2007). Thus, as Shavinina points out, ''the question is not one of whether or not to innovate but rather on how to do so successfully'' (2003, p.761). Despite its importance, there is a variation between firms in their innovativeness and the facilitation of innovations (Battisi & Stoneman, 2009; Damanpour, 1987). This is partly due to the fact that the question on 'how' to facilitate sustainable innovation in an effective and efficient way, is not easily answered (Pohlmann, 2005). In an attempt to contribute to an answer of this question, it can be argued that the people of an organization are one of the key factors in the facilitation of innovation (Youndt, Snell, Dean, & Lepak, 1996). Accordingly, innovative firms know how to manage and compensate their employees (Gupta & Singhal, 1993) and HRM has a crucial role to play in the establishment of this process (Searle & Ball, 2003). Hence, based on empirical as well theoretical research, it can be stated that, when HRM is designed and implemented properly and in alignment with organizational strategy (e.g. innovation strategy), it serves as an influential facilitator of innovation.

Current study focuses on the relationship between HRM and technological innovation. More specific, the study aims to explore which HRM-practices or sets of HRM-practices (HPWS) are supportive for technological innovation within manufacturing firms in the Netherlands and how they are implemented in the workplace. First, using quantitative data gained from European Manufacturing Survey (EMS), the statistical effect(s) of a set of HRM-practices as well their (squared) synergy effect on product and technological process innovation in manufacturing firms are examined. Second, to explore which and how HPWS HRM-practices are implemented within the firms and how they are received (perceptions and behaviors) by employees, a qualitative research is conducted through semi-structured interviews. In sum, both statistical relationships between the concepts and the mechanisms (inter-concept processes) through which these relations occur are investigated. For this reason, current chapter follows with a discussion of the research design. Chapter two starts with a brief elaboration on the concept of innovation, followed by a comprehensive literature study on HRM and HPWS. The methods used in this research are outlined in chapter three and followed by chapter four on the presentation of the results. Finally, conclusions and their implications are addressed in chapter five.

1.2. Problem statement

HRM has been scarcely treated in studies of organizational innovation and empirical evidence is still limited (Cooke & Saini, 2010). However, past research has shown that HRM can be an important predictor of organizational outcomes, such as productivity, flexibility, innovation and financial performance (Chen & Huang, 2009; Shipton et al., 2006). For example, a study done by MacDuffie (1995) indicates that the integration of sets of HRM-practices is related to the improvement in productivity of manufacturing firms. The HRM-practices system is directly associated with numerous dimensions of operational performance and that strategies moderate this relationship (Youndt et al., 1996). Taken together, previous evidence clarifies the potential that HRM has in facilitating organizational innovation.

Nevertheless, a comprehensive research on the relationship between HRM and innovation is still deficient. As pointed out by Jimenéz-Jimenéz and Sanz-Valle point out, ‘’even though there have been some research done on the relationship between HRM and innovation, the conclusions are heterogeneous or even contradictory’’ (2005, p.365). Therefore, it has been concluded that the results presented thus far are incomplete (Rowden, 2002). Previous research on this relationship has been mostly carried out in US (Jimenéz-Jimenéz & Sanz-Valle, 2005) and the information available is for the most part about the *Fortune 100* (Rowden, 2002). Accordingly, there is still a gap in the literature examining the relationship between HRM and innovation in the Netherlands. Even though most scholars and practitioners agree that bundles of HRM-practices have a greater impact on organizational outcomes than a single practice (Jimenéz-Jimenéz & Sanz-Valle, 2005), a consensus about which sets of HRM-practices as a system are supportive for innovation is yet to be reached (Chen & Wang, 2010). Since empirical studies differ on their samples and outcomes, prior research doesn’t clarify this inconsistency either (Jimenéz-Jimenéz & Sanz-Valle, 2005). A last shortcoming in past research is the ignorance of the ‘the black box’, meaning that qualitative research examining the implementation process of HRM, its relationship with employees, innovation and their inter-concept relations is still rare. Overall, regarding the relationship between HRM and innovation, two types of questions are yet to be answered, namely: 1) what are the innovation-facilitating HPWS HRM-practices and 2) (a) how are they implemented by HRM-managers and (b) what is their effect on employee perceptions and behavior within manufacturing firms? To address the problem statement, next section will continue with outlining the objectives, relevance and the research questions in this study.

1.3. Objective, relevance & research question(s)

As mentioned above, for their survival and competition, firms place innovation high on the strategic agenda (Koberg, Detienne, & Heppard, 2003). Current study aims to explore (1) which HPWS HRM-practices are supportive for innovation and (2) how they are implemented and received by the employees. By examining question one, a relationship between the constructs may or may not be found. However, finding a statistically significant relation doesn’t clarify what is actually happening within the process. For this purpose it is useful and necessary to open the black-box and examine the value-creation process between HPWS HRM-practices, employees and technological innovation. By doing so, the study aims to fill the knowledge gap in the literature and provide evidence. Second, by directly (quantitatively) and indirectly (qualitatively) examining the synergy effects of HPWS on technological innovation, this study adds to the ongoing debate on HPWS-configuration and

its added value (Macky & Boxall, 2007). Third, by approaching the concepts and their relationships on both macro and micro level, it is made possible to understand the phenomenon from organizational as well as employee perspective. In today's knowledge economy, people are seen an important resources possessing the potential to positively contribute to various organizational outcomes, including innovation (Macky & Boxall, 2007, p.538). The problem statement pointed out in previous section and the objective of this paper lead to the following question which is central in present study *''Which HPWS HRM-practices support technological innovation and how are they employed within manufacturing firms and received by its employees?* With this central question as a guiding pillar, the following sub-questions are addressed:

(1) The effect(s) of individual HRM-practices and their synergetic effect as HPWS on product and technological process innovation in manufacturing firms.

(2) a) Which and how these HPWS HRM-practices are implemented and b) what are the perceptional and behavioral reactions of employees on the practices

Whereas the first question is more explorative and mainly focused on the examination of statistical relations, the second question is an insight-question to understand 'how' these relations occur.

This study is relevant for several reasons. First, this paper starts with a literature study and by doing so, it provides an overview of existing academic literature on HRM and its relationship with innovation. Second, by combining literature study on prior research with this research, the paper contributes to the debate on the approaches of (S)HRM and on theory formation of HRM. Finally, based on this study, theoretical as well as practical implications will be discussed and some recommendations will be made. This could support HRM-practitioners to establish the process of the development and the implementation of HRM in general, more effectively and goal-oriented. Especially, in manufacturing firms. To address the problem that is formulated and in an attempt to contribute to an answer of the questions that have been formulated, a mixed-methods is used.

For the first question, a quantitative research is conducted using data from European Manufacturing Survey (2009). With regard to the second question, a qualitative research is done by means of semi-structured interviews. Both EMS (2009) and the interviews focus on manufacturing firms within the Netherlands. Quantitative data is then analyzed with different regression analyses and theory-guided coding is used for the analysis of the qualitative information. After the presentation of the results from both analyses, conclusions are drawn and implications are discussed. A detailed presentation of the paper outline follows next.

1.4. Paper outline

In chapter two, a literature review is provided on the main concepts of present study and their relationship. Based on this literature study, hypotheses are formed about the main concepts and their expected relations. This is also visualized in two separate conceptual models, representing the (expected) relationship of HRM-practices and (squared)HPWS with products as well as technological process innovation. A detailed discussion of the methods used in this study is presented in chapter three. In chapter four, the analysis methods of both quantitative and qualitative research are elaborated and followed by an outline of their findings. Chapter four is finalized with similar conceptual models included in chapter three, supplemented with the visualization of actual outcomes from this study. In chapter five, conclusions are drawn from the findings and both theoretical and practical implications are discussed. Finally, a reflection of present study and suggestions for future research are elaborated in chapter five as well.

CHAPTER 2 - THEORETICAL BACKGROUND

2.1 Introduction

Previous chapter introduced shortly the main topic of this study and addressed the questions that are yet to be answered. In the first part of this chapter, the concept of innovation, its characteristics and dimensions are introduced briefly. The second part of this chapter elaborates on HRM, strategic HRM (incl. High Performance Work Systems), and on the relationship between HRM and innovation. Finally, the chapter is completed by a separate discussion of HRM-practices included in this study.

2.2 Innovation

Innovation is considered one of the key factors in economic competition (Pohlman, 2005) and for corporate success (Schumpeter, 1935). But, what is innovation exactly? The word 'innovative' is derived from Latin, *in+novare*, that is to 'make new', to renew or to alter (Clark & Baker, 2011, p.19). The term innovation has many definitions, varying from very broad to very specific ones (Damanpour, 1987). A general definition corresponding to the scope of present study is: ''innovation is the intentional introduction and application within an organization of ideas, processes, products or procedures, new to the unit of adoption, designed to significantly benefit the organization or wider society'' (West & Farr, 1990, p.9).

Although there are exceptions, many scholars nowadays agree that both dimensions are essential and that innovation comes in various forms. Differentiating between types of innovation is necessary for understanding innovative behavior in organizations (Damanpour, 1987). Despite the importance of non-technological innovations, a technological perspective on innovation has dominated past research (Pareira & Romero, 2013).

A closer look shows that, in addition to the differentiation between technological and non-technological innovation, two other dimensions or classifications have gained a lot attention in the literature. These are respectively, product and process innovations and radical versus incremental innovations (Utterback, 1994). Damanpour argues that ''all types or dimensions of innovation do not have the same characteristics, do not follow the same process of implementation and finally, do not relate equally to the same predictor variables'' (1988, p.547). Therefore, he continues, differentiation between types of innovations is necessary for understanding innovative behavior in organizations (1988). The three dimensions mentioned here, are briefly discussed in the next subsections.

2.2.1 Product vs. technological process innovation

Product innovations are changes in the end product or service (Utterback, 1994), whereas technological process innovations are modifications in the production process – the way in which an organization produces products or services (Damanpour, 1988). Before continuing, it is important to clarify what is meant by a production process and a product. Utterback and Abernathy define a production process as ''the system of process equipment, work force, task specifications, material inputs, work and information flows, etc. that are employed to produce a product or service'' (1975, p.641), whereas a product is defined as ''a good or service that is offered to a customer or client'' (Barras, 1986, in: Damanpour & Gopalakrishnan, 2001, p.47). Examples of technological process innovation are alternations in input materials, task specifications, work and information

flow mechanisms, and equipment used to produce a product or provide a service with the aim of achieving lower costs and/or higher product quality (Utterback & Abernathy, 1975; Cooper, 1998). While product innovations tend to be more market-focused and are mainly customer-driven, process innovations take a more internal focus and are primarily efficiency-driven (Utterback & Abernathy, 1975).

Product as well as technological process innovations may have various advantages for the firm, namely growth, business expansion, differentiation from competitors, short-term payback and lowering of costs. However, the other side of the coin which cannot be ignored is that, both types of innovation can create high costs and expenses for the organization and carry the risk of failure (Betz, 2011). In sum, technological processes are the means by which products are produced and both innovations can vary from incremental to radical ones. The next sub-section follows with a discussion of the radicalness dimension.

2.2.2 Incremental vs. radical innovation

Innovations can be differentiated based on their radicalness dimension as well, indicating the degree of change in existing practices or products of the organization (Damanpour, 1991). Radical innovations produce fundamental changes in the activities (products or services) of the organization and represent a clear departure from existing practices (products or services) (Damanpour & Gopalakrishnan, 1998), while incremental innovations ‘’enhance and extend the underlying technology (product or service) and thus reinforce the established technical order ‘’ (Tushman & Anderson, 1986, p.441) resulting in a lesser degree of departure. Thus, while radical innovations are fundamental and new to the world, incremental innovations are mainly concerned with renewal and improvement (van Engelen & Hadders, 2004)

The distinction between incremental and radical innovation is mostly used to specify the changes at the level of the product or the process, but it applies to other aspects as well (Hage & Meeus, 2006). There are various reasons why radical innovation can be valuable. Some examples include, entrance and fast growth in a new market and by doing this effectively, the firm can create an opportunity for becoming a key player in the industry. Incremental innovations on their turn, are mostly small changes or improvements, or short-term solutions. This type of innovation is most appropriate for competition in existing markets. The radicalness dimension can be applied on technological as well as non-technological innovations that are outlines in the next section.

2.2.3 Technological vs. non-technological innovation

The dual-core theory states that organizations have both an administrative (non-technological) and technological core and that innovations in each core follow a different process (Daft, 1978; West & Altink, 1996). According to Gopalakrishnan and Damanpour, this categorization is important because of its reflection of the general distinction between the social structure and the technology in organizations (1988, p.19). While the technical core is mainly concerned with the transformation of raw materials into products and services, the administrative core takes care of the organizational structure, control systems and coordination mechanisms (Daft, 1978). For this reason, even though the examination of technological innovations is essential and necessary, it does not include all the innovation activities that an organization may facilitate.

On firm-level, technological innovations relate to innovations of the machinery or production process, including processes and technologies applied for the improvement or the development of new products or services (Daft, 1978; Damanpour & Gopalakrishnan, 2001). Thus, it includes both process and product innovations which can be differentiated based on their level of radicalness (Lawless & Anderson, 1996). Technological innovations are carried out for the reasons including, costs cutting and expansion. However, they can also lead to concerns of employees regarding becoming redundant and to upfront costs. Non-technological innovations on the other hand, relate to changes in administrative processes, an organization's structure, allocation of resources (Cooper, 1998; Damanpour & Gopalakrishnan, 1998), management practices, marketing concepts and corporate strategies (Battisti & Stoneman, 2009, p.2). Non-technological innovations can be done in order to increase and improve motivation and health of employees, efficiency and effectivity, productivity and so on. Non-technological innovations have been named differently by different scholars with all of them referring to more or less similar dimension of innovation. Examples are, non-technological innovation (Armbruster, 2005), administrative innovation (i.e. Evan, 1966; Damanpour, 1987; Cooper, 1998) and organizational innovation (Battisti & Stoneman, 2009). Even though these terms might vary in their inclusiveness of different aspects of non-technological innovation, they all share one communality, the acknowledgement of the social structure and thus the role of human factor within these innovations. In this regard, HRM can be considered a part of the social structure and improvements in HRM-practices system are seen as non-technological innovations. Past research has shown that HRM possess the potential, when designed and implemented properly, to facilitate (technological) innovation within organizations (Eslami & Nakhaie, 2011). The exact role of HRM as a facilitator of innovation will be addressed in the following sections.

To recapitulate, current section cleared up that innovation is a multidimensional concept and thus, researching it from one perspective is complicated and insufficient because of the reciprocities and relatedness of the two structures and their associated innovations (Damanpour, Szabat & Evan, 1989).

2.3 Introduction - (Strategic) Human Resource Management literature

The following sections focus on HRM, HPWS and their relationship with innovations, based on past research. A section with the elaboration on HRM will be followed by a discussion of Strategic Human Resource Management (SHRM). Next, a section on the approaches of SHRM (including HPWS) is continued with a section on the relationship between HPWS and innovation, based on existing research outcomes. Last, the chapter is finalized by a separate discussion of each HPWS HRM-practices with corresponding hypotheses of this study.

2.4 Human Resource Management (HRM)

HRM is concerned with all aspects of how people are employed and managed in organizations (Armstrong, 2009). More specific, HRM is a crucial element which has the capacity to contribute to the success of an organization and is defined as ''the primary means by which organizations can influence and shape the skills, attitudes, and behavior of individuals to perform their work and thus achieve organizational goals'' (Eslami & Nakhaie, 2011, p.518). The growing emphasis on the internal resources that serve as a source of competitive advantage, has brought legitimacy to HR's assertion that people are strategically important to the success of an organization (Wright, Dunford & Snell, 2001). A shift has taken place in the way how people are viewed in an organization, namely from seeing people as an instrument to accomplish work, to recognizing and appreciating the need for putting people at the top of the agenda in achieving organizational objectives (Itika, 2011).

HRM covers activities such as strategic HRM, human capital management, knowledge management, organizational development and more. Its goal is to develop and implement policies which balance the needs and objectives of the organization with its stakeholders (Armstrong, 2009). It is important that the HRM-policy and its corresponding HRM-activities support the strategic objectives of HRM (Dessler, 2015). Various specific objectives of HRM have been formulated in the literature (Armstrong, 2009). A summarized example includes: ''support the organization in achieving its goals by developing and implementing HRM-strategies that are integrated with the business strategy; contribute to the development of a high-performance culture; ensure that the organization has the talented, skilled and engaged people it needs'' (Armstrong, 2009, p.5). In general, HRM differentiates itself from other aspects of an organization in a way that, it recognizes people as a valuable resource to be managed as efficiently and effectively as any other resource (Dessler, 2015). By doing so, HRM fulfills the function of a bridge between the objectives and interests of the organization and its employees.

2.5 Strategic Human Resource Management (SHRM)

Strategic Human Resource Management (SHRM) is a mean which links HRM to organizational strategy and is defined as ''the pattern of planned human resource deployments and activities intended to enable the firm to achieve its goals'' (Wright & McMahan, 1992, p.298). SHRM ensures that (1) HRM is highly related to firm-strategy, (2) HRM-policies and practices are in alignment, and (3) HRM-practices are properly implemented by the staff as well as employees (Schuler, 1992). The elaboration of Schuler (1992) highlights the importance of 'fit' within SHRM. In the context of SHRM, 'fit' relates to the alignment of HRM-practices with each other, and with other aspect of an organization, including strategy (Boselie, 2010).

Way and Johnson (2005) have defined a theoretical framework for SHRM research which aims to integrate its various aspects and components. Although the authors elaborate on many aspects of SHRM, for the purpose of this paper, only relevant components are briefly discussed here. As the framework illustrates, SHRM can be divided into two sub-stages: (1)HRM-strategies and (2)HRM system. Before continuing with these two concepts, it is important to clarify what is meant by organizational strategy. The strategy of a business refers to ''the direction and scope of an organization over the long term, which achieves advantage in a changing environment through its configuration of resources and competences with the aim of fulfilling stakeholder expectation'' (Johnson, Scholes & Whittington, 2008, p.22). HRM-strategy serves as an important bridge for the linkage between HRM and business strategy. HRM-strategy and policies define HRM in practice and how it should be implemented in order to contribute to the succession of its goals, along with business objectives (Lengnick-Hall, Lengnick-Hall, Andrade, & Drade, 2009). The basic idea behind these strategies is to convert the insights of HRM into HRM-practices system which has tangible and beneficial economic outcomes (Chew & Sharma, 2005). For instance, past research has shown that HRM-strategy drives 15 percent of profit performance for the average organization (Roberts, 1995).

As stated above, HRM-strategy can be categorized as a more conceptual and intangible aspect of HRM, whereas HRM-system consists of the actual HRM-practices which are more tangible and visible. For this reason, HRM systems (consisting of HRM-practices) are the most appropriate level of analysis because they more accurately reflect the multiple paths through which HRM-practices will influence successful strategy implementation. Also important to emphasize, the general or overall HRM-system, because it is the systematic and interrelated influence of HRM-policies and practices that provide their inimitability, and therefore a strategic lever for the firm (Becker & Huselid, 1998). In a nutshell, SHRM is concerned with the alignment of HRM-strategy to firm-strategy (Boselie, 2010; Schuler, 1992) and the HRM-practices system is the actual implementation of this purpose in practice.

2.6 SHRM approaches and introducing HPWS

Despite the scholarly attention and efforts from the field of HRM over the past twenty years, a theory about HRM is still lacking (Guest, 1997; Paauwe, 2009). However, there are three broad approaches in HRM research which are commonly applied and which link the firm-strategy and HRM. These approaches are: the universalistic or best practice approach, the contingency or best fit approach, and the configurational approach (Delery & Doty, 1996; Boxall & Purcell, 2003).

The universalistic approach argues that some HRM-practices are always better than others and states that all organizations should adopt these HRM-practices (Marchington & Grugalis, 2000). This approach accentuates the universal importance of particular HRM-practices for all businesses (de Leede & Looise, 2005), regardless of the context. The notion that - regardless of the context - an HR-systems oriented towards innovation will enhance innovation, has been generally accepted but not fully supported by the literature (Delaney & Huselid, 1996; Wright & McMahan, 1992). Lau and Ngo (2004) relate this to the inadequacy of such a simplified view and Marchington and Grugalis (2000) go even further by calling it the ''illusion of best practice''. Marchington and Grugalis claim that the context and the other elements of an organization, *do* play an important role in determining the effectiveness of HRM (2004). Delery and Doty note that the basic assumption of SHRM is that organizations require different HRM-practices depending on the strategy they adopt (1996).

This means, given a particular strategic objective such as service, efficiency, quality, or innovation, a set of HRM-practices should be designed and implemented in order to direct human resources in meeting these objectives (Scarbrough, 2003). This notion leads to the second approach, namely the contingency approach which states that HRM-practices must fit with other aspects of an organization if it aims to be effective (Marchington & Grugalis, 2000). In this approach, context does matter and it assumes that fitting HRM-strategy and practices to its context is of great importance (Delery & Doty, 1996). For example, innovation-oriented organizations ask for innovation-enhancing HRM-policies and practices and they may differ from conventional HRM in a stable environment (Lau & Ngo, 2004).

Finally, the third approach which is called the configurational approach, goes even further, by treating HRM-practices as a system and points out the importance of fit between HRM-practices and organizational elements as well as the alignment within the HRM-practices system. As Delery and Doty note, ''this approach is guided by the holistic principle of inquiry, and theories within this approach are, in general, concerned with how the pattern of multiple independent variables is related to a dependent variable rather than with how individual independent variables are related to the dependent variable'' (1996, p.803). In strategic literature, HRM-practices as a system, have been named as High Performance Work Systems (HPWS). In HPWS, the practices are considered as separate but at the same time interdependent, indicating a horizontal and vertical fit between HRM-practices and the context (Chen & Wang, 2010). Accordingly, horizontal fit refers to the internal consistency among HRM-practices, whereas vertical fit is referring to the alignment of HRM-system with other aspects of the organization, including organizational strategy (Chen & Wang, 2010; Delery & Doty, 1996; Marchington & Grugalis, 2000; Wright & McMahan, 1992). A change from practice-oriented view on HRM to a bundle-oriented (HPWS) view can be identified in the field of SHRM (Youndt & Snell, 2004).

To recapitulate, examples of various forms of alignment exist (Delery and Doty, 1996), as discussed in the universalistic, contingent and configurational approaches (HPWS). In recent years, there is a growing interest in the configurational approach and various studies point out that the success of HRM partly depends on its introduction as an integrated package and its alignment with the context and strategy of the organization (Lau & Ngo, 2004). Literature on the relationship of HRM (HPWS) with innovation, based on past research, will be presented in the following section.

2.7 Linking HPWS HRM-practices & innovation

Since individuals are engaged in the whole innovation process, human factor and thus HRM are seen as crucial elements in successful innovation (Vrakking, 1990). It has been argued that HRM possess the potential to promote innovation within organizations (Shipton et al., 2006). Employees from all layers of an organization have the capacity to provide new ideas and solutions to challenges that are related to firm activities (Ceylan, 2013). In this regard, HRM-practices can enhance the creativity of employees by supporting an adequate work environment and thus stimulating them to involve more in innovative activities. For this purpose to be fulfilled successfully, alignment between business strategy, HRM-strategy and HRM-practices becomes crucial. Adoption of HPWS is an example of this alignment. Although the literature reveals that researchers vary in which practices they include in HPWS, there are also many similarities and most of them share the conclusion that HPWS can serve as a facilitator of innovation. Some research outcomes on this relationship are presented next.

To start with, in a research done by Guerrero and Barraud-Didier (2004) they hypothesized that - because of synergy effects - the combination of empowerment, compensation, communication and training will lead to superior organizational performance. The results reveal that, except for compensation, all the other practices are indirectly related to financial performance, with social performance as the mediating factor. Thus, when HRM-practices are developed and implemented strategically and as a complementary system, they increase the performance of the firm. In a longitudinal study, Shipton and colleagues (2006) examined the relationship between various HRM-practices and technological within manufacturing firms. They showed that training, induction, team work, appraisal and exploratory learning focus are all determinants of innovation. Moreover, the outcomes revealed that their combination predicts innovation over and beyond their main effects. In another study, it was hypothesized and confirmed that the implementation of an HRM system including flexible jobs, empowerment, team work, long-term skill-oriented resourcing, extensive and long-term training, broad career opportunities, behavior based appraisal, variable reward system is positively related to innovation within organizations (Macky & Boxall, 2007). Similarly, it has been shown that interdisciplinary workgroups, quality circles, systems for collection of employee proposals, planned job rotation, delegation of responsibility, integration of functions, performance-related reward relate (almost) equally to the ability of a firm to innovate (Laursen and Foss, 2003). Consequently it is concluded that these HRM-practices, when adopted properly, lead to a higher level of innovation performance. Based on this literature review, both linear and squared effects for HPWS are expected, meaning that not only cumulatively effect of HPWS on technological innovation will occur, but the effect of the HRM-practices will increase exponentially - because of their synergies.

Building on these outcomes, HPWS is considered a potential determinant of competitive advantage (Becker & Huselid, 1998). In order to achieve superior HRM-outcomes and facilitate innovation, particular configurations of HRM-practices are desired and different integrations of these practices generate different organizational outcomes (Guest, 1997). This section presented the relationship between HPWS and innovation in general. For a better understanding of each HRM-practice that is included in present study, a discussion of individual HRM-practices will follow in the next section.

H1a – HPWS	*The HPWS index will be positively related to product innovation in manufacturing firms.*
H1b – HPWS	*The HPWS index will be positively related to technological process innovation in manufacturing firms.*
H2a – squared HPWS	*The squared HPWS will be positively related to product innovation in manufacturing firms.*
H2b – squared HPWS	*The squared HPWS will be positively related to technological process innovation in manufacturing firms.*

2.8 Separate HRM-practices

In the previous section, research outcomes on the relationship of HPWS with innovation have been briefly presented. These outcomes shed some light on the relationship between HPWS and innovation and reveal that the implementation of HPWS requires the inclusion of certain HRM-practices. However, an agreement about which practices these are or should be, does not exist yet (Chen & Wang, 2010). Thus, building on the work of Chen and Wang (2010) and based on commonly cited HPWS (Macky & Boxall, 2007), current study

considers the following HRM-practices as being part of HPWS: staffing, training, planning, appraisal and reward system. Before continuing, it is worth to note the part about 'alignment' once again. With HPWS, alignment becomes crucial, both internally (among HRM-practices) and externally (with other organizational elements). These complementarities can be positive, where the whole is greater than the sum of the parts (powerful synergies), or negative (deadly combinations), where elements of the system conflict (internally or externally) and actually destroy value rather than creating it (Becker & Huselid, 1998). In order to clarify this point, current section will deep dive into the role that each HRM-practice, mentioned before, may have in facilitating innovation.

2.8.1 Staffing – recruitment & selection

Even though recruitment and selection represent just a part of HRM, this practice have been generally accepted as lying at the core of people resourcing within organizations (Millmore, 2003). Since an organization's human capital is a strategically important asset, this practice is a crucial step in the achievement of organizational goals (Armstrong, 2014). After an organization decides on the number and the type of people it needs, the next step is to recruit and select them. Whereas recruitment is concerned with finding and attracting the right people, selection is about deciding which applicants should be selected and appointed to certain jobs (Millmore, 2003).

Some results exist in the literature on the relationship between staffing and innovation (Al-Laham, Tzabbar & Amburgey, 2011). Since the generation of novel ideas is a requirement for continuous innovation, an organization must find ways to get these ideas inside and recruitment serves as an effective tool for this purpose (Nesheim, Olsen, & Kalleberg, 2007). Especially the implementation of external sources of recruitment is generally accepted as having a positive effect on innovation (Jiménez-Jiménez & Sanz-Valle). For instance, Rosenkopf and Almeida (2003) showed that firms can access new knowledge and gain new competencies by using acquisition methods such as external recruitment and alliances. In a longitudinal study done by Al-Laham and others (2011), the outcomes show that, with support of proper internal structures, organizations can implement recruitment as a tool to learn from their external field and fulfill the gaps in their existing knowledge. Additionally, Al-Laham and colleagues (2011) have demonstrated that hiring new people can support innovation by promoting the development of new technological competencies. Also, the flow of people across organizational- as well as geographic boundaries, decreases the likelihood that a firm sticks to the 'old way of doing things' (Madsen at al., 2003). Overall, the results show that recruitment from outside is a mean which firms can use, to get those unique ideas and insights into their firm.

Regarding the selection of people, many companies have emphasized the importance of being selective in staffing (Rowden, 2002). Selective staffing refers to ''the extent that a firm's staffing process uses information gathered from several selection devices (e.g., interviews, tests, work samples, etc.) to evaluate job candidates'' (Rowden, 2002, p.80). Various studies have shown the benefits of selectivity in staffing. For instance, Delaney and Huselid (1996) found that selectivity in hiring is positively associated with organizational performance measures. Also, by being selective in staffing, a company may decrease the amount and the expenses of formal training activities. To sum up, the HRM-practice 'staffing' consisting of recruitment and selection is one of the basic practices which has the potential to contribute to other HRM-practices.

H3a – Staffing *Recruitment from outside will be positively related to product innovation in manufacturing firms.*

H3b – Staffing *Recruitment from outside will be positively related to technological process innovation in manufacturing firms.*

2.8.2 Training

For an organization to create competitive advantage, it is not only important to obtain the right people, but also to retain and develop them. Nowadays, the term training and development is mostly replaced by the concept 'strategic human resource development' (SHRD). Strategic HRD strives for vertical (with strategic organizational objectives) and horizontal (with other HRM-practices) integration of training and development practices (Millmore, 2007).

Regarding training, the outcomes of empirical studies done so far are not conclusive. Whereas some researchers have found a positive relationship between training and innovation (Jiménez-Jiménez & Sanz-Valle, 2005), others have found contrary outcomes (Raghuram & Arvey, 1994). Jiménez-Jiménez and Sanz-Valle (2005) state that training provides the staff with the knowledge, skills and abilities (KSA's) that are needed for innovation. Similarly Bauernschuster, Falck and Heblich (2008) reveal a strong relationship between continuous training and innovation. In another study where high-tech companies in China were examined, it was found that workforce training is positively associated with technological innovation, including product and system improvements (Li, Zhao & Liu, 2006). On the other hand, by offering extensive training to employees, an organization may run the risk of determining too much for its employees and thus creating rigidity (decrease flexibility) and no room for experimentation, learning by doing or exploratory learning. These factors are of great importance for innovative firms. For these types of learning, support and encouragement of 'on the job development' might be more effective than offering external training programs (Li, Zhao & Liu, 2006). Therefore, it is concluded that success of innovation is also influenced by the skills of employees which they developed on-the-job. Kok and Ligthart (2014) go further by making a distinction between incremental and major innovation. Based on the outcomes of their study, the researchers conclude that training and education do not influence major new product development, but progressively more enhance the employees' employability to improve products. Also, training is not the only source of sustaining an up to date knowledge and skills. The customers, suppliers, competitors and other internal structures, such as job-design and planning are major sources of information for innovation as well. Last but not least, it is worth noting that formal training can be a costly activity. Therefore, as elaborated in the previous section, being selective in staffing, companies might decrease their expenses on formal or external training activities.

Put together, the literature on the relationship of training and innovation is not conclusive yet. Along with the beneficial outcomes of training-programs, selectivity in training is advised.

H4a – Training *Implementation of formal training programs will be positively related to product innovation in manufacturing firms.*

H4b – Training *Implementation of formal training programs will be positively related to technological process innovation in manufacturing firms.*

2.8.3 Strategic planning

Strategic human resource planning (HRP) is important because it links HRM directly to organizational strategy (Koberg, Detienne, & Heppard, 2003). In short, HRP is concerned with analyzing and defining the needs of workforce and putting 'the right people at the right place' (Gupta & Singhal, 1993). An important characterization of organizations striving for innovation is flexibility, which allows them to anticipate to external changes in their field. Internal organizational structures such as self-managing teams and task-integration as a form of job enrichment play a supporting role when pursuing an innovation strategy. In this regard, HRP is a practice that serves as a bridge for the alignment of the workforce and the internal structures with organizational strategy (Gupta & Singhal, 1993).

Since experimentation, exploring, flexibility and self-management are all aspects of innovative organizations, it is essential to create supporting internal structures and work-environments. One example includes 'self-managed teams', referring to the allocation of responsibility and power to the employees within certain (autonomous) teams (Evan & Davis, 2005). Several studies have shown the supporting role of self-managing teams for innovation within organizations. Gupta and Singhal (1993) for instance, revealed that motivated self-managing teams existing of different individuals with various skills and experience, generally achieve more than a single employee. Further, Rowden (2002) researched and found a positive association between work-teams and firm performance. The companies in this study also mentioned that, after they created and implemented work teams, their profitability had doubled. For the successful implementation of self-managed teams, task-integration (job-enrichment) can play an important role. Here, the employee is not only responsible for the execution of a job, but also for its planning and control.

Briefly, in addition to other HRM-practices, creation of innovation facilitating work environments and organizational structures is needed as well. Implementation of self-managed teams and task-integration can support this purpose by promoting learning through experimentation, knowledge sharing and problem solving.

H5a – Planning *Employment of self-managing teams and task-integration through task-integration will be positively related to product innovation in manufacturing firms.*

H5b –Planning *Employment of self-managing teams and task-integration through task-integration will be positively related to technological process innovation in manufacturing firms.*

2.8.4 Appraisal

Performance appraisal (PA) is an HRM-practice that contributes to the development of a 'high-performance culture' and improvement of organizational performance (Armstrong, 2009). As Foot and Hook describe, PA is '' the ongoing process of evaluating employee performance'' (2008, p.285). It is important that an organization first and foremost defines the performance criteria and how it will be assessed, prior the actual execution of the assessment. The three general possibilities to do this are- trait, behavior (process) or result (outcome) oriented appraisals. Researchers investigating performance appraisal, face several difficulties (Jiménez-Jiménez & Sanz-Valle, 2005. Some examples include; purpose of the assessment (evaluation versus development), formal versus informal appraisals, outcome versus behavioral oriented assessments, design and development of the appraisal instruments and finally, training of people (managers) who will conduct the

assessment. It is not an easy task to decide which aspect or type is most suitable, which one should be chosen and implemented in order to generate beneficial outcomes. Nevertheless, despite these issues, many theoretical studies as well as empirical outcomes highlight the importance of using a performance appraisal within organizations (Gupta & Singhal, 1993; Jiménez-Jiménez & Sanz-Valle, 2005). Appraisal process can motivate employees to work innovatively by providing them with feedback and thus with insights about the gap between their performance and the strategic objectives (Guzzo, Jette, & Katzell, 1985). Further, performance appraisal can create positive pressures and challenges for employees and thus be an essential source of motivation by bringing insights in what has been achieved (Jaw & Liu, 2003).

Even though the advantages of having a performance appraisal within organizations are undoubted, when the system is not designed and implemented properly, there might be still a few downsides that should be taken into consideration. As an illustration, formal appraisal is sometimes considered a bureaucratic activity which is not completely related to how the personnel is actually assessed (Mullin & Sherman, 1993). Since performance appraisal is a form of control and, control is closely related with autonomy, it is important that organizations find a balance between these two aspects. Especially within innovative organizations where creativity, room for experimentation and failure (to some degree), and learning by doing are crucial.

Briefly, performance assessment can be a source of motivation for employees to perform in a way that is favorable for innovation within their organization. Caution is needed when designing and implementing an the appraisal system.

H6a – Appraisal	*Implementation of regular appraisal sessions will be positively related to product innovation in manufacturing firms.*
H6b – Appraisal	*Implementation of regular appraisal sessions will be positively related to technological process innovation in manufacturing firms.*

2.8.5 Reward system

When designed and implemented properly, a reward system can serve as a strategic mean to achieve organizational goals (Thorbe & Homan, 2000). Rewards management is ‘’concerned with the strategies, policies and practices required to ensure that the value of people and the contribution they make to achieving organizational, departmental and team goals is recognized and rewarded’’ (Armstrong, 2014, p.370). It can help to attract and retain the right people and by motivating employees, affect their performance (Boselie, 2010). There are three primary pay options that may be a part of the total reward system: fixed or base pay (salary), variable compensation (e.g. bonuses and incentive pay) and finally, employee benefits such as insurance and family-friendly benefits (Boselie, 2010).

Some results exist in the literature between compensation and organizational outcomes, including innovation. A study done by Kalleberg and Moody (1994) showed that various forms of compensation positively relate to profit, customer satisfaction, sales growth and product development. In another review, the relationship between profit-sharing and productivity of 26 studies was analyzed and the review revealed that the majority of these studies have found a statistically significant relationship between the concepts. Concerning innovation, different studies have shown a positive effect of incentive-based pay on innovation (Jimenéz-Jimenéz & Sanz-Valle, 2008).

In sum, various compensation options exist. A balanced combination of different types of reward can facilitate innovation.

.

H7a – Reward *Profit-sharing, variable pay and employee benefits will be positively related to product innovation in manufacturing firms.*

H7b – Reward *Profit-sharing, variable pay and employee benefits will be positively related to technological process innovation in manufacturing firms.*

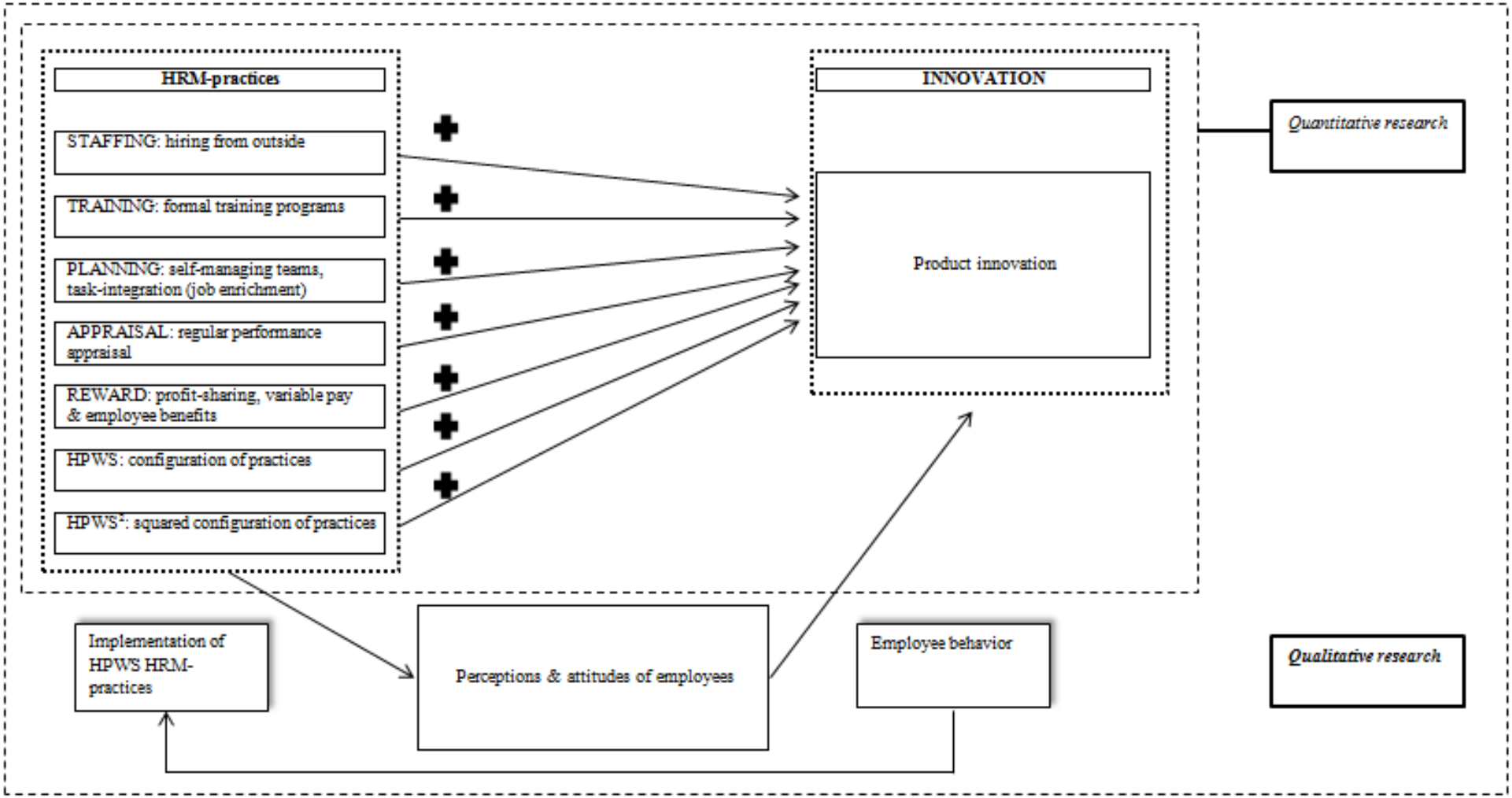

Figure 1. Conceptual model for product innovation

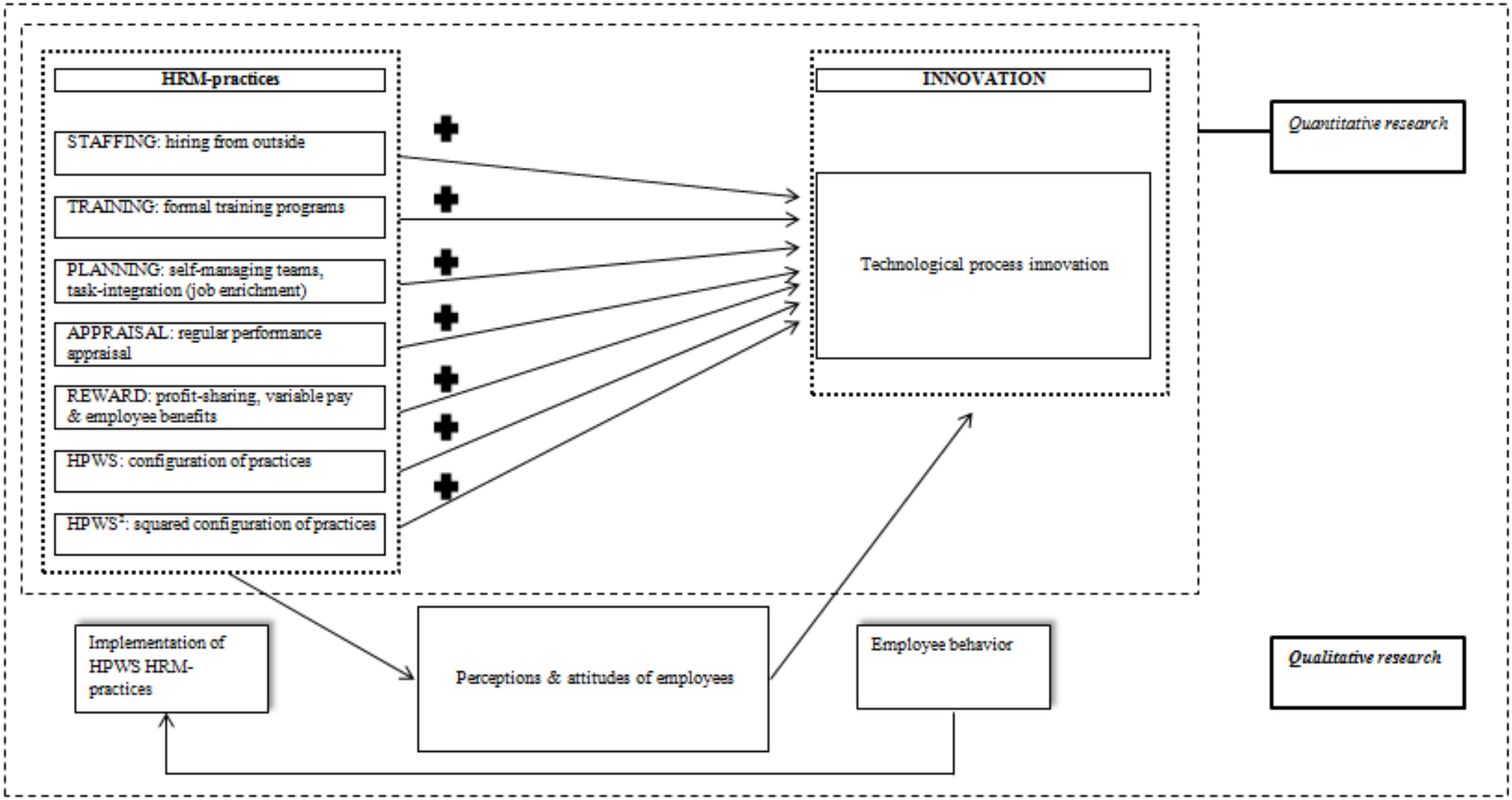

Figure 2. Conceptual model for technological process innovation

CHAPTER 3 – METHODS

3.1 Introduction

In the previous chapters, the research design and a literature study on the main concepts were introduced. This chapter will continue with a discussion of the methods that are used in current study. For this purpose, chapter three starts with an introduction of research process and continues with a discussion of the methodology that is applied for quantitative as well as qualitative research. Also, an operationalization of the following concepts is provided: innovation (product and process), (HRM) staffing, training, planning, appraisal, reward, and finally HPWS. Subsequently, the analyses are briefly mentioned and the chapter is finalized with a section on validity and reliability.

3.2 Research process

Current study aims to explore which HPWS HRM-practices facilitate innovation in firms that are operating within the Dutch manufacturing sector. Also, which of the practices are deployed by the firms and how they are received by the employees (in perceptions and behavior). For this purpose, a mixed-methods approach is used by performing personal and group interviews (questionnaires). This research method was deemed the most appropriate way to understand the relationship between HPWS HRM-practices and technological innovation. The method allows to research the variables quantitatively and analyze statistically as well as in more depth and interpretatively. While existing data from the European Manufacturing Survey (EMS) is used for quantitative analysis, semi-structured interviews with HRM-managers and were conducted to acquire information for qualitative analysis. Thus, the information that is missing from EMS is complemented with interviews. A mixed-methods approach has several advantages. First, it provides not only information on HPWS HRM-practices that are supportive for innovation and their preferred configuration, but creates also the opportunity to explore how this value is created. Second, using triangulation - the combination of diverse research methods and techniques for researching the same variables and their relationship - it is possible to study the concepts and relations in more precision by approaching them from various angles, which is also applicable in present study (Hesse-Biber, 2010). First, by examining an additional construct (employees), the semi-structured interviews will extend the information from the EMS. Second, by investigating the same constructs as well, the semi-structured interviews will enable to reflect on the EMS-data . Participation of the organizations and the respondents in current research is voluntarily and without monetary compensation. Confidentiality and anonymity is guaranteed for the information gathered from both sources (EMS and semi-structured interviews). The output of the EMS analysis along with the recordings and the notes of the interviews, will be used only for research purposes.

3.3 Methodology

The data has been gathered in two ways. First, the relationship between HPWS HRM-practices and product as well as technological process innovation has been examined through quantitative data from European Manufacturing Survey (EMS), conducted in 2009 – referring to the period from 2007 to 2008. More in-depth information about the concepts 'innovation, HRM and employees (perceptions & behavior)' and their inter-concept relationships have been gathered by means of semi-structured interviews.

European Manufacturing Survey. The aim of EMS is to investigate the efforts of manufacturing firms for innovating their products and production processes. The EMS examines manufacturing firms across different European countries (Lay et al., 2010). More specific, the questionnaire attains information about the different types of innovations and their extent. In order to systematically verify the manufacturing sector, the EMS is conducted every three years (Lay et al., 2010). The questionnaire focuses on firms with at least ten employees and more. In general, the EMS is carried out as a written questionnaire and which was also the case in Netherlands in 2009. The Dutch database from the EMS which has been conducted in 2009, was employed in current study. The response rate is around 5% and approximately representative for the manufacturing industry in the Netherlands.

Semi-structured interviews. For current study, the main purpose of these interviews is to gain additional and more in-depth information about the implementation of HPWS in manufacturing firms. In other words, to explore which practices HRM-managers implement and how these practices affect employees and innovation outcomes. In general, the interview will start with an introduction, followed by a combination of predetermined and new questions, and end with a summary. The interview structure includes the following main topics to be addressed: 1)innovations carried out in the past three years, 2)HPWS HRM-practices implemented by the firm, 3)perceptions and behavioral reactions of employees regarding these practices, 4)inter-concept relations between these subjects (Appendix B). Several manufacturing firms across different sectors in the Netherlands were selected randomly and their HRM-managers were invited to participate in the interview, by means of an e-mail. The e-mail contained information about the research, the researcher, anonymity and confidentiality. Based on the responses of the invitations, a total of three interviews was performed and each session lasted approximately one hour. From each organization, the interview was performed with one respondent at a time and took place within the organization building. During the conversations, written notes were made by the interviewer and the conversation was audiotaped using an IPhone 5. In chapter four, more detailed information is provided on both types of research methods and their analyses.

3.4 Operationalization, measures & scales

For the empirical measurement of the main variables and their relationships, the variables have been operationalized. For the measurement of some constructs in this study, proxy variables from EMS are used and which will serve as their indication. Also, for the analysis of some constructs, an index scale is created. Operationalization of the following constructs will follow: innovation (product and technological process), HPWS HRM-practices: staffing, training, planning, appraisal, reward, and finally HPWS. The items that were used to measure each construct are presented in Table 1, Table 2 and Appendix A.

3.4.1 Product & technological process innovation

A general definition corresponding to the objective of this study is ''innovation is the intentional introduction and application within an organization of ideas, processes, products or procedures, new to the unit of adoption, designed to significantly benefit the organization or wider society'' (West & Farr, 1990, p.9). Innovation is a multidimensional concept existing of a technological and non-technological dimension. Technological innovations can be divided in product and production process (incl. machinery) innovations. Product innovations are changes in the end product or service (Utterback, 1994), whereas process innovations are modifications in the production process – the way in which an organization produces products or services (Damanpour, 1988). Since there is no agreement on how innovation should be defined, studies vary on how they define and operationalize innovation. Innovation can be measured with a single item or multiple items, that can be either general or very specific. For instance, Zahra and colleagues divide the construct innovation into three sub-parts; product, process and organizational innovation. They operationalize these constructs as ''the number of new products, processes (machinery), and practices in management or administration'' (2000, p.34). On the other hand, Li, Zhao and Liu (2006) focus mainly on technological innovation and operationalize the construct with five items about product and process innovation. Based on the focus of a particular study, general or specific definitions can be used, and followed by an operationalization that is in line with it. However, one could debate on the predictive validity of a multiple-items versus a single-item measurements of the same constructs.

Current study investigates product and technological process innovation. A single categorical item with two response categories (yes/no) from EMS has been used, as an indication for product innovation. The question is about important product innovations within past three years, referring to whether or not the firm has introduced new products or innovated them, excluding minor enhancements. To note, the question contains the following word 'to a considerable degree', which can be interpreted differently by respondents and thus should be taken into consideration. For the measurement of technological process innovation, 13 items from EMS were included and an index scale for the construct has been created by counting the number of the technological process innovations implemented by the firm (maximum 13). Each of these 13 items represent a specific type of process technology (Table 1) and are therefore not related to each other. Thus, the 13 items do not represent different facets of one latent variable 'process technology' but are rather separate process technologies that can be either implemented by the firm or not. For instance, some of the items represent a very specific industry-related process technology which is most likely implemented , only by that industry and not by others. Thus, a high inter-item correlation is not expected for this scale and the scale is therefore treated as a formative scale (an index scale) instead of a reflective scale. The EMS items regarding both types of innovation, can be considered

as specific and mainly focused on technological innovation and at the same time applicable for most firms (across different sectors) operating within the manufacturing industry.

Table 1
Constructs and items for product and technological process innovation from EMS (2009).

Construct	Item
Product innovation	Total innovation: In past three years, are there new products or technologically renewed products to a considerable degree (small improvements excluded) incorporated into the production process of the firm (for example, implementation of new materials, changes in in the function of product etc.)?
Technological process innovation	Total number of innovative process technologies implemented by the firm, 13 items: 1. Integrated product design engineering 2. Industrial robots 3. Integrated quality control 4. Radiofrequency identification 5. Automated warehouse management systems 6. Laser tooling 7. Dry Processing systems 8. Rapid prototyping systems 9. Bio and gen technology 10. Novel materials 11. Supply chain management systems 12. Manufacturing execution systems 13. Virtual reality in development manufacturing

3.4.2 HPWS HRM-practices

STAFFING. Staffing includes activities regarding recruitment and selection of people. While recruitment is about finding and attracting people, selection is about choice of applicants that should selected and appointed to certain jobs (Millmore, 2003). Recruitment can be differentiated on its sources (external or internal), techniques (e.g. website, recruitment firms) and intensity. For selection, there are differences in the extensiveness of selection, the methods used (e.g. interviews, assessments), and the requirements (KSAs).

Staffing has been measured differently by different researchers, varying from single-item measurements to multiple-item measurements. For example, Chen and Huang (2007) operationalize staffing with three items, all of them referring to selection of people. Thus, even though they define their items as 'staffing', the questions cover the construct only partly. Jimenez-Jimenez and Sanz-Valle (2005) make a distinction between recruitment and selection in their operationalization of the construct 'staffing'. However, they use a very specific single-item for each part (recruitment and selection) of the construct, so there is a chance that the construct is not fully covered. In EMS, staffing is measured by two items. First, with a categorical item on whether or the firm has temporary employees and second, the number of temporary employees within the firm. To streamline other independent variables, the dummy variable about staffing is used in this study. This item is a general indication of whether or not a firm recruits from outside and provides less information on the selection of people. This information is supplemented by asking questions about staffing (recruitment as well as selection) during the interviews.

TRAINING. Training is defined as ''the organized activity aimed at imparting information and/or instructions to improve the recipient's performance or to help him or her attain a required level of knowledge''

(Way, 2002, p.767). Referring to chapter two, training programs can be distinguished on being formal or informal, their intensity, continuity and so on. Consequently, the operationalizations and measures of the construct training varies between studies. While some focus on more aspects of training including, the investment, goal and continuity of training (Li, Zhao and Liu, 2006), others operationalize it with six-items focusing on just one aspect 'the extensiveness' of the training (Wan, Kok & Ong, 2002). Way (2002) operationalizes training with a single-item about the percent of frontline employees who received formal training within one year. As for EMS, training is assessed by asking the firm about continuous training programs for employees, as part of their HRM-policy. The response category includes yes or no and thus, EMS focuses on the absence or presence of formal training programs. However, training includes more than just formal training, and therefore more in depth questions about training will be addressed during the interviews. For instance, what these training programs contain, if there is room for implementation of knowledge and skills gained during the programs.

PLANNING. Human Resource Planning is concerned with analyzing and defining the needs of workforce and putting 'the right people at the right place' (Gupta & Singhal, 1993). Internal organizational structures such as self-managing teams and task integration (job enrichment) play a supporting role when pursuing an innovation strategy. In this regard, HRP is a practice that can serve as a bridge for the alignment of internal structures and workforce with organizational strategy (Gupta & Singhal, 1993). Bae and Lawler (2000) operationalize planning (empowerment) with eleven items. In their case, high values represent concepts such as employment involvement, delegation, autonomy, pursuit of a cooperative climate and egalitarianism. A sample item is ''The jobs in our firm provide non-managerial employees with many chances to use personal initiative or judgement in carrying out the work'' (Bae & Lawler, 2000, p. 35). In EMS, planning is measured by asking two questions about the organization of work. The questions include the implementation of autonomous teams and task-integration (job enrichment). Both concepts play an important role in innovation within manufacturing firms. However, compared to the items of Bae and Lawler (2000), the EMS includes just two aspects of this HRM-practice when there are more aspects that can be included to cover the practice more completely. For this purpose, some items from Bae and Lawler (2000) are adopted and asked during the interviews (Appendix B).

PERFORMANCE APPRAISAL. Performance appraisal is ''the ongoing process of evaluating employee performance'' (Foot and Hook, 2008, p.285). The three general possibilities to do this are trait, behavior (process) or outcome oriented appraisals. Based on the research of Prowse (1995) and Xu and Wang (1997), Li and colleagues (2006) created three items that measure process appraisal. On the other hand, Hitt and others (1996) have developed a list of items that measure outcome appraisal. Even though these scales do not cover the construct completely, depending on the focus and the purpose of the research, they might be very useful. The EMS contains an item about the regular conduction of performance appraisal. Although the item does not make a distinction between the types of appraisal, it still covers an important aspect of the HRM-practice that could impact innovation. Another point worth noting is, the item from EMS can be rather subjective because of the use of the term 'regularly' which may be subject to different interpretations. It is therefore crucial to formulate questions in such a way that the interpretation of the terms is made explicit. Since, an existing data collected with

EMS (2009) is used in this study, this is not an option. Therefore, to verify the concept and its implementation within the firms, questions regarding appraisal are addressed during the interviews.

REWARD SYSTEM. Reward management is ‘’concerned with the strategies, policies and practices required to ensure that the value of people and the contribution they make to achieving organizational, departmental and team goals is recognized and rewarded’’ (Armstrong, 2014, p.370). As mentioned earlier, there are three primary pay options that might be part of the total reward system: fixed or base pay, variable compensation and finally, employee benefits (Boselie, 2010). A proper and balanced combination of these pay options can stimulate innovation by employees.

The items provided by Kuratko, Hornsby and Naffziger (1997), include questions about material as well as non-material incentives. One example of an item is ‘’acquiring social acceptance, praise and honor’’. As for EMS, three items were used to measure the reward system. Namely, a question about the reward system with allowances for team performance (profit-sharing), an item about financial participation (variable reward) and a third item about teleworking (employee benefits). Even though EMS has less items on this practice compared to the items of Kuratko and colleagues (1997), it covers (to some degree) all three options of compensations. Also, no subjective words are used in these items and all the items are categorical with a dichotomous response category (yes/no).

(squared) HPWS. HRM-practices as a system have been named as High Performance Work Systems (HPWS). Here these practices are treated as separate but at the same time interdependent (Chen & Wang, 2010). Thus, the configuration of the separate HRM-practices ‘staffing, training, planning, appraisal and reward’ introduced above, can be labeled as HPWS. These HRM-practices as a HPWS can strengthen each other’s effects. For the measurement of HPWS, eight items from EMS (Table 2) are used and an index scale for the concept has been created. This scale stands for the total number of the HRM-practices implemented by the firm (maximum 8). Each of these eight items represent a specific HRM-practice. As discussed in chapter two, the individual HRM-practices together are considered HPWS and the practices are treated as separate but supplementary. Thus, the outcome and the performance of one HRM-practice does not necessarily have to correlate with the performance of another practice. Even though, some common influential factors such as ‘extra time and monetary investment’ for HRM in general may affect them all, a high internal consistency is not to be expected. Based on this information and the literature study elaborated in previous chapter, the scale ‘HPWS’ is treated as a formative index scale instead of a reflective scale. In addition to the linear effect of HPWS, a new variables ‘squared HPWS’ (HPWSxHPWS) has been created. This variable measures the squared (exponential) effect of HPWS on product as well as technological process innovation.

Table 2
Constructs and items for HRM-practices, HPWS and squared HPWS from EMS (2009).

Construct	Item (all dummies)
	Organizational concepts implemented within the firm:
Staffing	Temporary employees
Training	Training programs for employees
Planning	1. Self-managing teams in the production 2. Task integration (planning, execution and control)
Appraisal	Regular individual interview with employees
Reward	1. Team performance incentives (profit-sharing) 2. Financial participation broad based (variable reward) 3. Teleworking (employee benefits)
HPWS	Total number of HRM-practices implemented by the firm (all items above)
Squared HPWS	Squared total number of HRM-practices implemented by the firm (all items above)

3.4.3 Control variables (firm size, age & industry)

The size, age and industry of a firm can influence innovational outcomes, because differences in these factors may be the source of differences in organizational characteristics (Chen & Huang, 2009). For instance, they may be the cause of differences in human- and financial resources, experience, position in the field and so on. Present study includes firm size, age and industry as control variables, in order to measure their potential effects and also exclude these confounding effects from the analysis of other determinants on product and technological process innovation. The size of the firm is measured with a logarithmic item regarding the number of employees (temporary employees excluded) within the firm. Industry has been measured with a categorical variable existing of seven industry categories. Finally, age of the firm has been defined as the firm's founding year and examined by a categorical item with three options. The items for the three variables can be found in Appendix A. The information on log-transformation of the variable 'size' and the conversion of continuous variables regarding age and industry to categorical ones, is elaborated in chapter four.

3.5 Design & analysis

A summary of research design and corresponding analyses is presented in Table 3. For the quantitative part, the independent variables are individual HRM-practices: staffing, training, planning, appraisal, reward and (squared) HPWS. The dependent variables are product and technological process innovation. The control variables are the industry wherein the firm operates, age and the size of the firm. The SPSS program (Statistical Package for the Social Sciences) has been used to analyze the data. Two separate binary logistic regression analyses and two multiple regression analyses were conducted on the data.

The qualitative part serves as a supplement to the quantitative analysis and aims to bring more insight on the concepts 'innovation, HRM and employees (perceptions and behavior)' and their inter-concept relations. Even though a hard distinction cannot be made, in general, the determinants are HPWS HRM-practices implemented within the organization, the mediating variables are the perceptions and behaviors of employees

regarding these practices. The dependent variables are the outcomes of the technological innovations on organizational level. A theory-guided approach was used for labeling and thus analyzing the transcripts. Based on their relation with the main topics and the intermediate processes, relevant extracts were selected from the transcripts. Finally, Microsoft Word and Excel were be used for elaborating and analyzing the transcripts on a computer. The preparation of the data and the procedure of both quantitative and qualitative analyses, is presented in chapter four.

Table 3
Design of research variables.

	Research question 1		**Research question 2 (a,b)**
	Quantitative section		*Qualitative section*
Dependent variables	Product innovation Technological process innovation	Categorical Continuous	
Independent variables	1. HRM 2. HPWS 3. $HPWS^2$	Index scale Index scale Index scale	
Control variables	Firm size Firm industry Firm age	Continuous Categorical Categorical	
Research concepts			1. Innovation 2. HRM (incl. HPWS) 3. Employee attitudes & behavior 4. Inter-concept relations
Analysis	Binary logistic regression analysis Multiple regression analysis		Theory-guided coding

3.6 Validity & reliability

First, regarding construct validity, the extent to which the items on a scale, measures the abstract or the theoretical construct (Chandler, 1991; Churchill, 1979). Except for technological process innovation and HPWS , the research variables are all measured by means of a single item. Based on the literature study, high inter-item correlations were neither for technological process innovation scale nor for HPWS expected. Therefore, the scales were considered formative index scales and verified with reliability tested. For the scale of technological process innovation, the reliability test revealed a Cronbach's alpha of .617 with 13 items. Highest attainable alpha would have been .66 with nine items. However, based on conceptual analysis of the construct, there were no grounds to assume a high inter-item relationship and thus no items were deleted (α=.617, 13 items, N=325). With regard to the formative index scale of HPWS, the Cronbach's alpha is .518 (8 items, N=305) meaning that the inter-item correlation is not adequate, compared to an adequate alpha of .70 (Field, 2009). Since the coefficients for both scales are below .70, the reliability tests support the choice for formative scales instead of an aggregated reflective scale.

Current study makes use of mixed methods in which the qualitative research supplements the information gained from the EMS. As mentioned before, this allows investigating the concepts and their relations, more accurately by approaching them from different points using different methods and techniques (Hesse-Biber, 2010).

To summarize, this chapter provided an overview of the methods used in this study and reflected on the validity and the reliability of the instruments. Next chapter will thoroughly elaborate on the analyses and their findings.

CHAPTER 4 – ANALYSIS & RESULTS

4.1 Introduction

To examine the research questions, quantitative as well as qualitative research have been conducted and the findings are presented in this chapter. For the quantitative part, the relationship of HRM and (squared) HPWS with product innovation were analyzed by means of two separate binary logistic regression analyses (abbreviated as LRA). In addition, two multiple regression analyses (abbreviated as MRA) were performed to examine the relationship of HRM and (squared) HPWS with technological process innovation. With regard to the qualitative part, a total of three semi-structured interviews were conducted with representatives of Dutch manufacturing firms and analyzed by means of theory-guided coding.

Current chapter starts with a brief discussion of sample characteristics for quantitative as well as qualitative analyses. The following section is devoted to the discussion of the analysis procedures, followed by four subsection outlining the results of respectively the LRAs and MRAs. Hereafter, the findings from theory-guided coding are presented and further analyzed. The chapter is finalized with a conclusion of the outcomes for both quantitative and qualitative analyses.

4.2 Sample characteristics

Quantitative analyses were conducted on the relationship of HRM and HPWS with product and technological process innovation. The descriptive statistics of the quantitative EMS data are presented in Table 4. The Dutch version of EMS (2009) data was used and as a consequence only firms with a minimum of ten employees operating within the Dutch manufacturing industry were included in this study. Since different analyses were conducted on the data, the sample size is around (N=300), ranging from (N=302) to (N=325) manufacturing firms. The exact size of the sample - corresponding to each analysis- can be found above the tables regarding the analysis. The firms have on average 64 employees (M=63.82, SD=9.88) with minimum 10 and maximum 3000 employees (mode=12, median=30). Industries in which the firms operate include 1) metals and metal products, 2) food, beverages and tobacco, 3) textiles, leather, paper and board, 4) construction and furniture, 5) chemicals (energy and non-energy), 6) machinery and equipment transport and 7) electrical and optical equipment. The firms are mostly active within the metal, construction and machinery industries. To analyze the age (foundation year) of the firm, three categories were created: young (before 1982), old (after 1982), missing (age unknown). Almost half (48.77%) of the enterprises have started their activities after 1982 and thus are considered old. The other half is almost equally distributed over young firms (28.22%) and firms of which the age is unknown (23.01%). HRM-practices are subdivided into; recruitment of temporary employees, training programs, teamwork, task integration, appraisal, team incentives, financial participation, and teleworking. Among these practices, recruitment of temporary employees, training programs and individual appraisal are mostly implemented. HPWS is defined as the total number of HRM-practices implemented by the firm. The firms carry out 42.49% (M=3.42, SD=.09) of the practices and which is almost half of the practices included (maximum 8). Regarding product innovation, the construct was measured as 'whether or not the firm has carried out a product innovation within past three years'. Of 325 firms, 163 facilitated a product innovation and which is half (50.15%) of the firms. As for technological process innovation, it was analyzed which of the 13 process technologies are implemented by the firms. Integrated product design engineering, industrial robots

and manufacturing execution systems are most common process technologies. On average, firms implement two process technologies (M=2.00, SD=1.85) which is around 15.38% of the process technologies (total 13).

With regard to qualitative analysis, a total of three semi-structured interviews were conducted with two HRM-managers and one CEO (highly active in HRM as well) from different firms. The firms are operating within the Dutch manufacturing industry and can be subdivided into paper and printing industry, oil and gas industry, and steel and wood industry. The size of the firms range from 40 to 450 employees with one of the firms having an exclusive department for Research & Development.

Table 4
Descriptive statistics of the EMS (2009).

Determinants	**Description**		**Frequency(%)**	***Mean***	***SD***
InSize(log)	Size of the firm in total number of employees (log)			3.57	.05
Size	Size of the firm in total number of employees		30 (median)		
Age					
Young	Firms started until 1982		28.22		
Old	Firms started after 1982		48.77		
Missing	Age of the firm is unknown, defined as missing		23.01		
Industry					
Metal			21.71		
Food			10.40		
Textile			7.34		
Construction			16.82		
Chemical			14.07		
Machinery			22.32		
Electronic			7.34		
HRM – practices					
Staffing					
Recruitment from outside	Temporary workers within the firm	yes/ no	73.98		
Training					
Formal training programs	Training programs for employees	yes/ no	50.78		
Planning					
Self-managing teams	Autonomous teams as teamwork	yes/ no	33.95		
Task integration	Integration of task planning, execution and control	yes/ no	45.51		
Appraisal					
Individual appraisal	Regular individual appraisal interviews	yes/ no	76.69		
Reward					
Profit sharing	Incentives for team performance	yes/ no	13.58		
Financial participation	Financial participation broad based (for all employees)	yes/ no	20.25		
Teleworking	Opportunity to work from home	yes/ no	31.37		
HPWS	Total of the number of HRM-practices implemented by the firm (temporary employees,		42.75	3.42	.09

	training programs, teamwork, task integration, appraisal, team incentives, financial participation, teleworking)				
Product innovation	Product innovation past three years	yes/ no	50.15		
Technological process innovation	Total number of the process technologies implemented within the firm		15.38	2.00	1.85
Integrated product design engineering		yes/ no	37.85		
Industrial robots		yes/ no	20.62		
Integrated quality control		yes/ no	18.15		
Radiofrequency identification		yes/ no	2.76		
Automated warehouse management systems		yes/ no	16.00		
Laser tooling		yes/ no	13.19		
Dry processing systems		yes/ no	16.05		
Rapid prototyping systems		yes/ no	5.85		
Biogen-technology		yes/ no	1.84		
Novel materials		yes/ no	19.38		
Supply chain management systems		yes/ no	19.02		
Manufacturing execution systems		yes/ no	27.47		
Virtual reality in development manufacturing		yes/ no	7.69		

4.3 Quantitative analysis and results

In this section, the analyses and result from quantitative research are presented and discussed. For testing the hypotheses, structural models were composed. The analysis procedure and the outcomes of LRAs are outlined first and followed by a similar discussion of the MRAs. An overview of the constructs and items used from EMS can be found in Appendix A.

4.3.1 Analysis procedures: LRA & MRA

To investigate the hypotheses, measurement as well as structural models were created and current section provides an overview of the research variables and analysis technologies being part of the data- and analysis preparation. This is done for logistic as well as multiple regression analysis.

For researching the statistical effect of the independent variables 'HRM practices', and '(squared) HPWS' on the dependent variable 'product innovation', two separate binary LRAs were performed on the data. Logistic regression is a multiple regression analysis which allows to research the models with *categorical* variable outcomes. The independent variables can be either categorical, continuous or both (Field, 2009). Since

the predictors include categorical as well as continuous variables and dependent variable 'product innovation' is categorical with a dichotomous outcome (yes/no), a binary LRA was considered suitable. In this study, binary LRA predicts whether or not the firm innovates its products, referring to the chance of the firm having a product innovation. Another reason for performing a LRA is that, the analysis does not require that the main assumptions with regard to linearity, normality and homoscedasticity are met (Hair et al., 2010). However, a logarithmic transformation was performed with the variable 'Size' (firm size: number of employees) to convert the data to a more normal distribution. The reason behind was to improve the data for further analyses (including MRA) and interpretation.

The variables that have been analyzed, originate from the quantitative EMS data from 2009. For the purpose of the research and analyses, some of the variables have been converted into dummy variables. The variable 'firm age' was transformed into a dummy with three categories (old >1982, mis=age unknown) and (young <1982) as the reference category. Also, 'industry' was converted into a dummy with the industry 'metal' as the reference category. A continuous variable 'InSize' (10-3000) was used as an indication of firm size. For the first LRA, the independent variables were eight separate HRM-practices regarding staffing, training, planning, appraisal and reward, all dichotomous (yes/no). In the second LRA, the independent variables were first, continuous index scale 'HPWS' (total number of HRM-practices implemented) and second, its squared version 'sqHPWS'. The dependent variable in both LRAs was the categorical variable product innovation 'dProductinnovation' with two categories (yes/no). Regarding the analysis procedure of both LRAs, starting from model 1, a set of determinants were added into the model and tested for their prediction of the chance of having a product innovation. First, in order to determine how well the model performs 'goodness of fit' is evaluated. Second, pseudo R square statistics 'Cox & Snell R2' and 'Snell R^2' which represent the amount of variation in the dependent variable that is explained by the model, are examined. Lastly, to analyze the outcome of each individual determinant, the significance and the value of the B-coefficients and their odds ratio are inspected and discussed.

For the analysis of the relationship between 'HRM practices' and '(squared) HPWS' as the independent variables and 'Tech_Inn' (total number of process technologies implemented) as the dependent variables, two separate MRAs were performed. Multiple regression analysis is a family of techniques which can be applied to investigate the relationship between one *continuous* dependent variable and a one or more predictors which are often continuous as well (Field, 2009). Since the dependent variable 'technological process innovation' is continuous and the independent variables are a mix of continuous and categorical variables, a MRA is applicable here. The key assumptions for a MRA include normality, linearity, homoscedasticity and independence of residuals. Except for the assumption of normality, which was addressed by performing a log transformation, there are no signs that the assumptions have been violated. The dependent variable in both MRAs was the continuous index scale for technological innovation 'Tech_Inn'. The independent variables, the control variables and the data preparation procedures that have been mentioned previously by the discussion of LRAs, are all the same and apply for the MRAs as well. In relation to the analysis procedure of both MRAs, a set of determinants were entered into the model and tested for their predictive value of the variance in the number of process technologies, employed by the firms. First, for each model as a whole (all determinants), the value and the significance of R^2 and R^2change are evaluated. Second, to examine the relative contribution of each individual determinant, the beta coefficients and their statistical significance are evaluated. The outcomes of all analyses are

presented and discussed in the subsections below. Appendix A provides an overview of all the constructs and corresponding variable names (items from EMS).

4.3.2 Binary logistic regression analysis 1 – results on HRM & product innovation

The statistics of the analysis between HRM and product innovation are presented in Table 5 and Table 6. For base model (model 0), Table 5 shows that odds ratio is close to 1 and non-significant (OR=.974, p>.05), thus the chance of having a product innovation is 50%. In model 2, variables 'InSize, Food, Textile, Construction, Chemical, Machinery, Electronic, FirmFormation_old and FirmFormation_mis' are examined. The test of model 1 is statistically significant (chi-square=22.456, p<.05, df=9) meaning that between 7.2% and 9.6% (Cox & Snell R^2 = 0.72 and Nagelkerke R^2 = 0.96) of the variation in product innovation is explained by the variables in model 1. Further inspection (Table 5) of the coefficients shows that this is caused by a significant effect of 'Insize' (B=.437), ' Chemical industry' (B=.986), and 'Machinery industry' (B=.743). Thus, the chance of having a product innovation increases (OR=1.547) with an increase in firm size and firms operating within chemical and machinery industries have more product innovations (respectively OR=2.682 and OR=2.103) compared to the reference category 'metal industry'. In the following step, a total of eight variables 'dSizeTemp, oi_TrainProg, oi_TeamP, oi_TaskInt, oi_IndAp, oi_TmPerf, oi_FinPart, and oi_TeleW' are entered into the model. Model 2 is statistically non-significant (chi-square=13.768, p>.05, df=8) meaning that the variables together do not improve the model. Hypotheses 3a, 4a, 5a and 7a are rejected. This outcome is also reflected by the individual HRM-practices (Table 6), where only 'oi_IndAp' is significant (B=.710). Firms that conduct regularly an individual appraisal interview with their employees, innovate their products with factor 2.0 (OR=2.034) more than the firms that do not implement this practice. Hypothesis 6a is confirmed.

Table 5
Model fit evaluation of binary logistic regression analysis on HRM and product innovation (N=302).

	Exp.(B)	***Sig.***	***-2 Log likelihood***	***Chi-square***	***df***	***Sig.***	***Cox&Snell R^2***	***Nagelkerke R^2***
Model 0[a]	.974	.818						
Model 1[b]			396.2	22.456	9	**.008**	.072	.096
Model 2[c]			382.4	13.768	8	.088	.113	.151

1. [a]*=Without any determinants*
2. [b]*=Addition of control variables: age, size, industry of the firm*
3. [c]*=Addition of determinants: HRM-practices (temporary employees, training programs, teamwork, task integration, appraisal, team incentives, financial participation, teleworking)*

Table 6
Results of binary logistic regression analysis for product innovation.

Determinants	HRM model (N=302)		Linear HPWS model (N=323)		Squared HPWS model (N=323)	
	B	***Exp(B)***	***B***	***Exp(B)***	***B***	***Exp(B)***
InSize(log)	**.437***	1.547	**.385****	1.469	**.385****	1.469
Age [a]						
Old	.250	1.284	.212	1.237	.212	1.237
Missing	-.223	.800	-.044	.957	-.044	.957
Industry[b]						
Food	.412	1.509	.345	1.412	.345	1.412
Textile	.469	1.598	.348	1.416	.348	1.416
Construction	.407	1.502	.483	1.620	.483	1.620
Chemical	**.986***	2.682	**.990****	2.690	**.990****	2.690
Machinery	**.743***	2.103	**.842***	2.320	**.842***	2.320
Electronic	.976	2.654	**1.014***	2.757	**1.014***	2.757
HRM - practices						
Staffing						
Recruitment from outside	.152	1.164				
Training						
Formal training programs	.177	1.193				
Planning						
Self-managing teams	-.038	.963				
Task integration	.438	1.545				
Appraisal						
Individual appraisal	**.710***	2.034				
Reward						
Profit sharing	.352	1.422				
Financial participation	.054	1.055				
Teleworking	.106	1.112				
HPWS			**.268****	1.307		
Squared HPWS					-.029	.972

1. [a] *Reference category for firm age is 'Young firms'*
2. [b] *Reference category for industry is 'Metal'*
3. *Significance level *p<0.05; **p<0.01*

4.3.3 Binary logistic regression analysis 2 – results on (squared) HPWS & product innovation

The statistics of the analysis between (squared) HPWS and product innovation are presented in Table 6 and Table 7. The outcome for model 0 (Table 7) reveals that odds ratio is close to 0 and non-significant (OR=.019, p>.05) meaning that the chance of having a product innovation is 50%. In model 2, variables 'InSize, Food, Textile, Construction, Chemical, Machinery, Electronic, FirmFormation_old and FirmFormation_mis' are examined. The test of Model 1 is statistically significant (chi-square=21.208, p<.05, df=9). Thus, the variance explained in production innovation is between 6.4% and 8.5% (Cox & Snell R^2 = 0.64 and Nagelkerke R^2 = 0.85) and caused by Model 1. This effect the consequence of the significant effect of 'Insize' (B=.385), ' Chemical industry' (B=.990), 'Machinery industry' (B=.842), and 'Electronic industry' (B=1.014). The chance of having a product innovation increases (OR=1.469) with an increase in firm size. Also, firms operating within chemical, machinery, and electronic industries have more product innovations (respectively OR=2.690, OR=2.320, and OR=2.757) in comparison to the reference category 'metal industry'. In model two, the HPWS variable ' sum of the implemented practices: dSizeTemp, oi_TrainProg, oi_TeamP, oi_TaskInt, oi_IndAp, oi_TmPerf, oi_FinPart, and oi_TeleW' is added into the analysis. The results show that Model 2 is statistically

significant (chi-square=11.524, p<.05, df=1) revealing that the addition of the predictor 'HPWS' to the analysis improves the model. HPWS explains between 9.6% and 12.8% (Cox & Snell R^2 = 0.96 and Nagelkerke R^2 = 0.128) of the variation in product innovation. Further inspection (Table 6) confirms that HPWS – implementation of more HRM-practices – significantly increases the chance of a having product innovation (B=.268) with factor 1.3 (OR=1.307). Hypothesis 1a is confirmed. In addition to the examination of the linear effect of HPWS, the squared effect of HPWS 'sqHPWS' on product innovation is analyzed in model 3. It is found that entering 'sqHPWS' into the analysis improves the model (chi-square=.659, p>.05, df=1), however this improvement is statistically non-significant. This finding is reflected in non-significant coefficients (B=-.029, OR=.972) as well. Hypothesis 2a is rejected. Thus, there is no squared effect of the implementation of HRM-practices as HPWS on product innovation.

Table 7
Model fit evaluation of binary logistic regression analysis on (squared)HPWS and product innovation (N=323).

	Exp.(B)	***Sig.***	***-2 Log likelihood***	***Chi-square***	***df***	***Sig.***	***Cox&Snell R^2***	***Nagelkerke R^2***
Model 0[a]	.019	.867						
Model 1[b]			426.5	21.208	9	.012	.064	.085
Model 2[c]			415.0	11.524	1	.001	.096	.128
Model 3[d]			414.4	.659	1	.417	.098	.131

1. [a]=*Without any determinants*
2. [b]=*Addition of control variables: age, size, industry of the firm*
3. [c]=*Addition of determinants: HPWS (sum of temporary employees, training programs, teamwork, task integration, appraisal, team incentives, financial participation, teleworking)*
4. [d]=*Addition of determinants: squared HPWS*

4.3.4 Multiple logistic regression analysis 1 – results on HRM & technological process innovation

The statistics of the analysis between HRM and technological process innovation are presented in Table 8 and Table 9. Model 1 examines the variables 'InSize, Food, Textile, Construction, Chemical, Machinery, Electronic, FirmFormation_old and FirmFormation_mis'. The proportion of the variance explained (R^2=.150) of the variables together is statistically significant (F(17,3)=5.752,p=000). Thus, the variables in Model 1 explain 15% of the variance in technological process innovation. In particular, this is caused by a significant effect of 'InSize'(beta=.312) and 'Electronic industry' (beta=.130). The analysis of the variables 'dSizeTemp, oi_TrainProg, oi_TeamP, oi_TaskInt, oi_IndAp, oi_TmPerf, oi_FinPart, and oi_TeleW' in Model 2 shows that the model explains additional 8.1% (R^2_{change}= .081, p=000) of the variance in technological process innovation. Thus, individual HRM-practices have an individual effect on technological process innovation. A closer inspection reveals a significant effect of 'oi_TrainProg' (beta=.102) ' oi_TeamP' (beta=.112) and 'oi_TaskInt' (beta=.126) which implies that the implementation of training programs, self-managing teams and task integration – with firm size, industry and age remaining constant – leads to an increase in technological process innovation. Hypotheses 4b and 5b are confirmed. The coefficients for 'dSizeTemp, oi_IndAp, oi_TmPerf,

oi_FinPart, and oi_TeleW' are statistically non-significant, thus HRM-practices 'staffing, appraisal and reward' do not necessarily lead to more technological process innovations. Hypotheses 3b, 6b and 7b are rejected.

Table 8
Model evaluation of multiple regression analysis on HRM and technological process innovation (N=304).

	R^2	Adjusted R^2	R^2 change	Sig.
Model 1[a]	.150	.124	.150	.000
Model 2[b]	.230	.185	.081	.000

1. [a]= *With control variables: age, size, industry of the firm*
2. [c]=*Addition of determinants: HRM-practices (temporary employees, training programs, teamwork, task integration, appraisal, team incentives, financial participation, teleworking)*

Table 9
Results of multiple regression analysis for technological process innovation.

Determinants	**HRM model** *(N=304)*	**Linear HPWS model** *(N=325)*	**Squared HPWS model** *(N=325)*
	beta	**beta**	**Beta**
InSize(log)	**.312****	**.301***	**.301***
Age [a]			
Old	.000	-.004	-.004
Missing	.063	.088	.088
Industry[b]			
Food	-.142	**-.153***	**-.153***
Textile	-.073	-.066	-.066
Construction	-.053	-.023	-.023
Chemical	-.034	-.035	-.035
Machinery	-.021	.003	.003
Electronic	**.130****	**.127***	**.127***
HRM - practices			
Staffing			
Recruitment from outside	.017		
Training			
Formal training programs	**.102***		
Planning			
Self-managing teams	**.112***		
Task integration	**.126***		
Appraisal			
Individual appraisal	.076		
Reward			
Profit sharing	.076		
Financial participation	.057		
Teleworking	.057		
HPWS		**.298****	
Squared HPWS			.134

1. [a] *Reference category for firm age is 'Young firms'*
2. [b] *Reference category for industry is 'Metal'*
3. *Significance level* $^{*}p<0.05$; $^{**}p<0.01$

4.3.5 Multiple logistic regression analysis 2 – results on (squared) HPWS & technological process innovation

The statistics of the analysis between (squared) HPWS and technological process innovation can be found in Table 9 and Table 10. The variables 'InSize, Food, Textile, Construction, Chemical, Machinery, Electronic, FirmFormation_old and FirmFormation_mis' are analyzed in model 1. The Model explains 14.7 % of (R^2=.147) of the variance in technological process innovation and the explained variance is statistically significant (F(20,3)=6.038,p=000). This outcome is particularly caused by a significant effect of 'InSize'(beta=.301), 'Food industry' (beta=-.153) and 'Electronic industry' (beta=.127). Compared to the reference category 'metal industry', firms operating within the 'Food industry' show less technological process innovations. The opposite is true for the industry 'Electronic'. In Model 2, the combined effect of HRM-practices as HPWS 'implemented sum of process technologies: dSizeTemp, oi_TrainProg, oi_TeamP, oi_TaskInt, oi_IndAp, oi_TmPerf, oi_FinPart, and oi_TeleW' on technological process innovation is analyzed. The addition of the variable 'HPWS' in the analysis explains additional 6.7% (R^2_{change} =.067) of the variance in produces innovation and this contribution is significant (F(27,3)=8.537,p=000). With regard to the coefficient of HPWS, the result (beta=.298) is statistically significant as well. Thus, an increase in HPWS as an index – after removing the effect of firm size, industry and age - goes along with an increase in technological innovation. Hypothesis 1b is confirmed. Lastly, the squared effect of HPWS 'sqHPWS' on technological process innovation is analyzed in Model 3. It is found that entering 'sqHPWS' into the analysis does not significantly (R^2_{change} = .001, p=451) improve the model and this finding is reflected in the non-significant coefficient (beta=.134) as well. Thus, there is no squared effect of the implementation of HRM-practices as HPWS on technological process innovation. Hypothesis 2b is rejected.

Table 10
Model evaluation of multiple regression analysis on HRM and technological process innovation (N=325).

	R^2	***Adjusted R^2***	***R^2 change***	***Sig.***
Model 1[a]	.147	.123	.147	.000
Model 2[b]	.214	.189	.067	.000
Model 3[c]	.215	.188	.001	.451

1. *[a]=With control variables: age, size, industry of the firm*
2. *[b] =Addition of determinants: HPWS (sum of temporary employees, training programs, teamwork, task integration, appraisal, team incentives, financial participation, teleworking)*
3. *[e]=Addition of determinants: squared HPWS*

4.4 Qualitative analysis and results

To bring insight on 'which' and 'how' HPWS HRM-practices are implemented within firms and how they are received by employees, qualitative research was conducted. Semi-structured interviews were hold with three firms and completely transcribed. Based on their reflection of the most relevant concepts and their inter-concept relations, six most contributing quotes from the interviews were selected. For each concept and their inter-concept relationships, the quotes were ranked on a three-point scale from (1)most relevant to (3)least relevant. The findings will be presented and discussed in this section. First, the results of the main concepts –

innovation, HPWS HRM-practices, employee attitude and behavior – will be presented. Then, an elaboration of the inter-concept relationship between - HRM and employees; employees and innovation; HRM and innovation – will follow. The section will be closed with a summarization of the findings and their conclusion.

4.4.1 Technological product and process innovation

Looking at the findings for the subject 'innovation', the results reveal that both product and process (machinery) innovations are carried out within the firms. However, the innovations differ on their objectives and intensity(newness). For instance, it is common for the firms to 'buy' machinery and, when necessary, make incremental alterations to the machinery and their production process. The major goal of technological process innovations are cost reduction and process improvement.

> *''Especially cost reduction and project lead time''* [Respondent A, paper & printing industry]

However, product innovations vary on their level of newness - from incremental to radical ones. Thus, with improving existing products, adding different types of products to existing lines of products on one hand, and developing a total new product to the firm and to the marketplace on the other hand. Major goals for product innovations are proactively anticipating on current and future demands, maintaining existing clients and gaining new ones, and profit making.

> *''We have a department here where people, with a university degree, are solely focused on innovation. Product X comes from that department and is a successful innovative and sustainable product.''* [Respondent B, oil and gas industry]
>
> *''With the products we make, we want to be a market leader all over the world. […] that it has benefits for the client and that finally, it is not necessary for us to approach the client..''* [Respondent B, oil and gas industry]

4.4.2 HRM: objectives, policy & activities

The outcomes shed some light on general HRM-policy, its objectives and the actual implementation process. To start with the policy, the findings show that along with HRM-department, different parties and factors influence its formation and execution. Examples include, organizational strategy and objectives, internal clients and employees. For firms to be and stay innovative, HRM aims to do more with less resources, create efficiency, stimulate sustainable employability and so on. For these reasons, various HRM-practices are implemented within the firms. Within the focus of this study, the following practices are questioned and analyzed: staffing, training and development, planning, appraisal and reward.

Staffing, along with training and development is considered as one of the most important HRM-practices. Staffing is seen as the most fundamental practice which is determinative for the success of other HRM-practices and goals of HRM. Staffing is most often done by recruiting from outside, by the firm itself or in co-operation with specialized firms.

> *''Even though the first selection round is done by external agency, we make the financial decision on recruitment and selection of our employees. They select a few people for us and afterwards our management and direction have an interview with them. Based on these activities, a final decision is made than.''* [Respondent B, oil and gas industry]

However, 'selectivity' in selection varies between industries and the occupation. Even though most of the firms are strict on the core competences they look for, some are flexible regarding the level of occupation-specific skills, such as education level and technical skills. At this point, training and education is considered an important HRM-practice in order to develop these skills. For this purpose, as well as for gaining and maintaining up to date knowledge and skills, formal training programs are regularly offered to employees.

> *''Recruitment and selection depends on the vacancy that we want to fill up. When it is a technical position, it is very hard to find the right people. For this reason, we recruit and select people from other industries and afterwards educate and retrain them.''*[Respondent A, paper and printing industry]

> *''Two and half years ago, we defined three core competences which we think should be present in every manager, to more or less degree. For this purpose, we hired an external agency […]. […] with individual education and coaching trajectories, we tried to get every manager to a level that was aimed.''* [Respondent C, steel and wood industry]

Regarding planning, the results show that the firms have designed their departments as self-managing teams with their own department managers. Each department functions independent and consists of employees from different disciplines, with differences in skills and experience with their own department managers.

> *''Since three years ago, we designed every workplace a project team. They all work as independent teams and we have four of these types of teams.''* [Respondent B, oil and gas industry]

Like self-managing teams, all the firms regularly implement performance appraisal and consider it as an important HRM-practice. As soon as an employee enters the firm, an appraisal trajectory is set up and used as a tool for monitoring and supporting the performance of employees, detection of a need for development or improvement, and in some cases even applied as a reference for rise in salary. Lastly, the findings show that all firms use different types of reward, to more or lesser degree. Next to financial compensation, work-time control, flexible planning, positive feedback, and personal responsibility are mostly implemented by the firms. Even though the majority of the firms implement self-managing teams, compensation is based on individual performance and profit sharing is rare to none.

> *''When you take a look at the appraisal system which is held periodically […]. With that I mean: the initiation of performance cycle, performance appraisal, personal development plan. Recently, we started with creating knowledge matrixes because knowledge is crucial for our employees and their work.''* [Respondent B, oil and gas industry]

> *''The compensation is done individually […].''.'' In principle, the guideline is that people are present here between 8.30-17.00. However, when our employees want to deviate from this rule because of their circumstances, there is a possibility for that. Flexibility and opportunities are possible after deliberation.''* [Respondent B, oil and gas industry]

4.4.3 Employee: communications

The outcomes discussed in this section, show how firms communicate with their employees about HRM and how they evaluate these communications. The analysis clarifies that almost all companies use more than one medium in order to inform their employees about HRM-policy and activities. Most basic and fundamental mediums are personal contact and written labor contract. Other examples include meetings on organizational level, intranet, organizational newspaper and blackboard. To make sure that HRM-related information reaches their employees, firms present their information verbally as well as visually. Also, most of the firms conduct periodically a questionnaire in which they ask about HRM-related topics as well.

> *''We have written secondary work conditions[…]. Thus, all agreements that are made internally, everything that is not included within the collective labor contract, is pointed out there. It is something that employees have to sight, and with that, we make sure that all the basics are known.''* [Respondent A, paper and printing industry]

> *''Each year, conduct a work satisfaction questionnaire. […]the themes within the questionnaire vary every two years. With this questionnaire, we try to find out how we can improve and also try to communicate with the employees within this process.''* [Respondent B, oil and gas industry]

4.4.4 Inter-concept relation: HRM & employee attitudes and behaviors

The inspection of the relationship between HRM and employees shows that, first and foremost, it is a challenging task for HRM-managers to set up a universal HRM-policy which will be received the same by all employees. To address this challenge, HRM-department aims to set up a universal HRM-policy which leaves room for adjustment and customization during its implementation. As one firm notes, feedback and reaction from the employees is a crucial determinant within this process. Also, all the firms mention that the opportunity to 'choose' is highly valued by the employees.

> *''Thus is very hard […]to set up a universal HRM-policy and expect that you can trigger people with that, and that is work for everybody. For this reason, you have to properly sort out and analyze how people react on these agreements and based on that, you would have to customize your policy somehow.''* [Respondent A, paper and printing industry]

Further analysis of all three firms shows that the attitudes and reactions of employees on HRM-practices can be summarized within three main categories. Most common situation is, a neutral to positive attitude and reaction from employees to HRM-practices and any changes within HRM.

> *''Yes, the resistance is low. Mostly neutral and people see it as an opportunity to do things differently. Moreover, there are employees who agree easily. In sum, when something has been decided and suggested, most employees are compliant.''* [Respondent B, oil and gas industry]

In the first scenario, there is a match between attitude and behavior of employees. However, there are cases when there is a mismatch between attitudes and behavior of employees. An employee might show a neutral to positive attitude towards any HRM-practice, but refuse to act in accordance with the HRM-practice or vice versa. For instance, an employee might properly follow a training program for 'new way of working', but afterwards consciously hold onto 'old ways of working'. In another example, an employee might be skeptical about an innovation within an HRM-practice, but still change his or her behavior in accordance to it.

''For instance, when training program is implemented, employees actually think it is all nonsense but still follow the training properly. However, after the training is over, they lean backwards and continue doing what they always did. Yes, it happens.'' [Respondent C, steel and wood industry]

As one firm notes, HRM plays an important role in detecting these mismatch scenarios and anticipating to it. According to the firm, this is done by explaining, repeating and providing time to change.

''It could be tough for people to suddenly do things differently, however, by now, everybody sees the use of the change. Resistance was existing, but by explaining, repeating and persisting on your standpoint, I think we were able to break through the resistance.'' [Respondent C, steel and wood industry]

4.4.5 Inter-concept relation: Employees & innovation

Looking at the relationship between the perceptions and behaviors of employees which contributes to innovation, a difference can be made between firms *with* and *without* an R&D (Research and Development) department. One firm has an R&D development where employees are dedicated solely on innovation. This includes both product and process innovations. As the respondent indicates, education and knowledge of employees are very important factors within this department. Knowledge sharing and collaboration are the most crucial behaviors that contribute to innovation. For instance, when the firm decided to develop a new product, they hired additional people with up-to date and specific knowledge and education. Subsequently, the new hires gradually shared their assets with other members of the R&D department and which finally contributed to success of the product innovation. Moreover, cooperation with members from other departments for different insights, specific knowledge, project planning and the feasibility of the project are examples of indispensable parts of innovative behavior.

''When we saw that, in order to make the project a successful, we need people with specific and more knowledge, we hired two people with university degree. They entered the firm with new knowledge and have shared it with existing employees from R&D department. From there, Product X became a successful product.'' [Respondent B, oil and gas industry]

As for the firms without an exclusive R&D department, other factors become important as well. The results show that in these cases, MT (management team) decides to innovate and employees are afterwards included within the process of innovation. Thus, MT plays a crucial role in encouraging and stimulating innovative behavior. In general, this is done by sharing the original idea with the employees and involving them within the process by asking them to provide advice, share specific knowledge and experience, and their preferences with the MT. For incremental process innovation, the MT provides employees with time and room for detecting possible areas for improvement and change. In most firms, when the employee has a 'good' or 'innovative' idea, there is an opportunity (time, support, money) to further develop and execute the idea.

''Yes, within our strategy, we (MT) decided that we are going to change it, but afterwards we have included employees by our choice of the system and its implementation. However, the initiation of the change of the system has been suggested by the employees.'' [Respondent A, paper and printing industry]

''We had to generate more production capacity and the whole division of teams and compensation structures […]. It has been all developed and implemented by the production management.'' [Respondent C, paper and printing industry]

According to the respondents from the firms without an R&D department, even though they do provide the employees with an opportunity to show innovative behavior, it is still less common for them to act innovatively. One firm assumes that a possible explanation for this behavior is 'fear for the unknown or satisfaction with current situation':

''Anyone who has a good idea and want to realize it, received time for that. Even money can be provided to that person, if needed. However, the funny thing is, it still isn't happening often. ''Familiarity is fine, even if I don't like it, it is known''. It is possible that there is fear for the unknown and reticence to the new. ''Leave it as it is, it is fine''.'' [Respondent C, steel and wood industry]

4.4.6 Inter-concept relation: HRM & innovation

The findings from the relationship between HRM and innovation bring to light that this relationship is very dynamic and complicated. Since, there are different HRM-practices implemented with varying objectives, it is not easy to measure the contribution of HRM (in general) on innovation. However, further analysis sheds some light on this relationship for the individual HRM-practices. One firm explains that staffing can form the basis for the success of other HRM-practices and innovation. As mentioned above, when the firm [Respondent B, oil and gas industry] decided to develop a new product, they hired new people which on its turn positively contributed to innovation. This example also shows the importance of training and development for an innovation to occur. Training can also become crucial after the initiation of an innovation, namely for its implementation process.

'' For example, we have invested in a new management information system […]. I have followed a training program from our supplier […]. […] I picked up the most important parts from that training and the parts that ask for extra attention, and I myself have carried out the training to our employees.'' [Respondent A, paper and printing industry]

One respondent states that appraisal can indirectly play a crucial role in stimulating, but especially from stagnation of possible innovation. More specific, when an employee doesn't function properly, and the employee as well as HRM has reached its limits, it can be decided to part ways. Thus, appraisal can positively affect in and outflow of employees and thus indirectly affect innovation within the firm.

''It is possible that we expect something but the employee cannot fulfill it, because he/she has reached his/her limits. It is a matter of agreement to part ways […]. The employee can develop elsewhere […] and we can hire someone else'' [Respondent B, oil and gas industry]

Regarding planning, one respondent [see above: Respondent B, oil and gas industry] revealed that the new way of working as 'self-managing project teams' is positively received and valued by employees. Even though the firm didn't explicitly measure the direct effect of this HRM-practice on innovation, the respondent assumes that it has a positive contribution to various processes and outcomes. Finally, the findings show that firms reward innovative ideas and behavior of employees, financially or non-financially. Similar appraisal, the relationship

has not been formally measured by the firms. Either way, the HRM-department believes that recognition and reward can stimulate innovative behavior to some degree.

> *''It is stimulated in the sense that, one a month […]. […] best ideas are being rewarded with a cheque or attention. We have a 'idea-box' and people regularly offer ideas. Thus, also from production employees on how to improve, and facilitate the production process.''* [Respondent C, steel and wood industry]

A summarization and corresponding conclusions of both quantitative and qualitative outcomes will be provided in the next section.

4.5 Conclusion

Based the outcomes of both quantitative and qualitative analyses that were presented in the previous chapter, a concluding summarization can be provided. Overall, where some of the findings confirm the corresponding hypotheses derived from the literature study, other results are contradicting.

4.5.1 Quantitative analysis conclusions

First, all quantitative analyses reveal that, based on the number of the employees and the industry in which a firm operates, there is a difference in whether or not a firm carries out a product innovation as well as in the total number of technological processes that the firm implements. Significant beta coefficients in all analyses indicate, the more employees a firm has the greater the chance of having a product innovation. Also, the larger the firm the more technological process innovations they have. With regard to the age, there is no difference between 'young' and 'old' firms in both innovations. Second, there is a general positive relationship between HRM-practices and technological process innovations. This effect is not found for product innovation. Further inspection shows that firms performing regular individual appraisal interviews with employees have a greater chance of innovating their products, where other HRM-practices don't have this contributing effect. On the other hand, the implementation of training and planning contribute to more technological process innovation. However, this contribution does not apply for other HRM-practices.

Regarding HPWS, it can be stated that there is a cumulative effect of HPWS on both types of innovation and the more HRM-practices included in HPWS the better the consequence for innovation. Thud, the configuration of individual HRM-practices as HPWS adds 'an additional value' above their single effect. Regarding squared HPWS, even though the synergetic effect of HPWS on both innovations increases with inclusion of more HRM-practices, this synergetic effect does not increase exponentially, neither on product nor on process innovation.

4.5.2 Qualitative analysis conclusions

The outcomes from qualitative analysis clarify 'which' and 'how' HRM as well as technological innovations are implemented within firms. Also, the attitudes and behavioral reactions of employees and their inter-concept relations are outlined. In general, it can be concluded that all firms of interest have carried out innovations in past three years, to more or lesser degree. With regard to HRM, even though customized to their firm, the HPWS HRM-practices examined in this study were all implemented by the firms. The HRM-practices are not single activities but are highly interrelated, complement and reinforce each other, when implemented properly. Concerning employees, the study has identified that in general, employees are compliant and react neutrally to positive to HRM-practices or any changes within these practices. However, there are instances of employees having negative or even destructive attitudes and behaviors towards a certain HRM-practice. Especially when the implementation process of the HRM-practices wasn't proper and not enough information, time and room for understanding and acceptance was provided, before as well as after the implementation.

Most outstanding findings of the inter-concepts relations can be summarized as following. First, staffing is considered an important HRM-practices since it forms the fundament for other HRM-practices. Main goal of recruitment is to fulfill positions and bring in people with exclusive knowledge and skills. A careful implementation of this practice can lead to knowledge sharing and cooperation between the new and existing employees, which on its turn supports innovation within firms. This finding is in line with the expectations from the literature study, but contradictory to the quantitative outcomes. Regarding training, the outcome of the qualitative analysis confirms the statistical significant relationship between training and technological process innovation. The qualitative outcome for planning is also corresponding to the statistically significant finding which reveals that the implementation of self-managing teams and task-integration lead to more technological process innovations. As for the fourth practice, appraisal is regularly and carefully implemented by all firms.
With regard to the compensation system, the combination of both financial as well as non-financial reward methods are generally implemented within the firms. Especially, the options to choose between different options within non-financial reward is highly appreciated by employees. As a general conclusion on the inter-concept relations, the contributions of HRM on innovation and the importance of employees within this process is not doubted by the firms. However, since the relationships are dynamic, reciprocal and many other factors are involved within the process, the causalities are not always easily shown.

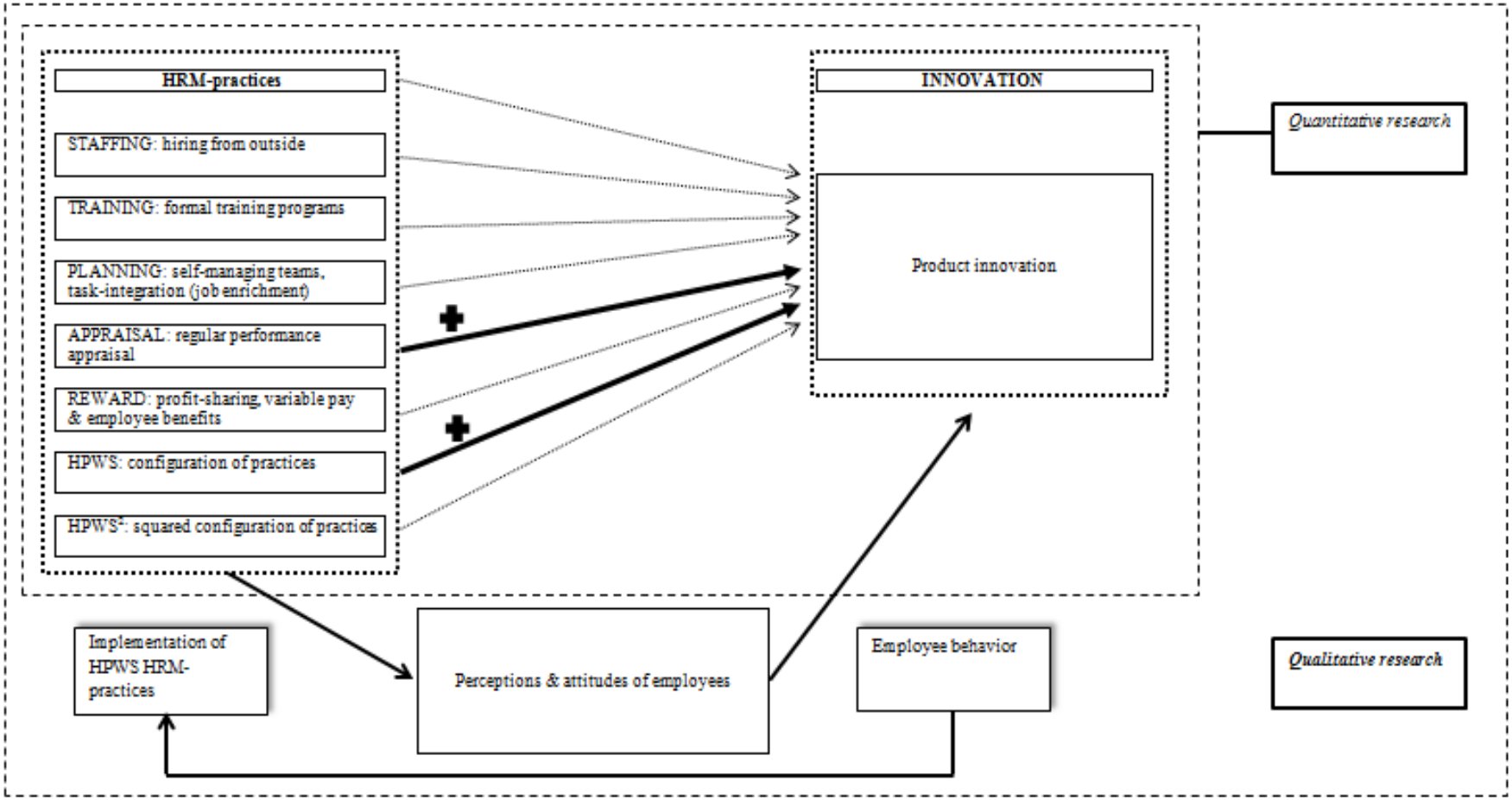

Figure 3. Conceptual model outcomes for product innovation

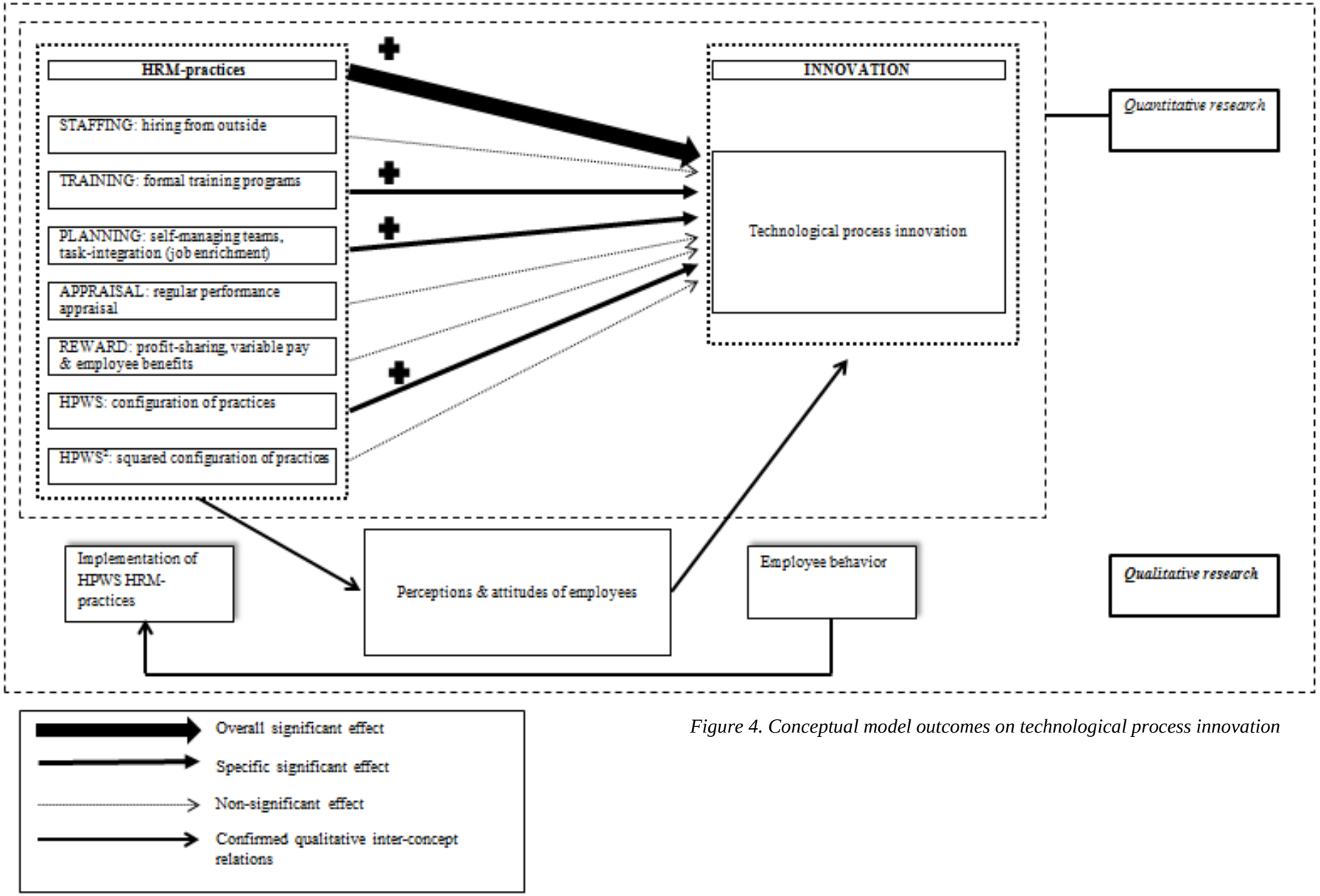

Figure 4. Conceptual model outcomes on technological process innovation

CHAPTER 5 – DISCUSSION

5.1 Conclusions

The central question of present study focuses on the relationship of HRM and HPWS with both product and technological process innovation, and on how these practices are implemented and received within manufacturing firms. In an attempt to contribute to an answer on this question, a literature study was conducted first. Consequently, the main concepts were defined and their dimensions were identified. Concerning technological innovation, a distinction was made between product and process innovation, with product innovation referring to changes in existing products or developing new products. Process innovation on the other hand, relates to alterations within the production process (and machinery). For HRM, common cited HPWS HRM-practices were identified and selected. Individual HRM-practices including staffing, training, planning, appraisal and reward, and their configuration as HPWS (configuration of the HRM-practices) was distinguished.

The findings from previous chapter can be summarized as following. An overall significant effect of HRM-practices on technological process innovation was identified. This outcome is not found for product innovation. In particular, appraisal shows a significant positive impact on product innovation, whereas training and planning have a significant relation with technological process innovation. No significant effects of other HRM-practices on both innovations is found and which is contradicting to the expectations. These findings show that, possibly, different practices are important for each innovation and in general, some practices are more important for technological innovation than others. The relationship between HPWS and both innovations appear to be significant, confirming the hypotheses on 'bundling-effect' and added value of HPWS above the single effects of each HRM practice. Even though there is a cumulative effect of HPWS, this effect does not increase exponentially and thus there is no squared effects of HPWS on both innovations. Regarding outcomes of qualitative research, it appeared that although variations in the intensity and the scope exist, all HPWS HRM-practices included in this study are implemented by the firms. The development of HRM practices follows in general the following sequence 'set up a general HRM-policy and derive specific HRM-practices and activities from the policy', which are then employed. Since the universality and generalizability of HRM policy are rather challenging, customization of HRM-practices to the situation of the individual employee is part of this process. The perceptions of employees towards HRM are often measured by work-satisfaction surveys, whereas behavioral reactions are often discussed during appraisal sessions or in other individual conversations. Based on this measurement and other observations, firms state that employees are in general neutral to positive towards HRM. However, there are also negative instances and feedback from employees can be seen as a crucial factor in this process. Thus, it is rather an iteration-process in which HRM affects employees and their feedback leads to possible changes within HRM, until the aimed goals are achieved.

5.1 Theoretical implications

To start with individual HRM-practices, only one HRM-practice appeared to be significantly contributing to product innovation and two for technological process innovation, while HPWS as a whole was found to be positively and significantly affecting both innovations. When these outcomes are compared against it other, it can be concluded that the results show support for the 'configurational approach' to HRM (Delery & Doty, 1996) and can be partly explained by the 'bundling-effect', which states that the impact of a single HRM-practice on organizational outcomes can be limited, compared to their synergetic effect, when combined together. This explanation is also confirmed by the qualitative analysis. For instance, it was mentioned that recruitment of people with technical skills doesn't necessarily lead to innovation, however after offering a training program on managerial skills to these employees, the two HRM-practices can strengthen each other's effects and thus possibly facilitate innovation. To conclude, the findings add to the debate on HPWS literature and contribute to the insights on the added value of HPWS.

Second, the outcomes on 'which' HRM-practices are contributing to both innovations, differ. Appraisal is apparently more important for product innovation than for technological process innovation. This outcome can be partly related to the measurement of the practice with EMS (2009). The EMS-item on this practice is rather general and doesn't make a distinction between outcome- and process-focused appraisal, which can stimulate the focus on either the 'outcome' or the 'process'. It is possible that most of the organizations from EMS data employ outcome-based appraisal, which means that they focus mainly on the accomplishment(innovation) of particular goals (products) rather than on the 'process' of production. With regard to technological process innovation, training and planning appear to be essential HRM-practices. The information from qualitative analysis clarifies the sequence in which a training program - regarding technological process innovation - is carried out. Namely, when the firm decides to innovate its process technology by either purchasing or developing it (fully or to some degree), training programs are organized and executed first. The actual implementation (buying or developing) of process technology innovation is carried out afterwards. Thus, the finding highlights that training is more important for technological process innovation than for product innovation. Apart from possible methodological factors that could have influenced the outcome, there is support from the literature for this finding. It has been argued that the impact of training may differ among different types of innovations, in this case product and process innovation (Shipton, 2006). As for the planning; the employment of self-managing teams and task-integration creates the opportunity to be fully responsible in terms of planning, execution and control. Referring to qualitative analysis, two obvious examples were provided with regard to this finding. More specific, since employees work in autonomous-teams with high degree of responsibility, barriers constraining the achievement of production goals are detected easily. Thus, when a problem or a shortcoming of the production process is encountered, it is easier for employees to detect them and at the same time provide incremental innovations for the process technology. This could possible explain why planning appears essential for process innovation and less for product innovation. The use of a questionnaire with items that distinguish between dimensions (e.g. outcome or process oriented appraisal) of HRM-practices in future research, can further clarify its actual and specific impact on innovation or other organizational outcomes.

Third, no significant squared effect of HPWS on both innovations were found and which is interesting. To start with, the scale of (squared) HPWS stands for the (squared) total number of HRM-practices implemented by the firm. A possible cause for the absence of significant squared effect, is the choice for HRM-practices that

are included in this study. Even though the choice have been made based on most commonly cited HRM-practices, there is no consensus in the literature about which HRM-practices should be concluded in HPWS, as explicitly mentioned before. An example of a possible important HRM-practice that was not included, but often mentioned during the interviews is the 'organization of the workplace' (structural or planning -related), referring to the (physical) arrangement of the workplace, the proximity and accessibility of the departments and transparence of the workplace. Thus, it can be concluded that not just *the number* of HRM-practices within HPWS count, for them to have a squared impact, it is important to consider which HRM-practices are included within the system as well (Guest, 1997). Another study with a different configuration of HRM-practices can verify this statement (hypothesis) by testing their linear as well as squared effect.

5.1 Practical implications

The results and the conclusions of both quantitative and qualitative research lead to some practical implications. First, the positive cumulative effect of HPWS on both innovations. This could be taken into consideration by the firms and their HRM-managers, when designing and implementing HRM-practices. The study reveals that the practices are interrelated and thus the HPWS has an added value above the impact of each single HRM-practice. Other factors excluded, it is advised that HRM-managers should prefer the implementation HRM as a system over HRM as existing of single practices. Also, from a practical point of view, is has been concluded that HPWS do not necessarily lead to outcomes which exceed the costs that are related to the implementation of these systems (Rowden, 2002). However, HRM-managers should take into account that 'deadly combinations' also exist, referring to the combination of 'wrong' HRM-practices – a mismatch between their intensity, scope and direction doesn't - can distract value rather adding it (Becker & Huselid, 1998). Even though the perception and experiences of employees with HPWS HRM-practices are measured through work-satisfaction questionnaires in the firms, interviews during qualitative research have shown that explicit measurement of the outcome of HRM as a system is still insufficient to rare. In order to prevent the firm from 'deadly HRM-combinations', the outcome of HPWS or HRM-practices systems in general, should be measured explicitly.

Another implication relates to the goal and consequence of each practice. Since a difference was found in the practices that are important for each innovation, it is recommended to formulate explicit goals for each HRM-practice, define its 'expected/unexpected' and 'wanted/unwanted' outcomes, prior to the actual implementation of the practice. It can be argued that most firms are already implementing this procedure, however the qualitative information in this study reveals that this is still not done enough and the respondents have pointed out that this is a point of attention for HRM-department. For instance, a firm mentioned that they provided a training program to their managers with the aim to improve their managerial skills and thus their performance, however this has unexpectedly resulted in a number of managers leaving the firm after the training. Thus, such action and preparation of the HPWS, contributes to the prevention of possible unexpected and unwanted outcomes.

5.1 Reflection of the study

Current study made use of a mixed-methods approach in which the qualitative research supplemented the information gained from the EMS (2009) data. This approach allows to investigate the concepts and their relationships more accurately by approaching them from different points using different methods and techniques. This approach has several advantages. First, by making use of mixed-methods, it was possible to gather information on HPWS HRM-practices that are supportive for innovation, but also to explore how this value is created. Second, triangulation of diverse research methods and techniques for researching the same variables and their relationship, made possible to study the concepts and relationship in more precision by approaching them from various angles.

With regard to the research process, the data gained through both sources have been treated very carefully, confidentially and anonymous. The quantitative outcomes from EMS analyses as well as the audiotapes and notes of the interviews, are solely used for the purposes of this research, its analyses and for the elaboration this paper. Two versions of current paper exist, one version containing the identities of the firms. This version is only accessible for the researcher herself, supervisor and the second reader. A second version doesn't contain the identities of the firms that were interviewed and no interview-transcripts are included..

Although the use of EMS has advantages, since it's a well-tested and validated questionnaire, this also means that the items are already determined. As an illustration, the way the variable 'size' or 'technological process innovation' are measured in EMS, represent one way to measure these constructs and along with their advantage, they have also consequences for the outcomes and interpretations. For instance, an index scale of different process technologies was computed for this study, however this construct could have also been measured with a single item from another questionnaire with a possible different outcome. This methodological issue should be taken into consideration when interpreting the outcomes of this research.

Finally, only three firms from three different industries within the manufacturing sector were interviewed for the qualitative part of this research. Despite that the outcomes are very insightful and useful, since the sample size is considered small, the degree to which these firms represent the manufacturing sector as a whole is questionable. Therefore, the generalizability of , especially, the qualitative outcomes is limited.

REFERENCES

Akhtar, S., Ding, D. Z., & Ge, G. L. (2008). Strategic HRM practices and their impact on company performance in Chinese enterprises. *Human Resource Management, 47*(1), 15-32.

Al-Laham, A., Tzabbar, D., & Amburgey, T.L. (2011). The dynamics of knowledge stocks and knowledge flows: innovation consequences of recruitment and collaboration in biotech. *Industrial and Corporate change, 20*(2), 555-583.

Armbruster, H., Kikel, S., Lay, G., & Maloca, S. (2005). Techno-organisational innovation in the European manufacturing industry: do European countries differ regarding the diffusion of technical and non-technical innovations in manufacturing companies? *Bulletin, 1,* 1-17.

Amstrong, M. & Taylor, S. (2014). *Armstrong's handbook of human resource management practice* (13th ed.). Croydon, CPI Group (UK).

Armstrong, M. (2009). Armstrong's handbook of performance management. An evidence-based guide to delivering high performance,(4th ed.). London and Philadelphia: Kogan Page.

Barras, R. (1986) Towards a theory of innovation in services. Research Policy, 15(4), 161-173. In: Damanpour, F., & Gopalakrishnan, S. (2001). The dynamics of the adoption of product and process innovations in organizations. *Journal of Management Studies, 38*(1), 45-65.

Battisti, G., & Stoneman, P. (2009). How innovative are UK firms? Evidence from the fourth UK community innovation survey on synergies between technological and organizational innovations. *British Journal of Management, 21*(1), 1-20.

Bauernschuster, S., Falck, O., & Heblich, S. (2008).The impact of continuous training on a firm's innovations, working paper, No. 2258.

Becker, B.E., & Huselid, M.A. (1998). High performance work systems and firm performance: a synthesis of research and managerial implications. *Research in Personnel and Human Resource Management, 16,* 53-101.

Betz, F. (2011). *Managing technological innovation: competitive advantage from change* (3rd ed.). New Jersey: John Wiley & Sons.

Boije, H. (2014). *Analyseren in kwalitatief onderzoek* (2nd ed.). Amsterdam: Boom Lemma Uitgevers.

Boselie, P. (2010). *Strategic human resource management: a balanced approach* (ed.). London, Berkshire: McGraw-Hill Education.

Boxall, P., & Purcell, J. (2003). *Strategy and human resource management*. Houndmills, Basingstoke, Hampshire ; New York: Palgrave Macmillan.

Cardozo, R., McLaughlin, K., Harmon, B., Reynolds, P., Miller, B. (1993). Product-market choices and growth of new businesses. *Journal of Product Innovation Management, 10,* 331-400.

Ceylan, C. (2013). Commitment-based HR practices, different types of innovation activities and firm innovation performance. *The International Journal of Human Resource Management, 24*(1), 208-226.

Chen, C.-J., & Huang, J.-W. (2009). Strategic human resource practices and innovation performance – the mediating role of knowledge management capacity. *Journal of Business Research, 62,* 104-114.

Chen, S., & Wang, D. (2010). High performance work systems and organizational innovative capabilities in the PRC: the mediating role of intellectual capital. *Technology Management for Global Economic Growth, July,* 1-9.

Chew, J.K.H., & Sharma, B. The effects of culture and HRM practices on firm performance: empirical evidence from Singapore. (2005). *International Journal of Manpower, 26*(6), 560-581.

Clark, M., & Baker, S. (2004). *Business success through service excellence* (1st ed). New-York: Routledge.

Cooke, F.L., & Saini, D.S. (2010). How does the HR strategy support an innovation oriented business strategy? An investigation of institutional context and organizational practices in Indian firms. *Human Resource Management, 49*(3), 377-400.

Cooper, J.R. (1998). A multidimensional approach to the adoption of innovation. *Management Decision, 36*(8), 493-502.

Crossan, M.M., & Apaydin, M. (2010). A multi-dimensional framework of organizational innovation: a systematic review of the literature. *Journal of Management Studies, 47*(6), 1154-1182.

Daft, R.L. (1978). A dual-core model of organizational innovation. *Academy of management Journal, 21,* 193-210.

Damanpour, F. (1988). Innovation type, radicalness, and the adoptions process. *Communication Research, 15*(5), 545-567.

Damanpour, F. (1991). Organizational innovation: a meta-analysis of effects of determinants and moderators. *Academy of Management Journal, 34*(4), 555-590.

Damanpour, F., & Evan, W.N. (1984). Organizational innovation and performance: the problem of organizational lag. *Administrative Science Quarterly, 29,* 392-409.

Damanpour, F., & Gopalakrishnan, S. (1998). Theories of organizational structure and innovation adoption: the role of environmental change. *Journal of Engineering and Technology, 15*(1), 1-24.

Damanpour, F., & Gopalakrishnan, S. (2001). The dynamics of the adoption of product and process innovations in organizations. *Journal of Management Studies, 38*(1), 45-65.

Damanpour, F., Szabat, K.A. & Evan, W.M. (1989). The relationship between types of innovation and organizational performance. *Journal of Management Studies, 6,* 587-601.

Damanpour. F. (1987) The adoption of technological, administrative, and ancillary innovations: impact of organizational factors. *Journal of Management, 13,* 675-688.

Deb, T. (2006). *Strategic approach to human resource management: Concept, tools and application.* New Delhi: Atlantic Publishers and Distributors.

Delaney, J. T., & Huselid, M. A. (1996). The impact of human resource management practices on perceptions of organizational performance. *Academy of Management Journal, 39*, 949–969.

Delery, J. E., & Doty, D. H. (1996). Modes of theorizing in strategic Human Resource Management: tests of universalistic, contingency, and configurational performance predictions. *Academy of Management Journal, 39*(4), 802-835.

Dessler, G. (2015). *Fundamentals of Human Resource Management*, (4th rev. ed.). Harlow: Pearson Education Limited.

Dewar, R.D., & Dutoon, J.E. (1986). The adoption of radical and incremental innovations: an empirical analysis. *Management Science, 32*(11), 1422-1433.

Eslami, N., & Nakhaie, H. (2011). Effect of human resource management activities to improve innovation in enterprises. *International Proceedings of Economics Development and Research, 12*, 518-522.

Ettlie, J.E., Bridges, W.P., & O'Keefe, R.D. (1984). Organizational strategy and structural differences for radical versus incremental innovations. *Management Science, 30*(6), 682-695.

Evans, W.R., & Davis, W.D. (2005). High performance work systems and organizational performance: the mediating role of internal social structure. *Journal of Management, 31*(5), 768-776.

Field, A. (2009). *Discovering statistics using SPSS* (3rd ed.). Chennai: C&M Digitals.

Filder, L.A., & Johnson, J.D. (1984). Communication and innovation implementation. *The Academy of Management Review, 9*(4), 704-711.

Foot, M., & Hook, C. (2008). *Introducing human resource management* (5th ed.). Harlow: Prentice Hall.

Gopalakrishnan, S., & Damanpour, F. (1988) Innovation research in economics, sociology, and technology management. *Omega, 25,* 15-28.

Guerrero, S., & Barraud-Didier, V. (2004). High-involvement practices and performance of French firms. *The International Journal of Human Resource Management, 15(*8), 1408-1423.

Guest, D. E. (1987). Human-resource management and industrial-relations. *Journal of Management Studies, 24*(5), 503-521.

Guest, D. E. (1997). Human resource management and performance: a review and research agenda. *The International Journal of Human Resource Management, 8*(3), 263-276.

Gupta, A.K., & Singhal, A. (1993). Managing human resources for innovation and creativity. *Technology Management, May-June,* 41-48.

Guthrie, J. P. 2001. High-involvement work practices, turnover, and productivity: evidence from New Zealand. *Academy of Management Journal, 44*, 180-190.

Guzzo, R.A., Jette, J.D., & Katzell, R.A. (1985). The effects of psychologically based intervention programs on worker productivity: a meta-analysis. *Personnel Psychology, 38*(2), 275-292.

Hage, J., & Meeus, M. (2006). *Innovation, science, and institutional change.* Oxford: University Press.

Harrison, R. (2002). Learning and Development, CIPD. In: Dessler, G. (2015). *Fundamentals of human resource management*, (4th rev. ed.). Harlow: Pearson Education Limited.

Hesse-Biber, S.N. (2010). *Mixed methods research: merging theory with practice.* New York: The Guilford Press.

Huselid, M. A. 1995. The impact of human resource management practices on turnover, productivity, and corporate financial performance. *Academy of Management Journal, 38*, 635-672.

Itika, J. (2011). Fundamentals of human resource management: engineering experiences from Africa. *African Public Administration and Management series, vol 2*, African Studies Cenre, Leiden.

Jiménez-Jiménez, D., & Sanz-Valle, R. (2005). Innovation and human resource management fit: an empirical study. *International Journal of Manpower, 26*(4), 364-381.

Jiménez-Jiménez, D., & Sanz-Valle, R. (2008). Could HRM support organizational innovation? *The International Journal of Human Resource Management, 19*(7), 1208-1221.

Johnson, G., Scholes, K., & Whittington, R. (2008). *Exploring corporate strategy: Text & cases*, (8th ed.). Harlow: Prentice Hall.

Kalleberg, A.L., & Moody, J.W. (1994). Human resource management and organizational performance. *American Behavioral Scientist, 37*(7), 948-962.

Kim, L. (1980). Organizational innovation and structure. *Journal of Business Research, 8*, 225-245.

Kimberly, J.R., & Evanisko, M. (1981). Organizational innovation: the influence of individual, organizational, and contextual factors on hospital adoption of technological and administrative innovations. *Academy of Management Journal, 24*, 689-713.

Koberg, C.S, Detienne, D.R. & Heppard, K.A. (2003). An empirical test of environmental, organizational, and process factors affecting incremental and radical innovation. Journal of High Technology Management Research, 14, 21-45.

Kok, R.A.W., & Ligthart, P.E.M. (2014). Differentiating major and incremental new product development: the effects of functional and numerical workforce flexibility. *Joutnal of Product Innovation Management, 31*(1), 30-42.

Lau, C.-L., & Ngo, H.-J. (2004). The HR system, organizational culture, and product innovation. *International Business Review, 13*, 685-703.

Lay, G., Copani, G., Jäger, A., & Biege, A. (2010). The relevance of service industries. *Journal of Service Management, 21*(5), 715-726.

Laursen, K., & Foss, N. (2003). New human resource management practices, complementarities and the impact on innovation performance. *Cambridge Journal of Economics, 27*(2), 243–263.

Lawless, M.W., & Anderson, P.C. (1996). Generational technological change: effects of innovation and local rivalry on performance. The Academy of Management Journal, 39(5), 1185-1217.

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

Lengnick-Hall, M, L., Lengnick-Hall, C.A., Andrade, L.S., & Drake, B. (2009). Strategic human resource management: the evolution of the field. *Human Resource Management Review, 19*(2), 64-85.

Li, Y., Zhao, Y., & Liu. Y. (2006). The relationship between HRM, technology innovation and performance in China. *International Journal of Manpower, 27*(7), 679 – 697.

MacDuffie, J.P. (1995). Human resource bundles and manufacturing performance: organizational logic and flexible production systems in the work auto industry. *Industrial and Labor Relations Review, 48*(2), 197-221.

Marchington, M., & Grugalis, I. (2000). ''Best practice'' human resource management: perfect opportunity or dangerous illusion. *International Journal of Human Resource Management, 11*, 1104–1124.

Macky, K., & Boxall, K. (2007). The relationship between 'highperformance work practices' and employee attitudes: an investigation of additive and interaction effects, *The International Journal of Human Resource Management, 18*(4), 537-567.

Madesen, T. L., Mosakowski, E., & Zaheer. (2003). Knowledge retention and personnel mobility: the nondisruptive effects of inflows of experience. *Organization Science, 14*, 173–191.

McEvily, S.K., & Chakravarthy, B. (2002). The persistence of knowledge-based advantage: an empirical test for product performance and technical knowledge. *Strategic Management Journal, 23*, 285-292.

Miles, R.E., & Snow, C.C. (1984). Designing strategic human resources systems. *Organizational Dynamics, Summer*, 36-52.

Millmore, M. (2003). Just how extensive is the practice of strategic recruitment and selection? *Irish Journal of Management, 24*(1), 87-108.

Montes, F.J.L., Moreno, A.R., Fernandez, L.M.M. Assessing the organizational climate and contractual relationship for perceptions of support for innovation. *International Journal of Manpower, 2004, 25*(2), 167-180.

Nesheim, T., Olsen, K. M., & Kalleberg, A. L. (2007). Externalizing the core: Firms' use of employment intermediaries in the information and communication technology industries. *Human Resource Management, 46*(2), 247-264.

Paauwe, J. (2009). HRM and performance: achievements, methodological issues and prospects. *Journal of Management Studies, 46*(1), 129-142.

Pareira, C.S., & Romero, F.C.C. (2013). Non-technological innovation: current issues and perspectives. *Independent Journal of Management and Production, 4*(1), 360-376.

Pohlmann, M. (2005). The evolution of innovation: cultural backgrounds and the use of innovation models. *Technology Analysis & Strategic Management, 17*(1), 9-19.

Raghuram, S., & Arvey, R.D. (1994). Business strategy links with staffing and training practices. *Human Resource Planning, 17*(3), 55-73.

Reichstein, T., & Salter, A. (2006). Investigating the sources of process innovation among UK manufacturing firms. *Industrial and Corporate Change, 15*(4), 653-682.

Roberts, K. (1995). The proof of human resource is in the profits. *People Management, February*, 42-43.

Rowden, R.W. (2002). High performance and human resource characteristics of successful small manufacturing and processing companies. *Leadership and Organization Development Journal, 23*(2), 79-83.

Rosenkopf, L., & Almeida, P. (2003). Overcoming local search through alliances and mobility. *Management Science, 49*, 751–766.

Rundle, S.J. (1997), "Flexibility, adaptiveness and responsiveness ('FAR-ness') as the key success factors in market entry in the South-East Asian growth wedge", PhD thesis, Department of Management, Monash University, Victoria. In: Chew, J.K.H., & Sharma, B. The effects of culture and HRM practices on firm performance: empirical evidence from Singapore. (2005). *International Journal of Manpower, 26*(6), 560-581.

Sarkar, S. (2007). *Innovation, market archetypes, and outcome: an integrated framework.* New York: Physica-Verlag Heidelberg.

Scarbrough, H. (2003). Knowledge management, HRM, and the innovation process. *International Journal of Manpower, 24*(5), 501-516.

Schuler, R.S. (1992). Strategic human resource management: linking the people with the strategic needs of the business. *Organizational Dynamics, summer,* 18-31.

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

Schumpeter, J.A. (1935). The analysis of economic change. *The Review of Economics and Statistics, 17*(4), 2-10.

Searle, R.H., & Ball, K.S. (2003). Supporting innovation through HR policy: evidence from the UK. *Creativity and Innovation Management, 12*(1), 50-63.

Shavinina, L.V. (2003). *The international handbook on innovation.* Oxford: Elsevier Science.

Shipton, H., West, M.A., Dawson, J., Birdi, K. & Patterson, M. (2006). HRM as predictor of innovation. *Human Resource Management, 16*(1), 3-27.

Thorbe, R., & Homan, G (Ed.). (2000). *Strategic reward systems.* Harlow: Pearson Education Limited.

Tornatzky, L.G., & Klein, K.J. (1982). Innovation characteristics and innovation adoption-implementation: a meta-analysis of findings. *IEEE Transactions on Engineering Management, 29*(1), *28-43.*

Trushman, M.L., & Anderson, P. (1986). Technological discontinuities and organizational environment. *Administrative Science Quarterly, 31*(3), 439-465.

Tzabbar, D. (2011). The dynamics of knowledge stocks and knowledge flows: innovation consequences of recruitment and collaboration in biotech. Industrial and Corporate Change, 20(2), 55-583.

Utterback, J.M., & Abernathy, W.J. (1975). A dynamic model of process and product innovation. Omega, 3, 639-656.

Vrakking, W.J. (1990). The innovative organization. *Long Range Planning, 23*(2), 94-102.

Wan, D., Kok, V., & Ong, C-H. (2002). *Compensation & Benefits Review, 23,* 33-42.

Way, S.A. (2002). High performance work systems and intermediate indicators of firm performance within the US small business sector. *Journal of Management, 28*(6), 765-785.

Way, S.A., & Johnson, D.E. (2005). Theorizing about the impact of strategic human resource management. *Human Resource Management Review, 15*(1), 1-19.

West, M.A., & Farr, J.L. (1990). *Innovation and creativity at work: psychological and organizational strategies*. Chichester: Wiley.

West, M.A., Altink, W.M.M. (1996). Innovation at work: individual, group, organizational, and socio-historical perspectives. *European Journal of Work and Organizational Psychology, 5*(1), 3-11.

Wright, P. M., & McMahan, G. C. (1992). Theoretical perspectives for strategic human resource management. *Journal of Management, 18*, 295–320.

Wright, P. M., & McMahan, G. G. (1992). Alternative theoretical perspectives on strategic human resource management. *Joumal of Management, 18*, 295-320.

Wright, P.M., & Snell, S.A. (1998). Toward a unifying framework for exploring fit and flexibility in strategic human resource management. *Academy of Management Review, 23*(4), 756-772.

Wright, P.M., Dunford, B.B. & Snell, S.A. (2001). Human resources and the resource based view of the firm. *Journal of Management, 27*, 701-721.

Youndt, M.A., Snell, S.A., Dean, J.W., & Lepak, D.P. (1996). Human resource management, manufacturing strategy and firm performance. *The Academy of Management Journal, 39*(4), 836-866.

Youndt, M.A., & Snell, S.A. (2007). Human resource configurations, intellectual capital and organizational performance. *Jounal of Management Issues,3*, 337-360.

Zaltman, G., Duncan, R. & Holbek, J. (1973). *Innovations and Organizations* (1st. ed) . New York: Krieberg Publishing Company.

Appendices

Appendix A – Items used from EMS 2009

Construct	VARIABLE NAME	Item	Number
Innovation			
Product innovation	dProductinnovation	In past three years, are there new products or technologically renewed products to a considerable degree (small improvements excluded) incorporated into the production process of the firm (for example, implementation of new materials, changes in in the function of product etc.)?	5.2
Technological process innovation	1. ti_IPDE 2. ti_Robot 3. ti_PIQC 4. ti_RFID 5. ti_AWMS 6. ti_Laser 7. ti_DryPS 8. ti_RaProt 9. ti_BioGen 10. ti_NovMa 11. ti_SCMS 12. ti_ManES 13. ti_ViReal Tech_Inn	Technologies implemented within your firm: 14. Integrated Product design engineering 15. Industrial robots 16. Integrated quality control 17. Radiofrequency identification 18. Automated warehouse management systems 19. Laser tooling 20. Dry Processing systems 21. Rapid prototyping systems 22. Bio and gen technology 23. Novel materials 24. Supply chain management systems 25. Manufacturing execution systems 26. Virtual reality in development manufacturing Index scale: sum of number of technologies implemented within the firm	2.1
HRM			
Staffing	dSizeTemp	Did your business branch have temporary employees employed in 2008?	13.1
Training	oi_TrainProg	Organizational concepts implemented in your firm: Training Programs	3.1
Planning	Oi_TeamP Oi_TaskInt	Organizational concepts implemented in your firm: Teamwork in Production Task Integration (integration of planning, execution and control)	3.1
Appraisal	Oi_IndAp	Organizational concepts implemented in your firm: Regular individual appraisal interviews	3.1
Reward	Oi_TmPerf Oi_FinPart Oi_TeleW	Organizational concepts implemented in your firm: Team performance incentives Financial participation broad based Teleworking	3.1
HPWS (squared)HPWS	HPWS SqHPWS	Index scale: sum of HR practices above (total number of HR practices implemented by the firm) Index scale: squared sum HR practices above (squared total number of HR practices implemented by the firm)	
Control variables			
Size	Size Insize (log)	Total number of employees from 31-12 (temporary personnel not included) Log transformation of Size variable	13.1
Age	FirmFormation_old FirmFormation_yng FirmFormation_mis	Year of foundation of the firm (continuous variable), new dummy variables created with: Founded after 1982 Founded before 1982 Foundation data unknown	13.1
Industry	1. Metal 2. Food 3. Textile 4. Construction 5. Chemical 6. Machinery 7. Electronic	Open question about industry of the firm: note. A categorical dummy variable Industry was created with seven industry categories including: 1) metals and metal products 2) food, beverages and tobacco 3) textiles, leather, paper and board 4) construction and furniture 5) chemicals (energy and non-energy) 6) machinery and equipment transport and 7) electrical and optical equipment.	11.1

Note: the items within this appendix have been translated from Dutch.

Appendix B – Interview script and questions (Dutch)

	ONDERWERP	VRAAG	TIJD
A	**INTRODUCTIE**	• Voorstellen zelf • Onderzoeksdoel: HRM-werknemers-innovatie en de relaties hiertussen • Bespreken: anonimiteit en privacy, dat ik notities zal maken en het gesprek wordt opgenomen (vernietigd na afloop onderzoek), hoe ik naar het bedrijf zal verwijzen, reflectie naar het bedrijf • Hoe lang het gesprek ongeveer zal duren • Of er nog opmerkingen en vragen zijn voor we beginnen	5(5)
B	**Introductie bedrijf & geïnterviewde**	***Ik wil graag beginnen met u en het bedrijf beter leren kennen*** • Kunt u iets vertellen over uw bedrijf? (wat doet het; wat zijn de belangrijkste diensten/producten) • Kunt u ook iets vertellen over uw functie binnen het bedrijf? Kort samenvatten en aangeven dat ik zal overgaan naar inhoudelijke vragen.	5(10)
1	**Innovatie (doel→ activiteiten→ resultaten)**	***Om te beginnen, wil ik graag ingaan op vernieuwingen en verbeteringen binnen uw bedrijf.*** • Met welk doel vinden er vernieuwingen en verbeteringen plaats binnen het bedrijf? • Welke activiteiten vinden er plaats m.b.t. vernieuwingen en verbeteringen? *(belangrijkste innovatie laatste 3 jaar; op welke gebieden; welke innovaties? Hoeveel?)* Kort samenvatten	8(18)
2	**HRM (beleid→ activiteiten→ resultaten)**	***Ik wil nu graag overschakelen naar HRM binnen uw bedrijf.*** • Hoe wordt HRM binnen uw bedrijf in praktijk gebracht? • (recruitment, ontwikkeling & training, planning, beoordeling, beloning? • Wat is het beleid (doelstellingen) m.b.t. HRM? • Met welke (HR)activiteiten wordt beoogd om dit beleid in te voeren en doelen te halen? *Eventueel:* - *Met welk doel worden HR activiteiten (per praktijk) ingezet/uitgevoerd?* - *Voor wie worden ze ingezet?* - *Hoe beïnvloeden de praktijken elkaar? Concreet vb. recruitment/training* Kort samenvatten	8(26)
3	**Percepties & attitudes werknemers**	***Ik wil graag verdergaan met de percepties en gedrag van werknemers in relatie tot HRM.*** • Zijn de HR praktijken bekend bij werknemers? • Waaruit blijkt dat? • Hoe worden ze geïnformeerd over HRM beleid/doelen? Kort samenvatten	8(34)
4	**HRM-Werknemers**	***Ik wil graag ingaan op het effect van HRM op de werknemers.*** • Hoe gaan de werknemers om met HR activiteiten die ingevoerd zijn/worden? (in hun percepties en gedrag) • Hoe wordt dit gemeten/vastgesteld? Kort samenvatten	8(42)
5	**Werknemers-Innovatie**	***INLEIDEN!!!*** *Ik zal nu verdiepen op de relatie tussen werknemers en vernieuwingen en verbeteringen.* • Welke percepties en gedragingen van werknemers zijn belangrijk voor innovatie? • Wat gebeurt er in de tussentijd dat hun gedrag leidt tot innovatie? *(concrete voorbeelden?)* Kort samenvatten	8(50)
6	**HRM-Innovatie**	• **Welke HR activiteiten zijn belangrijk voor innovatie?** • Hoe komt het HRM leidt tot innovatie (vernieuwing & verbetering?) *(vb. nieuwe mensen, nieuwe machine)* • Hoe meet u het effect van HRM op innovatie? Kort samenvatten	8(58)
C	**AFSLUITEN**	• Bedanken voor het interview en het gesprek kort samenvatten • Vragen of er nog opmerkingen of vragen zijn • Herhalen wat er met data zal gebeuren en hoe verder • Bedanken en afsluiten	5(63)

Appendix C – Interview coding (Dutch)

For each concept and their inter-concept relations, the six most important quotations are presented below. An electronical and full version of interview coding and ranking can be obtained through the researcher or supervisors of this study. The quotations are ordered from most relevant to least relevant. Abbreviations:

R = Relevance of the quotation (1 most relevant and 3 least relevant

ID, A = Paper and printing industry

ID, B = Oil and gas industry

ID, C = Steel and wood industry

(TECHNOLOGICAL) INNOVATION		
ID	**QUOTATION**	**R**
A	Met name kostenreducties en verkorten van doorlooptijden. Dus het is belangrijk om voor klanten drukwerk te hebben die zo snel mogelijk nadat gegevens bekend zijn geworden, gepubliceerd kan worden. Dus de doorlooptijd is daardoor heel erg belangrijk. En, omdat publiceren op internet een stuk goedkoper is dan drukken, is het ook belangrijk dat de kosten zo laag mogelijk zijn. Daarom: zo efficiënt en zo goedkoop mogelijk.	1
B	Ja, wat ik net aangaf, die duurzame systemen. Daar ligt toch wel onze kracht om daar naar te kijken om elke keer te kunnen bedenken hoe je daar efficiënter mee omgaat. Met energievormen, om daar efficiënter mee om te gaan. Dat door de systemen die we maken, onze technologieën die we willen verkopen om daar marktspeler in te zijn over de hele wereld.	1
B	[Product X] zeker. Dat is een uitvinding van ons advance en design afdeling. Die hebben we echt hier zelf ook, een afdeling met echt universitair geschoolde medewerkers die puur bezig zijn met innovatie. [Product X] komt echt van die afdeling af en dat is echt wel een geslaagd product als je het ook hebt over innovatie en duurzaamheid. De [Product Y] is een zelfde uitvinding, ook van die afdeling, maar die is nog niet in het stadium dat die eigenlijk helemaal al in werking en verkocht wordt.	1
C	We hebben in huis wel afspraken gemaakt voor het doen van dit soort grote investeringen voor dit soort apparatuur, maar dat is per definitie gekoppeld aan het hebben van voldoende werk en/of opdrachtgevers. En we hadden deze investering waarschijnlijk niet gedaan als we niet zeker hadden geweten dat het bedrijf waar we zaken mee doen, die vloerverwarmingsfabriek, dat werk niet bij ons had neergelegd. Dus er moet altijd wel iets tegenover staan, die investeringen doen we niet zomaar. Wij hebben al jaren contract met wat bedrijven, bijvoorbeeld dat vloedverwarmingsbedrijf die pompen maakt. Wij proberen dan ook met zo'n opdrachtgever af te stemmen ''wat moeten wij doen , onder andere aan het investeren in technieken en aanschaffen van machine, om te kunnen voldoen aan jouw vraag''. Dus die afstemming zal er geweest zijn en zal dit een uitkomst van zijn geweest.	1
A	We hebben bijvoorbeeld geïnvesteerd in een nieuwe management informatiesysteem en wat ook gecombineerd is namelijk dat de dat de klant dus sneller zijn offerteaanvragen krijgt. De klant krijgt snel zijn offertes. Als de klant een offerte plaatst dan krijgt die zelf een link waarmee die zijn documenten kan uploaden. Tijd! Is heel erg verkort. Nou, dat is dus de aanleveringskant.	1
C	Ja, dus we proberen opdrachtgevers ertoe te leiden om hun seriematige productie bij ons neer te leggen, dan wel dat wij groepen mensen extern detacheren naar die werkgevers, zodat men op locatie bij die werkgever seriematige productie kunnen maken. En daarnaast onderhouden we natuurlijk het bestaande machinepark. Dat is een normale cyclus van aanschaffen en afschrijven	2

HRM – HPWS		
ID	**QUOTATION**	**R**
B	Wij doen uiteindelijk de werving en selectie zelf, maar de eerste selectie doen bureaus voor ons. Zij selecteren twee tot drietal medewerkers voor ons en de directie en managers voeren gesprekken en uiteindelijk wordt een beslissing genomen. Dan komen ze voor een jaar, worden ze gedetacheerd door de bureau bij ons. Daarna is het doorgaans de stap dat ze bij ons in dienst komen voor onbepaalde tijd.	1
C	We hebben 2,5 jaar geleden drie kerncompetenties gedefinieerd, waarvan wij vinden dat die in meer of mindere mate aanwezig moeten zijn bij alle leidinggevenden binnen dit bedrijf. Daar hebben we een externe bureau voor in handen genomen en die heeft een ontwikkelassessment bij alle 36 leidinggevende binnen dit bedrijf afgenomen en daar is een individuele ontwikkelingsplan voor uitgekomen en we hebben met individuele scholings- en coaching trajecten in twee jaar tijd geprobeerd om iedere leidinggevende op het voor haar of hem gewenste niveau te krijgen.	1
A	Werving en selectie hangt erg af van de functie die we willen gaan invullen. Als het technisch is, is het verschrikkelijk lastig om aan personeel te komen, dus daar zijn we nu mee bezig om mensen van andere sectoren te werven en die om te scholen naar drukker of in de afwerking te werken. Dus, als het een technische functie is: is het meestal uitzendbureaus en daarna omscholen	1
A	En om dan de link te leggen naar jouw HRM – we hebben onlangs onze drukkers allemaal geschoold tot procesoperators. En, daarbij werd niet alleen hun druk-kennis op peil gebracht – dat is iets wat hier intern ook gebeurt en waar ze voor opgeleid zijn op school. Maar ook vooral alles daaromheen – het proces.	1
B	Op verschillende gebieden, maar grootste gebied is ontwikkeling van medewerkers. Daarmee bedoel ik: het initiëren van functioneringscyclus, functioneringsgesprekken, POP gesprekken. We zijn onlangs gestart met het maken van kennismatrixen, omdat kennis zo belangrijk is voor onze medewerkers en functies. Als je wilt innoveren, dan moet je over de juiste kennis beschikken, maar die kennis ook blijven ontwikkelen.	1
A	Mijn doelstelling is dat ik meer omzet wil realiseren door te exhaleren in de punten die we net geschreven hebben: door dat wij efficiënter en sneller willen zijn dan onze concurrent en meer werk deze kant op willen halen.	2

EMPLOYEES – ATTITUDES&BEHAVIOR		
ID	**QUOTATION**	**R**
A	Ja! We hebben jaarlijks een aantal kantinesessies en daar worden presentaties gegeven over de strategie die we voeren en hoe ver we daarmee zijn. Daar worden investeringen besproken, er wordt het aannamebeleid kenbaar gemaakt.	1
B	Nou, iedereen die bij [B] binnenkomst die krijgt een introductieprogramma. Dat betekent dat die de eerste maand bezig is met kennismaken met alle afdelingen. Spreekt met eindverantwoordelijke van de die afdelingen over ins en outs van die afdeling. Ze spreken ook met mij, dan vertel ik de HR zaken die spelen enz. stelt elke afdeling zich eigenlijk voor. We hebben eigen nieuwbrief die elke maand naar elke medewerker wordt verstuurd en waar ook HR gerelateerde zaken in staan. Daarnaast ook, het persoonlijke contact met de medewerkers als er dingenspelen. Voor de rest hebben we een eigen kennisbank, een wiki-achtig kennisbank. Daar zijn per afdeling alle kennis en waardigheden die je nodig hebt om te weten wat je van de afdelingen kunt verwachten. Ja, en regelingenboek waarin alle regelingen worden beschreven, maar ik wil meer naar een handboek.	1
A	Wij hebben secundaire arbeidsvoorwaarden die schriftelijk vastliggen en als mensen met een tijdelijke of onbepaalde tijd aangenomen worden, dan krijgen ze die mee en die is erg uitgebreid. Dus alle afspraken die wij hier intern hebben, alles wat buiten de cao geregeld is, staat daarin vast. En, daar tekenen ze ook voor, want daar zit ook een stuk arbobeleid bij voor veiligheidsschoenen etc. Daar moeten ze voor tekenen, en daarmee weten wij dat basale dingen bekend zijn.	1
B	elke jaar wordt er een tevredenheidsonderzoek gedaan. Die houden we niet anoniem en meestal wisselen elke twee jaar tussen een aantal onderwerpen daarin. Dan kijken we ook hoe we dat kunnen verbeteren en proberen dan ook om met de medewerkers te communiceren. Onze directie hecht ook een grote waarde aan tevredenheid van medewerkers en dat is ook de reden dat die niet anoniem wordt gehouden. We willen namelijk welke medewerkers iets vindt en welke opmerking er is gemaakt. over het algemeen vinden medewerkers het niet erg dat het niet anoniem is, want dan wordt er ook werkelijk wat gedaan met hun antwoorden	1
C	Er zijn werkoverleggen op verschillende niveaus. Het is wel de bedoeling dat de leidinggevende, samen met HRM adviseur, directeur of manager om de zoveel tijd praten met die mensen over er hier gebeurt. We hebben hier ook grote digitale informatieborden hier, daarin komen elke keer pagina's voorbij. Zo'n ding gaan we ook ophanden in de fabriek, zodat mensen daar ook actuele bedrijfsinformatie voorbij zien komen. Er komt één keer in twee maanden ook het bedrijfsblad uit, daar staat ook algemene bedrijfsinformatie in.	1
A	De functionerings- en beoordelingsgesprekken natuurlijk, maar ook als mensen slechten functioneren of als er een klacht is. We hebben bijvoorbeeld klachtenadministratie of procedure, als mensen gefaald hebben, dan krijgen we gesprekken en kijken waar kunnen dingen verbeterd worden en hoe gaan we het oplossen. Het is vrij plat allemaal, we hebben geen intranet, daar zijn we echt te klein voor. We spreken mensen gewoon aan en de drempel naar mijn kantoor is ook zo laag,	2

RELATIONSHIP – HRM & EMPLOYEES		
ID	**QUOTATION**	**R**
A	Wat ik lastig vind daarin is, waarmee je een medewerker triggert. Als je puur en alleen naar financiën kijkt, dan zijn daar sommige mensen heel erg vatbaar voor. En dat zijn met name de jongere mensen die net een huis gekocht hebben of die niet een gezinsuitbreiding hebben. Die zullen dan eerder overwerk willen verrichten en daar de beloning voor willen hebben. En oudere mensen hebben bijvoorbeeld meer interesse in vrije tijd. Dus het is heel moeilijk om in te schatten, om een HRM universeel beleid neer te leggen en te kunnen denken dat je daarmee mensen kunt triggeren en dat het voor iedereen hetzelfde werkt.	1
A	Dus je moet heel goed kijken, hoe reageren mensen op de afspraken die er zijn en daar zal je dan maatwerk op moeten doen. En om dan antwoord te geven op jouw vraag, hoe reageert iemand daar dan op. Dat is dus heel verschillend, als je mensen dus vraagt om over te werken dan verschillen ze daarin en dan geven zij wel aan waarom wel of juist niet.	1
C	Verassend soepel. Je zou je kunnen voorstellen dat mensen dat eng vinden, want mensen werken hier best lang, 20 of 30 jaar. Het zou dus best lastig kunnen zijn voor hun op hun werk opeens anders te doen, maar iedereen heeft daar uiteindelijk het nut van ingezien. er was wel weerstand, maar door maar te volharden in je standpunt en elke keer weer uit te leggen waarom je bepaalde dingen doet, denk ik dat we die weerstand aardig hebben kunnen weerleggen en doorbreken.	1
C	Nee, niet direct, maar mogelijk wel indirect. Bijvoorbeeld, als er een training wordt georganiseerd, het eigenlijk allemaal flauwekul vindt, maar wel alles netjes volgt en na afloop van die training gewoon achterover leunt en blijven doen wat ze altijd al hebben gedaan. Dat gebeurt.	1
B	Ja, lage weerstand. Wel redelijk neutraal en ze zien het als een kans, we gaan het dus anders aanpakken. Er is dus weinig weerstand. Verder is het zo, dat er medewerkers zijn die het snel prima vinden. Dus over het algemeen is het zo, als er iets wordt bedacht of voorgesteld dat de medewerkers het snel prima vinden.	2
A	Vroeger stonden er twee drukkers, maar omdat je al relatief weinig drukkers hebt, is het lastig om dan ook eens twee drukkers te laten overwerken. Die tweede is alleen nodig, omdat één iemand niet alleen aan een machine mag staan. Dus iedereen van het kantoor hebben we laten intekenen op die lijst als tweede man. Dus in het weekend staat er één drukker en er staat altijd iemand van het kantoor erbij. Die kan dan niet aan de drukpers staan, maar kan dan gewoon zijn eigen werk in het weekend doen, maar die kan ook uitstralen naar de mensen dat de drukker er niet alleen voor staat, we doen het met zijn allen. Ja, die waarderen dat ja.	2

RELATIONSHIP – EMPLOYEES & INNOVATION		
ID	**QUOTATION**	**R**
B	Ja, want als er goede ideeën zijn, dan worden ze ook uitgevoerd.	1
B	Toen we zagen dat om het project tot een succes te maken, hebben we meer kennis in huis nodig, hebben we twee universitair opgeleide jongens aangenomen. Die zijn met nieuwe kennis binnengekomen en hebben hun kennis ook overgebracht aan de bestaande medewerkers op de RD afdeling. En vandaaruit is ook [Product X] een succesvolle product geworden	1
C	Iedereen die hier een goed idee heeft en die wil dat graag uitvoeren, krijgt daar tijd voor. En die kan er zelfs ook nog geld voor krijgen. Het grappige is dat eigenlijk veel te weinig gebeurt. Wat vertrouwd is - is fijn, al vind ik het niet leuk, het is bekend. In dit soort organisatie, is de angst voor het onbekende en de terughoudendheid voor het nieuwe is heel groot. Laat maar zoals het is, het is prima.	1
A	Ja, in onze strategie vonden we dat het gingen aanpassen, maar daarna hebben we de mensen er wel bij betrokken ‘’welk’’ systeem gaan we dan implementeren. Het is niet zo dat de verandering van het systeem door de mensen is gekomen. uiteindelijk zou zo’n opmerking voor de innovatie uit de mensen zelf moeten komen. Daar hebben we maar een paar mensen van in het bedrijf. Als ik zo zou moeten aanwijzen hoeveel mensen er innovatief meedenken, dan denk ik dat we op vier mensen zitten dus 10%.	1
A	Ja, in ieder geval, de leiding op de afdeling metaal (productie), wordt daar natuurlijk bij betrokken. Dat zijn de mensen die direct betrokken zijn bij het gebruik van deze machines, dus als het gaat om de specificaties van wat zo’n machine moet kunnen, dan maken we natuurlijk gebruik van de expertise van de leiding op de afdeling. En de inkoopproces vindt door de afdeling inkoop plaats en dat staat eigenlijk buiten de productie heen.	2

RELATIONSHIP – HRM & INNOVATION		
ID	**QUOTATION**	**R**
A	Daar is de webshop misschien een voorbeeld in. Vervolgens moesten we de site gaan vermarkten en gaan kijken hoe we daar marketing omheen gaan doen, zodat de klanten de site gaan vinden. En daar heb ik dan die jongen met de universitaire opleiding voor aangenomen. Dus dat is een stukje HRM, dat je bepaalt dat je die jongen gaat aannemen. Die heeft dat totaal aangepakt en uitgewerkt conform hoe wij het voor ogen hadden en daar ook echte resultaten mee geboekt. Hoe wij het meten is zijn omzet. We hebben breed bij hem neergelegd. Maar op meerdere gebieden dus dat we konden gaan meten en vaststellen.	1
B	Maar het merendeel van je personeel, bestaande mensen moet je ervoor zorgen dat die blijven meegaan en zich ontwikkelen voor innovatie en waar we naartoe willen. En iedereen moet op zijn manier en tempo in zijn functie toch die stappen gaan maken om te blijven ontwikkelen. Dat kan zijn door jezelf te trainen, door stage te lopen op een andere afdeling, kennis tot je te nemen.	1
B	En daarnaast, als het gaat om een praktische kennis, dan komen ze bij mij en kijken we welke opleiding geschikt is. Door er tijd voor de maken. Dat begint bij managers, door de managers daar tijd voor te geven. Maar ook de manager moet de medewerkers daar tijd voor te geven. De medewerkers kan bijvoorbeeld een presentatie geven aan collega's die die kennis nog niet beheersen. Of de tijd en ruimte te geven om met andere collega's van andere afdelingen mee te lopen of bezoek andere bedrijven, platforms om daar kennis op te halen.	1
B	Maar het kan ook zo zijn dat iemand vastloopt in zijn functioneren. Het kan zo zijn dat wij iets verwachten, maar dat het de medewerkers niet lukt en dat die zijn plafond heeft bereikt. Dat is het een kwestie van accepteren of tot een overeenkomst te komen om dan uit elkaar te gaan. Dat een medewerker zich op een andere gebied elders verder kan ontwikkelen en dat wij dan verder kunnen met een ander iemand.	1
C	Het wordt gestimuleerd in de zin dat één keer in de maand, zit die commissie bij elkaar en de directeur zit daar ook bij. Beste ideeën worden beloond, met een bon of attentie. We hebben ideeënbusje en daar zijn enige regelmaat ideeën geofferd, ook vanuit de productie om die productie soms makkelijker, aangenamer of sneller te maken. Er komen dus degelijk wel ideeën uit de werkvloer die leiden tot proces of productinnovaties.	1
B	Een HR afdeling moet ook blijven innoveren, want je moet bepaalde HR tools en systemen bedenken die ervoor zorgen dat je ontwikkeling van medewerkers zo goed mogelijk inzichtelijk maakt en houdt. Dus daarin ben je bezig met innovatie. Daarnaast, heb je werving en selectie. Dat je daarin ook goed kijkt, waar willen we als bedrijf naar toe? Als het op de innovatiekant is, dan heb je daar ook medewerkers voor nodig die daarin een grote rol kunnen spelen. Die zelf ook openstaan voor innovatie en die zelf ook innovatief zijn en zich daarin kunnen ontwikkelen. Daarvoor moet je dus eigenlijk aan poort al mee beginnen.	3

Appendix D – Interview transcripts (Dutch)

The interview transcripts are available by contacting the researcher or the supervisors of this master thesis.