"The employee as driver of digital innovation: a qualitative study"

The relation of HRM-practices and digital innovative work behavior in manufacturing companies

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1. Industry 4.0

About ten years ago, the concept of Industry 4.0 came up through a German cooperation of universities and companies. It was a program that aimed to develop advanced production systems that could increase the productivity and efficiency of the German industry (Kagerman, Helbig, Hellinger & Wahlster, 2013). Throughout the years, a lot of companies in various industries tried to implement digital innovations into their processes and have joint the advantages of Industry 4.0. Also Small and Medium Enterprises (SME's) see the advantages of the developments and want implement these innovations. Just as in the first three industrial stages, this stage also demands an evolution of the role of humans in the production process (Stock, Obenaus, Kunz & Kohl, 2018). As technology develops, employees need to develop too, in order to make the new technologies work in an efficient way. Some studies indicate that younger employees might be better in dealing with radical changes (Herrmann & Peine, 2011). Another study expected that the lack of employees' qualities and their fears and concerns regarding new technologies would be a challenge while implementing Industry 4.0, but had opposite results (Müller, Kiel & Voigt, 2018).

Employees are not only seen as barrier in an innovation process, but also as an important asset. Employee Driven Innovation (EDI) (Kesting & Ulhøi, 2010) is a concept that has gained attention in literature over the last ten years. Not only experts, but also ordinary employees should be part of the innovation process in order to implement innovations successfully (Tirabeni, Soderquist & Pisano, 2016). Several theories describe how companies can create the best circumstances for employees to engage in innovation processes and to be creative. One of them is the Abilities Motivation Opportunities (AMO) framework (Appelbaum et al., 2000). Cai and colleagues (2020) state that future research should address the topics of digitization and its impact on workplace creativity. Especially digital tools could have positive impact on human creativity, since these tools have made it much easier to share and discuss ideas with colleagues (Cai et al., 2020).

Given these studies, it can be stated that there are various contradictory views on what role employees play when a manufacturing company tries to implement Industry 4.0 innovations. On the one hand, employees could play a negative role in the implementation of Industry 4.0, since they might have a lack of expertise on new technologies and might have a negative attitude towards these innovations (Müller, Kiel & Voigt, 2018). During interviews it turned out that same employees with a long history of working for the company opposed digital innovations. On the other hand, employees could have a positive impact, since their creativity

and experience in practice can be of value in the innovation process (Tirabeni, Soderquist & Pisano, 2016). Several interviewees came up with examples of innovations that resulted from participating work floor employees in (parts of) the innovation process.

Companies need to be innovative to survive and are highly dependent on their employees' creativity (Korzynski et al., 2019). Janssen (2000) defined this employee role as innovative work behavior. That is idea creation, but also the introduction and application of ideas within a work role, group or organization. This study will take perspectives on innovative work behavior and apply them on the situation of digital innovations in the wave of industry 4.0.

The goal of this study will therefore be to find out how companies can influence the role their employees play when they try to implement industry 4.0 innovations in their processes. This leads to the following research question:

What factors affect digital innovative work behavior of employees through which medium sized manufacturing companies can adhere to Industry 4.0?

In order to answer this question several perspectives will be discussed regarding industry 4.0 and employee involvement in innovations in chapter 2. Three HRM-perspectives will be reviewed: the Abilities Motivation Opportunities-model (Appelbaum et al., 2000), Job Demand and Resources-model (Bakker & Demerouti, 2007) and Demand Control Support-model (Karasek & Theorell, 1990). There will be an elaborate review of HRM-practices resulting from these perspectives in chapter 3. Reward system, job demands and job control are the three main practices resulting from these perspectives.

Based on the abovementioned practices, 4 propositions will be proposed in chapter 3. Reward system is expected to have a positive impact on digital innovative work behavior, since it encourages employees to cooperate in innovation projects. Job demands is expected to have a positive impact on digital innovative work behavior. Job demands reduce the time and energy employees have to take part in innovation projects. Job control is expected to have a positive relation with digital innovative work behavior. When employees have authority to make decisions concerning their, they will have more opportunities to generate and implement ideas. On top of that, job control is expected to moderate the negative effects of job demands.

These propositions will be tested with qualitative research methods. The main concepts of the study will be operationalized in the methods chapter. This study uses a strategy as practice approach. This means that the intended strategy will be compared with the practice. The study

will be held at a medium sized manufacturing companies. Within this company employees from several layers in the hierarchy, from the general manager to operational employees, will be interviewed. This increases validity and is of extra value since the influence of digital innovative work behavior of employees is studied in this thesis.

In chapter 5, the interview results will be described and the propositions will be discussed. Finally, conclusions will be drawn in chapter 6. The theoretical and managerial implications will be discussed in this chapter. There will also be a reflection on this study in the final chapter.

2. Industry 4.0 and employee involvement

In this section, the research field of industry 4.0 and employee involvement in innovation will be discussed.

2.1. Industry 4.0

The focus of Industry 4.0 is on the establishment of intelligent products and production processes (Brettel et al., 2014). It is seen as the fourth industrial revolution that transformed the way we produce goods. The introduction of steam and water power, the introduction of electrification and the introduction of the digital computer were the three former revolutions. McKinsey (2015) defines Industry 4.0 as "*digitization of the manufacturing sector, with embedded sensors in virtually all product components and manufacturing equipment, ubiquitous cyberphysical systems, and analysis of all relevant data.*"

Industry 4.0 offers manufacturers opportunities to produce smarter and more efficient through the internet-based connected of people and machines. Via these technologies, industry 4.0 promises more profitable business models, higher efficiency and quality and better working conditions (Kagermann et al., 2013). Still, research shows that the realization of industry 4.0 is slow, this could be ascribed to unclear opportunities and challenges according to Kane and colleagues (2017). The abovementioned definition shows that Industry 4.0 consist of the digitization of as well products and processes, and thus Industry 4.0 is about a broad range of digital innovations in a manufacturing company. The alternations that the digitization of in the manufacturing process bring, require abilities from a manufacturing company and its employees. Industry 4.0 even changes the way people work, according to Stock et al. (2018). A socio-technical evolution of the human role in production systems is needed in this new industrial stage. All working activities in the value chain will be grounded in information and communication technologies (Frank, Dalenogare & Ayala, 2019). Based on the support of emerging technologies, employees will have to perform their activities in new ways (Stock et al., 2018). The abovementioned studies mainly emphasize the possible negative role of employees in implementing industry 4.0 practices. On the other hand, in the field of innovation science, lots of studies also acknowledged the value of employees in innovation processes (e.g. Korzynski et al., 2019 and Zejnilovic et al., 2012). The current study aims to explain the role of employees in the implementation of these digital innovations, and how the company could enhance the positive impact of employees on digital innovations.

2.2. Digital Innovative work behavior

The current study looks into digital innovations in the manufacturing sector and uses the industry 4.0 definition of McKinsey (2015): '*digitization of the manufacturing sector, with embedded sensors in virtually all product components and manufacturing equipment, ubiquitous cyberphysical systems, and analysis of all relevant data.*' Digital innovations are thus innovations that contribute to this digitization of the manufacturing sector. The definition of innovation that fits well for this study was formulated by West and Farr (1990): '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). Since the subject of the current study is the innovative behavior of employees, the operationalized definition must embed this. Janssen (2000) defines Innovative Work Behavior as 'the intentional creation, introduction and application of new ideas within a work role, group or organization, in order to benefit role performance, the group, or the organization.' Thus, Innovative Work Behavior is not only about idea creation, but also about the introduction and application of ideas. West and Farr (1990) distinguish process and product innovation. This study will focus on process innovation, since industry 4.0 is about the digitization of manufacturing, and not about the digitization of end products. Kok and Ligthart (2014) emphasize the importance of differentiating between radical and incremental innovation. This study focusses on both, since digital innovations in a manufacturing environment could be of both natures. During the interviews and the processing of the results, these differences are considered and will be described.

In the following section, the role of employees in digital innovations will be discussed.

3. Employee as challenge and opportunity

In this section, the possible relations between employees and the implementation of industry 4.0 will be elaborated on.

3.1. Employee Driven Innovation

In the 1980s business leaders realized that only being technology driven did not work. Failure rates approached 90 percent in the ICT industry (Ulwick, 2005). Companies started to adopt the principles of the customer driven approach. In the last decades many new practices have been introduced with the focus on the employee's creativity and the best ways to capture it. Employees can be seen as resources for idea generation. Practices range from the suggestion

box to the Idea Management Systems (Sandstrom & Bjork, 2010). Employees contributed mainly to incremental process innovations and were encouraged to share their ideas about how to change or improve methods, procedures and systems (Tirabeni, 2016). Still, in such systems employees only submit ideas. The implementation of these ideas will be done by 'experts'.

More recently, Open Innovation has come up, in which employees acquire ideas from beyond the company's boundaries and work in an open innovation process (Chesbrough, 2003). In an open innovation process, employees can have the role of 'idea scout' or 'idea connector'. At least, employees play a central role as connectors in an open innovation process (Whelan et al., 2011).

Employee-driven innovation (EDI) is going one step further. Employees take the initiative to develop, propose and implement the change (Høyrup et al., 2012). In the definition of Kesting and Ulhøi (2010, p.66) "employee-driven innovation (EDI) refers to the generation and implementation of significant new ideas, products, and processes originating from a single employee or the joint efforts of two or more employees who are not assigned to this task". The focus of this concept is on all the employees of a company.

One way of EDI is to conceive employees as users of product or service innovations. Also other forms, such as process innovations can be developed, proposed and implemented by employees (Tirabeni, 2016). According to Zejnilovic and colleagues (2012, p. 17), "the employee-user proposals are more likely to be turned into the firm's broader practice than other proposals are". Contributions by employee-users are not only process and product innovations, but also include new revenue generators (Zejnilovic et al., 2012). In order to have creative and innovative employees, companies must set right the circumstances.

3.2. Employee qualifications and attitudes

Industry 4.0 and the implementation of digital innovations bring all sorts of changes for employees. There will be less dependence on fixed workplaces and work schedules. That changes the nature of work in knowledge-intensive companies, but also in a manufacturing company (Bauer, Hämmerle, Schlund, & Vocke, 2015). One of the developments is transition from human-computer interaction towards human-computer cooperation. Such developments require new qualifications for employees in manufacturing environments (Bauer et al., 2015). Digital innovations give employees opportunities to regulate their own work, but will also mean that other qualifications are required, for instance in the field of media and social skills, but also technical skills (Bauer et al., 2015; Müller et al., 2018). The new techniques have several new required skills that come with it. Erol and colleagues (2016) performed a literature on the new

required competencies that employees in order to work in the Industry 4.0. They made a classification of the competencies into four categories: Personal, social, action-related and domain-related competencies.

Besides the qualifications employees need to use industry 4.0 innovations, they also have attitudes towards these innovations. Trust plays a role in the implementation of new online technologies (Gefen, 2000). Employees often concerns regarding data transparency and dependency and their workspace safety in human-machine interaction systems (Müller et al., 2018). On top of that, anxieties of users have also an effect on the decision to adopt a new technology (Bozionelos, 2004). These challenges of employee qualifications and employee acceptance were hypothesized by Müller and colleagues (2018) to have a negative effect on manufacturing companies' tendency to implement industry 4.0. Employees thus, were regarded to be a challenge when companies want to implement industry 4.0.

Employees play an important role in the success or failure of industry 4.0 implementation. In order implement digital innovations successfully, companies must find practices that let their employees have a positive impact on these innovation processes. Therefore delving into perspectives on the subject of the innovative impact of employees can be very useful for this study. In the following section perspectives that enable innovative work behavior are introduced and will be discussed. These are theories that see employees as opportunities for companies.

3.3. Perspectives for innovative employee behavior

The perspectives described below have been schematically analyzed. First the context of the perspectives is described, information about the origin shows how a perspective is a logic result of the findings of academics. Secondly, the practices involving the perspective are described. It shows how a company can benefit from the perspective in practice. Thirdly, the relation of the perspective with the specific subject of the current study is described. The perspective must offer practices that can benefit the implementation of digital innovations. Lastly, the perspectives' view on the tension between the companies espoused practices versus the experiences of the employees will be described. Since the current study dives into both the role of the employee and the company, it is important to consider that the intended practices of managers might not actually be experienced by the employees.

3.3.1. Abilities – Motivation – Opportunity

Context

The Abilities Motivation Opportunities (AMO) framework (Appelbaum et al., 2000) is a theory that aims at improving the behavior of employees. One of the key challenges for companies is to structure their employees' work to have the most innovative outcomes (Minbaeva, 2013). The AMO framework consists of 'basic concepts of psychology: Motivation – the impetus toward a behavior; Ability – skills and capabilities requisite to the performance of a behavior; and Opportunity – contextual and situational constraints relevant to the performance of the Behavior.' (Hughes, 2007) Motivation influences the behavior of an employee. That relationship is moderated by the abilities of the employee and the opportunities the employee gets. Figure 1 shows these relationships in a model (Hughes, 2007).

Figure 1
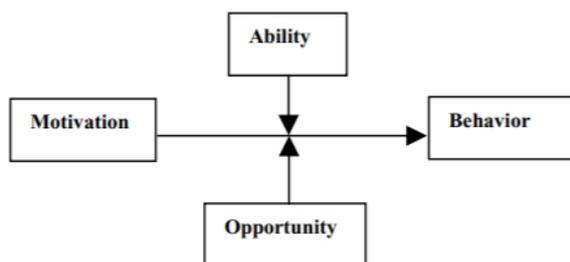
AMO Framework

Figure 1. AMO framework. (Hughes 2007)

Practices

The components of this framework all have practices a company could use to enhance the performance and be innovativeness of their employees. Regarding ability practices, Shalley and Gilson (2004) describe the abilities that have to be found to facilitate innovativeness. These are the ability to think creatively, generate alternatives, engage in divergent thinking and suspend judgment. Rigorous selection, extensive training and development are understood as ability-enhancing practices (Cai et al., 2020; Seeck et al., 2017).

Regarding motivation practices, Seeck and colleagues (2017) mention job content, achievability of goals, desirability of rewards and sense of fairness. These factors are influenced by performance management and compensation system. According to Cai and colleagues (2020), employees are motivated via a reward system, incentives and rewards, promotion, and relationships with supervisors.

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Regarding opportunity practices, 'flexible job design, teamwork, employee participation, organizational climate and culture for support, and information sharing empower employees to perform better' (Cai et al., 2020, p. 4). According to Seeck and colleagues (2017), opportunity can be seen as enabled autonomy. Also job design, workload and time have impact on the opportunities the employee has for innovation (Seeck et al., 2017)

Relation with digital innovation

The interest of this study is in the innovative behavior of the employee. Lots of studies about the relation of the AMO model and innovation were conducted, with often significant results (Seeck et al., 2017). Employee creativity mediates the relationships between certain HRM practices (hiring and selection, reward, job design and teamwork) and organizational innovation (Jiang et al., 2012). Employee creativity is behavior that is vital for future organizations in order to be innovative (Korzynski et al., 2019). The AMO framework can serve as the explanatory mechanism for how HRM influences innovation, since individual employees are the source of creative ideas and therefore innovation (Seeck et al., 2017). Cai and colleagues (2020) have developed a framework using AMO to predict employee creativity, their conceptual model is shown in figure 2. They concluded, based on their literature view on the combination of AMO theory and creativity, that ability-enhancing factors should be considered as a starting point of the AMO-creativity relationship, since those factors are personal predictors. Motivational-enhancing factors and opportunity-enhancing factors are the contextual predictors that interplay with the personal factors to explain the employee creativity at a company (Cai et al., 2020).
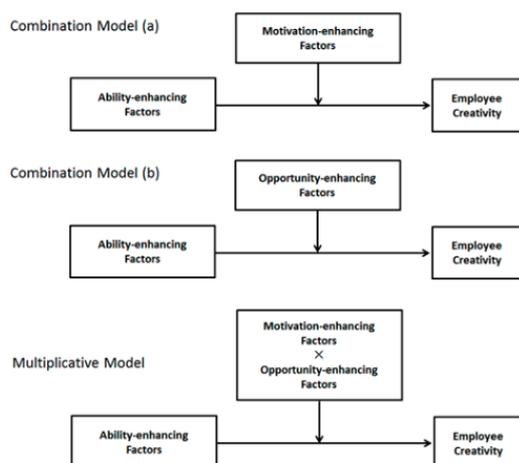

Figure 2. Combination and multiplicative models of AMO framework. (Cai et al., 2020)

3.3.2. Demand – Control – Support

Context

Another model in the literature that relates employees and innovation in the organization is the demand-control-support model (Karasek & Theorell, 1990). The model is part of psychological work environment research, but results in predictions for motivated and in some studies also creative employees. The model has built on the Job demand-control model, that holds two predictions. High job demand and low job control are both risk factors that could result in work stress and health issues. It also predicts that high job demand and high job control combined foster motivation and learning (Dhondt et al., 2014). The model was extended with the dimension of (social) support referring to the functional support an employee experiences from colleagues and supervisors.

Practices

The model consists of three dimensions: Job demands, job control and support. Job demands are usually quantitively operationalized as workload and time pressure (Häusser et al., 2010). Aspects of job demands are role conflicts as well as physical and emotional demands. Job control is about the authority to make decisions concerning the job, for example deciding when and how to execute tasks (Daniels et al., 2011). According to Häusser and colleagues (2010, p. 2), job control is subdivided in two major aspects: skill discretion and decision authority. Skill discretion is about 'a person's opportunity to use specific job skills in the working process'. Decision authority is similar to the job control definition of Daniels et al. (2011) and can be described as 'the extent to which a person is autonomous in task-related decisions, such as timing and method control' (Häusser et al., 2010, p. 2). Job control allows employees to apply their own knowledge to problems and to choose how they cope with problems. Employees can test alternative actions in tackling problems and learn what actions are effective or ineffective (Daniels, 2011). Daniels and colleagues (2011, p. 583) operationalized job control as 'the extent to which workers change aspects of their work activities to solve problems'.

Social support is the third dimension of the DCS model. It is defined as helpful interactions with others at work (Daniels et al., 2011). Social support allows collective discussion of problems and can be used for problem solving (Karasek & Theorell, 1990). Daniels and colleagues (2011, p. 583) operationalized social support as 'the extent to which workers discuss problems with others to solve problems'.

Relation with digital innovation

The relation between the DCS model and innovation is studied by Daniels and colleagues (2011). Innovation was divided in two components: idea generation and ideas implementation. They found that job control relates to the ideas generation of employees and that social support relates to ideas implementation. They used personal initiative as a mediator in such a way that the relation between job control or social support was higher for people 'high in personal initiative' (Daniels et al., 2011). The relations are represented in figure 3.
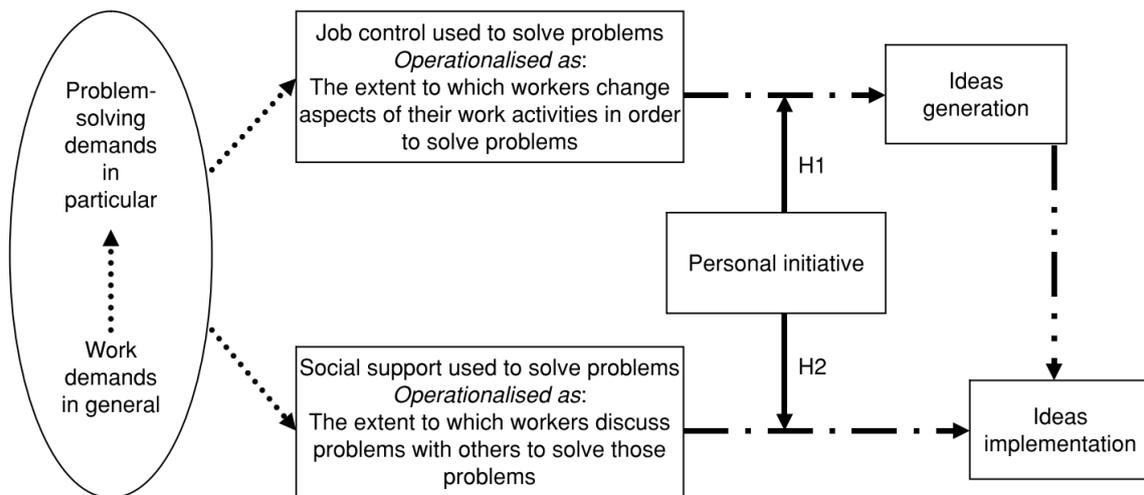
Figure 3. DCS model and innovation. (Daniels et al., 2011)

3.3.3. Job demand – resources

Context

A third model that relates employees and the innovation in the organization is the job demand – resources (JD-R) model. The research of employee engagement was expanded by Bakker and Demerouti (2007) by proposing their JD-R model. The model claims that decreasing job demands would help employees contrate on their jobs and minimizes moments of unproductivity. Employees would preserve energies and remain engaged when job or personal resources are increased (Kwon & Kim, 2020).

Practices

The model consists of two dimensions: job demands and resources. Job demands are often a hindrance, because it generally comes with strain. The demands refer to 'job-related characteristics that require significant physical and psychological investment' (Kwon & Kim, 2020, p. 2). Job demands are divided in hindrance demands and challenging demands. The demands hinder performance when they are overwhelming.

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Job resources are described at three levels: organizational, team and individual level. The organizational level refers to organizational practices and culture. The team level refers to leadership styles and interpersonal relationships at work. The individual level refers to personal resources and job characteristics (Kwon & Kim, 2020). The organizational and team level resources are attributes that 'positively influence an employee's work achievement, physical and psychological well-being, and learning and growth' (Kwon & Kim, p. 2). The individual refer to 'an individual's sense of his or her ability to successfully control and impact circumstances' (Kwon & Kim, 2020, p. 2).

In figure 4, the practices that come with these dimensions are shown.

Relation with digital innovation

Kwon and Kim (2020) relate the JD-R model, that usually aims for employee engagement, with innovation. The authors conclude that employee engagement has a positive relation with innovative behavior. There is next to a direct relation, also a relation mediated by coping. The used definition of coping is 'constantly changing cognitive and behavioral efforts designed to manage specific external and/or internal demands that are appraised as taxing or exceeding the resources of the person' (Lazarus & Folkman, 1984, p. 141).
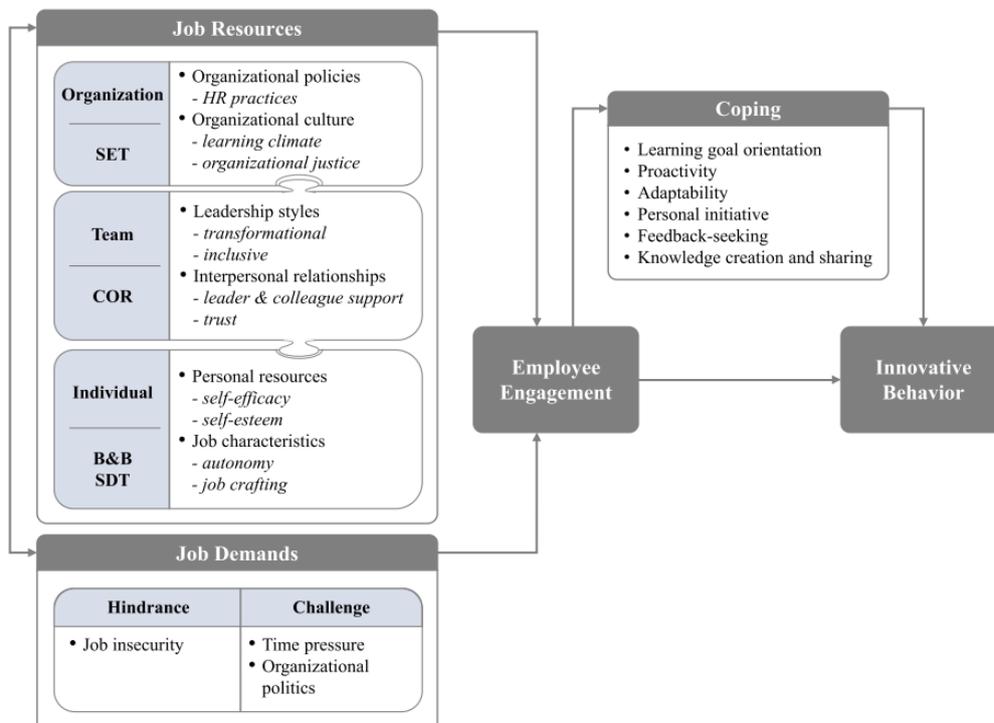
Figure 4 JD-R model and innovation. (Kwon & Kim, 2020)

3.4. Comparison of perspectives

An overview of the described perspectives is shown in table 1.

Model	Origin	Goal	Dimensions	Measures / practices
AMO	HRM	Explaining personnel performances via HRM practices	Ability-enhancing factors	Rigorous selection
				Training
			Motivation-enhancing factors	Performance management
				Compensation systems
				Relationships with supervisors
			Opportunity-enhancing factors	Flexible job design (autonomy)
				Involvement
				Teamwork
DCS	Psychological Research	Explaining the occurrence of mental strain in a workplace context	Job demand	Workload
				Time pressure
				Physical and emotional demands
			Job control	Skill discretion
				Decision authority
			Support	Helpful interactions
				Collective discussions
JD-R	HRM	Explaining organizational outcomes via motivation and strain	Job demands	Job insecurities
				Time pressure
				Organizational politics

		Job resources	Organizational policies
			Organizational culture
			Leadership styles
			Interpersonal relationships
			Personal resources
			Job characteristics

Table 1. Comparison of perspectives.

The perspectives have at first sight numerous similarities. They all use job design to influence the employee's behavior, in order to achieve better organizational (innovational) results. Interesting are some differences that raise questions.

3.4.1. Reward system

The AMO and JD-R model both incorporated forms of a reward system into their practices. Yet, this is no part of the DCS model. Häusser and colleagues (2010) do not even once mention the influence of any kind of reward systems in their article. In the AMO model, performance management and compensation system are important practices of motivation-enhancing factors. Practices like these express organizational respect to workers and motivate them to achieve desired job performance (Cai et al., 2020).

There is a debate on what the influence is of rewards on creativity. Some studies show a positive relationship (Eisenberger & Aselage, 2009), while other have found a negative relationship (Amabile, 1996). The argument for the negative relation between rewards and creativity is that rewards constrain individual cognitions and reduce self-interest to undermine creativity (Cai et al., 2020). The positive relation originates from the claim of researchers that rewards fulfill employees' need for competence, which supports their creative efforts (Eisenberger & Aselage, 2009). More specific, the authors use the dimension performance – reward expectancy as a predictor for self-determination and performance pressure. Those two dimensions lead to higher intrinsic interest and more creativity (Eisenberger & Aselage, 2009). In the JD-R model, effort-reward fairness is seen as an organizational level resource that makes employees trust in their future returns. Innovative behavior implies extra investments of employees regarding idea generation, promotion and realization. 'Perceptions that efforts are fairly rewarded by the organization free and motivate employees to transform higher job

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demands into IWB in order to cope with the heavy workload.' (Janssen, 2000, p. 290). In both models rewards can be seen as accelerator of innovative behavior. In the DCS model, only one side of the employee-employer relationship is viewed, namely the demands that the company have of an employee. The enablers of innovative behavior are intangible (e.g. interactions and discussions), not tangible like rewards.

It is interesting to figure the reward system – innovation relation out, since the several perspectives have different understandings of it. Based on the findings of Eisenberg and Aselage (2009) the following proposition is proposed:

Proposition 1: *The presence of a reward system for innovative behavior are positively related to digital innovative work behavior.*

3.4.2. Job demands

The third difference between the perspectives is job demand, which is incorporated in both the DCS model and the JD-R model, but which is not in the AMO model. As described in the previous section, in the DCS model job demands are operationalized as workload and time pressure (Häusser et al., 2010). In the JD-R model, job demands consists of hindrance and challenging demands. The challenging demands are similar to the operationalization in the DCS model. Time pressure and organizational politics are mentioned by Kwon and Kim (2020). On top of that, they add the hindrance demand of job insecurity. Job insecurity is a hindrance for employee engagement. Since innovation is an intensive, long-term endeavor, employees that experience job insecurity are expected to show less innovative behavior. The AMO model does not mention anything like job demands, the model focusses at enablers as motivation and opportunity enhancing factors. Challenges that have a negative relation towards innovative behavior are not described.

The dimension job demands could be an important dimension to add to the AMO model. Based on the findings described by Kwon and Kim (2020) the following proposition is proposed:

Proposition 2: *Job demands are negatively related to digital innovative work behavior.*

3.4.3. Control

The AMO and DCS model both stress the importance of control or autonomy, but the JD-R model does not take this into account. According to Bakker and Demerouti (2007), job

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control is only partly able to buffer the impact of job demands on employee wellbeing and therefore it is not part of their model.

In the operationalization of the JD-R model of Kwon and Kim (2020), autonomy is mentioned as a job characteristic that enhances employee engagement. Cai and colleagues (2020) mention job autonomy as an element of well-designed tasks in their description of the AMO model. Well-designed tasks nurture the problem-solving responsibilities of employees in order to inspire creativity (Cai et al., 2020). In the DCS model, job control receives the most attention, since it is one of the predictors of the model. Daniels and colleagues (2011) found that job control has a direct relation with idea generation. Autonomy, just as in the JD-R model, is closely related to job control in these perspectives and can be found as one of the decision authority practices of the DCS model. In the original introduction of the Demand-Control model, control was seen as a buffer that moderates the negative effect of high job demands (Karasek & Theorell, 1990). It is interesting to figure the job control – innovation relation out, since the several perspectives have different understandings of it. Based on the findings of the beforementioned studies the following propositions are formulated:

Proposition 3a: *Job control positively affects digital innovative work behavior.*
Proposition 3b (moderator): *Job control positively affects digital innovative work behavior in a situation of high job demands.*

3.4.4. Conceptual model

Based on the hypothesis proposed in the previous section, a conceptual model can be composed. The dimensions reward system and job control are expected to have a positive relation with digital innovative behavior of employees. The dimension job demands is expected to have a negative relation with innovative behavior of employees. This negative relation is expected to be buffered by moderator job control. The conceptual model is shown in figure 5. In the following chapter will be described how the propositions will be tested.
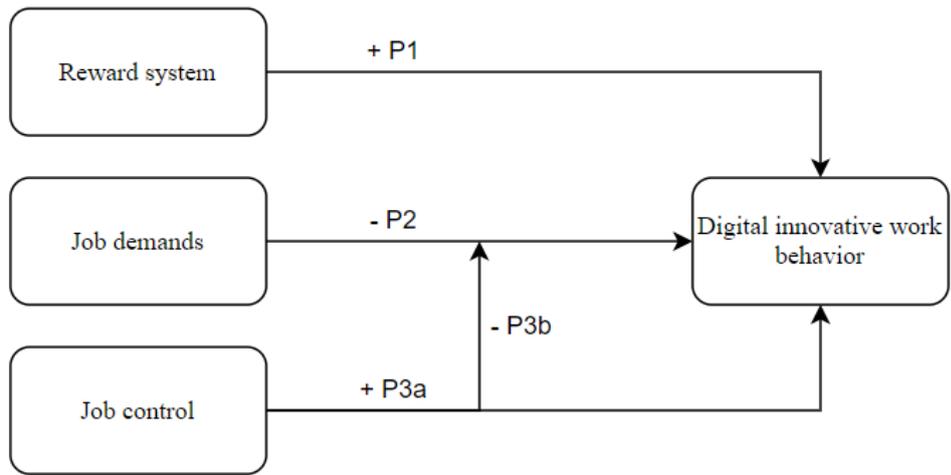
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Figure 5. Conceptual model.

4. Methods

In the previous chapters, the research design and a literature study on the main concepts were introduced. This chapter will discuss the methods that are used in this study. The chapter describes the research process and describes the methodology used for the qualitative research of the current study. The main concepts of this study will be operationalized and the analyses will be described.

4.1. Research process

This study aims to explore the relations between certain HRM-practices and digital innovative behavior of employees. The scope of the research is firms operating within the Dutch manufacturing sector. The interviews were held at one medium size manufacturing company active in the industry for indoor climate systems and energy constructions in buildings. In order to increase validity, the interviews were held with employees active in several layers of the company. That is of extra value since the digital innovative work behavior of employees is the subject of the study. This study uses the strategy as a practice perspective (Johnson, Langley, Melin & Whittington, 2007) and aims to exhibit what the grounds are for practices and how they are conceived by employees. For this purpose, individual semi-structured interviews will be performed. This research method allows to study the concepts qualitatively and have a deep dive in the relations between the concepts. Separated interviews with management and middle-management on one hand, and work floor employees on the other hand offer an opportunity to study whether the everyday experiences of employees resemble the intended practices of managers. This method is an application of the strategy as a practice perspective (Johnson, et al., 2007). The interviews will be fully transcribed and coded in Atlas.ti. Excel will be used to create tables consisting the most important quotes and codes from the interviews.

4.2. Methodology

The main purpose of the current study is gaining in-depth information in the relationship between employees and digital innovations in manufacturing firms. More specifically, the aim is finding out what the role is of several HRM practices to the digital innovative work behavior of employees. Studying documents and semi-structured interviews are used in order to gain this in-depth information. These sources of information were combined in order to apply triangulation and to increase internal validity and reliability. The documents were supplied by the management of the company and were treated with integrity. The documents gave a broad

overview of the current state of the company regarding the implementation of digital innovations.

Fourteen employees in several layers of a manufacturing firm were interviewed. In the management layer of the organization, interviews were held with the General Manager, Human Relations Manager, Manager Operations, Research and Development Manager and Product Manager. On work floor level interviews were held with Injection Mold Technicians, Process Engineers and Operators. These employees are working on the Injection Mold and several Assemblage departments. The distinction between employees from several departments was made to contribute to the internal validity and reliability of the study.

The interviews started with an introduction of the subject and practices of the study, followed by a combination predetermined and new questions. The interviews ended with a summary of the conversation. The interviews followed the structure of the following topics: 1) reward system and its relation with digital innovations, 2) job control and its relation with digital innovations, 3) job demands and its relation with digital innovations. All interviews were held at one manufacturing firm with around 150 employees, 100 employees working in the factory hall and 50 employees working in office. During the conversation, the interviewer made written notes and the interview was recorded to be transcribed and analyzed afterwards.

4.3. Operationalization, measures & scales

In this section, the main concepts of this study will be operationalized. The operationalized concepts were processed into an interview script in Excel, consisting a number of questions for any of the concepts. The interview script can be found in the appendix of this document.

4.3.1. Digital innovative work behavior

The current study looks into digital innovations in the manufacturing sector and uses the industry 4.0 definition of McKinsey (2015): '*digitization of the manufacturing sector, with embedded sensors in virtually all product components and manufacturing equipment, ubiquitous cyberphysical systems, and analysis of all relevant data.*' Digital innovations are thus innovations that contribute to this digitization of the manufacturing sector. Since the subject of the current study is the innovative behavior of employees, the operationalized definition must embed this. Janssen (2000) defines Innovative Work Behavior as 'the intentional creation, introduction and application of new ideas within a work role, group or organization, in order to benefit role performance, the group, or the organization.' Thus,

Innovative Work Behavior is not only about idea creation, but also about the introduction and application of ideas. During the interviews and the processing of the results, these aspects of innovations are considered and will be described. The questions to study digital innovative work behavior can be found in the interview script in the Appendix. One of the questions is 'From which department do ideas for digital innovations in the organization come?'

An example of digital innovative work behavior was given during an interview: 'From that role I increasingly came had to do with industry 4.0. Started with cobots, to get them into the company.'

4.3.2. Reward system

A positive Reward System is a facilitator of digital innovative work behavior in the conceptual model of this study. In the AMO model, performance management and compensation system are practices of motivation-enhancing factors. In the JD-R model, employees base their trust in future returns on effort-reward fairness. Both perspectives see rewards as an organization level resource. JD-R also emphasizes the factor of how employees experience rewards. In this study we look both into the intended reward practices of the company and the experiences of employees. 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, 2009). This definition will be used in this study. One of the questions was 'What HRM activities are carried out at your company? What does this mean for the Reward system in the company?'

A distinction between base pay and variable compensation and other employee benefits was made in the interviews. An example of a reward system was given in an interview: 'About four or five years ago, employees that worked overtime or worked on projects during the weekend, were rewarded with a weekend trip or a gift voucher.'

4.3.3. Job demands

Job demands is a barrier for digital innovative work behavior in the conceptual model of the current study. In the DCS model, high job demands combined with low job control result in stress and health issues. Daniels and others (2011) pointed out the relation of the DCS model with innovation. Also in the JDR model, job demands are a barrier for innovative behavior. For the current qualitative study, the definition of Kwon and Kim (2020) is well applicable: 'job-related characteristics that require significant physical and psychological investment'. This

definition takes as well physical and psychologic investments into account. Both could hinder employee engagement and the innovative behavior of employees. One of the questions is 'In the unit where you work, how do you describe the pressure of time under which the work is carried out?'

An example of job demands was given during an interview: 'Organize my time? I am being lived. I am a troubleshooter. I am working on one thing, but if a process goes wrong in the meantime, I have to go there.'

4.3.4. Job control

The demand-control-support perspective (Karasek & Theorell, 1990) uses job control to enhance innovation and to moderate the negative effect of demands as well. In this study job control is also used as a facilitator of digital innovative work behavior and as a moderator of the negative effect of job demands. The concept of job control is about the authority to make decisions concerning the job, for example deciding when and how to execute tasks (Daniels et al., 2011). According to Häusser and colleagues (2010, p. 2), job control is subdivided in two major aspects: skill discretion and decision authority. Skill discretion is about 'a person's opportunity to use specific job skills in the working process'. Decision authority is similar to the job control definition of Daniels et al. (2011) and can be described as 'the extent to which a person is autonomous in task-related decisions, such as timing and method control' (Häusser et al., 2010, p. 2). Daniels and colleagues (2011, p. 583) operationalized job control as 'the extent to which workers change aspects of their work activities to solve problems', that definition will be used in this study. One of the question is 'How do you describe the opportunity that the work offers to determine the method of working yourself?'

An example of job control was given during an interview: 'I decide for myself if I will continue with something, the freedom to do that is already something why I want to work here, that is worth a lot.'

4.4 Validity and reliability

The current study was only performed at one company, which results in issues with validity and reliability. Yet, the chosen company is representative for the industry since it is of medium size and in a typical stage of implementing digital innovations. In order to increase the validity and reliability several measures were taken. Triangulation was applied by combining studying documents and performing interviews with fourteen employees and managers in the company. Furthermore, the choice was made to interview employees from several layers of the

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company, in order to find out if work floor employees experience the same effects of practices as managers do. These measures make that the current study can result in a valid description of relations of the concepts. The reliability of the study was guaranteed through the use of interview scripts and the transcribing and coding of the interviews.

The results of the study performed as described in this methods section will be discussed in the next chapter.

5. Results

To bring insight on which and how HRM-practices are related to digital innovative work behavior of employees within industrial companies and how they are received by employees, qualitative research was conducted. Semi-structured interviews were held with 14 employees of a Dutch industrial company with about 150 employees. The company is active in the industry for indoor climate systems and energy constructions in buildings. Products are directly sold to contractors and are also available via wholesalers. Some steps towards industry 4.0 are already taken, such as the use of 3D-pinters and 'cobots' in the production process. Yet, these innovations are not yet widespread in the company. Many administrative actions are being done on paper and have not been digitized yet.

The interviewees were selected based on their role in the company and were divided into two groups. The same topics were discussed with all interviewees, but the emphasis of the interviews could differ. The first group were managers and middle-managers. Among them were the General Manager, HR-manager and R&D-manager, but also middle-managers responsible for a producing factory line. The focus of the interviews with the managers was to investigate what the *intended practices* were concerning digital innovative work behavior and the reward system, job control and job demands. The second group of interviewees consisted of working floor employees working on factory lines (operators) and specialists, such as injection mold technicians. The focus of the interviews with the working floor employees was to investigate what the *experiences* were concerning digital innovative work behavior and the reward system, job control and job demands. In the tables with interview quotes, IDs of employees' functions are shown. ID 1-7 are management employees, IDs of 8 and higher refer to work floor employees.

The interviews were completely transcribed and coded. For every concept of the study, two tables with ordered quotes were generated based on the codes. One table with managers' quotes and one table with working floor employees' quotes. In the following sections the studied company and its activities and the concepts of this study will be discussed. First a theoretical definition will be given, then the most important quotes will be discussed and finally conclusions will be drawn.

5.1 The case company

In order to place the results of this study in the correct circumstances, the company were this study was held will be described in this section. The company is a medium size company active in the industry for indoor climate systems and energy constructions in buildings. 200 employees are divided in 150 employees in the factory hall and 50 in offices. Across these workplaces, several managers and middle-managers are stated, they are not exclusively operating from offices. The goods are manufactured from a combination of raw materials and semi-finished products, several product lines are divided over the factory lines. Employees that work on these lines have simple and repetitive tasks, they are mainly unschooled.

Digitization and the implementation of digital innovations is one the main focus points for the company. The companies has the ambition to be one of the frontrunners in their industry. Concerning the use of cooperating robots and the use of 3D-pinters in the manufacturing process, they are a frontrunner in the industry. With regard to creating a smart or digital workplace, the company is a bit behind with their digitization steps. Lots of administrative tasks are still being done on paper and many work floor employees complain about the lack of investments in computers for these tasks.

Concluding, the company represents its industry since it is of a medium size and it is not in atypical stage of digitization. With regard to digitization, they are ahead in some fields, but behind their industry on other fields. Therefore the implementation of digital innovations is a hot topic in the company. Although this study was held at one company and is less generalizable, it can still be useful for other companies in the industry that want to address issues regarding digital innovations.

Furthermore, the fact that this study was held at one case company has some advantages. The company was studied thoroughly and a large number of employees were interviewed. Most importantly, these employees came from all layers in the organization. Therefore, this study gains rich insights in how work floor employees themselves experience their role in the innovation process. For organizations that aim to innovate bottom-up, it is key to consider the differences between the intentions and the experiences of their practices.

5.2. Reward System

In this section the results of the interviews regarding the reward system will be described. First the reward system of the case company will be described. Then, the intended practices of the managers and the experiences of the employees will be analyzed. Finally, some conclusions will be drawn on the proposition proposed in chapter 3.

Reward system was operationalized as '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, 2009). In order to look into the intended practices of the company that was studied, the managers and middle-managers were interviewed. There was no reward system for innovative work behavior in the company were this study was conducted, at the time of the interviews. There was a profit sharing arrangement, but this was the same for all employees and not dependent on behavior. In the past there had been a reward system for outstanding effort, employees received for instance a voucher of 125 euros.

Intended practice

Quote	ID	Open coding	#
Alles wat we bedenken is voor ons werk. Daar krijg je niks voor, ook niet bij een patent.	(2) Research & Development	Rewards don't result in innovation	2
Nee dat denk ik niet. Dat is een verkeerde drijfveer.			1
Ik geloof zelf niet in bijvoorbeeld verbeterideeën belonen enzo. Als ik beloon, beloon ik het team, want wat ik net zeg: dat Kaizensysteem is voor mij teamwork. Als ik een individu beloon geef ik het signaal dat het één belangrijker is dan het ander	(4) General Manager		3
Als ik kaartjes ge belonen loop ik ook het risico dat ik concurrentie krijg en dat mensen hun ideeën niet meer met elkaar delen. Ik kan me voorstellen dat ik een KPI zet op het aantal verbeterideeën en dat we na 100 verbeteringen iets leuks gaan doen. We gaan niet individuele kaartjes belonen.			2
Dat je te vroeg in een oplossing gaat denken, laten we eerst een patent aanvragen. Terwijl je eigenlijk bezig zou moeten zijn met of een heel goed product of heel goed een probleem dat vindt oplossen.	(2) Research & Development	Thinking in solutions too soon	3

Table 2. Reward system intended practices.

The interviewees, mainly in the managers' group, were questioned about their vision on reward systems and the current situation of absence of any reward system. The interviewees responded differently on the proposal of a reward system for innovative work behavior. Most employees with management functions emphasized that it would be at the expense of the team work. On top of that would it result in too many bad ideas and it would be the wrong incentive.

'I think it is the wrong incentive. (…) I do not know whether it is an honest motive. No, I do not think that it would help.'

'I personally do not believe in rewards and all that. If I reward someone, I reward the whole team, because what I just said: that Kaizen system is teamwork for me. When I reward an individual, I signal that one is more important than the other.'

In general, the shared view of employees with management functions was that a reward system has many disadvantages and that it would not result in more or better innovations. The intended practice was to trigger the intrinsic motivation of employees in all levels of the organization. If at all rewards would be given, then it would for a whole team or department and not for a single outstanding employee.

Experienced impact

Based on proposition 1 and the literature discussed in chapter 3, the availability of a reward system is expected to have a positive relation with digital innovative work behavior. The positive relation originates from the claim of researchers that rewards fulfill employees' need for competence, which supports their creative efforts (Eisenberger & Aselage, 2009). In the following table the most important quotes regarding the relation between reward system and digital innovative work behavior are shown.

Quote	ID	Open coding	#
De stimulans zit hem in een stukje autonomie. (…) Ik denk dat de autonomie de enige beloning is.	(8) Process engineer	Immaterial reward available	2
Aan de andere kant kun je beloningen zien als tijd en ruimte en mogelijkheden om allerlei werk gerelateerde beurzen te bezoeken of bedrijven die bekend staan als benchmark om daar te snuffelen en mensen te ontmoeten.	(3) Manager operations		2
Nee. Ik vraag me af of. Bij mij is dat in ieder geval niet zo, niet geld gedreven om te innoveren of daarmee bezig te zijn. Dat is puur interesses. (…) Het zal mij niet inspireren als ik meer geld zou krijgen en ik zou bezig zijn met een proces of product dat me niks lijkt.	(8) Process engineer	Rewards don't result in innovation	2
Maar goed ik heb wel eens verhalen uit het verleden gehoord dat mensen van productontwikkeling ideeën gingen vertellen aan mensen op de vloer en dan goed geld kregen. Dus ja, het is allemaal een beetje dubbel.	(11) Operator	Rewards have negative impact	2
Ja. Ja. Ik denk dat heel belangrijk is om dat wel te doen, ja. Want wat je merkt is de mensen die juist dat soort projecten en de energie daarin stoppen, dat zijn gedreven, enthousiaste, betrokken mensen. Als die hetzelfde beloond worden als mensen die net niet de kantjes er vanaf lopen.	(7) Manager operations	Rewards result in innovation	3
Ik denk zeker wel dat dat nut heeft, want dat stimuleert om ideeën in te brengen.	(10) Assemblage		2
Het spoort wel aan erover na te denken. Wat meer over na te denken	(11) Operator		1
Dat meer mensen met een idee komen	(12) Inboxter		1

Quote	ID	Open coding	#
Ja, nu houd je gauw je mond. Het heeft toch misschien geen nut denk je dan. Ik denk als je echt een idee hebt en het levert misschien wat op. Dan ga je dat wel eerder doen denk ik.	(13) Assemblage		2
Een kleine motivatie is dat ze uitrekenen, wat is de winst, daar kreeg je een deeltje van. Dat dat er niet meer is, daar worden mensen ook wel terughoudender van.	(9) Spray technician (workplace)	Too little reward is demotivating	1
Als er geen extra beloning is, waarom zou je dan een stap extra zetten	(8) Process engineer		2
Ik kan me voorstellen als iemand vind dat hij te weinig beloont wordt in financiële zin, dan denk ik dat je de motivatie niet hebt. Dat kom ik wel eens tegen hier.	(8) Process engineer		1
Ze vinden dat ze te weinig verdienen. Ik heb m'n geld al opgebracht, het is goed, ik naar huis.			1
Ik denk dat mensen niet meer zo snel met ideeën komen. Een kleine motivatie is dat ze uitrekenen, wat is de winst, daar kreeg je een deeltje van. Dat dat er niet meer is, daar worden mensen ook wel terughoudender van. (…) Als jij ergens geld mee kan verdienen, wees zelf eerlijk, dan zou je sneller met ideeën komen. Ook al slaat het nergens op. Ik denk dat dat de mens zelve is.	(9) Spray technician (workplace)		3
Ze brengen nu ook wel ideeën in. Maar het is zo prettig als dat misschien gewaardeerd wordt.	(10) Assemblage		2
Ja, nu houd je gauw je mond. Het heeft toch misschien geen nut denk je dan. Ik denk als je echt een idee hebt en het levert misschien wat op. Dan ga je dat wel eerder doen denk ik. (…) De mensen hebben toch gauw dollartekens in de ogen denk ik. Hahaha. Dat denk ik dan. Je hebt wel eens dat je denkt kunnen ze dat niet beter zo doen? Dat overleg je dan gewoon met de lijncoach. Dat gaan we dan proberen. Daar blijft het dan eigenlijk bij. Ik breng het niet verder. Je gaat gewoon zelf zo verder. Ja grote dingen dat moet dan wel natuurlijk. Ja je doet het niet. Ik weet ook eigenlijk niet waarom.	(13) Assemblage		3

Table 3. Reward system employee experiences.

The experiences, regarding the impact of a reward system, of the employees where very divergent. A good part of the interviewees stated that the motivation indeed was intrinsic for them and that the interesting subjects regarding digital innovation were motivating enough to show innovative work behavior.

On the contrary, employees closer the workplace did see benefits in a reward system. Very little incentive to come with innovative ideas was left since the abolition of a reward system. These employees experienced a lack of appreciation. The amount of reward would not be the issue, but the fact that taking an extra step is noticed would be of importance for them.

'If there is no reward, why would you take the extra step?'

'I can imagine if someone think he is not being sufficiently rewarder in a financial sense, that you do not have the motivation. I sometimes experience that around here.'

These quotes, and the ones in table 2 show that employees feel that is unfair to reward every employee the same, regardless how hard they work. That is particularly true for employees on the work floor and those close to the work floor. They see colleagues that cut the corners and do not feel motivated to take an extra step when they still get the same rewards. The general impression of the employees was that a reward system as itself could be a wrong and counterproductive incentive. Nevertheless, the absence of appreciation for employees that take the extra step could be a barrier for innovative work behavior of employees. Especially employees closer to the workplace mentioned that they encountered this barrier in the practice of the workplace. The following proposition was stated regarding a reward system:

Proposition 1: *The presence of rewards for innovative behavior are positively related to digital innovative work behavior.*

Regarding proposition 1, the results indicate that work floor employees are indeed motivated by rewards. A part of the workforce has intrinsic motivation to show digital innovative work behavior, but most employees are more likely to show innovative work behavior when there are rewards available for taking an extra step.

Furthermore, work floor employees emphasized the importance of the presence of any reward. The financial gains of a reward would be welcome, but the main function of rewards would be the gesture. In the current situation there was no distinction between employees that do or do not take an extra step. The presence of reward would show that the company really sees the benefits of bottom-up innovation. Also, the work floor employees would feel more appreciation and therefore be more likely to show digital innovative work behavior.

5.3 Job demands

In this section the results of the interviews regarding job demands will be described. First the reward system of the case company will be described. Then, the intended practices of the managers and the experiences of the employees will be analyzed. Finally, some conclusions will be drawn on the proposition proposed in chapter 3.

Job demands was operationalized in this study as 'job-related characteristics that require significant physical and psychological investment' (Kwon & Kim, 2020). A majority of the interviewees mentioned that the job demands were high in the company of the current study. In order to look into the intended practices of the company, the managers and middle-managers were interviewed.

Intended practices

Quote	ID	Open coding	#
Niet dat je vrij spel moet krijgen van het duurt een jaar langer, jammer dan. Je moet altijd wel met deadlines werken, maar wel reële deadlines.	(1) Process engineer	Reachable goals are necessary	1
Heeft dat te maken met haalbare deadlines? Het resultaat hangt daar ook misschien wel vanaf. --- Dat klopt.	(2) Process engineer		2
Want als je dat niet direct benoemt dan staat iedereen elke week vol ingepland en gebeurt er niks. Dus die structuur is ook nodig om dat dagdagelijkse te doorbreken. Om te zeggen nee we gaan iemand uitplannen en die krijgt uren om iets te doen met een projectgroep. Dus daar moet actief wat mee gebeuren.	(7) Manager operations	High demands result in less innovation	3
Ik denk dat het goed is, als mensen het gevoel hebben dat ze door de hoge werkdruk geen tijd hebben voor verbeteringen, dat daar vanuit de organisatie, het management, antwoord op gegeven wordt. (…) Daar zou het misschien helpen als de managers, zowel midden- als hoger management, als die de nadruk leggen op de lange termijn.	(5) Research & Development		1
Daar zou het misschien helpen als de managers, zowel midden- als hoger management, als die de nadruk leggen op de lange termijn.	(5) Research & Development	Long-term should have the upper hand	3
Want als je dat niet direct benoemt dan staat iedereen elke week vol ingepland en gebeurt er niks. Dus die structuur is ook nodig om dat dagdagelijkse te doorbreken. Om te zeggen nee we gaan iemand uitplannen en die krijgt uren om iets te doen met een projectgroep. Dus daar moet actief wat mee gebeuren.	(7) Manager operations		3

Table 4. Job demands intended practices.

The interviews turned out that there was some kind of consensus on the importance of this subject. The managers explained the need reachable goals to keep the work floor employees motivated to reach those goals. Also the relation of demands and innovation was mentioned.

'So that structure is also necessary to break through that day-to-day business. To say no, we are going to schedule someone who is given hours to do something with a project group. So something has to be done actively with that.'

'Not that you should be given free rein because it takes a year longer, too bad. You always have to work with deadlines, but realistic deadlines.'

The daily tasks should not demand all attention, according the managers and middle-managers, long-term planning was evenly important. The intended practice was therefore to work with reachable goals, to prevent high demands from blocking the innovation process.

Experienced impact

Based on proposition 1 and the literature discussed in chapter 3, job demands are expected to have a negative impact on digital innovative work behavior. Since innovation is an intensive, long-term endeavor, employees that experience job demands are expected to show less innovative behavior (Kwon & Kim, 2020). In the following table the most important quotes regarding the relation between job demands and digital innovative work behavior are shown.

Quote	ID	Open coding	#
De grotere structurelere verbeteringen, grote engineeringsprojecten, die sneeuwen onder op zo'n operationele afdeling. Daarom is Industrial engineering apart gezet, moet meer met langere termijn bezig zijn. Daar ontstond het gevaar van smart industry, dat dat ondersneeuwde omdat de waan van de dag de overhand heeft.	(2) Process engineer	Daily issues take the upper hand	2
Vandaag voert toch gauw de boventoon. (…) Ik kan de hele week vullen met kleine brandjes blussen.	(4) Product management NL & Technical department		2
Maar dat heeft ook te maken met dat je bezig bent met je eigen gedeelte van het werk zo goed mogelijk doen. Dan houd je meestal niet veel tijd over om over andere dingen na te denken. (…) Dat is heel belangrijk. Je kan heel druk bezig zijn met de waan van de dag. Maar als je niet innovatief bent, is dat toch een probleem.	(5) Research & Development		3
Die wordt groter naarmate ik hier langer werk. Ja. Is die te groot? Soms, ja. (…) Maar in het verleden hadden we meer vrijheid.	(1) Process engineer	High demands experienced	2
Nee, er is wel een hoge werkdruk. (…) Dat is een hele harde deadline voor die afdeling.	(2) Process engineer		2
Ik heb heel weinig tijd om zulke dingen te doen. (…) Die is gewoon wel hoog. Die is gewoon hoog.	(4) Product management NL		2
Mijn tijd indelen? Ik wordt geleefd. Ik ben troubleshooter. Ik ben hier aan sleutelen, als er tussentijds een proces in de soep loop, moet ik daar heen. (…) Ik vind dat de werkdruk bij iedereen wel erg hoog ligt bij iedereen bij Ubbink. (…) Ja, ik vind dat mensen op de afdeling ook wel een hoge werkdruk hebben in vergelijking met vroeger.	(6) Spray technician (workplace)		2

Quote	ID	Open coding	#
Ja, we hebben alle moeite om onze orders eruit te krijgen. Omdat we in de basis in het primaire proces een boel zaken missen om het gesmeerd te laten lopen. (…) Dat geeft werkdruk. Operationeel moet er veel gewerkt worden om orders eruit te krijgen. Omdat je in de basis de rust mist, heb je weinig tijd over om leuke dingen te doen.	(7) Manager operations		2
Werkdruk omdat je dan natuurlijk ook de kwaliteit in de gaten moet houden. Werkdruk geeft tempo en dan moet je ook zorgen dat er kwaliteit blijft. Dat is natuurlijk werkdruk.	(9) Assemblage		2
We hebben er nou overwerk bij. (…) Wij werken ook 's zondags nu. En vroege en late diensten	(12) Assemblage		2
Het is pittig nu. Dit houden we geen 2 weken vol denk ik.	(11) Inboxter Injection Mold		2
Door productiedruk, vraag, wordt er wel eens minder snel geïnnoveerd.	(1) Process engineer	High demands result in less innovation	3
Ja. Alleen op dit moment zit ik meer op het operationele dan het andere. Mijn agenda is erg druk. (…) Ja, een hele duidelijke link. Ja. Bij mijn vorige werkgever was er wel rust en stabiliteit waardoor je projecten, testjes en proeven kon doen.	(7) Manager operations		2
In ieder geval nou wel ja. Als het echt druk is zijn er andere dingen die voorrang krijgen en dan krijgt dat minder aandacht. Want je kunt maar met één ding tegelijk doen. Zo werkt het wel in de praktijk.	(9) Assemblage		2
Sommige projecten, ja, die lopen gewoon heel lang. Veel onderzoek voor nodig. Veel uitproberen. Sommige producten hebben wij ook machinetijd voor nodig om dingen uit te proberen. De machinetijd hebben op het moment gewoon niet. We zitten bommetje vol. (...) Maar goed, we krijgen af en toe wel de vraag van hoe staat het ervoor. Dan moet je toch elke keer weer uitleggen van ja we hebben nog niet ze heel veel kunnen doen, want het is gewoon te druk.	(10) Operator		3
Wij werken heel veel met uitzendkrachten. Alles staat een beetje op een laag pitje.	(12) Assemblage		1
Op dit moment is dat gewoon heel lastig, want wij zijn eigenlijk structureel onderbezet.	(11) Inboxter Injection Mold		1
Het wordt vervelender als je dingen niet af krijgt of dingen lopen niet goed af. Dan gaat de motivatie hard naar beneden, dan wordt de werkdruk wel een probleem. Het hangt van het resultaat af.	(2) Process engineer		3
Over het algemeen niet. Nee.	(1) Process engineer	Job demands are not too high	2
We willen ook best eens wat extra's ervoor doen. In de fabriek wordt veel overgewerkt, de directie ook. Dat is ook niet erg denk ik. (…) Ik denk niet dat het negatief is. Je hebt de lijst projecten gezien. Er wordt ook wel geïnvesteerd. We krijgen er een PM'er bij. Ze laten ons ook niet verzuipen.	(4) Product management NL		2
Voor mij persoonlijk voel ik ook niet meer werkdruk door de verantwoordelijkheid van mijn eigen welbevinden. (…) Als iemand iets vraagt, op een gegeven moment is het bakje vol. Je doet alles wat je eraan kunt doen. Maar goed, ik heb niet het idee dat ik hoge werkdruk heb.	(5) Research & Development		2

Table 5. Job demands employee experiences.

The experiences, regarding job demands, of the employees where largely consistent. Some of the management and middle-management employees did not see the job demands as too high, but other of that group experienced a growth in job demands. The work floor employees had the consensus that the experienced job demands were too high or at least very high.

'Anyway, we occasionally get the question of what the status is. Then you have to explain every time that we have not been able to do much yet, because it is just too busy.'
'Yes, a very clear link. Yes. At my previous employer there was peace and stability so that you could do projects, tests and trials.'

The following proposition was stated regarding job demands:
Proposition 2: *Job demands are negatively related to digital innovative work behavior.*

Regarding proposition 2, the results indicate that high demands result in less innovation, as was expected. Employees, throughout different layers in the organization, experienced high demands and also experienced the consequence of the high demands. Most employees mentioned that the high demands resulted in less innovation from the work floor. Especially work floor employees stated that innovation projects took much longer than necessary because of the high job demands. But also managers and middle-managers experienced the negative impact of the high job demands. All interviewees stated that high job demands resulted, therefore this negative impact does not only count for bottom-up innovation, but also for innovation in higher layers of the organization.

5.4 Job control

In this section the results of the interviews regarding job control will be described. First, the reward system of the case company will be described. Then, the intended practices of the managers and the experiences of the employees will be analyzed. Finally, there some conclusions will be drawn on the proposition proposed in chapter 3.

Job control is operationalized as 'the extent to which workers change aspects of their work activities to solve problems' (Daniels et al., 2011, p. 583). Most employees stated that there was a lot of autonomy in the organization where this study was conducted. Especially in management functions, employees stated that they have freedom to schedule their own time and to work on projects of their own choice. Also employees closer to the workplace had the freedom to use their time to take on innovative projects, but most did not use this freedom. In order to look into the intended practices of the company that was studied, the managers and middle-managers were interviewed.

Intended practice

Quote	ID	Open coding	R
Maar je hebt de verantwoordelijkheid er wat aan te doen. (...) Wat ik wilde zeggen is dat in die sessies een soort verantwoordelijkheid zat, als er aanwezig was. Om je eigen situatie te verbeteren of goed te houden. Dat je zelf leiding moet nemen om het op te lossen. Dus mopperen dat het niet goed gaat is daarmee ook niet meer terecht, dan moet je wat aan doen. Je krijgt alle tools.	(2) Research & Development	Job Control means responsibility	3
Dat is het creatieve stuk, die autonomie. Met dingen bezig zijn waar je niet meteen een toepassing voor hebt, maar waarvan je denkt dat zou wat kunnen zijn. Normaal bij een productiebedrijf 'dat zou wat kunnen zijn', dan heeft dat niet gauw prioriteit, dan zijn er wel hogere prioriteiten. Dingen onderzoeken, ontdekken of uitproberen, dat zie ik eigenlijk als autonomie. Als ruimte die er is om dingen te ontdekken.	(8) Process engineer	Job Control necessary for innovation	3
Dat is volgens mij wel nodig, die creativiteit om out-of-the-box te denken.	(8) Process engineer		1
Ik kan m'n hele dag vullen met brandjes en kleine dingen. Ik reserveer gewoon een bepaalde tijd voor (innovatie). (…) Maar als ik nooit aandacht aan overmorgen besteed, dan weet ik zeker dat we nooit komen waar we moeten komen. (…) Maar je wilt met morgen bezig zijn bij Product Management.	(1) Product management NL		3
Bijvoorbeeld Jochem zijn verhouding zit scheef, te veel met vandaag bezig. Bert heeft het net als ik, die laat zich niet gek maken. Je moet er ook het type persoon voor zijn. Als je je snel gek laat maken, dan moet je niet bij PM zitten.	(1) Product management NL		2
Van goh geef mij die 20 procent dan heb ik goede dingen.	(2) Research & Development		2
Zou moeten komen inderdaad. Wat je daarvoor nodig hebt is een stabiel geborgen proces in de basis. Dan zit het veel in leiderschap, wat maakt dat je beseft dat als je jouw afdeling verder wilt brengen, dat je naast de werkdruk van vandaag dat je met morgen bezig moet zijn. Je moet de mix maken	(3) Manager operations		2

tussen vandaag leveren en voldoende tijd investeren en de rust gunnen aan je team. De randvoorwaarden bieden om een stap te zetten richting toekomst. Ik denk dat het vanuit leidinggevende laag is dat die randvoorwaarden gecreëerd moeten worden. Het besef moet zijn bij een afdelingsleidinggevende dat de taak is om het team verder te brengen en wat daarmee gemoeid is.			
Dan moet je even een ander moment voor kiezen, dan heb je ook meer tijd en rust om dingen goed uit te zoeken en daarna uit te vogelen wat het beste is. Als je iets nieuws wilt doen of iets wilt verbeteren.	(10) Assemblage		2
Ik maak ze uiteindelijk verantwoordelijk voor hun eigen indeling van de functie. (…) Ik zal het altijd stimuleren, dat is eigen verantwoordelijkheid verder. Ik zie dat het vaak goed werkt. Dat is wel iets wat ze zelf aan moeten geven.	(1) Product management NL	There is much job control	3
Ja, die krijgen er wel tijd voor. Ik weet even niet hoeveel tijd. Het is meer van hoeveel tijd gunnen ze zichzelf en hoe frequent plannen ze die afspraken? Maar er wordt tijd voor vrijgemaakt, ook voor samenwerking met andere bedrijven. (…) Iedereen! Als iemand van de productievloer zegt ik wil graag een keer. In je introductiemap zit een label zoals voor een koffer. Stel iemand van de vloer zou een keer willen meedraaien bij Brilon op een afdeling, dan kan dat.	(4) General Manager		2

Table 6. Job control intended practices.

All management-layer employees fully agreed with each other that job control and autonomy are necessary for innovation. They stated that a good proportion of time should be available for all employees to work on innovative projects.

'Yes they get the time of for it. I don't know how much time. It's more a matter of how much time they allow themselves for it and how frequently they plan such appointments.'

There are always small tasks that need to be done on short-term, but job control is necessary to work on improvements on the long-term. To motivate work floor employees to take part in innovation projects, according to the managers, they have the freedom to schedule time free. For instance, new employees receive a suitcase label in their introduction papers. The label can be used to travel to other locations of the concern in order to gain new ideas. To lower barriers for sharing, there was since half a year a new tool for work floor employees to share their improvement ideas: a so-called LEAN cube. This tool was meant for all employees to share improvement ideas, from small working place improvements till large innovative ideas.

Experienced impact

Based on proposition 3a, 3b and the literature discussed in chapter 3, job control is expected to have a positive impact on digital innovative work behavior. On top of that, job control is also expected to moderate the negative impact of job demands on digital innovative

work behavior. In the following table the most important quotes regarding the relation between job demands and digital innovative work behavior are shown.

Quote	ID	Open coding	#
Ik denk dat het bedrijf er op zich achter staat dat die autonomie genomen kan worden. Alleen je moet erop aansturen dat de autonomie gevoeld wordt. Dat iemand de vrijheid voelt om aan te schuiven in een project of wat dan ook. Dat zie ik in mijn afdelingen veel te weinig terug. (...) Dus aan de kant is er de vrijheid er wel, maar we hebben nog geen mechanismen om vanuit een suggestiesysteem te komen tot projecten en die af te tikken. (...) Dus die ingrediënten die je nodig hebt om innovatief te zijn die zijn dus niet aanwezig vanaf de werkvloer op dit moment. (...) Tijd vrij plannen kun je gewoon. Je kunt ook een week vrij krijgen. Het zit er nog niet zo in, we weten die randvoorwaarden om innovatief te zijn niet goed beschikbaar te maken.	(3) Manager operations	Job control is not experienced	3
Ja daar mogen we tijd voor vrijmaken. Ja. Maar goed, zoals we zeiden op het moment is het zo druk, die dingen blijven nu vaak wel liggen.	(11) Operator		3
Dat wordt niet zo zwart op wit verteld maar dat voel je zelf wel aan. Dan moet je even een ander moment voor kiezen, dan heb je ook meer tijd en rust om dingen goed uit te zoeken en daarna uit te vogelen wat het beste is. Als je iets nieuws wilt doen of iets wilt verbeteren.	(10) Assemblage		3
Wij werken heel veel met uitzendkrachten. Alles staat een beetje op een laag pitje.	(13) Assemblage		1
Op dit moment is dat gewoon heel lastig, want wij zijn eigenlijk structureel onderbezet. (…) Nou, dat niet. Liever tussen de bedrijven door.	(12) Inboxter Injection Mold		1
Ik heb het helemaal nog niet meegemaakt.	(13) Assemblage		
Niet de tijd in te delen, we hebben wel vaste pauzetijden en begin- en eindtijden, daar heb je geen zeggenschap over. Dat is gewoon, dat staat vast. (…) Wat wij op de afdeling wel onderling zoveel mogelijk proberen te regelen is de machines ook in de pauzes door te laten lopen door elkaar af te lossen. Dus ja. Zo min mogelijk uren te verliezen	(11) Operator		2
Wat wij op de afdeling wel onderling zoveel mogelijk proberen te regelen is de machines ook in de pauzes door te laten lopen door elkaar af te lossen. Dus ja. Zo min mogelijk uren te verliezen	(11) Operator		2
Ja, als dat gewoon onder werktijd zou zijn, ja. Dan doe ik er daar gewoon aan mee.	(13) Assemblage	Job Control necessary for innovation	2
Maar als ik er de tijd voor zou krijgen. Als er genoeg personeel was dan wil ik gerust in een verbetergroepje.	(12) Inboxter Injection Mold		2
Ik kan m'n hele dag vullen met brandjes en kleine dingen. Ik reserveer gewoon een bepaalde tijd voor (innovatie).	(1) Product management NL	There is much job control	2
Als ik naar mezelf kijk heb ik een enorme vrijheid binnen het bedrijf, werk hier 12 jaar met plezier. Als ik een goed idee heb en ik kan het onderbouwen. (…) Als je die stap zet heb je enorm veel vrijheid en krijg je veel voor elkaar.	(7) Manager operations		2
De stimulans zit hem in een stukje autonomie. (…) Dus als er iemand is die denkt of zegt dat hij wel ideeën heeft, dan wordt er ook gezegd van 'ja, doe maar, want wij weten het ook niet'.	(8) Process engineer		2

Ik beslis zelf dat ik ergens mee verder ga, die vrijheid om dat te doen is al iets om hier te willen werken, dat is veel waard. (…) Ik kan m'n hele dag vullen met brandjes en kleine dingen. Ik reserveer gewoon een bepaalde tijd voor (innovatie).	(1) Product management NL	3
Voor zover ik weet: heel ver. (…) Eén van de uitkomsten is wel dat het in principe voor iedereen mogelijk is om er wat aan te doen. (…) Ik heb idee dat je in onze organisatie alle ruimte krijgt om aan te pakken wat je niet bevalt. Waar je verbetering ziet. Dat kan ik je eigen werkomgeving zijn of producten of processen die niet kloppen. Ik heb het idee dat die vrijheid er is.	(2) Research & Development	3
Nou daar krijgen we in ieder geval zeker medewerking voor.	(11) Operator	2

Table 7. Job control employee experiences.

With regard to the employee experiences, a different image is shown. A majority of the employees did not experience the intended job control. That certainly applies to most work floor employees. During the interviews they stated that they know of some of the possibilities to use time for innovation projects. They also viewed their company as workplace with a lot of job control, but a lot of them did not make use of it. Even though they would like to do so. The main reason given for this were the job demands, which was also be discussed in section 5.2.

Yes we can make time for that. Yes. Anyway, as we said at the moment it is so busy, those things often stay put.

I think that the company is committed to the opportunity of taking that autonomy. Only you have to make sure that the autonomy is felt. That someone feels the freedom to join a project or whatever. I don't see that much in my departments.

The following propositions were stated regarding job control:
Proposition 3a: *Job control positively affects digital innovative work behavior.*
Proposition 3b (moderator): *Job control positively affects digital innovative work behavior in a situation of high job demands.*

Regarding proposition 3a, the results of the interviews do not give a clear view. The employees did not unanimously agree whether there was a lot of job control or not. At least the intended practice was to involve all employees in innovation processes and to allow them to schedule parts of their time for innovation. In practice, not all employees felt the freedom to do so. Some of them did feel this job control, but mentioned that they needed to take this step actively by themselves. This job control situation results in the fact that a large amount of

employees do not participate in any part of the innovation process at all, which does not match the intended practice of the company.

Regarding proposition 3b, the results of the interviews indicate the opposite. Even though most employees indicated that they believe there is much job control at the company, most of them did not feel the freedom to utilize this job control. The main reason they gave was the job demands were very high. The results of the interviews consequently indicate that job control cannot moderate the negative effects of job demands. In fact, the opposite relation might be the case. The high job demands at the work place might moderate the positive effects of the high job control. Employees do mention that there is a lot of job control, but do not experience this due to the high job demands.

Furthermore, the discrepancies between the experiences of managers and employees are remarkable. Work floor employees experience less freedom to make use of job control than managers. At first sight, it seems that this comes from the different tasks they have, but in the interviews the managers stated that they also could fill entire days with day-to-day business. Another explanation for the discrepancies might be that the higher educated managers, have more abilities to overview their tasks and see the importance of long-term projects. This underpins the importance of the abilities component of the AMO-framework (Appelbaum et al., 2000).

5.5. Updated conceptual model

Based on the findings described in the previous sections, an updated conceptual model can be constructed. With regard to proposition 1, the results indicated that rewards for innovative behavior do indeed result in digital innovative work behavior. Employees experience a lack of appreciation when there are no rewards for taking part in innovation projects. This appreciation encourages the intrinsic motivation that some employees already have.

With regard to proposition 2, the results of this study indicate that job demands do result in less digital innovative work behavior. The high demands make that other tasks are prioritized and innovation projects are often delayed.

With regard to proposition 3a, the results of this study are ambiguous. Not all employees did experience the job control similarly. Most employees stated that the job control was necessary for innovation, some of them utilized this freedom and did show digital innovative work behavior. Others did not really feel the freedom to make use of the intended job control. Job control makes it easier to create a long-term vision and work bigger projects. In order to see the benefits and opportunities for such innovative projects on long-term, specific abilities might be necessary for the employees. With regard to proposition 3b, the results of this study do not support this proposition. The job control at the company did not moderate the negative effects of the high job demands. On the contrary, a fourth proposition can be added to the model: high job demands can moderate the positive effects of high job control on digital innovative work behavior. The results of this study indicate that high job demands work as a barrier for innovative work behavior, even when there is much job control. In the updated conceptual model are some keywords added for every proposition. The updated model is shown in figure 6.
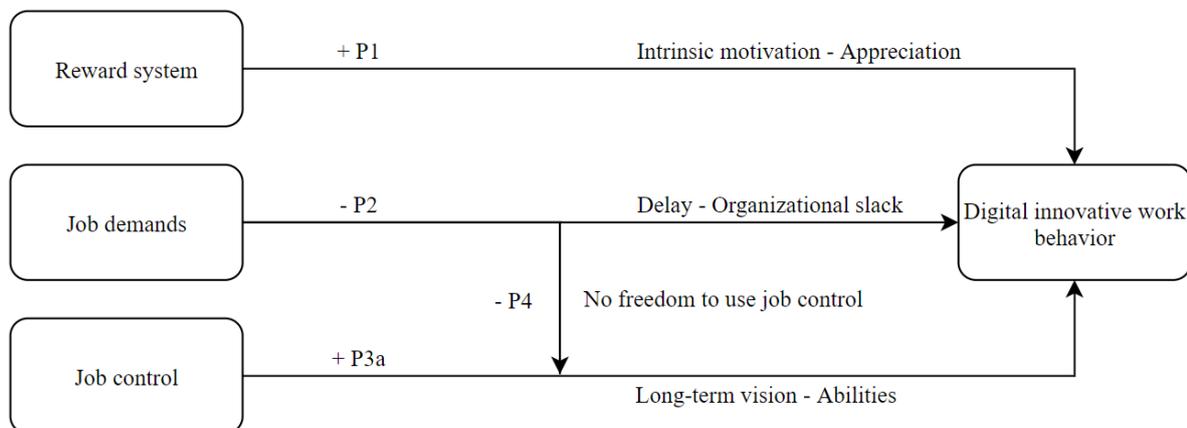

Figure 6. Updated conceptual model.

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6. Summary and discussion

In this chapter the results of this study will be discussed. Firstly, the conclusion regarding the concepts of the study will be described. Secondly the theoretical and practical implications of the conclusion will be discussed. Finally, there will be a reflection on this study.

6.1. Summary

This study explored the relation between several HRM-practices and digital innovative work behavior. There has been a long history in the research field of this subject, but since the digital era has changed the way people work and the way companies need to innovate (Stock et al., 2018), these principles might have changed. Several studies indicated that employees are becoming of more importance in innovation processes, especially for digital innovations. Müller and colleagues (2018) highlighted the importance of employees in Industry 4.0 and described it as challenges of employee qualifications and barriers of employee acceptance. The research question of this study was *What factors affect digital innovative work behavior of employees through which medium sized manufacturing companies can adhere to Industry 4.0?* In order to answer that question, literature was studied to find insights in this issue.

Three well-known HRM-perspectives for employee engagement and innovative behavior (AMO, DCS and JDR) were described in order to find out how they can enhance digital innovative work behavior. These perspectives were analyzed through a table describing the core elements and practices coming forth from the perspectives. Three overlapping practices HRM-practices were selected and resulted in an eclectic model. These practices were supposed to have a significant impact on digital innovative work behavior: reward system, job control and job demands. Based on these practices four propositions were proposed and a conceptual mode was drawn.

In order to draw conclusions on these propositions, interviews were held at a medium size manufacturing company in the industry for indoor climate systems and energy constructions in buildings. This company was one of the frontrunners regarding the use of cooperating robots and 3D-printers, but was lagging behind with the use digital instruments for administrative tasks on the work floor.

Two of the propositions seemed to be confirmed by the results of the interviews: Proposition 1 and Proposition 2. That means that the results of this study indicate that the presence of a reward system has a positive relation with digital innovative work behavior. The opposite counts for high job demands. The results indicate that high job demands has a negative

relation with digital innovative work behavior. Regarding proposition 3a, the results were not very clear. Interviewees did not fully agree whether or not they experienced high job control. Yet, they did agree that high job control was necessary for digital innovative work behavior. Regarding proposition 3b, the results of this study indicated that this supposed relation did not exist. Job control did not work as a moderator for the negative effects of job demands. On the contrary, job demands negatively moderated the positive relation of job control with digital innovative work behavior. This resulted in proposition 4: high job demands can moderate the positive effects of high job control on digital innovative work behavior. This result contradicts the implication of the Demand-Control model that predicts that high job demand and high job control combined foster motivation and learning (Dhondt et al., 2014).

In this study, the strategy as practice approach was used. Intended practices were compared with the actual experienced impact for work floor employees In the following sections the theoretical and managerial implications will be discussed, finally a reflection of this study will be given.

6.2. Theoretical implications

The current study supports the practices of a reward system, which originates from the AMO-model (Appelbaum et al., 2000) and JDR-model (Bakker & Demerouti, 2007). A reward system has a positive relation towards digital innovative work behavior. Also the general view on the practices regarding job demands, which originates from the DCS-model (Karasek & Theorell, 1990) and JDR-model are supported. The relation between job demands and job control, also originating from the DCS-model, was not supported. As Bakker and Demerouti already argued in their study, job control was not, or only partially able to moderate the effects of job demands. On the contrary, the results of the current study indicate that job demands can negatively moderate the positive effects of job control on digital innovative work behavior. This unexpected result that contradicts one of the implications of the Demand-Control is work for further research. Researchers can ask the question in which layer of the organization job control can really moderate the negative effects of job demands.

Intended practices and the experienced impact of these practices were compared during this study. This resulted in an number of relevant discrepancies between these intentions and experiences. Regarding job control, employees espoused that they experienced job control, in accordance with the intended practice. Yet, work floor employees did not feel the freedom to make use of this job control. This means that there was a discrepancy between the intended practice and experiences. Still, the interviewed managers did experience the job control

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themselves and were not aware of the experiences of the work floor employees. When practices do not results the desired outcomes, managers are inclined to try find other practices. The current study shows that investigating whether or not the practice is fully implemented could be a solution as well. If companies can repair the discrepancies between intended practices and experienced impact, they will be able to enhance digital innovative work behavior through a reward system, low job demands and high job control.

Literature on internal communication could help to solve the issue of intended practices versus experienced impact. Wilson and Irvine (2013) showed that bottom-up approaches have more impact on behavior than top-down communication. A bottom-up approach helps creating an environment where employees discuss issues with like-minded individuals instead of having managers explaining new practices to them. Further research could ask the question how to implement such a communication approach regarding innovation subjects, that might be new to employees.

Another issue that arose during this study is the need for the right abilities to make use of job control. According to the DCS model (Karasek & Theorell, 1990), employees with high job control are more likely to contribute to idea generation and idea implementation. However, in this study it appeared that there was a difference between work floor employees and managers in how they made use of job control. In order to make use of job control and contribute to bigger innovation projects, certain abilities to overview the long term effects are necessary. Here the AMO model (Appelbaum et al., 2000) comes to mind. Opportunity in the AMO model relates to job control. AMO model adds abilities to this. Future research should take the ability dimension into account, when studying the DCS model.

Future research could study how digital innovations are different to other innovations when it comes to bottom-up innovating. As many employees stated during the interviews, digital innovations are everywhere, also in their private lives. Since employees will use digital devices all day long in their private lives, it is much easier for them to understand and apply these innovations, compared with technical innovations of machines work processes. Therefore are digital innovations perfectly suitable for bottom-up innovations.

6.3. Managerial implications

This study has also some practical implications that could help managers to make more use of the knowledge and skills among their employees regarding digital innovations. The results of this study indicate that rewards and job control can help to motivate employees to show digital innovative work behavior. Both of these practices, of course, come at a cost.

Regarding rewards, this study indicates that employees seem not to care a lot about the numbers, but mostly they appreciate the gesture. For work floor employees, it is important that managers notice it when take the extra step compared with a colleague. Small rewards would result in employees having more motivation to show digital innovative work behavior. What already work well for the case company is the fact that employees see it as a reward that they are allowed to take time for innovations and have their intrinsic motivation triggered.

Regarding job control, it might be very expensive for companies to give their employees time off to work on innovation projects. Still employees experience this as an important facilitator of innovative work behavior, but companies will have to figure out whether this is profitable in their specific situation. This study has indicated that job demands are a main barrier for digital innovative work behavior. Managers need to take into account that job demands can also frustrate their positive efforts regarding job control. If managers really want their work floor employees to use time for innovation projects, they need to make them feel free to take this time. If job demands remain very high over a period, employees will not feel the freedom to make use of the offered job control. In order to make employees feel this freedom, one of the best practices is to give employees more responsibilities. De Sitter and colleagues (1997) call for a shift 'From complex organizations with simple jobs to simple organizations with complex jobs'. That would mean that work floor employees would have more control over their work. One of the positive consequences of this would be more involvement in innovation processes.

6.4. Limitations and reflection

In this section, there will be reflected on this study and limitations will be discussed. In the literature study, only scientific articles from peer-reviewed journals were used. The interview script used during the interviews is attached and can be found in the appendix. As far as possible, the question originated from studies in peer-reviewed journals that studied the same practices. All data gained in the interviews was treated carefully, confidentially and anonymous. The interests of all parties were guaranteed. The audio records and notes of the interviews were solely used purposes of this research, its analyses and for the elaboration this paper. Committing to these agreements and treating information with integrity contributed to the mutual trust and the openness of the interviews. This method contributed to the validity and reliability of the study.

This study was executed in 2020, during the Covid-19 pandemic. Due to this pandemic, it was very hard to find companies willing to invest time in interviews and open up their factory halls to an outsider. This, jointly with the opportunity of a work floor – management comparison

approach, was a reason for choosing to held the interviews at one company. Due to this single company, it is harder to generalize the findings of this study on other situations. Still, the attempt was made to offer insights in how the relation of the HRM-practices were with digital work behavior. The case company was as far as possible representative for its industry. It was of a medium size and the issue of digital innovations was a current subject in the company. This resulted in some interesting results, that can be useful for managers and companies and that can result in some further research.

Performing the case study at a single company also had significant advantages. It was possible to hold fourteen interviews with employees across all layers in the organization. This resulted in rich insights in the discrepancies between the intended practices and the experienced impact of these practices. Also regarding these experiences there were considerable differences between work floor employees and managers. Comparing employees from different layers of the organization increased the reliability of the study. This way of working finally resulted in interesting results.

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Appendices

Appendix 1 – Interview script

Thema	*Open hoofdvragen uitgeschreven; specifieke doorvragingen alleen steekwoorden*	*geschatte tijd*
Intro	Stel je zelf voor, student Radboud Universiteit ; Doel van het onderzoek (neutraal geformuleerd)	5 minuten
	Vraag toestemming voor opname interview; alleen voor transcriptie, geheel anoniem en niet identificeerbaar rapporteren (bv machinebedrijf X) gesprek van +/- een uur; Vragen vooraf?	
Oriënterende vragen respondent, bedrijf	Wie bent u en wat is uw rol binnen het bedrijf? (functie, ervaring algemeen, binnen bedrijf)	5 minuten
	Wat voor bedrijf is uw bedrijf ? (grootte, hoofdprodukt(en)?; Aanvullende diensten? Bedrijfstak?)	
	Ondernemingsstrategie: Wat probeert uw bedrijf vooral te bereiken in de komende 5 jaar? Binnen welke markt(en) opereert uw bedrijf vooral? Welke kernactiviteiten worden uitgevoerd, wat onderscheidt bedrijf van andere bedrijven?	
	Op welke manieren bent u betrokken bij innovatie activiteiten in uw bedrijf ? (productie?, productontwikkeling? Innovatiestrategie? Focus op werkzaamheden/ activiteiten)	
innovatie in Proces Technologie	vooraf gegaan door neutrale inleiding nieuw onderwerp (MBT DIGITALE INNOVATIE)	10 minuten
	Welke vernieuwingen/ verbeteringen zijn er in de afgelopen tijd door gevoerd in de productie (bijv. machines, installaties, gereedschappen) in uw bedrijf? (vooral productie!, marketing/verkoop, O&O, imago, design, product/ aanvullende diensten)?	
	Wat vormt vooral aanleiding tot het invoeren van deze veranderingen ? (aanbod leveranciers, verandering product; marktvraag; ondernemingsstrategie; suggesties personeel/ concurrenten; voorbeelden?)	
	Hoe komen deze innovaties in de productie tot stand? (eigen onderzoek & ontwikkeling? Welke functies/ afdelingen zijn op welke manier bij betrokken? Externe partijen?	
eigen suggesties?		
innovatie in Proces Organisatie	vooraf gegaan door neutrale inleiding nieuw onderwerp (MBT DIGITALE INNOVATIE)	10 minuten
	Welke vernieuwingen/ verbeteringen zijn er in de afgelopen tijd door gevoerd in de werkprocessen (taken/ functies, procedures, procesorganisatie, management) in uw bedrijf? (vooral productie!, marketing/verkoop, O&O, logistiek, dienstverlening)?	
	Wat vormt vooral aanleiding tot het invoeren van deze veranderingen ? (aanbod leveranciers, verandering product; marktvraag;, ondernemingsstrategie; suggesties personeel/ concurrenten; voorbeelden?)	

Thema	Open hoofdvragen uitgeschreven; specifieke doorvragingen alleen steekwoorden	geschatte tijd
	Hoe komen deze innovaties in de werkorganisatie tot stand? (eigen onderzoek & ontwikkeling? Welke functies/ afdelingen zijn op welke manier bij betrokken? Externe partijen, consultants (hoe, waarom)?	
eigen suggesties?		
Rewards - demands - control	vooraf gegaan door neutrale inleiding nieuw onderwerp	10 minuten
	Welke activiteiten worden er bij uw bedrijf uitgevoerd inzake HRM? Wat betekent Rewards / Demands / Control voor uw bedrijf? (Welke functies/ afdelingen zijn op welke manier hierbij betrokken?)	
	Wat is van (1) BELONINGEN / (2) Demands / (3) autonomie van belang voor uw bedrijf? Waarom? (bedrijfsstrategie, bedrijfseconomische overwegingen, afstemming betrokken partijen?)	
	DEMANDS In the unit where I work, work is carried out under pressure of time. Physical demands Emotional demands (aggressive clients)	
	CONTROL. The opportunity that the work offers to deter-mine the method of working yourself."	
	Welke andere zaken/ ontwikkelingen spelen nog een rol in Digital Innovative Work Behavior ?	
aanvullende suggesties?		
Invloed Rewards / Demands / Control op procesinnovaties (Beloningen, demands en autonomie)	vooraf gegaan door neutrale inleiding nieuw onderwerp	10 minuten
impact	Op welke manieren beïnvloedt Rewards / Demands / Control de vernieuwingen in de productie (bijv. machines, installaties, gereedschappen) ? (voorbeelden, activiteiten, ondersteuning, hindernissen, risico's)?	
impact	Op welke manieren beïnvloedt Rewards / Demands / Control de vernieuwingen in werkprocessen (taken/ functies, procedures, procesorganisatie, management) ? (voorbeelden, activiteiten, ondersteuning, hindernissen, risico's)?	
impact	Op welke wijze werkt Rewards / Demands / Control door op het afstemmen van vernieuwingen in productiesystemen en de werkprocessen ? (voorbeelden, activiteiten, ondersteuning, hindernissen, risico's)?	
eigen suggesties?		
Outro	vriendelijk bedankt! Afspraken herhalen en bevestigen (anonimiteit) Ontvangen van eindverslag ?	5 minuten