MASTER

Determining what resources are required to stimulate employees' willingness and ability to work with robots

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Determining what resources are required to stimulate employees’ willingness and ability to work with robots

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Management Summary

This thesis has researched what resources are required to stimulate employees’ willingness and ability to work with robots. A spike in development has taken place in the robotics field, with robots increasing productivity drastically and companies needing to automate in order to stay competitive. Organizations will need to facilitate employees in the process of robotization, because successful cooperation will lead to the most beneficial effects for both employees and companies. However, research has been limited. This thesis uses the Job-Demands Resources model to give possible directions in finding resources that an organization can provide to boost the ability and willingness of employees to work in a specific setting. The research question is: ‘’What resources can organizations provide in order to make employees able and willing to cooperate with robots to improve work performance?’’

In order to answer this question, an exploratory study was conducted for which qualitative interviews were used. This helped uncover more aspects which were not covered as much in current literature on robotization. Further, this thesis examined a sample of warehouse employees from different organizations within the Dutch logistics industry, varying in size and level of robotization. The logistics industry is very relevant in the robotization-era, since it is currently experiencing a staggering growth in its implementation. Data was collected by means of conducting semi-structured interviews with the employees of these different logistical organizations who deal with/have dealt with the implementation of robotization in the work place. After this, the data was analysed via different rounds of coding using nVivo 12.0.

The result of the exploratory study was the discovery of the themes job security, quality of the interaction between human and robot, training, participation, task variety and job autonomy. Job security was found to be an important factor in determining how employees accept their work. However, no (strong) link to the willingness of employees to embrace robotization was found. Quality of the interaction between human and robot had been found to determine willingness of employees to embrace robotization. In this, it was referred to successful interactions (robot doing exactly what human wants) and the positive effect this has. Further, proper training is the most important determinant of employees’ ability to deal with robotization. Receiving proper training has not always been the case in the sample, and it should be clear from the start what exactly is being expected from employees with regards to robotization. Participation in decision making was found as a resource of employees’ willingness to embrace robotization. In this, voicing is suggested as a tool to help employees speak up and give suggestions regarding the implementation of the robots. Finally, task variety and job autonomy were found as aspects relating to willingness and ability to embrace robotization. However, for both, no strong link was found to either aspect.

Practitioners can use the results of the thesis to make more conscious decisions regarding robotization and its effects on employees. This, through the means of distinguishing what resources and guidelines must be followed in order to improve employees’ willingness and ability to embrace robotization. The logistics sector is where the results of the thesis will be most relevant, considering that this is where the case study took place. A couple of limitations were the subjectivity of the exploratory study method, the limited data sample and the testing of the effectiveness of the suggestions made. In order to test the effectiveness of the concept as a whole and its components, future empirical research using a more deductive approach is necessary.
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1. Introduction

Robotics is something that has had a huge impact, not only on the world’s economy, but also on society as a whole (Rossiter, 2017). Over the course of history, humans have constantly tried to seek for substitutes of themselves which are able to mimic their behaviour with regards to their various types of interaction with the environment surrounding them. These have been led from economic, social, scientific and even philosophical principles (Siciliano et al., 2010). Especially in the last decade or two, a spike in the development of this field has taken place.

Digital technologies have become really good at ‘’human’’ jobs in this period of time, such as providing customer service, translating languages, diagnosing diseases and many more (Wilson & Daugherty, 2018). Additionally, recent trends in the development of industrial robots show that employees will almost certainly have to co-exist with robots. This is due to robots increasing productivity drastically and companies needing to automate in order to stay competitive (International Federation of Robotics, 2017).

With companies needing to automate and making use of robotics, employees will have to deal with this change in working environment. As a result, a significant organizational change takes place. Organizations should and can only exert change with support from its members (Judge et. al, 1999) and will only be successful when the individuals which are influenced alter their behaviour on-the-job in the appropriate manner (Choi, 2011). It is said to be impossible to change as an organization unless employees change- they must act differently in the sense that they should be both willing and able to embrace this change (Woodman & Dewett, 2004).

However, a common reaction amongst employees towards robotization is that of experiencing fear for their future employment (You & Robert, 2018). In turn, this job insecurity negatively influences the willingness to embrace this technological change. Furthermore, robotization often results in employees being handed more complex tasks in which a different skill set is required. This,
in turn, can negatively influence the ability of employees to work with the newly introduced robots (Wilson & Daugherty, 2018). These are a number of reasons why people might tend to resist this type of change caused by robotization. By resisting, employees are both less committed to the organization and less willing to dedicate effort towards the organization’s success (Meyer et al., 1989), and thus being detrimental to their work performance (Jones & Van De Ven, 2016).

Organizations will need to facilitate employees in the process of robotization for of a number of reasons. First of all, it will need both employees and robots in operation, because while a digital ‘team member’ in the form of a technology system or robot may be programmed to perform certain tasks, it is essential for the human team member(s) to coordinate the tasks to be performed together accordingly in order to ensure successful deployment (Fryman & Matthias, 2012). Secondly, most significant improvements in performance and thus revenue can be seen when robotic systems and humans work together in a successful manner (International Federation of Robotics, 2018).

However, literature on this topic has been limited. The Job-Demands Resources model may provide perspectives on this, because it can possibly give directions in finding resources that an organization can provide to boost the ability and willingness of employees to work in a specific setting (Bakker & Demerouti, 2007). The JD-R model can thus provide a relevant perspective on how to deal with the potential job demands as imposed by robotization. Therefore, the research question is: What resources can organizations provide in order to make employees able and willing to cooperate with robots to improve work performance?

The purpose of this thesis is to conduct a qualitative study of an exploratory nature to understand how companies can implement robotization while considering the willingness and ability of employee to cope with the change. Data will be gathered amongst employees of warehouses working in various logistics companies in the Netherlands, mainly at the middle and low-levels in the organization. This can be seen as the proper target group, considering that they will be impacted by
robotization the most (Frey & Osborne, 2013). This industry is considered, since it is currently experiencing a staggering growth in robotics (Bonkenburg, 2016) and has a lack of labour power (Sparkman, 2018). Especially lack of labour power is currently the biggest motivation for implementation of automatized production lines and robotic workplaces (Mikušová, 2017).

Organizations can take advantage of this knowledge, due to the fact that if employees are happy with their job and they feel supported, ultimately the organization will be repaid in different ways. Improved happiness on the work floor and work performance are a number of these ways (Fisher, 2010). However, in the end, work performance will be what matters most to companies.

In the remaining part of this thesis, the effects of robotization on the work floor are discussed to great extent with the use of existing literature. An exploratory field study is held in order to gain more insight in this topic and address the research gap identified in the methodology section. Qualitative interviews will be used for this. Consequently, the results are discussed. New additions to existing literature are provided, together with suggestions for further research in the discussion.
2. Literature Review

2.1 What is meant by robotization and semi-autonomous machines

The term ‘robot’ was first used as a term to describe artificial automata in a play of the Czech writer Karel Čapek, in 1920 (Kurfess, 2004). The word robot was not new though, being around in the Slavic language for far longer, used as a term to classify peasants obligated to perform work under the feudal system (Intagliata, & Merkel, 2011). Nowadays, the term robot is used to describe a machine—mostly programmable by a computer—able to carry out a complex series of actions automatically (Oxford English Dictionary, 2016). External controlling devices can used to guide a robot, which are then navigated by humans. The control may also be embedded within. There is no real agreement on what type of machines qualify as robots, but there is a general consensus that robots tend to possess some or even all of the following functions: process data electronically, move around, operate physical parts of itself, operate autonomously and exhibit intelligent behaviour amongst others (Harris, 2009).

The International Federation of Robotics (IFR) goes further than this by classifying all robots associated to robotization in two categories, being either a service robot or an industrial robot (Cho & Kim, 2018). A service robot can be fully or semi-automated and is designed to perform a range of services for individuals and families (for example, vacuum cleaners and floor washers). Semi-autonomous robots can make decisions and perform actions without direction, while being (partly) instructed by a human. An industrial robot is defined as a multipurpose-machine, which is reprogrammable and automatically controllable. Typically, industrial robots are stationary or fixed-mounted on mobile equipment and generally used in manufacturing and logistical industries (for example, welding, assembly, pick and place and painting robots). These are usually semi-autonomous machines.
2.2 Why robotization is necessary, but employees as well

We live in a world where technology, especially robotization, is changing the way in which organizations and industries create value, where and how we do our work and how we communicate with these technologies (Cascio & Montealegre, 2016). While robots will change the way work is done and who does it because of its advantages, the larger impact will be the complementing of human capabilities, rather than replacing them (Wilson & Daughtery, 2018). Both humans and robots are required to accompany each other in order to create value as a business (International Federation of Robotics, 2018), implying that having a disbalance between the two may result in inefficient business processes.

Robots increase competitiveness and productivity (Graetz & Michaels, 2018). This is a statement which is generally agreed upon, which also applies to multiple industries. When robots are used in an effective manner, they can enable companies to remain competitive in the ever changing work environment (Hedelind & Jackson, 2011). Especially for SME-businesses (small-to-medium sized), which are the backbone of most countries, this is particularly important. As well as that it helps larger companies to increase their competitiveness through an increase in product development and delivery. Thereby stating that the greatest threat to employment currently is not robotization, but the inability to remain competitive (International Federation of Robotics, 2017).

Furthermore, robotization is necessary and will continue to proceed when human labour is not available (Frey & Osborne, 2013). Industries such as the logistical one are experiencing labour shortage (Sparkman, 2018). A report by the UWV states that effects of the economic growth are very much visible, especially in the logistics and transportation sectors (Dijkhuizen, 2019). The number of jobs at the end of 2018 was at the level of before the economic crisis and the number of vacancies grew enormously. Half of these vacancies were extremely hard to fill. With a shortage of human workers to fill these gaps, robotization seems a viable option.

Additionally, in the modern day era, e-commerce is becoming a booming business (Ding et al., 2017). It is the quickest growing segment of the retail industry. Its sales hit $1 trillion for the very first time in 2012. From there on out, it has been growing steadily at about 15% per year and is
expected to continue this growth for (at least) the next couple of years (Bogue, 2016). The emergence of e-commerce has a large impact on the logistics industry in the sense that a lot of robots are necessary to deliver high efficiency rates. However, not everything can be done by robots, with employees still being needed to complement robotization.

Namely, the increasing appliance of robots and other digital technologies in these various industries entail that learning to work with these robots is becoming an ever greater priority (Breazeal et al., 2004; Fryman & Matthias, 2012). It is also said that an increase in demand for labour is a result of robotization (Ozcan, 2017). In an ideal world, this is due to robotization not replacing, but rather complementing human workers. Humans and robots can possibly enhance each other’s complementary strengths: the creativity, teamwork, social skills of humans combined with the accuracy, speed and scalability of robots (Wilson & Daughtery, 2018). It can therefore be important for organizations to have people and robots be able to work with each other, because while a digital ‘team member’ in the form of a technology system or robot may be programmed to perform certain tasks, it is essential for the person to coordinate the tasks to be performed together accordingly in order to ensure successful deployment (Fryman & Matthias, 2012). In other words, human employees must keep an eye out for what the robot is doing exactly. In complex production environments (e.g. electronics industry), a trend towards the deployment of robots side-by-side with human operators can be seen (Meneweger et al., 2015). Things that robots have trouble doing on their own are dealing with order disparities, for instance (Huang et al., 2015). Also, fluctuating demand, facility breakdowns and technical maintenance are all things that a robot will find it hard to deal with. That is why, next to the need for robots, the need for human workers alongside them is also still very much present.

Thus, organizations will need to facilitate employees in the process of robotization for a number of reasons. First of all, it will probably need both employees and robots in operation in order to complement each other, which would entail properly implementing these digital technologies whilst preserving their business value, having people doing things that machines cannot do or do well enough (Coovert & Thompson, 2014). Secondly, most significant improvements in performance and thus revenue can be seen when robotic systems and humans work together in a successful manner.
(International Federation of Robotics, 2018). This way of implementing robotization is something that is still well underlit in literature.
2.3 Organizational change as a result of robotization

Organizational change is a way in which companies make alterations in the way it gets certain things done by means of changing its way of working in order to develop itself towards new markets or situations (Jones, 2013). There are a number of drivers of this type of change: crisis, consumer habit changes, new business entrants, technological change, mergers & acquisitions to name the most common ones (Marquis et al., 2013). Many theories exist for organizational change management, in which the majority adopts a leader-centric focus on change processes (Armenakis & Harris, 2009; Cummings & Worley, 2015; Kotter, 1996). In these theories, the focus is a lot on transformational leadership and inspiring vision, next to the employee-centric focus on how to make them embrace the change instead of rejecting it. However, it must not be underestimated in the sense that it is not only a shift in structures, systems and routines, it also has hugely important psychological and behavioural implications for human employees (Choi, 2011). Organizations should and can only exert change with support from its members (Judge et. al, 1999) and will only be successful when the individuals which are influenced alter their behaviour on-the-job in the appropriate manner (Choi, 2011). It is said to be impossible to change as an organization unless employees change- they must act differently in the sense that they should be both willing and able to embrace this change (Woodman & Dewett, 2004). A weak culture that isn’t aligned with the organization’s mission, lack of participation, under-communicating of a powerful vision, over-communicating a poor vision and not enough resources or training are a number of reasons organizational change management might fail (Gleeson, 2017). If, as a result, employees are then not willing to welcome organizational change, resistance and even sabotage might occur (Piderit, 2000).

Employee acceptance of organizational change can be further decreased when job security, amongst others, is negatively influenced (Iverson, 1995). On the other hand, if employees are not able to work in a new environment, frustration and a decline in work performance will be seen (Choi, 2011). That is why, after organizational change, organizations are more likely to reduce their demand the most for unskilled workers, because skill requirements have gone up (Caroli & Van Reenen,
Thus, the effectiveness of organizational change is largely determined by the extent to which an organization can motivate and properly prepare its employees for it (Armenakis & Harris, 2009).

Organizational change happens continuously throughout the labour market as a result of robotization (Jones & Van De Ven, 2016). Jobs can vanish or new jobs can be created as a result and the work itself will likely change as well. Frequently, people tend to be fearful for their future employment (Meneweger et al., 2015), possibly creating unwillingness to change. As well as that skill requirements tend to go up as jobs become more complex due to robotization, and as result, people being less able to work in these new settings (Molet et al., 1989). The fact that work will change is down to digital technologies being so responsive to humans and vice versa as they has ever been (Wilson & Daughtery, 2018). Most activities with human-robot collaboration require humans to do new and different things (e.g. training a chatbot) and being able to do things differently (provide better customer service with this chatbot) (Dautenhahn, 2007). This has to do with the fact that robots treat humans simply as other objects in the environment (Dautenhahn, 2007). They are not aware of the intentions or goals that humans have, as well as their feelings, emotions or attitudes. This can make it hard for humans to be willing and able to work with robots. It makes it hard for robots as well to prioritize what is most important for humans to be done at a certain moment, as opposed to a human. Consequently, human-robot collaboration is often reduced to using social cues simply as a natural interface for operating the robot as a tool (Breazeal et al., 2004). However, not a lot of companies have redesigned their business processes to optimize employees working with robots, thus having an influence on the willingness and ability to deal with robotization (Wilson & Daughtery, 2018).

It is down to the organizations themselves to facilitate employees in making this change go as smoothly as possible (Jones & Van De Ven, 2016). Organizations providing the appropriate resources during and after times of strategic change - preparing their people in the best way possible - tend to have a beneficial effect on work performance of employees (Kraatz & Zajac, 2001). This is extremely important, considering that over 70% of organizational change initiatives fail (Hughes, 2011). So, if this were to be successfully achieved by means of getting employees both willing and able to work
with the robots, organizations can increase their performance as a whole to a significant degree (International Federation of Robotics, 2018). Making use of these organizational resources is critical in this, because they have a motivational potential on employees (Hackmann & Oldham, 1980). Basic human motivation is directed toward the creation, maintenance, and accumulation of resources (Hobfoll, 2001). Resources are either valued on their own or because they enable other valuable resources to be acquired (Salanova et al., 2005). Thus, the existence of available resources increases motivation and stimulates personal development.
2.4 Robots and their effect on the willingness and ability of employees

To analyse the impact that robotization may have on the willingness and ability for employees to change and work in this new environment, the Job Demands Resources model is used. The Job Demands-Resources model is a theory which can be used to properly understand employee well-being. This has to do with the fact that it incorporates many possible working conditions and focuses on both positive and negative indicators of employee well-being. The model focuses on the demands and resources incorporated with the job. Demerouti et al. (2001, p. 502) define job demands as "those physical, social, or organizational aspects of the job that require sustained physical or mental effort and are therefore associated with certain physiological and psychological costs (e.g., exhaustion)."

Numerous studies have shown that high job demands may cause both job-related depression, anxiety and emotional exhaustion (e.g., Buunk et al., 1998; Warr, 1990). On the other hand are the job resources defined by Demerouti et al. (2001, p. 502) as "physical, psychological, social, or organizational aspects of the job that, amongst others, are essential in achieving work goals, stimulate personal growth, learning and development". In general, there are two categories of job resources, namely, external resources (organizational and social) and internal resources (cognitive features and action patterns) (Richter & Hacker, 1998). In this thesis, the focus will be on external resources, since internal resources are extremely hard to generalize as a result of different organizational settings (Demerouti et al., 2001). The external job resources considered can depend on the specific company (e.g. job security, growth opportunities and monetary rewards), social and interpersonal relations (e.g. company support from superiors and colleagues), the organization of work (e.g. participation in decision making, role clarity) and at task level (e.g. performance feedback, task significance, task identity, skills variety and autonomy) (Bakker & Demerouti, 2007).

Robotization can be seen as a job demand in the JD-R model. This is due to the fact that it alters numerous job demands - such as the physical, social or organizational aspects - related to a profession and can therefore be considered a job demand itself as well. Job resources buffer the effect that these job demands, as imposed by robotization, have on job strain (Bakker et al., 2003). That is because the main assumption of the model states that whereas every profession has its own specific
risk factors, it can be used to help deal with the job demands incorporated in the job. So, by framing robotization as a demand and researching what type of resources can be used to deal with it, the JD-R model can possibly provide guidance for organizations in order to boost the ability and willingness of employees to work in a specific setting. Not only can this be done in a wide range of professions, it will also help explain employee performance as well (Bakker & Demerouti, 2007).

Robots in the new working environment may thus have an impact on a number of job demands, but possibly on resources as well. This, in the sense that there may be an alternation in the need for specific resources due to the changing of job demands. If so, it may also have an impact on the willingness and ability of employees to work with robots. There have been a couple of main aspects with regards to robotization mentioned in literature. These overarching themes can be classified as job security, quality interaction between robot and human, skill requirements and perceived reasonability. These themes are a combination of job demands and job resources. All are influenced by robotization in different ways.

2.4.1. Job security

Job security is the probability that someone will keep their job. When someone has a job with a high level of job security, they perceive that they have a small chance of losing it (Neely, 2010). Job security is an important determinant of employee health and the inclusion of this construct in general models of stress and well-being may help to improve work performance as well (Kuhnert et al., 1989). Furthermore, job security influences the willingness to work in a specific work setting, with insecurity over one’s job being detrimental to this willingness (Hartley et al., 1990). With regards to the JD-R model, job security can be classified as a job demand influencing willingness to work (with robots).

Technological unemployment will of course vary from work context to work context. Even so, estimates are that 47% of human jobs are at a high risk of ‘‘computerization’’ (Frey & Osborne, 2013). Especially the low-paid occupations are at risk of this. This is due to the fact that the pattern over the past decades, which was that the demand for middle-income occupations reduced, has changed. Namely, recent models predict that computerisation will mainly substitute for low-skill and low-wage jobs in the near future. Additionally to this, robots are gaining intelligence and creativeness,
allowing them to conduct a wider range of manual tasks (Manyika et al., 2013). This makes it quite logical that when organizational change occurs due to robotization, the main reason for resistance amongst employees is fear for their future employment (Sorells, 2018). One of these reasons being that employees tend to see robots as a rival. In a production environment working together with industrial robots, this was seen as due to so-called imposed cooperation and perceived ‘non-cooperation’ (Meneweger et al., 2015). Namely, in these organisations, the operators of the robots at a production line had little choice in working with the implemented robots. However, they were aware that their company simply had to make use of the robots in order to stay ahead of the competition. This can result in imposed cooperation, which is the powerless feeling all the employees from the different levels had, knowing that their company must use robots in order to keep up, but perhaps at the cost of themselves. Whereas non-cooperation relates to employees experiencing no possibility to influence the robot’s behaviour, therefore not being able to communicate with them. This all results in numerous employees preferring to work with humans instead of robots and ultimately seeing the robots as ‘rivals’. Thus, robotization can cause a feeling of job insecurity, a job demand, which negatively affects the willingness to work with it.

2.4.2. Quality interaction

In general, (social) interaction entails that information has been shared between two individuals or entities (Oseland et al., 2011). The idea of a two-way interplay effect is essential in this process, as opposed to it being one-way. In the JD-R model, quality interactions at work can be classified as job resources for employees. Even more so, these type of interactions (regardless of it being with a human or a digital system) result in greater job satisfaction and self-esteem (Casper & Fishbein, 2002).

Human interaction with digital technologies is something that has been researched for many years (Myers, 1998). Society is full of physical objects and innovations in the form of robots which are designed for humans to use and to benefit from. However, the people operating them can sometimes be satisfied with some of those artefacts, whereas with others they are not. A major determinant in this is their assessment in how the interaction between them and the digital technologies goes. If humans are dissatisfied and reluctant to use these technologies, potential benefits
of an artefact are possibly not realised or misused, with abandonment or even rejection as a consequence (Pirhonen et al., 2005).

Robot experts develop and design intuitive interfaces for industrial robots, however they usually do not recognize the social implications of their systems and rather focus on the operational issues at stake (Moniz & Krings, 2016). These operational issues are for example problems of communication between the equipment units of an automated system. These can be errors, malfunctions or other deficiencies when these machines try to work together. This has partly to do with the fact that the innovative capabilities of robotic systems raise questions on how to support coordination, which have not been addressed in the past (since it is a new system). Currently in literature, people’s experiences of human-robot cooperation in production environments rarely focuses on their experience of becoming a co-worker of a robot, how they have to cooperate with these systems and the best way of supporting human-robot collaboration (Meneweger et al., 2015). The way humans fit into the functioning of these robots and how to facilitate them in the best way possible is thus something which is rarely considered (Meneweger et al., 2015). The result being a reduction of quality interactions between humans and robots, which will reduce this resource for employees. In turn, this can negatively influence the willingness and ability to work with them.

2.4.3. Skill requirements
Over the last decade, it has been widely accepted that technological change in the modern workplace is generally skill-biased (Gera et al., 2001). Employee involvement in the workplace and digital technologies promote the use of more cognitive skills. Problem-solving skills are seen as becoming increasingly important as well in this, whilst repetitive physical skills tend to stay unchanged (Green, 2012). These skill requirements hold an increase in job demands in the JD-R model.

Predominantly this different skill set that employees require after robotization has taken place has been negatively associated to the ability to work with robots. This is due to the fact that a lot of the time, integrators of automated robotic systems simply take it for granted that humans need to adapt to their machines (Moniz & Krings, 2016). In these cases they need to acquire appropriate
experience, training and skills as well as extra social competences in order to integrate in the ‘new’ working teams and to be able to perform their tasks in the ‘new’ automated environment. So frequently, the integration of an automated robotic system is something employees have to deal with in their own way. In a lot of manufacturing and production environments, the acquirement of proper knowledge to operate with the robots is gained through trial and error (Körner et al., 2019). This tends to result in working with robots being accompanied with negative experiences (due to non-functioning and errors). Taking human employees into consideration whilst implementing these systems is important, because it would help employees both perform their work in the appropriate manner and learn additional aspects of the job (Adams, 2005). Thus, robotization can cause the need to acquire skills that employees do not possess, a job demand, which can negatively affect the ability to work with robots.

2.4.4. Perceived reasonability

Another theme related the implementation of robots is that of perceived reasonability (Meneweger et al., 2015). This can be described as understanding the need for robots within the organization. There are some employees who experience both higher efficiency and reduced amount of work due to the implementation of robots. Overall, employees in simple and quick process areas are rather positive towards the implementation of robots. Robots are able to perform the mundane, manual and repetitive tasks (International Federation of Robotics, 2018). In this, job demands will thus reduce, having a positive influence on the willingness and ability to deal with robotization.

A danger here though is that the remaining tasks can become monotone and therefore possibly boring (Molstad, 1986). So, it can be a reduction of a mental or physical job demand, but also negatively influence the willingness to embrace robotization. Also, the employees working in complex process areas are a bit more negative as well (Meneweger et al., 2015). This, due to the fact that complex processes are more error prone and simple/quick processes are not. In the logistics industry, lots of processes require multiple tasks with mistakes easily made and can thus be considered complex (Nilsson, 2006). As a result, the job demands will possibly rise, also negatively influencing not only the willingness but the ability of employees as well. Thus, perceived reasonability is a resource for employees which positively buffer job demands. In turn, this would
positively influence the willingness and ability of employees to deal with robotization. It remains to be seen how organizations can create this sense of reasonability amongst employees.

2.5 Summary

Several effects of the implementation of robotization have been discussed in the theoretical framework. Unfortunately for a lot of jobs, the usage of robotics and automation of the work floor is inevitable due to their increase in competitiveness and productivity for organizations. Especially with new lines of businesses such as e-commerce and the existence of labour shortage this is emerging ever more. However, the cooperation as well as the coordination between humans and robots is essential to help organizations thrive. Research has shown how important the willingness and ability of human employees to work together with robots appropriately can be. However, research has not found specific guidelines in how this can be achieved. Job and organizational resources can help provide employees with the necessities to be willing and able to work together with these robotics by dealing with the main themes mentioned (which influence demands and resources) and simultaneously answer the research question of this thesis.
3. Methodology

An exploratory field study was held in order to gain more insight in this topic (Stebbins, 2001), while addressing the research gap previously identified. This is relevant, due to the changing of the whole labour industry and the requirement of sufficient knowledge on the proper implementation of robotics (Bonkenburg, 2016). The exploratory nature of this thesis, which helped discover numerous aspects relating to robotization, made it flexible and extremely open to numerous different perspectives.

In this exploratory research form, an abductive approach was chosen. Suddaby (2006) stated that instead of moving from data to theory (inductive approach) or from theory to data (deductive approach), the abductive approach moves back and forth and combines the two approaches. In this thesis, the inductive approach was used for the exploratory part, in which new information was used to expand the conceptual framework. Whereas the deductive approach gave guidance through current literature and what aspects to focus on (job resources in this case).

3.1 (Qualitative) Interviews

In order to properly collect the empirical data, qualitative interviews were used. Qualitative research analyses data from direct fieldwork observations, which are in-depth and open-ended interviews as well as written documents. This is predominately useful when there is little known about a topic (Saunders et al., 2007). Qualitative researchers study real-world settings in such a way that they can generate rich narrative descriptions and construct multiple case studies from it (Patton, 2005). Furthermore, it can provide new insights by discovering processes which can appear either irrational or even incidental, however are critical for understanding how things really work (Locke, 2011). This is useful for the implementation of robotization because some aspects which were discovered could be down to a specific company, for example.

Interviews were used, as they allow processes and perceptions to surface that would otherwise be difficult to find (Saunders et al., 2007). So, the constructs of willingness to work with robots, organizational resources, social resources and factors internal to the organization were focused on, but there was space for new matters to be considered as well (Savin-Baden & Major, 2013). For this
matter, a semi-structured approach was be used. First of all, because semi-structured interviews provide reliable, comparable qualitative data (Bernard, 1988). Plus, the specific topic that the thesis wants to explore is well thought of in advance, but due to the open-ended questions exploration of new answers/perspectives is still possible. This differs from a structured interview in the sense that the questions are planned and created in advance, leaving little to no room for exploration (Patton, 2002). Whereas an unstructured interview includes questions which are not at all prepared in advance, making it both harder to compare answers between candidates and the risk of drifting away from what is sought to be known (Patton, 2004). The semi-structured approach has allowed the discussion of things that could help with the implementation of robotics that were previously not considered, but are crucial for understanding cooperation with robotics for employees.

3.2 Sampling strategy

This thesis examined a sample of warehouse employees from different organizations within the Dutch logistics industry, varying in size and level of robotization. The logistics industry is very relevant in the robotization-era, since it is currently experiencing a staggering growth in its implementation (Bonkenburg, 2016). This partly has to do with the enormous growth of the e-commerce business, which has had its fair share of influence on the logistics industry in the sense that many companies are now investing in robotic solutions to meet the ever increasing demand (Mikušová, 2017). The increase in flexibility and low cost robotized workplaces creates the opportunity for their application in logistics activities such as order picking, deliveries, packing and shipping (International Federation of Robotics, 2018). Next to this, the logistics industry has been dealing with a lack of labour power (Sparkman, 2018), with this lack of labour power being the most important motivation for robotization (Mikušová, 2017). Because of all this, it is essential to know to effectively implementing robotics in an organization whilst maintaining willingness, ability and thus performance of employees.

The goal was to be able to generalize the findings, in order to add information to existing literature and provide guidance for future research. This is why it was important to sample precisely (Saunders et al., 2007). Employees from different organizational levels were therefore interviewed, in
order to acquire this generalizability (Hannabuss, 1996). Robotization may or may not have had a different influence depending on a organizational level, making it interesting to compare these experiences. A list of the data sample can be seen in Table 1.

### Table 1: Description of the data sample

<table>
<thead>
<tr>
<th>Organization</th>
<th>Company description</th>
<th>Function</th>
<th>M/F</th>
</tr>
</thead>
<tbody>
<tr>
<td>(A)</td>
<td>Distributor of computer and technology products</td>
<td>Order picker (1)</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Order picker (2)</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Order picker (3)</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Trouble shooter</td>
<td>M</td>
</tr>
<tr>
<td>(B)</td>
<td>Global logistics and freight management solutions provider</td>
<td>Operation manager</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Warehouse supervisor</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Warehouse coach</td>
<td>M</td>
</tr>
<tr>
<td>(C)</td>
<td>Seller of health, beauty and home care products management and contract logistics</td>
<td>Order picker (1)</td>
<td>M</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Order picker (2)</td>
<td>F</td>
</tr>
<tr>
<td>(D)</td>
<td>Global supplier of logistics solutions</td>
<td>Team leader</td>
<td>F</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Machine operator</td>
<td>M</td>
</tr>
</tbody>
</table>

3.3 Data collection

Data was collected by means of conducting the semi-structured interviews with the employees of these different logistical organizations who deal with/have dealt with the implementation of robotization in the work place. Responses from as many as possible employees were preferred. The employees who were approached were interviewed for approximately 30 to 45 minutes. The interview protocol which was used for this is provided in Appendix A. Confidentiality is important and therefore entailed that the identity of the respondents remained anonymous. The interview only took place if there was permission from the respondent. A voice-recorder was used in order to prevent loss of information. The interview was then transcribed accordingly. All of this information was given at the beginning of the interview.
3.4 Data analysis

The data was analysed by means of coding. Coding is an analytical process in which data is categorized to facilitate analysis (Hay, 2005). For this thesis, remembering the research question and working continuously on the data while coding helped keep the focus on relevant codes (Stuckey, 2015). The qualitative data analysis software of nVivo 12.0 was used in this thesis, in which the coding, identifying of themes and patterns were conducted by the researcher. This process of coding is depicted in Figure 1.

In the first round of coding, a start list of codes from the theoretical framework were made and identified in the transcripts. In this, the researcher scanned the transcripts to find answers and pieces of text which complemented what was previously found in literature on the influence of robotization. If these were considered relevant, they were added to the first list of codes. But there was also room for new, emerging codes. In other words, if there were other aspects found which were not mentioned previously in literature but were considered relevant, they were added to this initial list as well. This is in line with the abductive research approach of this thesis. This resulted in perceptions on the willingness and ability to work with robots relating to; job security as a result of organizational change, quality interaction between human and robot, training, participation, task variety and job autonomy. This was followed by a second round of coding, in which relationships and key themes were sought and identified between all of these (new and expected) aspects found. Additionally, a number of actions were found which characterized these relationships and themes. Subsequently, a third round of coding was performed in which additional suggestions arose from these actions and themes. By means of constantly iterating between data through the multiple rounds of coding, an extensive analysis of the gathered data was established.
Interviews

New themes relating to willingness and ability to work

Relationships / themes / (actions)

First round of coding
Codes based on literature
Emergent codes

Second round of coding
Finding relationships
Identifying key themes

Third round of coding

Further suggestions

Figure 1: Scheme of data analysis process
4. Results
The results of the thesis are presented in this section. For clarification purposes, Figure 2 shows a model of the resources identified together with their type of relationship to the willingness and/or ability of embracing robotization. Also, it shows to what extent employees and managers are willing or able to embrace robotization.

![Diagram showing resources and their relationship to willingness and ability to embrace robotization.]

**4.1 Willingness and ability of embracing robotization**
First of all, a distinction between the willingness and ability was observed between employees at the lower-levels (order pickers and packers) and employees in the managerial positions. With regards to willingness of embracing robotization, the initial reaction of employees at the lower levels was mixed. Whereas some were positive, such as this interviewee: ‘‘I think the fact that robots are coming is good. … It’s just a matter of getting used to’’ (Organization A – Order Picker 3). Others were a bit more careful in their judgement, such as this interviewee: ‘‘I am not sure what to make of all these robots. I first have to see what benefits they bring to judge them. I am a bit sceptical’’ (Organization B – Order Picker 1). Further, with regards to the ability of working in a new environment with robots, some of the low level employees had their doubts as well, such as this interviewee: ‘‘It’s really hard to say if these robots are going to help. It could be that it will become
too difficult for us’’ (Organization A – Order Picker 1). So, employees at the lower levels had somewhat mixed feelings about robotization.

On the other hand, managers were very much willing to embrace robotization. The fact that the current trend of labour shortage amongst logistical companies was very much present amongst the organizations in the case study resulted in these managers to be more willing to embrace the introduction of robotization. An interviewee said: ‘‘Until a couple years ago it was not hard to find people. People were quite replaceable. But the last couple years you see that temporary workers are becoming more important since the flow of workers has plummeted’’ (Organization B – Warehouse Coach). The labour market has shifted significantly, with these organizations predominantly having to hire temporary workers and engage in programs integrating asylum seeker into work environments for the roles of order picker and packer. As of now, lots of these temporary workers are labour migrants, coming from countries such as Poland. As an interviewee put it: ‘‘When people study for something, they usually become it. No one studies to become a warehouse worker. That is why 90% of our people are from Poland at the moment. The quality of people is worsening as well, considering that the Polish economy is improving so people choose to stay there’’ (Organization B – Warehouse Supervisor). This is an argument which makes the implementation of robotization a serious consideration. Further, this holds that this specific organization has to make use of robotics to fill their gaps in their working force and support current employees. Also, it is important to keep hired employees on board. As this interviewee pointed out: ‘‘If people leave the company and we have to recruit someone new, it will cost us 1500 euros to prepare them for the job (training). So, everyone you keep within the company and who you do not have to train (again) is financially beneficial. In this, you need people to want to stay’’ (Organization B – Warehouse Coach). Thus, recognizing the need to keep current employees in their ranks, because evidently, they have to do the best they can with what they have got and simultaneously minimizing the costs. Further, it underlines that the ability to work with robots is becoming ever more important, considering that the quality of people (and thus skills) is experiencing a downward trend and new employees are expensive to prepare. In short, the willingness and ability to accept robotization from these employees at managerial levels
comes from the need to make up for a lack of (good) worker flows. The employees at the lower levels (order pickers and packers) do not really acknowledge the labour shortages.

Furthermore, perceived reasonability seems to be a feature of employees’ willingness to embrace robotization. This is described as acknowledging robotization as necessary for oneself and/or the company, by means of seeing its benefits. An interviewee said: ‘‘After the implementation, a part of the work was done by the system. That was very nice for us and made the work to be done more pleasant’’ (Organization A – Trouble Shooter). For this particular employee, the work to be done was checking if batch sizes are correct, fixing the assembly line if it malfunctions or if people make mistakes. In this particular case, robotization reduced the amount of work the employee had to do, which was regarded as pleasant. Complementary to this, another interviewee stated that the best way to see if employees really are willing to embrace the technological change is when an (unwanted) appeal for the old approach is made: ‘‘At first, employees really had to work; fold the boxes, grab the products and take precautionary action if a wrong box was packed. … Robotization has really reduced the physical strain of the work. Sometimes we have to switch back to the old system because the machines need maintenance or have broken down. Then you can really notice the aversion the employees have of doing the more labour intensive work again. It gives them an extra bit of appreciation for the innovation’’ (Organization B – Warehouse Supervisor). Of course a switch between the old and new system should not be the standard as to underline if employees are willing to embrace the technological change, however it can help.

Another interviewee described the whole process of acquiring perceived reasonability quite detailed: ‘‘When they adopted the new technology in our section, it gave us the feeling they destroyed something which was like... the strategy of the company, you know. And for everyone at the beginning it was like: ‘Come on, why is this happening? You don’t need it’. But then after a month or two it started to calibrate really well. And right now I can’t imagine working without it. Of the last two years, I have been working with this system for one year and one year without it. I honestly cannot imagine working without it anymore. Of course there are some small problems, but it’s fine. It’s still improving our work’’ (Organization A – Order Picker 2). This employee’s view of robotization
developed over time, after working with it. Another interviewee added: ‘’People were really happy to hear that the work had become less physical because of the innovation’’ (Organization B – Warehouse Coach).

A comparison between the old warehouse and the new one gave a similar type of insight to the following interviewee: ‘’The major difference? Primarily the reduced strain. We don’t have to walk with heavy containers anymore, as was the case in the previous warehouse. Here, we walk with trolleys and you don’t have to carry all the heavy items, because those items come towards you now. So, the strain on the employees is way less than before. Also, we can see that the efficiency has increased which gives a satisfying feeling as well’’ (Organization A – Order Picker 3). In addition to the reduced workload, employees acknowledged the benefits in efficiency, giving a satisfying effect. Although interviewees see that for some forms of robotization less people are required as a result, they see the increase in productivity. As one interviewee said: ‘’Yes, of course the machine is doing the job faster. Normally we are using a lot of people for the packing. But now, only one machine. Of course it’s very expensive for the company, but it does its job and it does it good’’ (Organization A – Order Picker 1). Thus, by acknowledging all these benefits (perceived reasonability), employees are more likely to be more willing to embrace robotization.

For some employees, the organizational change as a result of robotization was something they had to learn how to work with on their own. This clearly affected employee’ ability to embrace robotization. An interviewee said: ‘’I had to figure it out through trial and error... I saw that for others who do not have a feeling for technical engineering, it was difficult and demotivating for their work’’ (Organization C – Order Picker 2). Another interviewee added: ‘’What they could have done is get people properly prepared via training with something such as an introductory video. It would really help people getting to grips earlier with the change’’ (Organization D – Machine operator). The properly preparing of employees via training, as mentioned by this interviewee, would have had a positive effect on the ability to deal with robotization. It is not the case that the organizational change in these organizations in the case study had failed; it just took longer than necessary for workers to get
properly acquainted with the new systems. Thus, costing the organization extra time to operate optimally.

The willingness and ability to deal with organizational change as imposed by robotization related to a number of main themes amongst interviewees: job security, quality interaction, training, participation, task variety and job autonomy. These will all be discussed individually with their relevance to robotization.

4.2 Job Security

Job security is extremely important for people working in organizations. The degree to which their job is safe, or their perception of it being safe in the near future, normally leads to influencing the levels of acceptance of embracing technological change (Vieitiz et al., 2001).

4.2.1 Fear for future employment

Robotization was not initially seen as a threat for employees at the lower levels. An interviewee when asked if he fears unemployment: ‘‘No, not at all actually. At this moment in time, robotization does not make me fear for my future job’’ (Organization A – Order Picker 3). Another interviewee said: ‘‘In my opinion I’m not scared that they will take my job, because I work hard and do my best every day. ... Furthermore, I’m still a bit sceptical that robots will just come in and replace all the people here’’ (Organization C – Order Picker 1). These interviewees do no see robotization as a threat. Let alone do they see the robots as rivals, which was seen in literature in similar work environments (Meneweger et al., 2015). As was stated by another interviewee as well: ‘‘I see robotization more as a challenge than a threat. Of course it’s the future, everybody knows that. However, I think that there is always stuff left to do for people (current employees)’’ (Organization C – Order Picker 2). An important reason why employees at these lower levels do not fear for their future employment is mentioned here; the belief that there will always be work to be done for humans. This was also stated by the following interviewee: ‘‘Of course, after robotization, the distribution of work might change. But considering that our company grows with 30% each year... that would be a reason for nobody to fear for their job. They will always need people. You can notice that this
‘insurance’ of a future job resonates amongst the employees in a positive way. They are more willing to accept what is coming’’ (Organization A – Order Picker 3). Adding to the conviction of employees that there will always be work left to do, robotization is also seen as an development in the distant future: ‘’When we’re talking about robotization... it is possible that in the current work environment a picker will not be required anymore considering that a robotized ‘pick-arm’ could be installed. However, I do not expect that this will happen anytime soon, considering that the whole building would then have to be modified’’ (Organization A – Order Picker 3). This employee does not expect a sudden change in work environment. So, it appears that these interviewees are not scared to be replaced by robots any time soon, because they do not acknowledge it as a threat. This is remarkable, especially considering that these low-paid, ‘’simple’’ occupations are mainly under threat of robotization (Frey & Osborne, 2013). Other interviewees were a bit more indifferent regarding the introduction of robotics. Bottomline however, was that no one explicitly mentioned their concerns of being out of a job anytime soon because of robotization.

The literature suggests that the main reason for resistance amongst employees is fear for their future employment (Sorells, 2018). The warehouse employees interviewed for the current study, already had job security, which they also emphasize as being necessary to conduct their work. However, job security is not seen as an essential resource to be either more willing or able to embrace robotization. Thus, is does not really have a strong relationship with one or two of these factors.

Table 2: Job Security and exemplary quotes

<table>
<thead>
<tr>
<th>Job Security</th>
<th>Exemplary Quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fear for future employment</td>
<td>‘’Of course a normal response to the implementation of a robot in our warehouse is that employees think: ‘They’re expecting more from me now and I have to work harder, considering that I am working alongside a robot now’’. However, in practice, we noticed that if we tell employees immediately that the robots are here to help instead of replace and that we expect the employees to work as hard as they always do, it gives a sense of protection to their jobs’’ (Organization B – Warehouse Coach)</td>
</tr>
<tr>
<td></td>
<td>‘’Robotization can be scary, that is true. What we try and do is ‘protect’ our own. With that, we mean the people who have been working here for 10/15 years. The company works a lot with temporary workers because of seasonal demand. We show our fixed employees that these workers are the first to go as a result of robotization. In this way, we try and show that they should not worry about the future of their job, because we will always try our best to keep them in our ranks. I hear that the fixed employees tend to be more relaxed regarding their future perspective as a result of this. They also seem less resistant to implementation of robotization’’ (Organization B – Warehouse Coach)</td>
</tr>
</tbody>
</table>
It can be concluded that job security is a factor which is necessary to perform one’s work. However, an increase in job security is suspected to only slightly improve the willingness of employees to embrace robotization whilst not contributing to the ability to do so. In literature, the main reason for resistance amongst employees was seen as the fear for their future employment (Sorells, 2018). Since there is a minimal amount of fear amongst interviewees for their jobs, resistance is minimal as well. In general, employees felt that despite robotization, their jobs are fairly secure. So, the results indicate no specific relationship between job security and willingness or ability to embrace robotization.
4.3 Quality of the interaction

Quality of the interaction between human and robot appeared from the empirical study as an important predictor and resource for the willingness of employees to embrace robotization. This quality of interaction is seen as a means to achieve company goals. In order to achieve these company goals with minimum effort, synchronization on how humans and robots function together is required (Money Matters, 2019).

If the interactions between human and robot are successful - the robot functions as wanted by the human - this is regarded as pleasant. One of the interviewees described that he could not use the robot to its full potential at first, because of the following reason: “The installation of the robot went really quickly. It was just there at a certain moment and we did not have time to get used to it, really. It took some time to operate it optimally” (Organization D – Machine operator). This interviewee clearly disliked the fact that there was no getting-used-to time and the successful interactions of the robot doing exactly what the human wanted took some time. However, only vaguely suggesting an influence on willingness of embracing robotization. The following interviewee describes this more clearly: “Robotization can take place, no problem. However, the robot really has to help me in order for me to want it. For example; there are a couple of loops which I can work at. If I am at loop 1 and they really need my help at loop 2, then the robot has to go. Because otherwise I would be exhausted at the end of the day of all the walking back and forth. This would help me a lot and would be great” (Organization C – Order Picker 1). So, in this particular case, the successful interaction is described as the robot knowing/acknowledging that it is required to help out elsewhere because the human lets it know that. Furthermore, highlighting that this is necessary in order to be willing to embrace it.

Another interviewee shared this view about the quality of the interactions leading to be more willing to embrace robotization amongst employees: “Whilst integrating, it was chosen to do it at the morning shift at first. That is when we do not have a lot of people on the work floor yet, so it’s not so crowded. We have time. We don’t have to rush. The perfect time to get used to the new technology. It clearly helped people overcome errors and as a result, be more inclined to work with the technology” (Organization A – Order Picker 2). So, the ways of achieving successful interactions between human
and robot clearly vary, however there seems to be a shared belief that they contribute to the willingness of employees to embrace robotization. Allowing employees to get accustomed to and learning to work with robots thus has beneficial influences for both work performance and acceptance. Something else that could be suggested is to give interested and skilled workers the possibility to get more responsibility regarding the handling of the robot. This could all promote positive and successful experiences in the interactions between humans and robots.

Table 3: Quality Interaction and exemplary quotes

<table>
<thead>
<tr>
<th>Quality Interaction</th>
<th>Exemplary quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Successful interactions</td>
<td>“What we need for people and machine to function optimally is that... first of all, enough space to practice with the robot and learning to get along with it. Therefore we need the people capable of getting along which such type of machines to be the first to handle them and after that discuss together with the company how to properly calibrate it with the rest of the employees. This, in order to make employees experience less struggles with the new technology resulting in being more willing to accept this change and preventing resistance” (Organization A – Order Picker 2)</td>
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</tbody>
</table>

With regards to the factor of interaction, it can be concluded that successful interactions influence the willingness of employees to embrace robotization in a positive manner. These successful interactions being the alignment of human and robot to function optimally without the frustration of errors or malfunctions. In literature, it was said that if people do not properly use new technologies, potential benefits of an artefact are possibly not realised or misused, with abandonment or even rejection as a consequence (Pirhonen et al., 2005). This is in line with what is found in the empirical study, emphasizing the importance of coordinating between human and robot. To properly promote this interaction, it will be organization-dependent with regards to how to implement robotization. This is outside the scope of this resource. All in all, interaction between human and robot is an important determinant and resource for the willingness to embrace robotization. It does not really have to do with the ability of embracing robotization.
4.4 Training

Robotization was seen to result in an increase in skill requirements for employees. These necessities in proper skills (in order to work with robots) are also considered as job demand in the JD-R model. In this, the acquisition of proper knowledge for new skills is vital for employees to not only be willing, but especially to become able to work with robots. Interviewees with lower ranked jobs indicated that providing training or receiving it (depending on their position) influenced their initial acceptance of the technology. Although this may seem as straightforward, many organizations fail to extensively brief and inform employees on the proper usage of a new system (Spitzer, 1984). For instance, an interviewee commented: 

“*In order to get acquainted with the new system, we mainly had to figure it out ourselves which wasn’t too great. We did have somebody who (kind of) gave an example how the system worked, but his Dutch was poor. His English was even worse and he mainly conducted his proposal in Spanish. Considering we don’t speak Spanish, we had to figure it out ourselves’*” (Organization A – Trouble Shooter). This is a rather standout example, but it underlines the fact that organizations tend to go about this lightly. As confirmed by this interviewee: “*How I learned to work with the technology? Everyone here has to learn it by themselves. I also learned it by myself*” (Organization C – Order Picker 1). When another interviewee was asked how they learned to work with the newly implemented technology, they responded: “*I had to figure it out through trial and error. Fortunately, I have a natural sense for technological engineering, because that particular field interests me. So, for me it was not that hard, whereas I saw that for others who do not have this feeling, it was way more difficult and demotivating for their work*” (Organization C – Order Picker 2). This is in line with what was seen in literature as well, namely that integration of an automated robotic system is something employees have to deal with in their own way (Moniz & Krings, 2016). It also matches what is seen in most manufacturing and production environments (Körner et al., 2019). In this case, the interviewee has managed to get to grips with the technology because of her personal skill set. However, considering that not all employees may possess these qualities, a better way of showing how the technology works is required. Also, it is mentioned that not having had proper training led to demotivation amongst employees. So, the willingness of embracing robotization is positively affected when proper training is provided. Furthermore, there is an overall expectancy that
employees should be properly briefed by the organization when robotization takes place. As one interviewee put it: ‘‘If they expect us to be able to work with the robots, we expect proper lessons and training to do so. Otherwise, they should not add it to our task description’’ (Organization A – Order Picker 3). Fortunately, there was also an interviewee who confirmed that proper training was beneficial: ‘‘We received a training before we got to use the technology. Since we had received that and the fact that we received it all together, made it easier for us to talk about it amongst ourselves and learn it real quickly’’ (Organization A – Order Picker 3). So, providing proper training in which relevant knowledge is transferred on how to work in the new environment - which is created by robots - is extremely important, as concluded by employees at lower levels. Else, there is a chance that shortly after this implementation phase employees will spend more time figuring out how to work with the technology, instead of already understanding it completely and increasing the intended productivity.

From somewhat higher up, this view is shared. Namely, an interviewee from the middle level added: ‘‘Personally I oversee the onboarding and transitioning of people. If robots and employees are to cooperate successfully, there should be proper training. In this, especially clarifying what is expected from employees and how we can achieve that in order to make it a success is vital. This helps employees be more able to accept this technological change’’ (Organization B – Warehouse Supervisor). Furthermore, it was noticeable that Organization B (where the previous interviewee works) has taken the training and constant supporting of employees very seriously, considering they have hired a warehouse coach specifically for this. This interviewee also had his own view on training: ‘‘Before we train people, I have to screen if they are being trained for the right position. Also, if the training matches what we expect from them. If those aspects are all aligned nicely, training will be successful and employees will be more able to work in new work environments created by robots’’ (Organization B – Warehouse Coach). This special attention to how training is shaped and who participates makes it a success in this organization. Something which other organizations (also in this case study) can take an example of.
As straightforward as it may seem, from my research it appears that companies do not always seem to grasp how important training is. By providing training, employees are more likely to see and experience benefits of robots (perceived reasonability/willingness), as being more able to work with them. Thus, providing training in order to get employees ready for robotization, is considered a resource. Predominately, the ability to embrace robotization is positively affected. However, the willingness (motivation to work) is also affected in a positive manner, although less significant.

Table 4: Exemplary quotes about training and its actions

<table>
<thead>
<tr>
<th>Training</th>
<th>Exemplary quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Knowledge acquisition and skills</td>
<td>“One of the key ingredients is not only providing training itself, but ensuring that they are done properly and people are well aware of what is expected from them from the get go. This helps the organization being more productive earlier, and employees from running into all kinds of problems at the beginning” (Organization B – Warehouse Coach)</td>
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<tr>
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<td>“We as an organization are obligated not only to ourselves, but also to the employees to properly provide schooling. Because if, for instance, someone can only drive from location A to B, with the current automation that is taking place, it will then soon be the end of the line for that person. So then you start and think, what now? I think we at [Organization B] are really good at that. We provide the people with the opportunity to develop themselves by means of schooling and training in order for them to make the next step in the new job (because of automation)” (Organization B – Warehouse Supervisor)</td>
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<td></td>
<td>“A very simple yet informative way we use is showing a before and after video, making it easy for employees to see what is going to change with regards to the new technology. Visual representation works the best in most cases” (Organization B – Warehouse Coach)</td>
</tr>
</tbody>
</table>
4.5 Participation

With regards to participation in decision making in an organization, determining when, how and to what extent to involve employees in decision making processes is vital for the successful implementation of technological change (Hyclak, 1986). In this, interviewees indicated that the being close to the decision making processes resulted in being more accepting of changing working conditions due to robotization.

One interviewee at the middle level of an organization said: ‘’Employees should not be involved in deciding whether the robotization feature is opted for or not, but they should be involved when determining how to implement the technology in the organization’’ (Organization B – Warehouse Supervisor). According to this interviewee, this gives the employees - that are involved in the implementation process - the feeling of being included, whilst the major decision to automatize or not is already made for them. This involvement can simultaneously stimulate loyalty, as stated by this interviewee: ‘’In general, you will need to do more than only a top down approach if you want to bind people to your company. That is why we started a whole ‘binding process’ asking questions to the people such as: ‘How do we get people to be fascinated and bonded to the company from the labour market?’ and ‘How can I keep them at the organization, what do they desire?’’ (Organization B – Operation Manager). A loyal and involved employee will understand better why the company is automating, as well as being more willing to embrace it due to his or her commitment to the company.

An interviewee from another company had been involved in this process: ‘’When the final installation took place, I was asked for my input with regards to getting the implementation done smoothly’’ (Organization D – Machine operator). Another form of participation can take place as well. That is, after the implementation of the automation, as another interviewee said: ‘’The organization stimulates us in the sense that after such a technological implementation has taken place, we should always speak up if we think something has to be changed in order to improve our work. This involvement gives us the idea that our position is of value and simultaneously makes us happier to deal with this change’’(Organization C – Order Picker 2). In this statement, it is clearly a given that this participation leads to being more willing to embrace robotization. Next to that, of
course it is a pleasant idea that an employee has the opportunity to give certain ideas and perspectives on robotization towards company management. However, it is equally as important that an organization does not pretend to listen, but actually does something with the employee input. As a higher ranked interviewee put it: ‘‘We changed the layout in our warehouse after automation and we already heard noises from the get go that things had to change in order to improve productivity and ergonomics. These remarks came from the employees and not the engineer who implemented the system. We listened to these remarks and applied them accordingly. This helped people accept the technological change’’ (Organization B – Operation Manager). This interaction between employees and management gives a voice for employees to be heard and an organization acting accordingly to improve working conditions for the employees, their happiness and thus simultaneously improving productivity and efficiency. As a result, employees will be more willing to embrace robotization. Also, since employee concerns can be heard and dealt with, the psychological and physical demands of robotization may be buffered as well. So, participation in decision making can be considered a resource for employees to be more willing to embrace robotization.

Table 5: Exemplary quotes about participation and its actions

<table>
<thead>
<tr>
<th>Participation</th>
<th>Exemplary quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Participation in decision making</td>
<td>“We have our assessment structure in which employees are asked to indicate a number of improvement ideas and that is something they can use to make themselves heard. Up to a certain level, all employees also have a 1 on 1 conversation with their supervisor, so that is a moment in which they could, for example, submit all their ideas or comments once a week. Depending on what it is about. With the continuous improvement structure they just have the opportunity to say to a manager: “Well I want to start something”. And if a supervisor says: “Well we see the added value of that”, then they can do it, then they can get to work. About every 2 or 3 months people are also rewarded for their ideas and then for the entire compound we have a chat and then people get a small financial compensation for the best ideas. So, not only can they get rid of their ideas but they also get a stage for their them which makes them feel appreciated and asked to stay within the organization.” (Organization B – Operation Manager)</td>
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<tr>
<td></td>
<td>“When a new system is installed, first it is consulted with the boss and the engineer of course. After that, the engineer will communicate with the employees responsible for the specific department where the new system will be installed. That is when consulting begins at which these employees are expected to understand how the system works. It is essential that these employees understand how it all works, because they have to communicate it down to the other employees working in the department. So, alterations can be made as a result of questions or feedback by this responsible employee. Because if they do not understand how the system works or have trouble with some of aspects of it, the automation process will not work making them nervous about being able to keep performing their jobs.” (Organization C – Order Picker 2)</td>
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</tbody>
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4.6 Task Variety

A new aspect found in the empirical study - which was thus not emphasized in current literature on robotization - was that of variation in one’s work, or to be more specific; task variety. Interviewees indicated that the degree of task variety enhances their job satisfaction. In other words, task variation is a resource for employees because it reduces the strain of monotonous work. This is not surprising, knowing that it has been considered a resource for people in their work for many years now (Roelen et. al, 2008; Umstot et. al, 1976). Furthermore, at both the middle and low level occupations in the various organizations, there is a consensus that if a job or task becomes too monotonous as a result of robotization, this has a negative influence on both job satisfaction and willingness to work. First of all, an interviewee when asked what she likes about the job: “I like my job a lot, because every day I can do a different task to finish the job” (Organization C – Order Picker 1). Clearly, doing different tasks to complete the job gives joy to this interviewee. Another interviewee can agree as well: “So it's not the same every day and more and more things are expected of you and it becomes ... You are put in a lot of different places, which is a refreshing and challenging thing really” (Organization C – Order Picker 2). So, showing what is already known from over decades of literature; namely, that task variety is considered pleasant for employees.

But, to what extent does it influence willingness and/or ability of people to work with robots? The following interviewee had a certain feeling about this: “The main reason that employees get to do different tasks during the day is because of the amount of no-shows we have on a weekly... no, even daily basis. Otherwise I’m not so sure, considering the amount of tasks the machines are already doing, that employees would have a lot of variety in their work. I think that these no-shows indirectly help employees accept the robots on the job more” (Organization A – Order Picker 3). For this particular case, the no-shows seem like a blessing in disguise for the employees who can do different tasks because of it. A direct effect of a reduction of willingness to work with robots with reduced task variety is not mentioned, but indirectly suggested. Another interviewee shares this feeling/concern: “I am afraid that my job as a machine operator could become more monotone because of robots. I would not like that” (Organization D – Machine operator). Here however, this interviewee clearly
states that if task variety were to be reduced because of robots, he would become less willing to embrace this change. Even so at the middle level, the following interviewee acknowledges the importance of task variety with regards to robotization: “The packers? No, they are not always at the same spot during the day. They tend to oversee 2 or 3 stations in which they can constantly walk back and forth. We can notice that they really like this alternation in the new robot work setting from time to time, because we receive less complaints” (Organization C – Trouble Shooter). This underlines that from both low and middle level, task variety is regarded as an important feature. Especially in the new work environment with robots, it is suggested that this task variety must be maintained for employees to accept their work. The interviewees agreed that keeping variation in the tasks after robotization is important for the job not to become boring and for employees to care less about their work. This is in line with the relationship between task variety and performance seen in literature, which is almost always positive (Dodd et al., 1996). For the job to become boring is undesirable, considering that interviewees feel that this could ultimately lead to employees resisting and being detrimental to work performance.

Something that could be suggested for employees to maintain variety in their tasks after robotization takes place, is the possibility to rotate in the job. Furthermore, it helps with the acceptance of robotization, as mentioned by this interviewee: “By adding new competencies to the skills of the employee, they are more able to rotate within the job. This helps them cope with robotization better” (Organization B – Warehouse Supervisor). In other words, rotating within the job helps the employees in the sense that they do not have to fear that their job will become more boring as a result of robotization. So, it is seen that if robotization decreases the variety of tasks of employees, the willingness of employees to embrace these robots will deteriorate. However, a relationship between an increase in task variety with willingness to embrace robotization is not necessarily found. Thus, the variation in work functions as a resource for employees in dealing with robotization, albeit not strongly; which will at least not decrease the willingness to embrace robotization.

Table 6: Exemplary quotes about variety and its actions
<table>
<thead>
<tr>
<th>Task Variety</th>
<th>Exemplary quotes</th>
</tr>
</thead>
<tbody>
<tr>
<td>Task Variety improvements</td>
<td>“What we do when the job becomes monotone as a result of robotization? It might then be necessary to adjust the training. Handling is one of the competencies that can become quite boring. So, what we do is try to add at least two other competencies to the skills of an employee so that they are able to perform different tasks as well. As a result, they are not doing only one task during the week, but are scheduled for other tasks as well. In this, we also try and rotate between physically heavy and light work. We can notice that this has a lot of influence on the way employees perform their jobs and the degree to which they accept it.” (Organization B – Warehouse Supervisor)</td>
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</tbody>
</table>
4.7 Job autonomy

The last aspect which appeared for the empirical study - which was also not found in literature on robotization - was that of the control over one’s work, or in other words; job autonomy. Autonomy in the workplace refers to how much freedom employees have while working. For organizations, autonomy holds that employees can decide how their work should be done (Robertson, 2019). For many years now it has been confirmed in literature that job autonomy leads to job satisfaction (Trow, 1957). Interviewees confirmed this by stating that job autonomy was an important determinant of being comfortable with one’s job. Also, that is strongly affected their openness of embracing change in the form of robotization.

An interviewee was asked about the degree of control they have in the warehouse: **‘Yes, I can decide for myself which production loop to go to (most of the time). I have been working here for twelve years now, so this has to do with experience as well. But when I see that another row/loop is busy, I can decide for myself to go there and help. I like this sense of freedom to make my own work choices’** (Organization C – Order Picker 1). Making the call to work elsewhere in the warehouse by oneself helps the employees have a sense of ownership over the work they are doing, thus being more in control. Another interviewee gave a similar statement: **‘In the company, I have all the freedom in the world to do what I want in the way that I want to. Also, if I think something can be done more efficiently, I can communicate that as I well. The fact that I can do this motivates me to work harder’** (Organization A – Order Picker 3). So, giving employees a sense of autonomy over their work results in being more satisfied with the achievements made, considering their share of influence. Similarly to task variety, this confirmed what we already knew about job autonomy.

Furthermore, for interviewees it seemed important to be able to make their own decisions when they work with robots. This is in line with the literature which indicates that job autonomy is essential for employees after an organizational change to maintain workplace health and wellbeing (Nini, 2016). An interviewee was asked about how job autonomy and robotization function together: **‘After the new automation system was installed, the order of handling the boxes became predetermined which was not the case beforehand. However, the way the boxes are (re)organised is**
still up to us. For example; we try and put the heavy items underneath and the light items up top whilst simultaneously making it as tidy as possible. If we do that appropriately, then the final check-up team saves a lot of time, which gives a good feeling of accomplishment. (Organization C – Order Picker 2). Another interviewee added: ‘‘We have the back-up system tell us which loop to work at. But sometimes when we see that our help is needed elsewhere, we make the call ourselves. The guidance of the back-up system is nice, but to be able to decide for myself where to go occasionally is really important to me’’ (Organization C – Order Picker 1). So, robotization is often inevitable in numerous work environments. However, job autonomy seems to be important in accepting this organizational change. If there is no or little influence that employees can exert on the outcome of a work process, they will be less willing to embrace robotization.

Giving responsibility over certain (important) tasks could be a suggestion for employees to maintain a sense of job autonomy after robotization. An interviewee at the middle level commented on this: ‘‘They can decide for themselves which order to maintain even though the machine gives an indication. The company noticed that in this way, employees develop their own plan on how to approach this packing process, which in turn, improves their satisfaction in their work and productivity as well’’ (Organization A – Trouble Shooter). Removing this responsibility, possibly as a result of robotization, decreases the willingness employees have to embrace this implementation. Similarly to task variety, it is seen that if robotization decreases the job autonomy of employees, the willingness of employees to embrace these robots will deteriorate. However, a relationship between an increase in job autonomy with willingness to embrace robotization is not necessarily found. Thus, job autonomy functions as a resource for employees in dealing with robotization, albeit not strongly; which will at least not decrease the willingness to embrace robotization.

Table 7: Exemplary quotes about job autonomy and its actions

<table>
<thead>
<tr>
<th>Job autonomy</th>
<th>Exemplary quotes</th>
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<tbody>
<tr>
<td>Autonomy</td>
<td>‘‘We try and give employees as a much freedom as possible, of course with certain boundaries. … However, when the packages come on the line and they are to be packed, they can decide for themselves which order to maintain. The company noticed that in this way, employees develop their own plan on how to approach this packing process, which in turn, improves their satisfaction in their work and productivity as well’’ (Organization A – Trouble Shooter).</td>
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5. Discussion

The focus of this thesis was to understand what resources employees need to be more able and willing to embrace robotization and simultaneously increase work performance. The result is the discovery of the themes of job security, quality of the interaction between human and robot, training, participation, task variety and job autonomy. Quality of the interaction and participation were the resources found with a strong link to the willingness of employees to embrace robotization, whereas training was linked strongly to the ability to do so. The other resources had either weaker links or no relationship at all with these two factors. Possible explanations and looking further than this will be discussed in this section.

5.1 Job Security

The empirical study has shown that job security is an important factor in determining how employees accept their work. It was shown that as a part of job security, fear for future employment was discovered. Fear for future employment is indeed an aspect relating to job security, whilst inhibiting productivity and performance as well (Keegan, 2015, p. 5). However, no (strong) link to the willingness of employees to embrace robotization was found. Loss of job security can have an adverse effect on employee health and well-being, which are not completely reversed when the threat to this security is removed and tends to increase with longer exposure to the stressor (Ferrie et al., 2002). Furthermore, the lack of job security leads to a decrease in organizational productivity and performance due to a loss of readiness (Imran et al., 2015). It is seen that attitudes such as job security pretty much exist well before any first-hand experience with the technology has taken place, let alone the actual implementation (Herold et al., 1995). This is in line with what was found. Namely, that a lot of the lower levelled employees possessed a significant deal of job security already, but admitted that this is necessary to be willing to conduct their work. It was surprising to see that there was no strong link to the willingness of employees to embrace robotization. This may on the one hand have to do with the fact that many of the organizations in the case study work with temporary workers. Over the past few decades, the number of flexible workers has increased and it has been shown in literature that in general, they posses far less job security as
compared to employees with permanent jobs (Silla et al., 2005). On the other hand, it could possibly be that - considering that robotization creates a lot of uncertainty for future employment (Frey & Osborne, 2013) – job security is not considered as relevant in this context, especially in combination with temporary workers. This, because there may be a belief that there will always be work for them to do, in their current organization or elsewhere. This thesis has shown that job security in itself is an important determinant in the willingness to conduct one’s work. However, it does not necessarily function as a resource for employees to be more willing to embrace robotization. Considering the context of the case study, alterations from what was expected could be explained.

5.2 Quality interaction

This thesis found quality of the interaction between robot and employee to be an important factor in determining willingness of employees to embrace robotization. In this, a fundament to Human-Robot Interaction theory is that of creating trust. Trust is critical in these situations, because it directly affects the willingness of people to follow robots’ suggestions, accept robot-produced information and thus benefit from the advantages produced by these systems (Freedy et al., 2007). In other words, trust is an important factor to HRI (Hancock et al., 2011).

A lot of interviewees at the lower levels acknowledged that with regards to robotization, they tend to be more willing to embrace this innovation when interactions take place which are successful. In literature it has been seen that these ‘real’ interactions – when humans actively control a robot – are mostly related with negative incidents (breakdowns, failures) and therefore negative experiences (Meneweger et al., 2015). One of the suggestions made was of implementing robotization in a step-by-step manner, in order to increase the possibility of successful interactions far more quickly. This step-by-step approach has been characterized in literature as phased implementation. This is a method of changing to a new system from an existing system which takes place in stages (Wainwright, 2009). The reason for this often is that if the new system does not work (properly), the old system can still be opted for and used. Applied to the current context, employees can get used to this human robot interaction in a slow, controlled manner whilst the company always has the opportunity to go back if necessary (Woods et al., 2004). For one of the organizations in the case study (and presumably many
others in the world), the implementation did not follow such an approach and robotization was suddenly there. As an interviewee already commented, this does not help acquire successful interactions in an ideal manner and therefore negatively influences willingness to embrace robotization. Further, it was suggested that if certain workers are interested and competent, giving them more responsibilities might be a way to increase successful interactions between them and robots. However, this heads more in the direction of job autonomy, which will be discussed later. So, this thesis has shown that positive associations of Human-Robot Interaction positively influence the willingness to embrace robotization. These successful interactions can be acquired in many different manners, being considered an important resource for employees to embrace robotization.

5.3 Training

This thesis has further shown that proper training is an important factor in determining the ability of employees to deal with robotization, as agreed upon by middle level employees and lower levelled employees. On many occasions in the sample however, lower levelled employees had to figure the majority of necessary skills in order to deal with robotization out themselves, which is obviously not ideal. Furthermore, the expectation of receiving proper training was also proclaimed by the lower levelled employees. In general, it has long been known that the increasing of acquired abilities of people in useful knowledge is the key to future economic productivity (Schultz, 1981). For people to acquire the proper knowledge and skill set to perform the tasks at hand, different training approaches are suggested in literature. Learning through demonstration is a technique in robot training which is frequently suggested as appropriate in such situations (Argall et al., 2009). Through this type of training, people can see what the robot does with their own eyes. This could be done real-life or via a before and after video, which was suggested by an interviewee in the study. Through this way of interactive educating, a deeper understanding amongst people will be created (Beeman, 2008). Actively engaging human employees in these types of training help them perform their work in the appropriate manner earlier and learn additional aspects of the job (Adams, 2005). It was quite interesting to see that although a couple of middle levelled employees agreed that receiving proper training is important, a lot of lower levelled employees said that they mainly had to figure it out by
themselves. The fact that none of the latter were part of the organization of the former logically explains this asymmetry. Thus, this thesis has shown that the increase in skill requirements, which is a job demand, can negatively influence employees by means of an increase in (mental) job demands. Especially, the ability to deal with the new automations or robots can suffer when proper training or schooling is not provided.

5.4 Participation

Participation in decision making was found in this thesis as an important resource for employees to be more willing to embrace robotization. By providing opportunities for employees to participate in the decision making processes, organizations increase the chances of satisfying basic employee’ higher order needs (Singh, 2009). That this ultimately leads to a greater employee acceptance of robotics had not concretely previously been identified. What has been found previously however, is that participation positively relates to worker performance (Mizrahi et al., 2009). One could argue that the positive relationship of participation in decision making on employee acceptance of robotization ultimately results in better work performance. In order to increase this participation in decision making, a suggestion was made for the giving of a voice to employees. In literature, a diversification between two types of voice behaviour has been made: that of speaking up (voice towards supervisors) and speaking out (voice towards peers) (Liu, 2010). Obviously, in this thesis, the emphasis is put on speaking up of employees with regards to the way robotization is applied in the organization. Studies have supported the suggestion made in this thesis that voicing of employees results in more trust between workforce and organization (Singh, 2009), which ultimately results in more willingness to accept a certain (new) work environment. So, this thesis has shown that the participation in decision making functions as resource for employees to be more willing to embrace robotization.

5.5 Task variety and job autonomy

Finally, the thesis had discovered two new aspects which had some relationship with the willingness and ability to work with robots. These were the aspects of task variety and job autonomy. In the JD-R model, task variety is seen as a significant job resource in dealing with job demands (Demerouti et al., 2001). It became apparent that as a result of robotization, it would not be desirable
that variety in the tasks would decrease. However, a strong positive relationship was not found between an increase in task variety with willingness or ability to embrace robotization. This is slightly surprising, considering that task variety has been linked to aspects such as satisfaction, engagement and performance in the past (Truxillo et al., 2012). One might argue that the willingness of embracing an organizational change in the form of robotization would also fit in this row. However, this has not necessarily been proven in this thesis. This may be down to the fact that it is quite difficult to for these workers to predict if they necessarily need task variety in order to become more willing to embrace robotization, because they do not always exactly know what the direct consequences for them will be. That is why the responses were primarily focused on the (possible) reduction of variation in the tasks.

With regards to job autonomy, the conclusion was quite similar. It was seen that if robotization decreases the job autonomy of employees, the willingness of employees to embrace these robots will deteriorate. However, a relationship between an increase in job autonomy with willingness to embrace robotization was not necessarily found. This was the case, whilst job autonomy has also been described as a resource to tackle job demands (Demerouti et al., 2001) as well as a predictor of people's ability to learn new computer software programs, their mental health and job performance (Bond & Flaxman, 2006). With the resource of job autonomy lacking, it has been seen before that this could possibly lead to worse workplace conditions and simultaneously decreasing employee performance (Kahya, 2007). Again, the difficulty for some employees to predict if an increase in job autonomy is necessary for willingness of embracing robotization, could be a possible explanation for not proving this positive relationship.
6. Practical implications

This thesis has provided guidance for practitioners, mainly organizations, to help improve willingness and ability amongst employees to deal with robotization. It has done this by distinguishing what resources and guidelines it must follow in order to achieve this. The themes which were identified were described as resources with different suggestions incorporated into them. This falls within the aspect of organizational change, in which these resources can be equipped to try and reach optimal employee’ willingness and ability to embrace robotization. In this, practitioners can use these results of the thesis to make more conscious decisions regarding robotization and its effect on employees.

The logistics sector is where the results of the thesis will be most relevant, considering that this is where the case study took place. Since labour shortage is still a major problem for many logistics companies, robotization is a viable option. That is why correctly implementing robotization is even more important. Employees will be happier with their job when they feel supported, with organizations being repaid with better work performance (Fisher, 2010). Guidelines on how to improve willingness and ability to embrace robotization is therefore of great importance to practitioners. With regards to the most important resource for ability to embrace robotization, which is training, it might be sensible for organizations to firstly find out what exactly is expected from employees. After that, determining an appropriate way of teaching the employees the ways of working in the new work environment with robots. In this way, optimally preparing employees to be able to work with robots. Furthermore, quality of the interaction between human and robot is key for the willingness to embrace robotization. Practitioners might consider the stepwise implementation technique suggested whilst simultaneously giving more responsibilities to interested and competent employees in order to improve successful interactions. For participation in decision making, which is the final important resource for the willingness to embrace robotization, there are also some steps to possibly follow. Giving employees a voice towards their peers in order to acknowledge their suggestions and reward them accordingly can help invigorate this resource for employees.
7. Limitations and suggestions for future research

The most straightforward limitation of this thesis is the subjectivity of the data analysis. In the methodology section it was described that an exploratory field study was used, which is very much open for interpretation. The process of interpretation is subjective and depends a lot on the capabilities of the researcher in question. Developing validity standards in this type of research is challenging and difficult, due to this necessity to include subjectivity and rigor as well as creativity into the scientific process (Whittemore et al., 2001). Additionally to this subjectivity, a number of interviews had to be translated from Dutch to English, which did not strengthen objectivity as well. Either way, there were positive aspects to this approach, namely the fact that new themes and relationships were identified with regards to the willingness and ability of employees to embrace robotization.

The next limitation of the thesis is the limited data sample. Organizations which were approached, were firstly only within the logistics sector and secondly within personal networks. That is why, only four different organizations are present within the sample, including only the available employees at the time. Fortunately though, the organizations had different levels of robotization and the employees differed in rank, creating a general overview of the situation. The diversity of the sample therefore tries to reduce this limitation. In order to increase validity of the findings of this thesis, in the future many more organizations could be approached to give an even broader view of robotization and its effects.

The final limitation of the thesis has to do with its discovering nature. Understanding and investigating the relationship to the willingness and ability to work with robotization is valuable. However, this thesis has only scratched the surface of this relationship. A number of themes relating to this relationship have been addressed, however many more probably exist. Additionally, a couple of suggestions were made which have not been tested in practice, so their effectiveness remains an educated guess at best as of yet. So, in order to test the effectiveness of the concept as a whole and its components, future empirical research using a more deductive approach is necessary.
8. Conclusion

This thesis has researched how organizations can provide employees with resources in order to improve both willingness and ability to deal with robotization. By means of tackling a number of themes concerning robotization - namely job security, quality of the interaction between human and robot, training, participation, task variety and job autonomy – resources were derived in order to facilitate this challenge. Qualitative interviews with employees from middle and low level positions within organizations revealed numerous perceptions relating to these themes and provided new insights as well. Up until now, robot experts had not integrated social implications in their designs for robotic systems. This thesis hopes to function as a starting point for organizations to recognize the need for employee’ willingness and ability to deal with robots and how to achieve it. This, since the current case study had a number of limitations in the sense of subjectivity, limited data sample and the lack of real life testing of a number of suggestions made. Future studies with a larger data sample and test possibilities may therefore complement what has already been found in this thesis.
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## 10. Appendix A

### Interview protocol

**Interview**

Het interview gaat om jouw werk en hoe je dat elke dag uitvoert. Er is geen fout of goed. Beschrijf het liefst in je eigen woorden en zo nauwkeurig en gedetailleerd mogelijk welke taken bij jouw werk horen zodat iemand die het werk totaal niet kent het zou kunnen begrijpen.

1. Kun je in detail beschrijven wat jouw werk is?
2. Hoe ziet een standaard dag op het werk eruit? Wat doe je elke dag? Welke taken moet je dagelijks uitvoeren? Welke taken hoef je niet elke dag te doen?
3. Welke verantwoordelijkheden heb je?
4. Welke systemen, machines, materialen gebruik je in je werk?
6. Wat moet je allemaal kunnen om jouw werk uit te voeren?

| 1. Is jouw werk verandert door de introductie van robots? Zo ja, op wat voor manier? |
| 2. Denk je dat jouw werk (binnenkort) gaat veranderen door robots? Op welke manier? |
| 3. Wat weet je over de robotisering jouw werk? Wat vind je ervan dat er steeds meer met robots wordt gewerkt? Is dit een goede/slechte ontwikkeling? |
| 4. In hoeverre vindt/lijkt het je leuk om met robots te werken? Kun je dat uitleggen? Wat is/lijkt je leuk, interessant en uitdagend hieraan? Wat is/lijkt je juist eng, moeilijk of vervelend? |
| 5. Wat is/zou er nodig zijn voor jou om met robots samen te kunnen werken? Wat doet/kan de organisatie doen? Wat doe/kan jij zelf doen om te zorgen dat je met robots kunt werken? |
11. Appendix B

Coding list

Job Security
- Fear for future employment

Quality of the Interaction

Training

Participation

Task Variety*

Job Autonomy*