Robotic Process Automation, a burden or reliever for office workers?

Exploring the effects of organizational strategy, job relevance, and employee learning orientation on the RPA - work engagement relationship: An Experimental Vignette study

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Master Thesis

Innovation Management

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Preface

Dear reader,

This master thesis document, as a partial fulfilment of the Master of Innovation Management at the University of Technology, Eindhoven, marks the end of my student career. The graduation project started in April 2022 at one of the most famous companies in Eindhoven, well known for its long history in the automotive industry. It made me proud to conduct the graduation project here at DAF and to be part of the organization. The journey at DAF has been a ride of ups and downs. Regardless of the situation, I could always count on the help and support of others. Therefore, first and foremost, I thank all the DAF colleagues, especially my company supervisor Eric Janssens. You not only provided guidance during the thesis project, you also prepared me better for the beginning of my professional career. I owe you a big thanks for this.

Second, I thank my first TU/e supervisor, Professor Ed Nijssen. When the way to go was unclear, you provided guidance that helped me during this graduation project. In addition, your patience and quick and comprehensive feedback increased the quality of my thesis. I am very grateful for your help during this journey. Also, I want to thank Dr. Kleingeld as my second TU/e supervisor during the master thesis project. Thank you for the valuable feedback, which increased my thesis's quality and helped me to reach this point. I am very grateful for your help.

Furthermore, I would like to thank Noortje Gevers, the person with whom I started my career as a student. From day one of the bachelor, you have been by my side as a friend. Your support over the last years helped me enormously and is very much appreciated.

Last but definitely not least, I would like to thank my family and my parents in particular. You gave me the opportunity to study all those years, for which I am very grateful. Your mental support definitely helped me during the past years as a student, although you were not directly involved in the process. Again, thank you for your unrestricted support.

Tom van Teeseling – April 2023

Abstract

Firms increasingly start to adopt work automation technologies within the office environment. However, research towards the work automation technology Robotic Process Automation (RPA), which refers to a preconfigured software robot that autonomously performs repetitive work tasks, is still in its infancy, focuses predominantly on the positive effects of RPA and presents mainly case studies for higher-level management. Hence, RPA literature lacks insights into employee-related consequences after implementing the technology. This study draws upon the job demand-resources (JD-R) theory to explain how RPA affects one's work engagement through changing work characteristics labelled as job demands and resources. The current research contributes to the RPA literature by investigating the neglected moderation constructs of organizational strategy and job relevance and includes employee learning orientation as a personal resource. We did so since work design literature argues that automation technologies' effects on work designs depend on the technology, external, and individual factors. We analyzed how organizational strategy and job relevance moderate the RPA and job demands-resources relationships and if employee learning orientation reduces the increasing job demands caused by the RPA implementation. In doing so, we try to shed light on the ambiguous findings that RPA, on the one hand, positively contributes to work designs. On the other, causes a decrease in work engagement among employees. This quantitative research gathers data via hypothetical scenarios using the experimental vignette methodology (EVM). The variance-based Structural Equation Modelling (SEM) results from 48 employees within different departments from one multinational within the automotive industry reveal that the substitution of repetitive work by RPA causes an increase in perceived job insecurity, job complexity, information processing, job autonomy, and task variety. Moreover, we found that the technology's characteristics do not solely determine the effect of RPA on work engagement. The results provide evidence for the finding that employee learning orientation reduces perceived job insecurity caused by RPA. Surprisingly, no support is found that job relevance strengthens the relationship between RPA and perceived job insecurity, such that employees who perform more repetitive work are more insecure about the continuity of their job. Finally, no support is found for a significant moderation effect of organizational strategy on the RPA and job demands-resources relationships.

Keywords: Robotic Process Automation (RPA), Job Demands-Resources (JD-R) Theory, Work Characteristics, Organizational strategy, Job relevance, Employee Learning Orientation, Work Engagement

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Executive summary

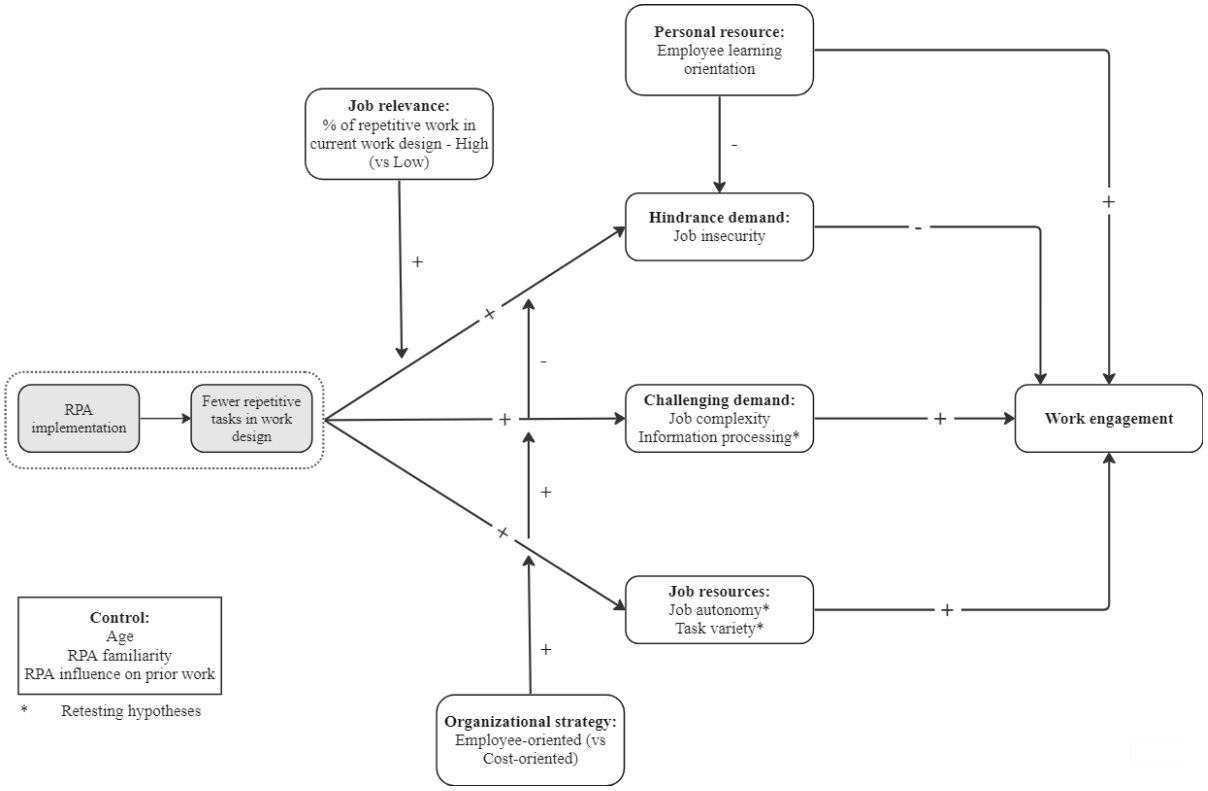
Organizations in many different industries have started to adopt work automation technologies to implement in their business processes. Robotic Process Automation (RPA), in particular, is increasingly popular among organizations (Mendling *et al.*, 2018). RPA performs existing business processes (e.g. Asatiani & Penntinen, 2016) and is extremely useful for executing high-volume standardized and repetitive work (e.g. Aguirre and Rodriguez, 2017). However, RPA knowledge development focuses predominantly on the positive aspects of the technology (Wewerka & Reichart, 2020) and presents primarily findings applicable to higher management (Syed *et al.*, 2020). Consequently, RPA literature lacks insights into the technology's dark side and its consequences for office employees. This trend is concerning since new technologies can be a double-edged sword for office workers since it, on the one hand, frees employees from the burden of simple and repetitive work. Conversely, it threatens one's job and career continuity (Ackerman & Kanfer, 2020). Hence, more research towards the effects of RPA on employee consequences and work engagement is required (Siderska, 2020).

Prior RPA literature examining the consequences it entails for office employees is still in its infancy and does not provide unambiguous results. On the one hand, prior studies argue for impairment of employees' work engagement at the hand of RPA (Peeters & Plomp, 2022). Others argue that RPA mainly benefits employees and fosters employee work engagement (Fréour *et al.*, 2021). Therefore, RPA literature lacks insights into how RPA affects office workers individually. To better understand and evaluate the consequences RPA has for employees, this study extends prior research by taking personal resources into account and including organizational strategy and job relevance as potential moderators who might influence the RPA and job demands-resources relationship. The reason for the inclusion is based on the proposition that technologies' effects are not predetermined but depend on individual and external factors (Parker & Grote, 2020). Furthermore, two neglected work characteristics within quantitative RPA literature are examined in the relationship between RPA and work engagement. This study aims to provide more comprehensive insights into how RPA affect work engagement through work characteristics. By including personal recourses and the two potentially moderating constructs, more extensive insights into the effects of RPA on work engagement should be generated. Consequently, the findings should solve, to some extent, the problem of ambiguous results provided so far and give managers more detailed tools to keep employees engaged when implementing RPA in their business processes.

The current study leverages on the Job Demand-Resources (JD-R) theory. The JD-R theory categorises the changing work characteristics due to the RPA implementation in job demands and resources. The JD-R theory asserts that job demands result in a health-impairment process, while job resources activate a motivational process. Personal resources can influence job demands and are expected to positively affect work engagement (Bakker & Demerouti, 2017). Taken together through the lens of the JD-R theory, the current study aims to answer the following research question:

RQ: *"Do organizational strategy and job relevance (i.e. the degree of repetitive work) moderate the RPA and job demands-resources relationship, and do personal resources (i.e. employee learning orientation) directly reduce job demands and stimulate work engagement?"*

With the JD-R theory as a guideline, a conceptual model was created and tested via an Experimental Vignette Methodology (EVM). In total, 48 participants from one Dutch company operating in the automotive industry completed the experiment and additional survey. Subsequently, the data is used to test the model via the variance-based Structural Equation Modelling (SEM) technique. The figure below presents the conceptual model. The results are summarized and elaborated on in the following paragraphs.



Direct relationships

In line with the expectations, the findings confirm that substituting repetitive tasks with RPA can increase perceived job insecurity, job complexity, information processing, job autonomy, and task variety. Additionally, the findings provide evidence for the positive relationship between job complexity, information processing, job autonomy, and task variety with work engagement. Surprisingly, the results indicate that job insecurity does not significantly lower employee engagement. The positive relationship between RPA and work engagement is mediated through information processing, job autonomy, and task variety. Hence, the increase in information processing, job autonomy, and task variety are essential prerequisites to keep employees engaged after the substitution of repetitive work by RPA.

Personal resources

Learning orientation as a personal resource, which concerns the employees' motivation to develop themselves, reduces perceived job insecurity. This finding supports that learning-oriented employees consider technological change (e.g. RPA implementation) as an opportunity for personal and skill development and see RPA not as a threat to the continuity of their current jobs. Hence, increasing learning-oriented behaviour can help employees consider work automation as an opportunity for personal development, thereby reducing the threat of robotization. This finding indicates that the effect of RPA on employee-related consequences is not solely determined by the technology itself. Finally, no support is found for a direct positive relationship between employee learning orientation and work engagement.

Moderating relationships

The increase in job insecurity, what concerns an individual's reaction to the changes in the work design, confirms that RPA is seen as a potential threat to the continuity of employees' jobs. Current research does not find that job relevance influences the relationship between RPA and perceived job insecurity. Job relevance concerns the applicability of RPA to one's job. Since RPA is utilized to perform repetitive and mundane work, it was expected that employees with a high job relevance (i.e. high forms of repetitive work in the current work design) would be more insecure about the continuity of their job. The findings of the current study do not support this expectation. Furthermore, the findings of this study

do not provide evidence for the influence of organizational strategy on the RPA and job demands-resources relationship. Organizations that aim to provide more pleasurable work were expected to diminish the relationship between RPA and perceived job insecurity and strengthen the relationship between RPA and job complexity, job autonomy, and task variety compared to companies that utilize RPA to reduce operational costs. All in all, the findings indicate that the RPA and job demands-resources relationship is not affected by job relevance and organizational strategy.

Managerial implications

Overall, the current research findings indicate that employees consider RPA a positive addition to their work designs. In general, implementing RPA for repetitive tasks increases challenging demands, job resources, and stimulate work engagement. Hence, practitioners who implement RPA in their business processes can provide higher-value work to their employees and, in addition to that, increase work engagement among their employees. According to our findings, two key managerial implications can be drawn from this study for a more successful implementation of RPA.

First, this study shows that the substitution of repetitive work by RPA causes an increase in perceived job insecurity among employees. Companies and managers should be aware that employees' repetitive work and organizational strategies do not affect the RPA and job insecurity relationship. Therefore, we point out to practitioners who implement RPA in their departments that the perceived job insecurity among employees will likely increase regardless of the organizational strategy and how much repetitive work employees currently perform. This study advises managers to help employees cope with the changing work design and increasing job insecurity by investing in learning activities and encouraging learning-oriented behaviour among their team members. Learning-oriented employees are likely to cope better with technological changes. However, increasing learning-oriented behaviour needs to focus on employees who rather keep the status quo. Therefore, managers should gain insights into which employees in their teams are learning-oriented and who is not. Learning opportunities can be provided, for example, by offering training and other development initiatives to employees. Increasing learning-oriented behaviour helps employees to cope with the change in work designs and consider RPA as a development opportunity and not a threat.

Second, although employees experience increased job insecurity with the implementation of RPA, our findings do not indicate that employees expect their jobs to become obsolete. Therefore, instead of focusing mainly on reducing the threat to employees, managers should also focus on the changes in work designs. Our findings imply that RPA increases job complexity in both organizational strategies. In turn, job complexity increases work engagement. Therefore, regardless of the organizational strategy, managers should take into account one’s expertise and qualities. In other words, job reclassification needs to be aligned with employees’ skills and expertise. From this perspective, managers should analyze upfront the RPA implementation if employees possess the abilities for more complex work. If not, it could be helpful for managers to ensure that employees gain the necessities for the increasing complexity.

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1.Introduction

1.1 Motive for research

Within the digital transformation, Robotic Process Automation (hereinafter, RPA) is a new Information Technology that recently received much attention (e.g. Aguirre & Rodriguez, 2017; Syed *et al*., 2020; Tschandl *et al*., 2022). In addition, there is an increase in organizations adopting and implementing RPA (Mendling *et al.*, 2018). RPA focuses on automating existing business processes with the help of software robots (Asatiani & Penttinen, 2016; Lu *et a*l., 2018; Syed *et al*., 2020) and can be integrated into administrative back office work (Ruiz *et al.*, 2022). Therefore, the technology is appropriate to take over structured and repetitive work tasks (Aguirre & Rodriguez, 2017; Lacity & Willcocks, 2016; Mendling *et al*., 2018; Ruiz *et al.*, 2022) in areas such as banking, accounting, human resource, insurance, and finance (e.g. Eikebrokk & Olsen, 2020; Gupta *et al.*, 2019; Lu et al., 2018; Plattfaut et al., 2022; Suri *et al.*, 2017).

When introducing RPA within a firm, "the organizational impacts include RPA deployment's implications for human labour, the process landscape, and IS ecosystems" (Hofmann *et al*., 2020, p.103). More specifically, critical aspects of the work design, such as the level of autonomy and job demands, like the level of workload, are potentially simultaneously affected when implementing new robots and other work automation technologies (Parker & Grote, 2020). Therefore, the technical replacement of human labour can have psychological consequences for employees (Granulo *et al*., 2019), influencing employees' attitudes and behaviours (Frese *et al.*, 2007). As such, employees can experience new robotic technologies as a double-edged sword. On the one hand, robotics can reduce the burden of repetitive and mundane work. On the other, it can disrupt the career paths of individuals (Ackerman & Kanfer, 2020). Consequently, it is essential to consider how new work automation technologies influence human resources (Welfare *et al.*, 2019). Moreover, employees' work design, which concerns the "content and organization of one's work tasks, activities, relationships, and responsibilities" (Parker, 2014, p. 662), requires proactive reconsideration when new technologies enter the workplace (Fréour *et al.*, 2021; Parker, 2014) since work designs affect employee well-being (Oldham & Fried, 2016). However, little emphasis is placed on the consequences RPA entails for employees and their work designs. Prior RPA literature focuses predominantly on the technology's positive effects (Wewerka & Reichart, 2020) and primarily presents case studies and experiences applicable to higher-level management (Syed *et al*., 2020). This suggests that limited evidence exists on employee-related consequences, which is concerning since a new technology can influence employees' work engagement. Consequently, it can negatively affect the workers' health and organizational performance (Demerouti, 2020; Welfare *et al.*, 2019). Therefore, it is essential to evaluate the consequences of automation for employees (Parasuraman *et al.*, 2000). More specifically, scholars should examine the potential effects of RPA on employee work engagement (Siderska, 2020).

Prior research investigating the effect of RPA on employee-related consequences is both scant and contradictory. Although one stream of research suggests that employees perceive RPA positively due to reduction of repetitive work (e.g. Asquith and Horsman, 2019; Eikebrokk & Olsen, 2020; Lacity & Willcocks, 2015), what provide employees with new opportunities to develop themselves (Ågnes, 2022). Another research stream argues for the technology's dark side since employees face job loss as RPA takes over work (e.g. Suri *et al.*, 2017; Priyadarshi & Premchandran, 2022). Therefore, Pramod (2022) emphasizes the need for research on the effects of RPA on employee-related consequences, such as job loss and reskilling. Investigating the work design on a micro level enables the examination of the effects of RPA on work characteristics (Fréour et al., 2021). This should provide a better understanding of how RPA affects the workers and give insights into how to reap the technology's benefits since "the

more that we can map out how, what, and why technology affects work design, the more we will gain important insights into how to optimize technology's benefits" (Parker & Grote, 2020, p.24).

Recent research answered this call by examining the effects of RPA on work characteristics and engagement using JD-R theory (Peeters & Plomp, 2022). Against the expectations, RPA significantly reduces work engagement through job autonomy and task variety. Additionally, results report that RPA does not increase work engagement by reducing the amount of information processing (Peeters & Plomp, 2022). These findings are concerning since it implies, according to the Job Demands-Resource theory (JD-R), that RPA causes a decrease in job resources (i.e. job autonomy & task variety), the main drivers of the development of job motivation (e.g. Demerouti & Bakker, 2017; Bakker & Demerouti, 2007). In addition, RPA does not reduce any job demands (i.e. information processing), which play a significant role in the development of job strain (e.g. Demerouti & Bakker, 2017; Bakker & Demerouti, 2007). Therefore, based on the JD-R assumptions, the findings of Peeters and Plomp (2022) indicate that RPA reduces work engagement, therewith harming employee well-being. On the other hand, qualitative research investigating the modification of work characteristics by RPA provides evidence that RPA enhances job resources (i.e. job autonomy) and job demands (i.e. information processing), suggesting that RPA does not impair employee work engagement (Fréour *et al.,* 2021). Moreover, recent results underline that employees perceive an increase in job enlargement and job satisfaction after implementing RPA (Johansson *et al.,* 2021), what implies that the technology can foster work engagement. Taken together, these studies do not provide unambiguous results on the relationship between RPA, work characteristics, and work engagement. Consequently, more research on the effects of RPA on work characteristics and employee work engagement is required.

The three neglected factors of a) employee learning orientation, b) organizational strategy, and c) job relevance might explain the conflicting results concerning the modification of work characteristics and work engagement by RPA. As Parker and Grote (2020) point out, the effect of new technologies on work design is not predetermined. Moreover, "the effects of technology on work design depends on: the technology per se, various higher-level factors, individual factors, and the inter-relationship of these elements" (Parker & Grote, 2020, p. 24). Therefore, as first, the JD-R theory asserts that personal resources can control for the unwanted effects of job demands and have a direct positive relationship with work engagement (Bakker & Demerouti, 2017), suggesting that personal resources might partly determine the effects of RPA on work engagement. Second, an important neglected factor in prior RPA literature is the organisational strategy behind the RPA implementation. For example, organisations can wield an automate strategy, which is characterised by automating as many processes as possible, aiming to replace employees with robots (Endsley & Kaber, 1999; Parker & Grote, 2020). Conversely, organisations that use a human-centred approach are more likely to keep employees in control and provide workers with meaningful work (Waschull *et al.,* 2020). In other words, organisations can differ in strategy when implementing RPA, what implies different results concerning the restructuring of the work design (Parker & Grote, 2020). Finally, Parker and Grote (2020) argue that the degree of repetitive work moderates the relationship between robots, algorithms, other contemporary technologies and work designs. A recent study investigating how digital technologies modify work characteristics underlines this proposition (Fréour *et al.,* 2021). The current study refers to the degree of repetitive work as job relevance, which concerns the applicability of RPA to the job (Wewerka *et al.,* 2020).

Taken together, as suggested by Parker and Grote (2020), it is likely that RPA only partially determines the effect on work characteristics and engagement. Personal and external factors, such as organizational strategy and job relevance, might influence the relationship between RPA and employee

work engagement. Therefore, by addressing an experimental vignette study, this study investigates how personal resources, organizational strategy, and job relevance influence the relationship between RPA and work engagement through work characteristics categorized as job resources and job demands. It is of great importance to provide better insights into how RPA affects the work design since "the work design is a key determinant of employee well-being, work attitude, and job performance" (Parker *et al.*, 2017, p. 267). More specifically, employee well-being in the form of work engagement predicts job satisfaction, organizational commitment, organizational citizenship behaviour, and turnover intentions (Saks, 2019). Engaged employees are associated with higher job performance, which increases organizations' competitive advantage (Albrecht *et al.*, 2015). By extending RPA literature, the current study aims to provide additional insights how RPA can be best integrated into the work design (Mendling *et al.*, 2018) and turned into a resource for all employees since "the only way to collectively profit from digitalization and automation is to turn it into a resource for all involved parties, including or even starting from the employees" (Demerouti, 2020, p. 4).

1.2 Research question

Following the gap from academic literature, this research aims to answer how RPA modifies work designs (i.e. job demands and resources) and therewith affects employee work engagement, taken personal resources, the organisational strategy behind the implementation of RPA, and job relevance into account. To provide a guideline throughout this research and with the JD-R theory as its base, this research tries to answer the following research question (RQ):

RQ:

"Do organizational strategy and job relevance (i.e. the degree of repetitive work) moderate the RPA and job demands-resources relationship, and do personal resources (i.e. employee learning orientation) directly reduce job demands and stimulate work engagement?"

To provide an answer to the main question, the following sub-questions (SQ) are formulated:

SQ1: How does employee learning orientation affect job demands and work engagement?

SQ2: Which strategies do organisations wield when implementing RPA?

SQ3: How do organisational strategy and job relevance moderate the RPA and job demands-resources relationships?

1.3 Research contribution

From a theoretical perspective, current research contributes to RPA literature by complementing the limited research towards the influence of RPA on work engagement through work characteristics. Specifically, this study contributes to existing literature by the following four aspects.

First, by including personal resources, the current study contributes to the existing RPA literature by providing more extensive insights into the effect of RPA on work engagement. According to the JD-R theory, personal resources affect job resources, job demands, and work engagement (Bakker & Demerouti, 2017). Additionally, Parker and Grote (2020) argue that the effects of technology on work design are not solely determined by the technology itself. Consequently, personal resources might determine how RPA affects work engagement to some extent. Hence, the current study considers personal resources as an essential construct to provide a better understanding of the consequences of RPA on work engagement. However, to the current knowledge, quantitative research has yet to consider

personal resources when investigating the effects of RPA on employee work engagement. Therefore, the current study includes personal resources in the research design.

Second, a prominent contribution to the existing literature is the inclusion of organizational strategy behind the RPA implementation as a factor that influences the relationship between RPA and work characteristics. Work design literature acknowledges the influence of organizations on work designs (Parker & Grote, 2020; Parker *et al.*, 2017; Parker, 2014). Nevertheless, to the current knowledge, none of the existing literature included organizational strategy as a moderation effect on the relationship between RPA and work characteristics. While organizational strategies have not been used to determine the effects of RPA on work characteristics, prior work design literature acknowledges that organizational factors can affect work characteristics (Parker, 2014). The current research argues that organizations significantly influence the determination of RPA, affecting work designs. Consequently, the current research aims to extend current research with this inclusion and provide more extensive implications on the effect of RPA on employee work engagement.

Third, while work design literature argues that the effect of work automation on work characteristics depends on the job relevance (i.e. degree of repetitive work) (Parker & Grote, 2020), prior RPA literature does not include this construct in research towards the effect of RPA on work engagement. Moreover, a recent preliminary study towards the effects of digital technologies on work characteristics suggests that the degree of repetitive work might determine how much work can be substituted by technologies, which partly determines the effect of technologies on work characteristics (Fréour *et al.*, 2021). Since RPA literature argues that RPA is effective in performing structured and repetitive work (Aguirre & Rodriguez, 2017; Lacity & Willcocks, 2016), the current research includes job relevance as a construct that influences the RPA and work characteristics relationships. Consequently, this study contributes to the existing literature by including another interaction effect in the research design.

Finally, to the current knowledge, this research is the first that differentiates between challenging and hindering demands within RPA literature. Prior JD-R literature extensively argued that not all job demands are equivalent and can be divided into challenging and hindering demands (Lepine *et al.*, 2005; Van den Broeck *et al*., 2010). Therefore, JD-R research argues that not all job demands are detrimental to employee work engagement. Nevertheless, current RPA literature has yet to make this differentiation so far. Henceforth, the current research investigates the differentiation between challenging and hindering demands in work designs affected by RPA. The reason for making this differentiation is to provide a more comprehensive insight into the effects of RPA on work engagement through work characteristics labeled as challenging demands, hindrance demands, and job resources.

1.4 Problem analysis

The current study concerns quantitative research to obtain insights and answer the research question. This graduation project is commissioned by DAF Trucks N.V. (DAF), located in Eindhoven, the Netherlands. DAF focuses on developing, producing, and selling medium and heavy-duty trucks. DAF recently introduced RPA within its financial business processes to increase process efficiency. The reason for doing so is the increasing demand (DAF, 2022), while the current hiring policy hampers the intake of new employees. In other words, DAF works with a headcount target, implying that an increase in demand cannot lead to an extensive increase in the number of employees. RPA, on the other hand, is found to be highly applicable for preventing headcount expansion (Lacity & Willcocks, 2016). Considering these two reasons, DAF is experimenting with new ways to optimize its existing business processes such that the same number of employees accomplish the increasing work demand. Hence, DAF recently adopted RPA technology. However, the practical knowledge of how RPA affects employees when implemented on a larger scale is lagging. In particular, the effects RPA has on employees' work design when applied on a larger scale are unknown since RPA is only implemented to a limited extent in small business processes.

Preliminary research in the form of two semi-structured interviews with RPA developers reveals internal concerns about the effect RPA has on employees in terms of their changing work design. Subsequently, both interviewees I and II confirm that RPA is received positively for now by the employees. For instance, Interviewee I & II respond to the question of how employees experience RPA so far as follow:

"In the beginning, multiple employees were sceptical and afraid of some job loss etc.; employees rather kept the status quo. They did not see the urge to change and rather kept the situation as it was. However, further on in the process, people become enthusiastic as they see it can really help them to create a better workspace" (Appendix A, p. 77); And: *"In general, employees are considered to be positive regarding RPA. However, this holds for the robots who are of value to them. What if RPA replaces complete tasks/ jobs, will they still be positive?"* (Appendix B, p. 80).

The perceptions of RPA are thus far overall positive. However, there are concerns about the future of employees' work design when RPA is implemented on a larger scale. More specifically, when looking at the question if RPA already changed the required skills of employees, interviewee I responded as follows:

"For now, this is not the case within DAF since only small processes are automated. Just to make the working day of an employee a little bit easier. It is "nice to have". So the proportions of the reductions are small, so there is no need for new work and skills. However, if you do this on a large scale, I presume this will definitely be the case. We already see some examples where we expect to reduce someone's job by 75%. In this case, this person really needs to do something else, and thus probably obtain a new skillset"; and: *"For now, I mainly see only benefits. It reduces repetitive work and enhances the job in general. The main goal, for now, is to make the working day for employees easier. However, in the future, it might lead to some job loss. However, I expect that the jobs will just change and people will have to do other tasks. I do not think the main focus should lie on job loss."* (Appendix A, p. 77).

Regarding the future, many aspects are unknown. What is known is that RPA can influence work design which has consequences for employees' well-being. Therefore, to keep RPA a success within the company, it is crucial to maintain the support for RPA from the employees. Moreover, according to interviewee II, it is essential to:

"Look how to maintain support among the employees. Due to the limited impact, there are, for now, only benefits. However, no hard decisions have been taken yet. How will these hard decisions, for example, affect the current support? How can we maintain the support? If support decreases by some employees in parts of the organization, will this affect the entire organization?" (Appendix B, p. 81).

Therefore, this research aims to combine the theoretical and practical problem and fill the practical knowledge gap within DAF to better understand the effects of RPA on work engagement through work characteristics when implementing RPA on a larger scale. Additionally, DAF is interested in how RPA affects employees' work engagement in their current jobs. Henceforth, this research aims to provide DAF with advice on how to cope with the changing work characteristics and keep employees engaged.

1.5 Thesis outline

The remainder of the thesis is structured in the following manner: First, Chapter 2 explains the theoretical background of this research. Second, Chapter 3 elaborates on the conceptual model with the corresponding hypotheses. Third, Chapter 4 describes the methodology used, with a detailed explanation of the vignette development, data collection, sampling, and analysis. Fourth, Chapter 5 elaborates on the results of the analyses. Finally, Chapter 6 discusses the theoretical and managerial implications and provides fruitful areas for future research.

2.Theoretical background

2.1 Robotic Process Automation

RPA are software robots that replace employees for repetitive and structured tasks (Aguirre & Rodriguez, 2017; Fréour *et al.*, 2921; Lacity & Willcocks, 2016; Mendling *et al*., 2018; Ruiz *et al.*, 2022; Van der Aalst *et al*., 2018). Up to now, RPA is mainly integrated into administrative back office work (Ruiz *et al.*, 2022) in the areas of banking, accounting, human resource, insurance, and finance (Aguirre & Rodriguez, 2017; Eikebrokk & Olsen, 2020; Gupta *et al.*, 2019; Lu et al., 2018; Mendling *et al.*, 2018; Plattfaut et al., 2022; Suri *et al.*, 2017). RPA performs work on employee level (Mendling *et al.*, 2018) and can perform tasks such as cost search, invoice creation, or transfers. Cost search involves extracting, combining, and synthesizing data from different systems. Invoice creation and transfers involve RPA to automatically encode the extracted information into the systems (Fréour *et al.*, 2021). Consequently, RPA focuses on performing existing business processes and does not relate to delivering an artefact (Syed *et al*., 2020).

According to prior research, the application of RPA can be segmented in horizontal or vertical segmentation (Ruiz *et al.*, 2022). Within the horizontal segmentation, RPA focuses on end-to-end automation and aims to automate complete business processes. However, the occurrence of a horizontal segmentation is considered to be scarce since the automation of complete business processes by RPA selfdom occurs due to the limited capabilities of RPA (Ruiz *et al.*, 2022). On the contrary, in vertical segmentation, business processes are partly performed by RPA and humans. In other words, employees are kept in the process. This hybrid scenario means that, on the one hand, RPA performs work tasks due to their repetitive and systematic nature. On the other, low frequent or cognitively demanding tasks are executed by humans (Ruiz *et al.*, 2022). Therefore, within the vertical segmentation, employees consider RPA as a technological colleague performing repetitive tasks (Asatiani & Penttinen, 2016; Lu *et al*., 2018; Syed *et al*., 2020). The occurrence of a vertical segmentation is therefore more likely to occur and thus the focus of the current study.

The execution of repetitive work tasks by RPA can enable employees to perform other, more unstructured, and complex work (e.g. Asquith & Horsman, 2019; Eikebrokk & Olsen, 2020; Fréour *et al.*, 2021; Siderska, 2020). Figure 1 depicts the simplified implementation of RPA into human-based workflows where the technology takes over work (Note: Figure 1 does not suggest an employee lay-off due to RPA). Once the robot is activated, the RPA software starts performing the task at hand (Moffit *et al.*, 2018). Based on the RPA characteristics described above, this study defines RPA as the use of "a preconfigured software instance that uses business rules and predefined activity choreography to complete the autonomous execution of a combination of processes, activities, transactions, and tasks in one or more unrelated software systems to deliver a result or service with human exception management" (IEEE Corporate Advisory Group, 2017, p.11). In other words, RPA is useful for performing "high volume standardized tasks that are rules driven, where there is no need for subjective judgement, creativity, or interpretation skills" (Aguirre & Rodriguez, 2017, p. 70).

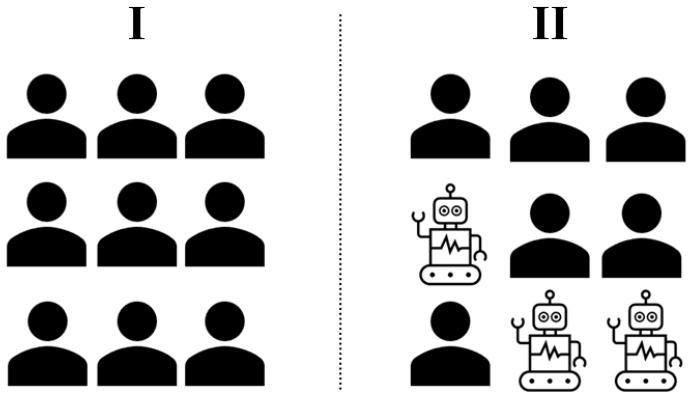

Figure 1: The effect of RPA on human based workflows (I: situation before; II: situation after); Source: Moffit et al. (2018)

2.2. The JD-R theory in prior RPA literature

Prior research investigating the effect of RPA on work characteristics and employees' work engagement uses the JD-R model to elaborate on these effects (Peeters & Plomp, 2022). Work characteristics will likely affect employees' motivation, performance, and well-being (Hackman & Oldham, 1976). Work characteristics can be defined as "the attributes of the task, job, and social and organizational environment" (Morgeson & Humphrey, 2006, p.1322). The JD-R model asserts that a qualitative work design entails high levels of motivational, knowledge, and social work characteristics while having limited job demands (Parker *et al.*, 2017). The primary assumption related to motivational characteristics is that these characteristics enrich jobs if they are present to a large extent. On the other hand, knowledge characteristics refer to the knowledge, skills, and ability demands that are put on the individual by performing the job and refer to job complexity. Social characteristics emphasize that work is executed within a broader social environment and relates, for instance, to the provided social support (Morgeson & Humprey, 2006). Peeters and Plomp (2022) used the JD-R theory to elaborate on the effects of RPA on work characteristics and employee well-being since new technologies can improve or worsen the work design (Parker & Grote, 2020), thereby employees face substantial changes in job demands and job resources. For a simplified overview of the general JD-R theory assumptions and the results from Peeters and Plomp (2022), see Figures 2 and 3.

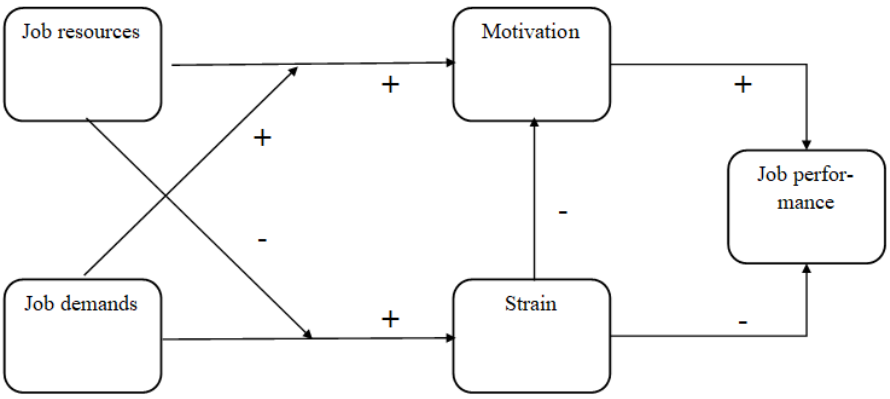

Figure 2: General assumptions JD-R theory (simplified); Source: Bakker & Demerouti (2017)

2.2.1 RPA & Job Demands

With the introduction of new technologies, job demands are likely to change (Demerouti, 2020). Job demands relate to physiological and/ or psychological costs. They refer to the "physical, psychological, social, or organizational aspects of the job that require sustained physical and/ or psychological effort or skills" (Bakker & Demerouti, 2007, p.312). Moreover, JD-R literature asserts that job demands "activate an energy depletion process whereby an employee's sustained increases in effort to meet perceived job demands are met with an increase in compensatory psychological and physiological costs that drain the employee's energy" (Crawford *et al.*, 2010, p.836). Job demands, therefore, play a significant role in the development of job strain (e.g. exhaustion, job-related anxiety, and health complaints) (Bakker & Demerouti, 2017; Xanthopoulou *et al.*, 2007). The conceptual model of Peeters and Plomp (2022) classifies one work characteristic as a job demand that the following paragraph elaborates on.

Information processing

Technologies with the ability to perform low-complex tasks can perform the activities such as information acquisition, information analysis, and decision selection. In other words, such technology can take over the employees' tasks involving information processing (Fréour *et al.*, 2021). Based on RPA capabilities, Peeters and Plomp (2022) identify the work characteristic information processing as a job demand likely to be influenced by RPA. Information processing refers to "the degree to which a job requires attending to and processing data or other information" (Morgeson & Humprey, 2006, p.

1323). The authors hypothesize that RPA relates negatively to information processing since RPA can take over administrative tasks, wherefore employees have to process less information themselves. This argument aligns with the proposition that robotics lower job demands by reducing repetitive work (Ackerman & Kanfer, 2020). As can be seen in Figure 3, against the expectation, a non-significant relationship is found between RPA use and information processing.

2.2.2 RPA & Job Resources

Job resources refer to "those psychical, psychological, social, or organizational aspects of the job that are functional in achieving work goals, reduce job demands and the associated physiological and psychological costs, or stimulate personal growth, learning, and development (Bakker & Demerouti, 2007, p. 312). The JD-R theory assumes that job resources activate a "motivational process whereby perceived resources that are instrumental in achieving work goals can also foster employees' growth, learning, and development; satisfy needs for autonomy and competence; and increase willingness to dedicate one's efforts and abilities to the work task" (Crawford *et al*., 2010, p. 836). Job resources are the main driver of the development of job motivation. Henceforth, the JD-R theory asserts a motivational path from job resources to employee well-being (Bakker & Demerouti, 2017; Xanthopoulou *et al*., 2007). Peeters and Plomp (2022) introduce two work characteristics classified as job resources that are affected by the implementation of RPA.

Job autonomy

One work characteristic introduced in the baseline model as a job resource and hypothesized to be affected by RPA is the work characteristic of job autonomy (Peeters & Plomp, 2022). A flood of research already investigated job autonomy as a motivational work characteristic (Morgeson & Humphrey, 2006). Early research defines job autonomy as "the degree to which the job provides substantial freedom, independence, and discretion to the employee in scheduling the work and in determining the procedures to be used in carrying it out" (Hackman & Oldham, 1975, p.162). This view of job autonomy is expanded and, according to recent research, consists job autonomy of three interrelated aspects, which are freedom in (1) work scheduling, (2) decision-making, and (3) work methods (Morgeson & Humphrey, 2006; Parker & Grote, 2020). Work scheduling refers to the possibility of employees determining the timing of work tasks. Decision-making includes having the autonomy to determine general decisions related to work processes. Work methods relate to employees' freedom to determine which methods to use for their work tasks (Parker & Grote, 2020).

A recent scholar examining the effects of automation on work designs argues that work automation technologies can increase job autonomy. Additionally, the authors refer to job autonomy as "a fundamental aspect of work design that affects multiple outcomes (e.g. motivation, stress, and performance)" (Parker & Grote, 2020, p.5). In line with this proposition, the conceptual model proposed by Peeters and Plomp (2022) argues that RPA frees employees from tedious work, which provides more time for other tasks or aspects of the job (e.g. Lacity & Willcocks, 2015; 2016). Therefore, employees gain more control over their work tasks, increasing their perceived job autonomy. However, as shown in Figure 3, a significant negative relationship is found between RPA use and job autonomy. This is concerning since these results imply that RPA causes a decrease in job autonomy and employee work engagement. According to these results, jobs are thus rather simplified with the implementation of RPA.

Task variety

The second, by RPA affected, work characteristic introduced as a job resource is task variety (Peeters & Plomp, 2022). Literature classifies task variety as a motivational work characteristic that refers to "the degree to which a job requires employees to perform a wide range of tasks on the job" (Christian *et al.*, 2011; Morgeson & Humphrey, 2006, p.1323). Jobs with multiple tasks are considered more interesting (Sims *et al.*, 1976), provide more meaningfulness to employees (Hackman & Oldham, 1976), and therefore positively affect work engagement (Albrecht *et al.*, 2021; Christian *et al.*, 2011). Peeters and Plomp (2022) argue that RPA increases task variety by eliminating repetitive work. The elimination of repetitive work should provide room for other tasks, resulting in job enlargement (Parker,

2014). Hence, the framework of Peeters and Plomp (2022) asserts that RPA causes an increase in task variety and thereby enhances work engagement. In contrast to this prediction, a significant negative relationship is found between RPA use and task variety (see Figure 3). This is concerning since these results imply that RPA results in job simplification and causes an indirect decrease in employees' work engagement through task variety.

2.2.3 RPA & Work engagement

Peeters and Plomp (2022) investigate the indirect effect of RPA on work engagement via work characteristics categorized as job demands or job resources. The first description of work engagement as a construct is provided by Kahn (1990), who describes work engagement as personal (dis)engagement. During engagement, employees "employ and express themselves physically, cognitively, and emotionally during role performances" (Kahn, 1990, p. 694). Conversely, during disengagement, employees "withdraw and defend themselves physically, cognitively, or emotionally, during role performances" (Kahn, 1990, p. 694). In line with these definitions, work engagement, according to a more recent study, focuses on the involvement of the emotional, physical, and cognitive aspects of the job (Truxillo *et al.,* 2012) and can be defined as "the mental state where employees feel full with physical energy (vigor), is enthusiastic about the content of their work and the things they do (dedication), and are so immersed in their work activities that time seems to fly (absorption)" (Demerouti & Bakker, 2017, p. 274). Others define work engagement as "a relatively enduring state of mind referring to the simultaneous investment of personal energies in the experience of performance of work" (Christian *et al.,* 2011, p.95). Both definitions seem to describe how employees experience work and what determines how much personal energy the employee invests in the job. When employees are highly engaged in their work, they experience positive work-related feelings like happiness when performing the work tasks (Kahn, 1990; Schaufeli *et al.,* 2002). Based on these findings and JD-R assumptions, this study asserts that job resources have a positive relationship and job demands a negative relationship with work engagement (Bakker & Demerouti, 2017).

In turn, work engagement is considered an antecedent for job performance, which can be divided into task and contextual performance (Christian *et al.,* 2011). Task performance, on the one hand, refers to the extent to which employees perform their required duties prescribed by the job. Contextual performance, on the other, refers to activities performed that are not formally part of the job description but are done voluntarily outside the formal boundaries of the job to help others within the organization to accomplish tasks (Borman & Motowidlo, 1997). Work engagement is thus a predictor of job satisfaction, organizational commitment, organizational citizenship behaviour, and turnover intentions (Saks, 2019). As such, work engagement relates to employees' performance, consequently influencing organizations' competitive advantage (Albrecht *et al.,* 2015).

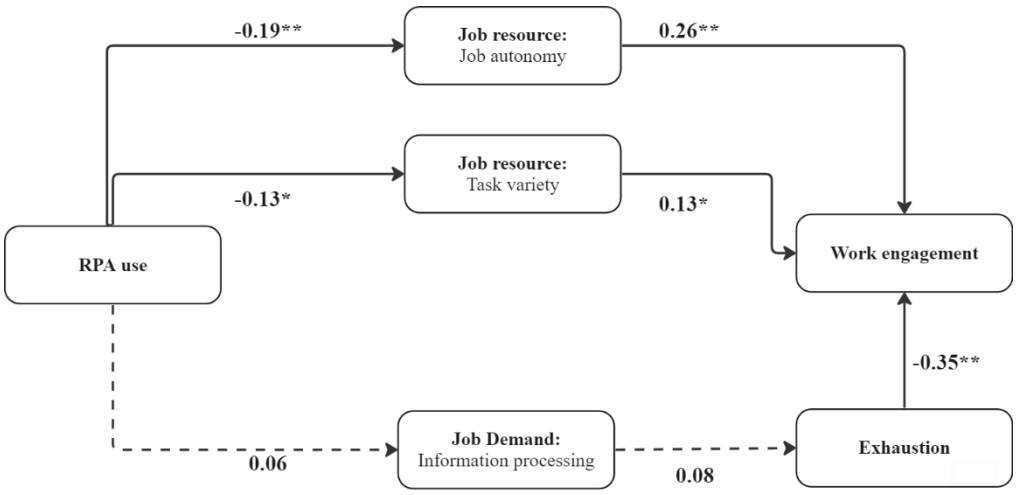

*Figure 3: Results prior research; Source: Peeters & Plomp (2022); *P<0.05, **P<0.01 (two-tailed)*

2.3 Contribution to prior RPA literature: the up- and downside of job demands

According to recent JD-R literature are not all job demands equivalent. Job demands can be divided into two subcategories: hindrance and challenging demands (Lepine *et al*., 2005; Van den Broeck *et al*., 2010). The differentiation in job demands implies that not all job demands play a significant role in the decrease in work engagement. This implication is based on the positive and negative feelings of stress, referred to as "eustress" and "distress"(Selye, 1956). Eustress includes the feeling of being challenged, which activates positive emotions that might increase employees' achievement. Whereas distress, on the other hand, activates negative emotions and results in the avoidance and withdrawal from and of work (Van den Broeck *et al*., 2010)

Challenging demands are defined as "demands that cost effort but that potentially promote personal growth and achievement of the employee" (Bakker & Demerouti, 2017, p.277) and are expected to promote personal growth and trigger positive emotions such as eagerness and excitement. Therefore, employees are more likely to invest in themselves to meet the challenging demands. Henceforth, challenging demands are anticipated to affect work engagement positively (Crawford *et al*., 2010). Hindrance demands, instead, are defined as "work circumstances that involve excessive or undesirable constraints that interfere with or inhibit an individual's ability to achieve valued goals" (Bakker & Demerouti, 2017, p.277) and cause negative emotions and interfere with one's work goal achievement and well-being (Van de Broeck *et al*., 2010). The JD-R theory asserts that employees are frustrated to overcome these hindrances, what triggers negative emotions such as fear and anxiety. Therefore, employees are less willing to spend energy to overcome hindrance demands, which negatively affects work engagement (Crawford *et al.,* 2010).

To the current knowledge, none of the RPA-related studies distinguishes between challenging and hindering demands when investigating the impact of RPA on work characteristics. Hence, the current study focuses on the influence of RPA on both types of demands and thus argues that not all job demands are necessarily detrimental to employee work engagement. Thereby, this study answers a recent call to do so since a better insight into how RPA influences job demands can contribute to a better implementation of RPA (Peeters & Plomp, 2022). In addition, Peeters and Plomop (2022) and Johansson and colleagues (2021) argue that it is interesting to uncover how other work characteristics, such as job demands, are affected by RPA since little is known about the effect of RPA on employees' work characteristics. Hence, in addition to prior research, this study identifies one challenging and one hindrance demand likely to be influenced by RPA. Both demands, in turn, are expected to affect one's work engagement. The following paragraphs elaborate on both job demands.

2.3.1 Job complexity

The first additional job demand to the baseline model of Peeters and Plomp (2022), categorized as challenging demand, is the work characteristic job complexity. Job complexity as a work characteristic refers to "the extent to which the tasks on a job are complex and difficult to perform" (Morgenson & Humphrey, 2006, p. 1323). According to Beer and Mulder (2020), work automation technologies introduces new mental tasks to employees. In other words, robots potentially increase cognitive demanding tasks by automating simpler ones (Parker & Grote, 2020). Thus, technologies that perform autonomously defined tasks, more complex work that automation cannot replace is left over for employees (Autor, 2015; Fréour *et al.,* 2021; Ruiz *et al.,* 2022). Implementing new automation technologies is, therefore, directly related to the increase of job complexity (Peeters & Plomp, 2022). Additionally, enriched jobs contain high levels of job complexity (Parker, 2014). Therefore, RPA might contribute to the enrichment of jobs.

Translating these findings to the current research, RPA takes over repetitive tasks that do not require much human cognitive action (e.g. Aguirre & Rodriguez, 2017; Eikebrokk & Olsen, 2020; Siderska, 2020; Suri *et al.,* 2017). Therefore, it is likely that jobs are reconstructed and expanded. In other words, while simple and repetitive work will be performed by RPA, it is arguable that this enables opportunities for work designs to increase in job complexity. Employees are expected to deal with more unstructured, demanding, and complex work tasks that RPA is incapable of performing (e.g. Ågnes,

2022; Asquith & Horsman, 2019; Eikebrokk & Olsen, 2020; Lacity & Willcocks, 2016; Mendling *et al.*,2018; Moffit *et al.*, 2018; Wewerka & Reichart, 2020). Thus, human resources saved by the application of RPA are likely confronted with more cognitively demanding tasks (Ruiz *et al.*, 2022; Syed *et al.*, 2020). Hence, this study argues that it is likely that one's job complexity is affected by the implementation of RPA. This proposition is underlined by the evidence found by Beer and Mulder (2020) in their systematic review of the effects of technological developments on work characteristics, who state that the complexity of work increases due to the automation and robotization of work. The general logic behind this rationale is that automating work tasks introduces new, more complex tasks to employees. Waschull and colleagues (2020) confirm this mechanism since their results conclude that the automation of simple and repetitive tasks provides opportunities for jobs to contain higher levels of complexity.

Jobs that are considered more complex require multiple high-level skills, making them more challenging. Complex tasks are therefore expected to have positive motivational outcomes (Morgeson & Humprey, 2006). Specifically, job complexity should increase job satisfaction, work engagement, and performance for older and younger workers (Truxillo *et al.*, 2012). In line with this finding is the evidence from Humphrey *et al.* (2007), who found that job complexity is positively related to attitudinal outcomes such as job satisfaction, job involvement, organizational commitment, and internal work motivation. The expectation is that this holds for both individuals with a strong and weak need for growth since both react positively to more complex jobs (Hackman & Oldham, 1976). Job complexity is considered a controllable stressor; wherefore employees will likely increase their effort to meet the new demands (Lepine *et al.*, 2005) and has positive motivational outcomes (Morgeson & Humprey, 2006). Consequently, the current study argues that job complexity can function as a challenging demand. According to the general JD-R literature, challenging demands increase employee's work engagement. By the inclusion of job complexity as a challenging demand, this study complements existing research on the influence of RPA on work design and employee work engagement.

2.3.2 Job insecurity

The second additional job demand to the baseline model of Peeters and Plomp (2022) is job insecurity. Job insecurity concerns the adverse reactions employees have to the changes in their work design (Sverke & Hellgren, 2002) and is defined by Heaney *et al.* (1994, p. 1431) as "the perception of a potential threat to continuity in his or her current job". Others define job insecurity as "a perceived threat to the continuity and stability of employment as it is currently experienced" (Shoss, 2017, p. 1914). Summarizing both definitions, job insecurity refers to an employee's subjective experience about the continuity of their current job (De Witte, 1999; Keim *et al.*, 2014). In other words, two employees exposed to the same potential risk might experience the threat differently. It is, therefore, noteworthy that job insecurity is not in line with actual job loss since job loss is instant and factual, while job insecurity is the perception of perceived risks (Sverke & Hellgren, 2002; Sverke *et al.*, 2002).

Prior RPA literature questions the effects of RPA in terms of job loss. Some researchers expect only a shift in the type of tasks for employees since employees "might lose their tasks, they still got to keep their jobs" (e.g. Ågnes, 2022, p. 58; Asquith & Horsman, 2019; Bhargava et al., 2021; Lacity & Willcocks, 2016). RPA, in this light, is seen as an aid tool since the technology does not automate all work tasks and therefore complements employees (Fréour *et al.*, 2021). Others challenge this line of reasoning and expect that RPA will make many jobs outdated and redundant (Priyadarshi & Premchandran, 2022), causing employee lay-off within several industries (Eikebrokk & Olsen, 2020). Specifically, Eikebrokk and Olsen (2020, p. 123) argue that RPA is an ideal technology for reducing personnel costs and propose the following: "as organizations gain experience with the RPA technology, they will use it more extensively for reducing personnel costs, including laying off among knowledge workers". Whether this will be the case or not, employees might fear for their jobs due to the substitution of work by RPA (Eikebrokk & Olsen, 2020; Suri *et al.*, 2017; Priyadarshi & Premchandran, 2022; Wewerka *et al.*, 2020). A recent study underlines this mechanism by the implication that the implementation of various new automation technologies lead to a feeling of job insecurity among employees across several industries (Nam, 2019). Consequently, in line with other research (e.g.

Eikebrokk & Olsen, 2020; Suri *et al.,* 2017), this study argues that RPA might cause the feeling of being replaced, resulting in job insecurity. To provide a better understanding on how RPA influences employees' work engagement, this study investigates if the implementation of RPA causes the feeling of job insecurity.

According to prior research, job insecurity is divided into the global and multidimensional perspectives. The global perspective classifies job insecurity as a unidimensional construct that focuses on the perceived probability of job loss (Mohr, 2000) or the fear of job loss (Johnson *et al.*, 1984). Others define the global perspective as quantitative job insecurity, where employees focus on the overall concerns of the existence of the current job (De Witte *et al.*, 2010; Sverke & Hellgren, 2002). The multidimensional perspective, instead, argues that more aspects, such as career insecurity, are part of job insecurity (Sverke & Hellgren, 2002). Moreover, Greenhalgh and Rosenblatt (1984) coined the idea of a multidimensional perspective of job insecurity. They argue that losing job features is an under-investigated but essential aspect of job insecurity. According to the authors, the perception of job insecurity is driven by losing the job, losing job features, the source of the threat, and the powerlessness to change the current situation. De Witte and colleagues (2010) and Sverke and Hellgren (2002) classify the multidimensional perspective as qualitative job insecurity whereby employees experience threats concerning valued job features. Taken together, unidimensional studies focus on single-item measures such as the fear of job loss, while research wielding the multidimensional perspective uses multiple indicators to investigate job insecurity (Sverke & Hellgren, 2002). In both perspectives, job insecurity is considered a subjective experience (Keim *et al.*, 2014). The current study includes job insecurity as a unidimensional construct and focuses on the perceived threat to one's job continuity with the substitution of repetitive work by RPA.

Sverke and Hellgren (2002) build upon the expectation that job insecurity is subjective, so job insecurity is based on the individual's perception. The authors, therefore, argue that the feeling of job insecurity differs among individuals while exposed to the same objective situation. Every individual's reaction to the perceived job risk therefore differs. Specifically, Sverke and colleague (2002) state that an individual's reaction depends on multiple factors such as age, market characteristics, and family responsibilities. This proposition is underlined by Brougham and Haar (2018), who report that older employees gain less stress and strain from the awareness of smart technology, artificial intelligence, robotics, and algorithms. Additionally, in their meta-analytic review of predictors of job insecurity, Keim *et al.* (2014) provide evidence that this finding is underlined with the significant relationship between age and job insecurity. Finally, employees with temporary employment report greater job insecurity than employees with a permanent contract (Keim *et al.*, 2014). Relationships towards individual differences in terms of gender, level of education, and employment status (full-time and part-time) with job insecurity are not found (Keim *et al.*, 2014). The current study builds upon these findings and argues that job insecurity is indeed a subjective experience and differs among individuals.

The effects of job insecurity are supposed to be detrimental to both employees' attitudes and work engagement. Prior research categorizes job insecurity as a stressor that causes strain for both the employer and the employee (Cheng & Chan, 2008; Sverke *et al.*, 2002). Moreover, findings support that job insecurity is considered one of the most harmful job stressors (De Witte, 1999; Keim *et al.*, 2014). Therefore, researchers, argue that job insecurity affects employees' attitudes towards the job, their relation with the organization, and entails health consequences for employees (Sverke *et al*., 2002; Sverke & Hellgren, 2002). Results confirm that job insecurity affects one's well-being and attitudes since evidence shows that job insecurity results in a decrease in job performance, job satisfaction, organizational commitment, psychological health, job involvement (Cheng & Chan, 2008; Fischmann *et al.*, 2018; Gilboa *et al*., 2008), and an increase in organizational withdrawal (Cheng & Chan, 2008). Considering the relationship between job insecurity and work engagement specifically, prior research by Näswall *et al.* (2005) identified a positive relationship between job insecurity and strain, which is a determinant of work engagement (Bakker & Demerouti, 2017). Additionally, prior literature argues that there is a direct negative relationship between job insecurity and work engagement (Guarnaccia, 2018). Based on these findings, the current study argues that job insecurity can cause

impairment in work engagement and therefore is an essential construct in the research towards the effects of RPA on work designs.

Since job insecurity causes negative emotions, stressful demands, is uncontrollable and interferes with one's work engagement, JD-R literature labels job insecurity as a hindrance demand (Lepine *et al.*, 2005; Van den Broeck *et al*., 2010). Specifically, since these job demands "elicit negative emotions, they would interfere with employees' work goal achievement and well-being. These job demands have therefore been labelled as "job hindrances" and they include work characteristics such as job insecurity" (Van den Broeck *et al*., 2010, p. 738). In other words, the negative emotions job insecurity causes affect work engagement. Therefore, the current study includes job insecurity as a hindrance demand. The current study, is to the current knowledge, the first that argues that job insecurity functions as a hindrance demand within RPA literature, thereby affecting employees' work engagement. Consequently, this study complements existing research that focuses on the effects of RPA on employee work engagement since the knowledge of the relationship between RPA and job demands is limited within RPA literature (Peeters & Plomp, 2022).

2.4 Contribution to prior RPA literature: the effect of employee learning orientation

Xanthopoulou and colleagues (2007) expanded the JD-R framework by including personal resources in their study. This expansion examines how personal resources function in relation to job demands, resources, and work engagement. Personal resources refer to "the beliefs people hold regarding how much control they have over their environment" (Bakker & Demerouti, 2017, p.275). The JD-R theory asserts that personal resources can buffer for the unwanted effects of job demands, have a direct positive effect on job resources, and directly positively influence one's work engagement (Bakker & Demerouti, 2017). Consequently, personal resources might play an essential role in the effect of RPA on work engagement. In other words, the current study argues that the technology's characteristics do not solely determine the effect of RPA on work engagement. Personal resources might interfere with the relationship between RPA and work engagement. As can be seen in Table 1, prior RPA scholars focus predominantly on the effects of RPA on process efficiency and opportunities for RPA implementation. The limited existing RPA literature focusing on employee-related consequences does not include personal aspects which might determine the effects of RPA on work engagement. Therefore, in order to provide a better understanding of the effects of RPA on work engagement, this study includes employee learning orientation as a personal resource.

2.4.1 Employee learning orientation

Employee learning orientation refers to the personal motivation for the development of an individual (Dweck, 1986) and can be defined as "a concern for, and dedication to, developing one's competence" (Dweck, 1986; Gong *et al.*, 2009, p.765). Prior literature investigating employee motivation suggests that employees with a high learning orientation seek new challenges and development opportunities. Therefore, research has suggested that employees high on learning orientation react with adaptive and solution-oriented responses when facing new challenges (Elliot & Dweck, 1988). Consequently, according to Gong and colleagues (2009), employee learning orientation benefits knowledge enrichment and skills enhancement and might interfere with positive work-related emotions (Zahoor *et al.*, 2022).

To bring this more in the perspective of the impact of new technology implementation, employees with a strong learning orientation have an increased motivation to learn from external factors such as technology trends (DeRue & Wellman, 2009). Consequently, learning-oriented employees are more motivated to participate in innovation and new tasks, even if this changes the status quo (Coetzer *et al.*, 2017). In this light, it is arguable that employees with an increased learning orientation are not particularly insecure about implementing RPA in their work designs. On the contrary, learning-oriented employees are rather excited and enthusiastic to learn from the challenges RPA entails. Therefore, this study argues that employee learning orientation might significantly impact the relationship between RPA and work engagement and includes the construct as a personal resource in the research design.

2.5 Contribution to prior RPA literature: Organizational strategy & job relevance

The results from Smids *et al.* (2020) reveal that there is no unequivocal relationship between technologies and work designs, meaning that the effect of technology on work design is not predetermined but relies on multiple aspects (Parker & Grote, 2020). Specifically, the "effects of digital technologies and related changes on work design depend on various factors including attributes of the technology itself, organizational attributes, and managerial choices about that technology" (Parker & Grote, 2020, p.5). Thus, with the introduction of new technology, several job redesigns are possible. Diminishing or improving the work design depends on how to use and implement the technology (Parker & Grote, 2020). As Kranzberg (1986, p.545) pointed out, "technology is neither good nor bad; nor is it neutral". However, as seen in Table 1, the limited RPA literature focusing on employee-related consequences does not specifically differentiate between organizational strategies behind the implementation of RPA, nor do they differentiate between current work designs in terms of how much repetitive work employees do perform. Therefore, the current study argues that the two neglected constructs of organizational strategy and job relevance might affect the RPA and job demands-resources relationships and can explain the ambiguous results from previous RPA literature that have, so far, been neglected in quantitative research towards the effect of RPA on work design. Henceforth, this study includes both constructs in the indirect relationship between RPA and work engagement via job demands and resources. The following sections elaborate on both constructs.

2.5.1 Organizational strategy

Recent research investigating the direct work-related consequences after implementing RPA underlines that the strategy is an essential construct in the relationship between RPA and work designs. As can be seen in Table 1, RPA literature reports overall two streams of consequences of RPA. On the one hand, multiple studies argue that organizations use RPA to increase process efficiency, resulting in employee lay-offs and headcount reductions (e.g. Eikebrokk & Olsen, 2020; Lacity & Willcocks, 2015; Suri *et al.*, 2017). On the other, many argue that RPA is a means to manage growth via a digital transformation, introducing new working methods (e.g., Asquith & Horsman, 2019; Fréour *et al.*, 2021). These findings imply that organizations wielding this strategy instead focus on developing high-quality jobs for their workers (Parker *et al.*, 2017) and promote learning skills for these new jobs (e.g. Ågnes, 2022; Eikebrokk & Olsen, 2020; Fréour *et al.*, 2021; Platfautt *et al.*, 2022). While work design studies (Parker & Grote, 2020; Parker *et al.*, 2017; Parker, 2014) point out the influence organizations have on employees' work design, quantitative PRA literature has to the current knowledge not examined this important construct in the effect of RPA on work characteristics. Work design refers to "the content and organization of one's work tasks, activities, relationships, and responsibilities" (Parker, 2014, p. 662). Since the current study focusses on the modification of work characteristics by RPA, the focus of work design lies on the content and organization of employees' work tasks and activities.

It is concerning that existing literature has yet to examine the influence organizations have on the relationship between RPA and work characteristics since organizational factors such as organizational design and practices directly affect or generate work characteristics (Parker, 2014). This study, therefore, argues that the influence of organizations should be considered in the research on the effects of RPA on work characteristics and work engagement. In other words, an important construct that determines the effect of technology is the organizational strategy behind the technology implementation (Parker & Grote, 2020; Parker *et al.*, 2017*)*. Organizational strategy refers to the organization's goals, objectives, and plans and contains the basic perceptions of perceived communication, intentions, and realization (Steensen, 2014). These goals, objectives, and plans can determine the implementation of new technologies. For example, for organizations that aim to gain competitive advantages by minimizing operational costs (Parker & Grote, 2020), the technology is more likely to be used for a cost-reduction purpose. Conversely, when others use new technology to gain competitive advantages by increasing the quality or innovating the existing products (Parker *et al.*, 2017), the technology is more likely to contribute positively to the work design. Therefore, the effects of new technology on employees depend on the organizational rationale for implementing the technology (Beer & Mulder, 2020). This proposition implies that organizations significantly influence

the implications new technologies have for their employees. Coovert and Thompson (2013, p. 2) state that "forward-thinking organizations use technology to enable their workforce, while others use it in a more oppressive fashion". Taken together, it is arguable that the effects of RPA on work design depend on the organizational strategy and corresponding decisions.

Looking at organisational decisions regarding technology implementation specifically, the effect of new technology on the work design depends on managerial decision-making. Work design literature asserts that those with formal authority, such as higher management, middle management, and team leaders, make decisions concerning the restructuring of the work design and not the employees him- or her selves (Parker *et al.*, 2017). The current study, therefore, argues that the organisation determines the modification of work design aspects, such as the content and organisation of work tasks and activities, due to RPA. Managers in organisations who wield a cost-minimisation strategy during technology implementation are more likely to design less enriched work and reduce staff costs with the help of the new technology (Parker *et al.*, 2017). This strategy is in line with the technology-centred approach (Endsley & Kaber, 1999) or automate strategy (Parker & Grote, 2020), which both are characterised by the automation of as many processes as possible, aiming to replace human labour with robots. Instead, organisations focusing on retaining employees are more likely to provide challenging tasks and more job autonomy using the new technology (Parker *et al.*, 2017). This focus aligns with the human-centred approach, where employees remain in control and are provided with meaningful work tasks (Waschull *et al.*, 2020). Both strategies imply that work design and the corresponding work characteristics are affected differently (Parker *et al.*, 2017). This mechanism is underlined by (1) Parker and Grote (2020), who report that organisational strategy and corresponding managerial decisions moderate the effect of technologies on work characteristics, and (2) Waschulll and colleagues (2020) who argue that organisational decisions influence to what extent tasks are substituted by technology, what determines the simplification or enrichment of jobs.

Taken together, prior literature indicates that RPA negatively affects employees' work design and causes layoffs when the technology is used to decrease operational costs. Others report that RPA is used as an innovation, positively affecting the work design. The current research argues whether RPA enriches jobs or not is not solely determined by RPA itself. Organizational strategy and corresponding decisions are expected to be an important construct in the effects of RPA on work design. This study, therefore, includes this construct within the research towards the effects of RPA on work engagement through job demands and resources.

2.5.2 Job relevance

A recent work design study investigating the effects of work automation on work characteristics argues that the effects of automation on work characteristics depend on employees' current work design. Specifically, the authors state that the effect of new technology on the work characteristics such as job autonomy, skill variety, and job demands depends on the degree of repetitive work tasks within the work design (Parker & Grote, 2020). The authors argue that new technologies influence jobs with a high degree of repetitive work differently than those without. This implication is based on the rationale that computers can substitute workers for explicit repetitive tasks and complements workers for more complicated nonrepetitive tasks (Autor *et al.*, 2003).

Since RPA aims to take over repetitive and mundane work (e.g. Aguirre & Rodriguez, 2017; Lacity & Willcocks, 2015; 2016; Van der Aalst *et al*., 2018) and only is applicable when predefined conditions are met (Murray *et al.*, 2021), the technology is limited to perform only structured and repetitive tasks. Jobs with high forms of repetitive work that can be executed based on predefined conditions are therefore based on Autor *et al.* (2003) propositions likely to be substituted by RPA. Instead, jobs that contain complex work, it is more likely that RPA complements employees within their work design. These propositions are underlined by recent results that report that the level of repetitive work determines the modification of RPA on work design. Specifically, when the degree of repetitive work is high, the job is likely to be performed by RPA, causing employees to feel replaced

by the technology. When the level of routine is low, RPA substitutes a small part of the daily tasks, what results in a more positive attitude towards RPA among employees (Fréour *et al.*, 2021).

Based on these results, this study argues that the impact of RPA on work engagement through work characteristics might depend on the repetitiveness within jobs. Therefore, the current research argues that the repetitiveness within work designs is an important construct in the research towards RPA and employee-related consequences. This study refers to repetitiveness as job relevance. The technology acceptance literature defines job relevance as "an individual's perception regarding the degree to which the target system is applicable to his or her job" (Venkatesh & Davis, 2000, p. 191). The current study uses the definition of job relevance provided by Wewerka *et al.* (2020, p.98) to determine the impact of RPA on work design. The authors refer to job relevance as the "new technology (RPA) is applicable to the job of the user". This means that for work with a high degree of repetitive work (i.e. job relevance is high), the impact of the technology might be more extreme than for those jobs with a low degree of repetitive work (i.e. job relevance is low).

Table 1: Review of RPA studies

Number	Reference	Level of analysis	Used theory	Study type	Aim of study	Area	Studied factors	Positive consequences of RPA	Negative consequences of RPA	Notes
1	Ågnes (2022)	Individual	ABC dimensions	Case study, Qualitative	Examining exployees responses to robotization (RPA)	Banking	Employee-related consequences	Employees identify new opportunities, take on new tasks, learn new skills, employees are considered to be more valuable than robots	Threat for job continuity, hiring freeze, reduction of employees	Focus on employee-related aspects; no differentiation in organizational strategies in all three cases for RPA; no differentiation between repetitive and non-repetitive jobs; no inclusion of individual aspects
2	Aguirre & Rodriguez (2017)	Process	-	Case study	To verify the benefits and results of RPA	Business Process Outsource provider	Process efficiency	Productivity improvement, cost reduction, increase process speed	Less employees required for the same work	Focus on process level; employee-related consequenecs not included
3	Asquith & Horsman (2019)	Process	-	Case study	Discussion of RPA application	-	Process efficiency	New roles for employees, more meaningful and pleasurable work	-	Focus on process level; employee-related consequenecs not included
4	Bhargava, Bester & Bolton (2021)	Individual	-	Qualitative	Exploring employees' perceptions of the implementation of robotics, artificial intelligence (AI), and automation (RAIA) on job security, job satisfaction, and employability	Consulting, accouting and finance, and hospitality	Job satisfaction, job security, and employability	Enhancing employees' ability to perform the work tasks, elimination of low-value, routine tasks, increasing employees' efficiency and accuracy	Employees need to upskill themselves to remain employable, reducing the workforce, potential misuse of RPA	No differentiation in organizational strategies; no differentiation between repetitive and non-repetitive jobs; no inclusion of individual aspects
5	Eikerbrokk & Olsen (2020)	Process & individual	-	Qualitative & Quantitative (mixed-method study)	Exploring the consequences of RPA for knowledge workers	Private (financial) & Public sector	Process efficiency & employee related consequences	Fewer routine tasks, more meaningful and complex work, knowledge and skill increasement	Downsizing/ headcount reduction, replacement of employees by RPA, hiring freeze	Differentiation between industries; no differentiation between repetitve and non-repetitive jobs; no inclusion of individual aspects
6	Fréour, Pohl & Battistelli (2021)	Individual	Work design model	Qualitative	Examining the consequences of digital technologies on work characteristics	Transport sector	Job autonomy, knowledge characteristics, social characteristics, work context characteristics	Increase in perceived job autonomy, acquire new skills, more meaningful and complex work, increasing social characteristics, less repetitive work	Feeling that the robot can replace employees	Focus on employee-related consequences; no differentiation in organizational strategies; only differentiating in repetitive and non-repetitive jobs regarding perceived job security; no inclusion of individual aspects
7	Hofmann, Samp & Urbach (2020)	-	-	Literature review & tool analysis	Identifying traits that characterize RPA	-	Direct and indirect effect of robotization on business processes	Increasing process efficiency	Not applicable for complex processes	Focus on process level; employee-related consequenecs not included

Table 1 continued

Number	Reference	Level of analysis	Used theory	Study type	Aim of study	Area	Studied factors	Positive consequences of RPA	Negative consequences of RPA (for employees)	Notes
8	Lacity & Willcocks (2015)	Business & individual	-	Case study	Assessing the current and long-term effects of RPA	Shared service organizations	Process efficiency & employee related consequences	Increasing process efficiency, fewer routine tasks, alternative work for employees	Downsizing/ headcount reduction, replacement of employees by RPA, hiring freeze	Differentiation between global business services & public sector; focusing on repetitive jobs only; no inclusion of individual aspects
9	Lacity & Willcocks (2016)	Business & individual	-	Case study	Assessing the benefits of automation for customes, employees and stakeholder	Various	Process efficiency & employee related consequences	Fewer routine tasks, reconstruction and expansion of jobs, new jobs quality improvement, speed improvement	FTE savings	No specific differentiation for using RPA among studied organizations; no differentiation between repetitive and non-repetitive jobs; no inlcusion of individual aspects
10	Mendling *et al.* (2018)	Organization, process & individual	-	Panel discussion	Summarize findings panel discussion to what extent emergence of recent technologies (i.e. machine learning, RPA, and blockchain) will reduce the human factor in business process management	-	Impact on business processes, task level, coordination level, work organization	Fewer routine tasks, more meaningful and complex work	Replacement of employees with RPA	No differentiation in organizational strategies; no differentiation between repetitive and non-repetitive jobs; no inclusion of individual aspects
11	Moffit, Rozario & Vasarhelyi (2018)	Process	-	-	Create a dialogue in the evolutionary area of RPA	Accounting	Process efficiency & employee related consequences	Increasing process efficiency, fewer routine tasks, more meaningful and complex work	Hiring freeze	Focus on process level/ implementation; employee-related consequenecs not included
12	Peeters & Plomp (2022)	Individual	JD-R framework	Quantitative	Examining the consequences of automation technology for work characteristics and employee well-being	Dutch ministry	Job autonomy, task variety, information processing, exhaustion, work engagement	-	Reduction in perceived job autonomy, task variety, resulting in less work engagement	Focus on employee-related consequences; distinction between RPA users and non-users; the difference in routiness of jobs is not included; no inclusion of individual aspects
13	Plattfaut *et al.* (2022)	Organization	-	Literature review & expert interviews	Deriving a framework for Critical Success Factors	Universal	Development structures, change management & Strategy and organizational setup	Changing roles for employees, new skill development, better customer experience, increase employee satisfaction, quality improvement	Potential headcount reduction	Organizational stragy included with alignmend for RPA use; no differentiation made on influence organizational strategy on work desing; influence routiness of jobs not included; no inclusion individual aspects
14	Pramod (2022)	-	-	Literature review	Identification of benefits, task eligible, and challenges of RPA	Universal	Industry adoption of RPA, RPA opportunities and benefits, RPA challenges, & ingredients for RPA implementation	Efficiency improvement, productivity improvement, quality improvement, scalability improvement	Workforce reduction	Focus on industry level; employee-related consequenecs not included

Table 1 continued

Number	Reference	Level of analysis	Used theory	Study type	Aim of study	Area	Studied factors	Positive consequences of RPA (for employees)	Negative consequences of RPA	Notes
15	Santos, Pereira & Vasconcelos (2020)	-	Design science research	Literature review	Provide an approach for analyzing RPA development	Universal	Future challenges, selection criteria, strategic goals, process assessment, tactical evaluation, benefits, disadvantages & future opportunities of RPA	More important tasks for employees to focus on, process efficiency, creation of new roles	FTE savings	Focus on suitable process identification and process level; employee-related consequences not included
16	Siderska (2020)	-	-	Literature review	Synthesizing the knowledge of RPA	Universal	RPA characteristics, RPA influence on digital transformation & RPA opportunities	Increasing process efficiency, unburden of repetitive work, more problem-solving and value-creation tasks	Potential elimination of job parts	Focus on RPA implications and future opportunities;employee-related consequences not included
17	Suri, Elia & Hillegersberg (2017)	Organization, process & individual	-	Quantitative	Examine the deployment of software bots and understand the businnes cases, drivers and challenges of software bots (RPA)	Shared services & functional services	Process efficiency & employee related consequences	Fewer repetitive tasks, increasing employee well-being due to the lay-off of non-rewarding tasks	Replace employees with RPA, FTE savings, employee anxiety	Focus on the drivers why organizations implement RPA; no research towards the effects of different drivers on work design
18	Syed *et al.* (2020)	-	Scoping review	Literature review	Identifying RPA-related themes and challenges	-	-	Operational efficiency, quality of service, new/ more interesting roles	Potential headcount reduction, replace employees with RPA	Focus on RPA related themes and challenges; employee-related consequences not included
19	Wewerka, Dax & Reichart (2020)	Individual	Technology Acceptance Model (TAM)	Quantitative	Assesing RPA user acceptance	Automotive industry	Perceived usefulness, perceived ease of use & behavioral intention to use	Only a supporting and not a substitutive technology, take over of frequently recurring and time consuming tasks	-	Focus on RPA adoption among employees; employee-related consequences not included
20	Wewerka & Reichart (2020)	-	-	Literature review	Analysing, assessing, and comparing RPA literature	-	Difference between RPA & related technologies, how to automate business processes, effects of RPA, combination of RPA with AI	Relieved from repetitive work, new more cognitive demanding and interesting tasks for employees	Fear for job loss, afraid to learn to use RPA, employee lay-off	Employee-related consequences included; no inclusion of organizational strategies; no differentiation in job relevance; no inclusion of personal resources

3.Conceptual model & hypotheses development

3.1 The conceptual Model

To assess the effects of RPA on work engagement through work characteristics, the current study leverages on the baseline model (Peeters & Plomp, 2022), the general JD-R assumptions (Bakker & Demerouti, 2017), the theoretical background, and the findings from Lepine *et al*., 2005 and Van den Broeck *et al*., 2010, implying that job demands can be divided into hindrance demands and challenging demands. The developed conceptual model depicted in Figure 4 shows the hypothesized effects between RPA, work characteristics, and work engagement. Additionally, the model presents the expected relationships between personal resources, job demands, work engagement, and the moderating effects of organizational strategy and job relevance (the degree of repetitive work within work designs) on the relationship between RPA and work characteristics. The following sections elaborate on the hypothesized effects as proposed in the conceptual model.

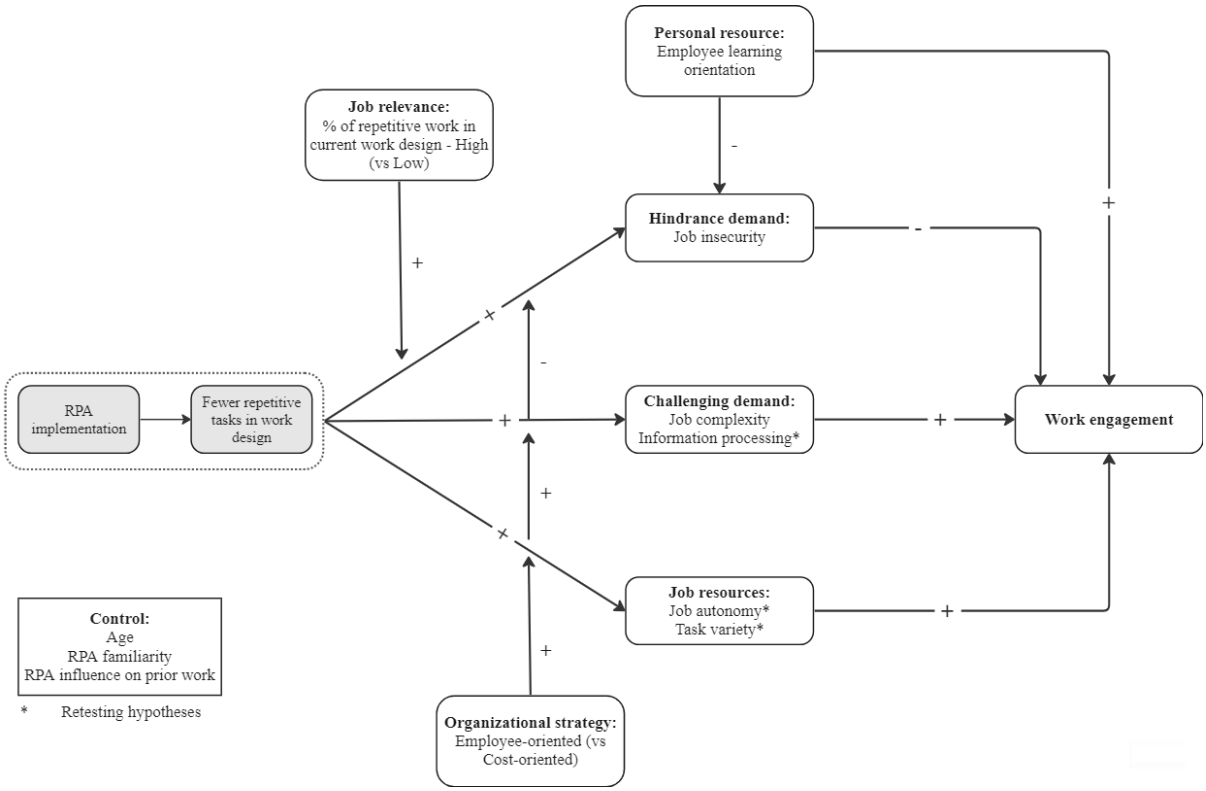

Figure 4: Conceptual model

3.2 The hypotheses of the baseline model

The debate on the effect of RPA on work engagement has yet to be resolved. On the one hand, prior studies report an increasing job autonomy, information processing (Fréour *et al.*, 2021), job enlargement, and job satisfaction (Johansson *et al.*, 2021) at the hand of RPA. On the other, a recent scholar reports decreasing job autonomy and task variety values after the substitution of repetitive work by RPA (Peeters & Plomp, 2022). To provide additional insights in the relationship between RPA and work engagement through job demands and resources, this study uses the elaborated model from Peeters and Plomp (2022) as a baseline model. Therefore, by adding neglected constructs, this study will retest the hypotheses from the baseline model that are depicted in Figure 3.

3.2.1 RPA & Job resources: retesting the effects

RPA & Job Autonomy and Task variety

The results from the baseline model indicate a significant negative relationship between RPA, job autonomy, task variety, and therefore decreasing work engagement. These results align with long-term

thoughts that work automation can reduce employees' autonomy and task variety (Parker, 2003). The rationale behind these thoughts is that automation results in standardized processes, what reduces employees' job autonomy and task variety (Parker, 2003). This mechanism is based on the job characteristics theory which proposes that work automation can affect important work characteristics (Hackman & Oldham, 1976). However, in contrast to these long-term thoughts and significant negative founded relationships, the current research expects that the automation of repetitive work by RPA results in increased perceived job autonomy and task variety. Digital technologies automating office work are likely to enhance job autonomy since these technologies free employees from repetitive work, increasing available time for employees to spend on other cognitively demanding tasks and providing employees with more work scheduling and decision-making autonomy (Fréour *et al.,* 2021). Therefore, in line with the baseline model from Peeters and Plomp (2022), RPA is expected to positively relate to job autonomy and task variety. Although a negative relationship was found between RPA and job autonomy and task variety, this research retest both effects and proposes the following:

H1: The automation of work tasks by RPA is positively related to the (a) perceived job autonomy and (b) task variety

3.2.2 RPA & job demand: a revision

RPA & Information processing

The findings from the baseline model indicate that RPA does not reduce the level of information processing nor leads to a significant increase in exhaustion (Peeters & Plomp, 2022). The lack of significant findings might be explained by the fact that Peeters and Plomp (2022) consider information processing as a job demand that, through exhaustion, negatively affects work engagement. However, Fréour and colleagues (2021) argue for an increase in information processing after the implementation of RPA. The rationale is that RPA "brings more information to the workers, what increases the information processing" (Fréour *et al.,* 2021, p.12). Therefore, information processing might not function as a hindering demand. Consequently, the current study argues for revising the hypothesis regarding information processing from the baseline model.

The current study expects increasing information processing values and refers to the amount of information processing as the extent employees have to focus on and manage information (Humphrey *et al.,* 2007). According to Parasuraman *et al.* (2000), human information processing comprises four stages: information acquisition, information analysis, decision and action selection, and action implementation. To what extent each stage is executed and or automated depends on the work tasks (Parasuraman *et al.,* 2000). In other words, prior research proposes that the amount of human information processing depends on the job (Wall *et al.,* 1995). It is considered that more complex jobs require more cognitive demands and higher forms of information processing (Humphrey *et al.,* 2007). This proposition aligns with findings from Campion (1989), who argues that more complex tasks are related to more cognitively demanding tasks. Consequently, more complex jobs demand higher forms of information processing. Hence, this study expects that RPA causes an increase in information processing since findings indicate that the automation and robotization of work tasks cause an increase in the complexity and mental work of jobs (Beer & Mulder, 2020; Waschull *et al.,* 2020). Specifically, "evidence suggests that complexity and mental work increases with ongoing automation and robotization of work" (Beer & Mulder, 2020, p. 15). These findings lend support that the automation of work by RPA can increase the mental demands of jobs, thereby increasing the level of information processing for employees. Therefore, instead of arguing that the degree of information processing decreases as hypothesized by Peeters and Plomp (2022), this study argues in line with the results from Fréour *et al*. (2021) that the more cognitively demanding tasks require employees to process more information and data to perform their work. Therefore, instead of expecting a negative relationship between RPA and information processing, this study hypothesizes the following:

H2: The automation of work tasks by RPA is positively related to the perceived information processing

3.3 Additions to the baseline model: Job complexity & job insecurity

Chapter 2.3 identified two work characteristics classified as challenging and hindrance demand. To the current knowledge, both work characteristics are not investigated as challenging and hindering demands in relationship with work engagement within RPA literature. Therefore, this study includes these demands as an addition to the conceptual model from Peeters and Plomp (2022), which functions as the baseline model.

3.3.1 RPA & challenging demand

RPA & Job Complexity

Based on the potential of work automation to increase cognitive demands and job complexity (Autor, 2015; Beer & Mulder, 2020; Waschull *et al.,* 2020), RPA is expected to affect the level of job complexity within work designs. Job complexity concerns how difficult the tasks on the job are to perform (Morgenson & Humphrey, 2006). In general, with the automation of simple and repetitive work, jobs shift towards a higher level of job complexity (Autor, 2015; Waschull *et al.,* 2020). As Fréour and colleagues (2021, p. 6) mentioned, "technologies with only the ability to select actions can autonomously perform some defined procedures. Tasks difficult to program are always performed by humans. This can result in a distribution of work where technology performs repetitive and easily programmable tasks and humans are left with the more complex tasks that are difficult to program". Within the RPA context, this implies work is performed by RPA due to its repetitive and systematic nature, while low frequent and more cognitively demanding tasks are executed by employees (Ruiz *et al.,* 2022; Syed *et al.,* 2020). This mechanism is explained by Fréour *et al.* (2021, p.12), who state that regarding RPA, "routine tasks are performed by the robot and more complicated cases - because they cannot be handled by the technology - need to be handled by the employees. Moreover, task completion by RPA frees up time for employees that they can spend on managing the exceptions, difficult or complex situations". The current study argues that the automation of repetitive work by RPA can result in job enrichment by increasing job complexity, what results in work with higher mental demands (Parker, 2014; Waschull *et al.,* 2020) and proposes the following:

H3: The automation of work tasks by RPA is positively related to the perceived job complexity

3.3.2 RPA & hindrance demand

RPA & Job Insecurity

Consistent with the finding that new technologies can lead to a feeling of job insecurity among employees across several industries (Nam, 2019), it is expected that RPA causes a feeling of job insecurity among employees. A recent study found that automation technologies and robotics cause a significant increase in job insecurity among employees (Brougham & Haar, 2020). Additionally, several scholars report that RPA can cause feelings of job insecurity among employees (e.g. Priyadarshi & Premchandran, 2022; Suri *et al.,* 2017*;* Wewerka *et al.,* 2020). Job insecurity concerns employees' adverse reactions to changes in their work design (Sverke & Hellgren, 2002). The mechanism of why employees concern about the continuity of their jobs can be explained by the consequence that RPA takes over employees' work tasks (Fréour *et al.,* 2021; Priyadarshi & Premchandran, 2022; Suri *et al.,* 2017*)*. As Fréour *et al.* (2021, p.14) point out, "the more employees see their tasks being automated, the more they can perceive being replaced". In other words, employees expect to be substituted by RPA, wherefore they experience RPA as the rival for their jobs (Asatiani & Penttinen, 2016; Santos *et al.,* 2020). The current study, therefore, expects that RPA is considered to be a potential threat to the continuity of one's current job and proposes the following:

H4: The automation of work tasks by RPA is positively related to the perceived job insecurity

3.4 Moderation of organizational strategy & job relevance

To provide additional insights into the debate on the effects of RPA on work engagement, the potential moderators of the effects of organizational strategy and job relevance are included in the baseline model. Including these moderators of effect is based on the rationale that the effect of technologies is not

predetermined and relies on aspects such as organizational attributes and routineness of work (Parker & Grote, 2020). The following two subsections elaborate on both hypothesized moderating effects on the relationship between RPA and, in the previous sections, discussed job demands and resources.

3.4.1 Organizational strategy

The organizational strategy behind the implementation of RPA is expected to moderate several RPA and perceived job demands-resources relationships. Work design literature report on the influence organizations have on employees' work design (e.g. Parker and Grote, 2020; Parker *et al.*, 2017). As a moderator, a new technology's effect on the work design is expected to depend highly on organizational decisions (Parker & Grote, 2020). This study, therefore, builds upon these findings and expects that organizational strategy moderates some of the relationships between RPA and job demands and resources. The idea behind this is that the management determines how functions and corresponding tasks are automated and how the remaining tasks are regrouped in new jobs (Waschull *et al.*, 2020). For instance, Parker and Grote (2020) provide an example where introducing CT scanners in one hospital increases the perceived autonomy among employees, while in a different hospital, the same technology decreases the same decision-making autonomy. The current study, therefore, argues that the effect of technology on work characteristics depends partly on the technology's implementation and use (Parker & Grote, 2020).

Recent RPA literature argues that the utilization of RPA differs among organizations (Eikebrokk & Olsen, 2020). In other words, prior RPA literature does acknowledge that organizations use RPA as a different means to an end. However, to the current knowledge, none of the RPA-related studies investigated whether the organizational strategy moderates the relationship between RPA and work characteristics specifically. For example, several studies point out that organizations use RPA to reduce the headcount and, in addition to that, the staffing costs via a process efficiency increment (e.g. Lacity & Willcocks, 2015; Suri *et al.*, 2017; Syed *et al.*, 2020). As pointed out by Eikebrokk and Olsen (2020, p. 123), organizations that wield a cost leadership and efficiency strategy, "it is not surprising that RPA has been utilized for achieving cost reduction". It is expected that with this strategy, organizations automate as much as possible (Endsley & Kaber, 1999; Parker & Grote, 2020), aiming to replace employees with RPA. Conversely, others point out that companies use RPA specifically to manage growth, introducing new work tasks for employees. For example, among others, Asquith and Horsman (2019) and Fréour *et al.* (2021) report that organizations use RPA to reduce the burden of repetitive work so that more meaningful and pleasurable work can be offered to the employees. Consequently, the organizational strategy for implementing RPA is expected to moderate the relationship between RPA and job autonomy and task variety. In the case of a cost reduction strategy, organizations are expected to focus on simplifying jobs, which are characterized by jobs with low forms of autonomy and task variety (Parker, 2014). On the other hand, organizations aiming to provide meaningful work to their employees with the implementation of RPA focus on the enrichment of work, which contains a variety of tasks and higher forms of job autonomy. With this strategy, as mentioned by Fréour and colleagues (2021, p. 12), it is more likely that the following occurs: "Task completion by RPA frees up time for employees that they can spend on managing exceptions, difficult or complex situations, or improving services". Therefore, it is expected that the relationship between RPA and perceived job autonomy and task variety is stronger when organizations focus on the enrichment of jobs compared to organizations that aim to reduce operational costs.

Concerning the complexity of jobs, organizations that focus on the enrichment of jobs are expected that management creates new roles for their employees (Platfautt *et al.*, 2017; Syed *et al.*, 2020), which can lead to increased job complexity (e.g. Asquith and Horsman, 2019; Freóur *et al.*, 2021). Instead, the current study expects that when organizations use RPA to reduce operational costs, reducing the number of employees is more in line with expectations (Eikebrokk & Olsen, 2020; Lacity & Willcocks, 2015; Suri *et al.*, 2017; Syed *et al.*, 2020). Considering the aim to reduce the headcount, this study argues that employers are unlikely to reassign all employees to more complex tasks since new tasks and routines often require new knowledge (Lundh & Rydstedt, 2016). Consequently, organizations have to reinvest in their employees. This study, therefore, argues that

investing in all employees to gain knowledge for new tasks while organizations wield a cost reduction strategy is rather unlikely. Instead, lay-off employees or regrouping tasks such that jobs are simplified is more in line with the expectation. Therefore, it is expected that the relationship between RPA and job complexity is more substantial in situations where organizations focus on the enrichment of jobs compared to organizations that aim to reduce operational costs.

The moderating effect of organizational strategy on the relationship between RPA and job insecurity has to the current knowledge, yet to be examined. However, Eikebrokk and Olsen (2020) conclude that several companies use RPA specifically to reduce costs, resulting in a headcount reduction. As Ågnes (2022, p. 59) mentioned in the study towards employees' responses to RPA: "If employees do not find opportunities to develop or have agency to pursue opportunities, they may evaluate change more negatively, identify robotization as a threat". Therefore, the current study expects that employees are more insecure about the continuity of their jobs when organizations wield a cost-reduction strategy since this strategy is unlikely to provide additional opportunities to employees. Instead, when RPA is used to reduce the burden of repetitive work, organizations show that employees are more valuable than robots by encouraging employees to pursue new tasks and positions within the company. Consequently, management aims to find employee alternatives and opportunities, ensuring job safety (Ågnes, 2022). This aligns with a restorative strategy characterized by management that maintains a positive workplace atmosphere and provides employees with trust in their job continuity (Kinnunen *et al.*, 2000). Moreover, Kinnunen *et al.* (2000, p. 456) report that a restorative strategy decreases perceived job insecurity. The rationale behind this mechanism is that "if the employees felt that the management had succeeded in reassuring them that their jobs were safe, they reported a decrease in job security". Therefore, this study expects organizations using RPA to reduce the burden of repetitive work and provide new opportunities that ensure job safety, reducing the perceived feeling of losing the job. Moreover, we posit that the organizational strategy influences the relationship between RPA and the feeling of the continuity of their job. Consistent with this, the current study expects that the relationship between RPA and job insecurity is weaker when organizations focus on the enrichment of jobs compared to organizations that aim to reduce operational costs.

H5: Organizational strategy moderates the relationship between RPA and the perceived (a) job autonomy, (b) task variety, (c) job complexity, and (d) job insecurity, such that the job enrichment strategy strengthens the relationship between RPA and job autonomy, task variety, job complexity, and diminishes the relationship between RPA and job insecurity compared to the cost reduction strategy

3.4.2 Job relevance

Job relevance, which refers to the amount of repetitive work within the work design, is expected to moderate the relationships between RPA and hindrance demands. While a recent study towards the modification of work characteristics by RPA point out that the degree of routine work might be a potential moderating factor in the modification of RPA on work characteristics (Fréour *et al.*, 2021), to the current knowledge does none of the existing RPA literature, examine this potential moderation.

Job relevance is expected the moderate the relationship between RPA and perceived job insecurity. Sverke and Hellgren (2002) and Sverke *et al.* (2002) point out that job insecurity is a subjective phenomenon, and therefore two employees exposed to the same threat can experience the risk differently. The current study builds upon this proposition and expects that employees who perform more repetitive work are substituted to a greater extent by RPA; therefore, this study argues that these employees are likely to feel more insecure about their job than employees whose work design does not contain much repetitive work. In other words, the amount of work substituted among employees with a higher degree of repetitive work within their job design is likely more significant than those who only perform a limited amount of repetitive work (e.g. Lacity & Willcocks, 2015; 2016), what influences the perceived job insecurity. This expectation is aligned with the finding of Goos *et al.* (2009). The authors report that employees with non-routine jobs are generally better off with technological changes. The rationale behind this is that their work is harder to substitute by technology, which provides them with

better bargaining power. This study, therefore, expects that these employees are more secure about the continuity of their jobs. Consequently, this study argues that the extent to which employees perceive job insecurity depends on the job relevance.

H6: Job relevance strengthens the relationship between RPA and perceived job insecurity, such that the perceived job insecurity is higher for employees with more repetitive work in their current work designs

3.5 Employee learning orientation: job demands & work engagement

In line with the previous sections, to provide additional insights into the effect of RPA on work engagement, the current study includes personal resources in the baseline model. The rationale for including personal resources is based on the findings that the effects of technologies on work design depend, among other things, on individual factors (Parker & Grote, 2020). The following paragraph elaborates on the effect of employee learning orientation on job demands and work engagement.

Employee learning orientation

As a personal resource, it is expected that employees high on learning orientation see RPA as a challenge and opportunity to develop themselves. Consequently, with the substitution of repetitive work by RPA, it is expected that employees high on learning orientation are more engaged in their work and are less insecure about the continuity of their jobs. Employee learning orientation refers to one's motivation to develop competencies (Dweck, 1986). Learning-oriented employees consider technological innovation an opportunity to develop their competencies (VandeWalle *et al.,* 1999). Subsequently, it is likely that employees high on learning orientation see change due to technological innovation not as something undesirable (Jones *et al.,* 2017). Therefore, learning-oriented employees might consider RPA not a threat but a challenge and opportunity for competence development and knowledge enrichment. As mentioned by Zahoor *et al.* (2022, p. 4): "employee learning orientation facilitates determination and intrinsic motivation to convert technological innovations into employees' security and welfare". Therefore, employees high on learning orientation are eager to develop themselves, consider new technologies as an opportunity, and convert it to their advantage. Since the current study argues that RPA increases the perceived job insecurity, it is expected that personal high on learning orientation consider RPA an opportunity for further personal development and not as a threat, resulting in less perceived job insecurity. Additionally, learning-oriented employees are motivated to "convert technological innovation into their own knowledge sets for achieving desirable outcomes – such as employee well-being" (Zahoor *et al.,* 2022, p. 4). This proposition aligns with findings that learning-oriented employees are generally more engaged in their work due to their intrinsic motivation (Jones *et al.,* 2017). Hence, it is likely that employees, during the implementation of RPA in general, report higher work engagement values. All considered, it is expected that employees high on learning orientation negatively affect job insecurity and that learning-oriented employees are positively related to work engagement during the substitution of repetitive work by RPA. Hence, the current study proposes the following:

H7: Employee learning orientation is negatively related to perceived job insecurity caused by RPA
H8: Employee learning orientation is positively related to work engagement

3.6. Job demands, job resources & work engagement

Already a flood of scholars tested the relationships between job demands, resources, and work engagement. First, employees with more job autonomy are likely to be more engaged in their work since more freedom in work scheduling, decision-making, and choosing work methods is provided to the employees (Morgeson & Humphrey, 2006; Parker & Grote, 2020). Consequently, employees feel more in control over their work tasks, which makes them more engaged. Several studies found a positive relationship between job autonomy and work engagement. For example, Albrecht *et al.* (2021), De Spiegelaere *et al.* (2014), and Zhang *et al.* (2017) provide evidence for the positive relationship between job autonomy and work engagement. Hence, increased job autonomy is expected to result in higher vigor, dedication, and absorption of work tasks among employees.

Second, task variety as a work characteristic is expected to make employees more engaged in their work tasks. According to Sims *et al.* (1976), the performance of multiple different tasks is more interesting for employees. Moreover, a wider task variety is positively related to both behavioural outcomes (e.g. job performance) and attitudinal outcomes (e.g. job satisfaction) (Humphrey *et al.*, 2007). As such, task variety increases the meaningfulness of work (Hackman & Oldham, 1976). More meaningful work results, according to Albrecht *et al.* (2021) and Christian *et al.* (2011), in more engaged employees. The current study, therefore, expects a positive relationship between task variety and work engagement.

Third, the complexity of jobs is likely to influence the engagement of employees. More complex jobs increase job satisfaction, engagement, and performance (Truxillo *et al.*, 2012). Furthermore, on a similar note, evidence provided by Humphrey *et al.* (2007) reports that job complexity is positively related to attitudinal outcomes such as job satisfaction, job involvement, organizational commitment, and internal work motivation. More complex jobs are thus likely to increase work engagement since work engagement is an antecedent of job satisfaction, job participation, and organizational commitment (Saks, 2019).

Fourth, the amount of information employees process is expected to affect work engagement. Information processing concerns how much information employees must focus on and manage (Humphrey *et al.*, 2007). According to Humphrey *et al.* (2007), information processing has a positive relationship with job satisfaction, which is predicted by work engagement (Saks, 2019). Following this line of reasoning, the current study expects information processing to be a challenging demand due to the positive relationship with job satisfaction. Consequently, this study argues for a positive relationship between information processing and work engagement.

Finally, employees who are concerned about the continuity of their jobs are expected to be less engaged. Prior research argues that job insecurity is detrimental to employees' well-being and attitudes towards the job (e.g. Cheng & Chan, 2008; Sverke *et al.*, 2002). Specifically, job insecurity can decrease job performance, job satisfaction, organizational commitment, psychological health, and job involvement (Cheng & Chan, 2008; Fischmann *et al.*, 2018; Gilboa *et al*., 2008). While not explicitly assessing the relationship between job insecurity and work engagement, Näswall *et al.* (2005) found a positive relationship between job insecurity and strain, a determinant of work engagement (Bakker & Demerouti, 2017). In addition, Guarnaccia (2018) provide evidence that there is a direct negative relationship between job insecurity and work engagement. Hence, it is expected that job insecurity lowers one's engagement. Taken together, based on all the findings described above, this study proposes the following:

H9: Job insecurity is negatively related to work engagement

H10: The negative effect of RPA on work engagement is fully mediated through job insecurity

H11: (a) Job autonomy, (b) task variety, (c) information processing, and (d) job complexity are positively related to work engagement

H12: The positive effect of RPA on work engagement is fully mediated through (a) job autonomy, (b) task variety, (c) information processing, and (d) job complexity

3.7 Control Variables

To control for extraneous influences and reduce the chance of falsely concluding that the exogenous construct is in a causal relationship with the endogenous constructs (Nielsen & Raswant, 2018), this research includes the following three control variables to estimate the hypotheses better.

Age:

Every employee likely experiences work characteristics differently (Zaniboni *et al.*, 2014). Therefore, the lifespan development perspective assumes that individuals' development does not end at adulthood but continues their entire life (Baltes *et al.*, 1999). This perspective suggests that during one's lifetime, individuals will cope with change, goal achievement, and the loss or gain of resources differently. Specifically, employees are expected to react differently to the same work characteristics depending on their age. Therefore, a lifetime perspective helps investigate the relationship between age and work characteristics (Truxillo *et al.*, 2012). Recent studies indicate that age is indeed a crucial factor in the perception of job insecurity (e.g. Keim *et al.*, 2014), job autonomy (e.g. Kanfer & Ackerman, 2004), and task variety (e.g. Zaniboni *et al.*, 2013). Hence, this study controls for employees' age.

RPA familiarity:

While most employees within the population are unfamiliar with RPA, some employees have knowledge on the capabilities of RPA. Employees who are familiar with and understand the technology might know the limitations and strengths of RPA. Moreover, it can give employees the confidence to work with RPA and pursue new opportunities (Ågnes, 2022). This could influence the experiment's results. Therefore, this study controls for this variable.

RPA influence on prior work tasks:

In line with RPA familiarity, several employees' work tasks within the population are already affected by RPA. This might affects their understanding of the technology and its capabilities. Since this can influence the outcome results, this study controls for the RPA influence on employees work tasks.

4.Methodology

4.1 Choice of Method

Since preliminary research revealed that the effects of RPA are not, or to a minimal extent, present within the organization due to the recent and limited implementation, this study addresses an experimental scenario method wherein hypothetical scenarios present the possible effects RPA has on work design for the employees.

4.1.1 Vignette Methodology

The quantitative method this study approaches for a scenario-based experiment is the factorial survey approach, also known as the experimental vignette methodology (EVM). There are two main components in a quantitative vignette study. First, the vignettes are "a short, carefully constructed description of a person, object, or situation, representing a systematic combination of characteristics" (Atzmüller & Steiner, 2010 p128; Wallender, 2009). The vignettes have various variables that all have their values (Wallander, 2009). Hence, different combinations can be created and introduced to the respondent and are therefore ideal for measuring the respondents' "beliefs, attitudes, judgements, knowledge, or intended behaviour with respect to the presented vignette scenario" (Atzmüller & Steiner, 2010, p. 129). The second component, the conventional survey, measures additional information from the respondent, which is then used to analyse the vignette data. Both components imply that a vignette study uses a classic survey and the more traditional experiment methodology (Atzmüller & Steiner, 2010).

4.2 Designing Experimental Vignette Study

The multidisciplinary literature review of Aguinis and Bradley (2014) identified ten essential decisions to properly plan, implement, and report an experimental vignette methodology study. Atzmüller and Steiner (2010) refer to five decisions to execute a vignette study properly. Both studies function as guidelines for setting up and conducting the experimental vignette study.

4.2.1 Factor levels

Factor levels refer to the number of levels for each manipulated variable. Thus, a variable that contains three values that are manipulated during the experiment has three factor levels (Atzmüller & Steiner, 2010). Consequently, choosing the number of factor levels determines the number of manipulations during the EVM study. Regarding the degree of repetitive work within the job design, it is recommended that the presented vignettes are as realistic as possible (Taylor, 2006). In addition, Aimen-Smith *et al.* (2002) argue that to make the study representative for real-life situations, it is beneficial to use respondents who have experience with the situation. Therefore, instead of presenting scenarios wherein employees perform a high degree of repetitive work (or vice versa) while in real life, this is not the case. This study argues for using respondents' current job relevance within their job design. Thus, the degree of repetitiveness of work within the job design is solely determined by the respondents' actual work design and does not require multiple levels to manipulate. The following two paragraphs elaborate on the factor levels for RPA influence and organizational strategy.

First, to measure the effect RPA has on the work characteristics classified as job demands and resources, this study uses two levels, namely: almost none of the current repetitive work is taken over by RPA, and RPA takes over almost all of the current repetitive work. This implies that employees still have to perform almost all of their current repetitive work in the first factor level. In other words, the effect of RPA on employees' work is limited. In the second factor level, employees perform almost none of their repetitive tasks. With this factor level, employees are expected to be significantly affected by RPA. The difference is expected to be evident for respondents, which should provide insights into the perceived effect of RPA.

Second, concerning the factor levels of organizational strategy and corresponding decisions, the current study uses existing literature to determine the most frequently applied strategies behind the implementation of RPA. On the one hand, research reports that RPA can be predominantly used to

increase process efficiency, which results in replacing employees with RPA. Eventually, this can reduce headcount and personnel costs (e.g. Eikebrokk & Olsen, 2020; Lacity & Willcocks, 2015; Suri *et al.*, 2017). On the other hand, RPA literature points out that RPA can also result in more meaningful, complex, and pleasurable work for employees due to reduced repetitive work (e.g. Asquith & Horsman, 2019; Eikebrokk & Olsen, 2020; Fréour *et al.*, 2021). Therefore, we argue that organizations use a cost-oriented or employee-oriented strategy. The manipulation of the organizational strategy construct thus contains two-factor levels. All in all, two constructs will be manipulated during the experiment. Each of these two factors contains two-factor levels.

4.2.2 Research Design

Showing the participant the correct number of vignettes is extremely important since "too few scenarios could limit the researcher's ability to manipulate critical variables and result in responses biased by the few issues contained in the scenarios presented" (Weber, 1992, p.142). On the other hand, "too many scenarios could lead to information overload and fatigue for the respondent" (Rogelberg & Stanton, 2007; Weber, 1992, p. 143). The correct vignette subpopulation for the respondents depends on the entire vignette population (Atzmüller & Steiner, 2010). The vignette population is determinable by the number of factors and levels of each factor. In other words, a complete factorial design acquires the total vignette population, which combines all vignette factors. This study uses the following formula to determine the total vignette population (M). V is the number of levels within the factor, and k is the factor itself (Atzmüller & Steiner, 2010).

$$M = \mathrm{v1} \times \mathrm{v2} \times \ldots \times \mathrm{vk}$$

This study's complete factorial vignette design has $2 \times 2 = 4$ vignette possibilities (i.e. two levels of RPA affecting work design and two various organizational strategies). We argue that presenting the entire vignette population to a respondent (four vignettes) and measuring the response for each vignette can cause survey fatigue (Rogelberg & Stanton, 2007). It is, therefore, necessary to select a subset of the vignette population (Atzmüller & Steiner, 2010). This study addresses an EVM with hypothetical scenarios presented in a mixed-subject design to test the hypothesis. A mixed-subject design implies that different groups of respondents receive different sets of vignettes. Within these sub-groups, all the respondents judge the same sample of vignettes. This subject design allows comparisons between the sub-groups and the respondents within a sub-group (Atzmüller & Steiner, 2010).

Participants are randomly assigned to a 2×2 (amount of repetitive work taken over: almost none vs almost all; organizational strategy: cost reduction strategy vs innovation strategy) mixed-subject design with the amount of repetitive work taken over as within-subject factors and organizational strategy as between-subject factors. Every respondent, therefore, receives both manipulations regarding the influence of RPA, while the manipulation regarding the organizational strategy depends on the subgroup and is incorporated into the vignette. As a consequence of the mixed-subject design, respondents receive and judge only two vignettes. One with a limited effect of RPA and one with a more significant effect of RPA. The factor levels of organizational strategy that are incorporated into the vignette depend on the between-subject factor.

4.2.3 Vignette development

The approach of "actual derived cases" is used during the development of the vignettes. This means that the study aims to use concrete attribute values to manipulate the variables found in actual settings. According to Shepherd and Zacharakis (1999), this approach should give the study greater face validity. The advantage of using the approach of actual derived cases is that the presented scenarios match reality better, wherefore the choices made by the participant are more realistic. This could help increase the generalizability of the study's outcomes (Aguinis & Bradley, 2014). In both conditions, the entire vignettes are presented identically to all respondents, except for the experimental manipulations to test the hypotheses (see Appendix C for the complete vignettes). The manipulation of the independent variable is very straightforward. Regardless of the assigned condition, the experiment manipulates the level RPA takes over to test the respondents' perception of their changing work design. More

specifically, as can be seen in the written scenarios presented in Appendix C, the amount of repetitive work taken over by RPA is manipulated in bold by **almost none**, and **almost all** of the repetitive work is taken over by RPA. Respondents will therefore perform **almost all/ almost none** of their current repetitive work. Respondents first receive the vignette wherein RPA has limited effect on their current repetitive work. After judging the vignette, the second vignette is presented to the participant where RPA significantly affects their current repetitive work. After the second vignette, the respondent judges the same variables. The manipulation regarding RPA implementation should be evident to the respondent and nearly impossible to overlook.

Regarding the manipulation values for the organizational strategy, the overview in Table 1 presents real-life consequences for each of these specific scenarios (cost reduction-oriented vs employee-oriented). In other words, this study bases the "actual derived cases" on RPA literature that present characteristics that occurred after the implementation of RPA. Consequently, the vignettes reflect scenarios which are likely to occur depending on the strategy used by the company. The written scenarios possess manipulations regarding the organizational strategy based on these characteristics. For example, a manipulation is that for management it is essential to *reduce the operating costs/ develop jobs for their employees so that they are pleasurable to perform*. Management's intention should be straightforward in this example and almost impossible to overlook. This should result in an evident manipulation of this moderator. The vignettes do not manipulate the degree of repetitive work within the respondent's job design. The moderation of job relevance will be tested based on the respondents' actual work design.

4.2.4 Manipulation check

This study performed a pre-test to test if the manipulations have the desired effects. Several DAF employees received an invitation with an anonymous link where they were asked to participate in a small test. First, participants were asked to read the baseline scenario, the same as presented in Appendix C. After that, participants received all four vignette scenarios one at a time (see Appendix C) and responded after every vignette to the four statements 1) “it is unlikely that employees will lose their job due to RPA”, 2) “RPA will have a great effect on my repetitive work tasks”, 3) “New tasks will be provided for those whose tasks are substituted by RPA”, and 4) “Most of my repetitive work tasks will be substituted by RPA”.

Statements one and three are used to compare the means for the organizational strategy. Both statements refer to the redesign of work based on organizational decisions. The means for statements one and three in the vignettes where RPA is implemented for most repetitive work are expected to differ significantly. Specifically, it is expected that the means for statements one and three are significantly higher for the scenario where RPA is implemented for most of the repetitive work in the vignette with a job enrichment strategy compared to the vignette where RPA is implemented for most of the repetitive work with a cost reduction strategy. Statements two and four check the manipulation to the extent RPA takes over repetitive work. Both statements refer to the influence RPA has on work designs. Both means are compared for the vignettes where RPA has limited and significantly more influence on the work design. The means for statements two and four are expected to be significantly higher in the scenarios where RPA takes over most of the repetitive work.

The response set for the four statements ranged from 1 = strongly disagree to 7 = strongly agree. In total, 16 employees participated and completed the pre-test. We removed one response from the data set since the respondent agreed with every statement (6 = agree). Disproportionally using the positive side of the Likert scale seems to occur here, which can mislead the analyses (Podsakoff *et al.*, 2012). The reaming 15 responses are used to complete four ANOVA post-hoc LSD analyses using the statistical package software IBM SPSS Statistics v.28.0. In addition, we compare the means of all statements on significant differences at a P value of <0.1. Table 2 presents the mean scores for every question across the scenarios.

First, statements one and three refer to RPA affecting job continuity and task provision based on the organizational strategy. The differences in means determine the effect of the manipulation of organizational strategy on work design in the situation where RPA directly affects the work design since these statements are not relevant when RPA does not influence the work design yet. In other words, the redesign of jobs depends on the implementation of RPA. In both the conditions of cost reduction and job enrichment strategy with RPA implemented, the results in Table 2 present, as expected, a significant difference in means between the cost reduction scenario and the job enrichment scenario. When RPA is implemented for most repetitive work tasks, the job enrichment scenario scores significantly higher on the question that it is unlikely that employees will lose their jobs due to RPA (difference in means: 2.93*). Hence, participants agree that people will likely retain their jobs in the enrichment scenarios when RPA takes over most of the repetitive work. In addition, the difference in means between job enrichment and cost reduction scenario on task provision is also significantly different. The participants expect that the job enrichment scenario will provide employees with new tasks in their work design after implementing RPA since the mean is significantly higher than the cost reduction scenario (difference in means: 3.07*). Consequently, participants expect employees to be more provided with new tasks in the scenario where RPA performs most of the repetitive tasks in the job enrichment scenario. Therefore, manipulating organizational strategy in the vignettes, as presented in Appendix C, seems to have the desired effect.

Second, statements two and four are used to check the manipulation for the amount of RPA taking over repetitive work. The difference in means are compared to see if the manipulations has the desired effect. The results in Table 2 concerning statement two, that refers to the effect of RPA on repetitive work, significantly differ in every situation. In the conditions where RPA is implemented, respondents report significantly higher that RPA will affect their repetitive work tasks (difference in means: 2.67* in the cost-reduction vignettes; 2.60* in the job enrichment vignettes). These findings also hold for the question regarding the substitution of repetitive work. As can be seen in Table 2, respondents report that when RPA is implemented, the substitution of repetitive work is significantly higher difference in means: 2.80* in the cost-reduction vignettes; 2.47* in the job enrichment vignettes. Consequently, the manipulation regarding RPA implementation seems to have the desired effect.

Finally, some respondents are asked to provide additional feedback on the scenarios after the manipulation check. The responses provided insights that the situations are overall clear and that the manipulations are recognized. However, the main feedback referred to the length of the manipulation survey. Reading and responding to all four vignettes is considered to be too long. Since the current study already anticipated the length of the survey and to prevent survey fatigue, respondents will only receive two vignettes. Taken together, the manipulations seem to have the desired effect. The length of the number of vignettes is expected not to be a problem since respondents will only be exposed to two scenarios.

Table 2: Results ANOVA post-hoc LSD analyses

Dependent variable: Effect on job loss		**Mean difference (I-J)**	**Dependent variable**: Effect on repetitive work		**Mean difference (I-J)**
Scenario condition (I)	**Scenario condition (J)**		**Scenario condition (I)**	**Scenario condition (J)**	
Cost reduction & little RPA	Cost reduction & much RPA	.80	Cost reduction & little RPA	Cost reduction & much RPA	-2.67*
	Job enrichment & little RPA	-1.00		Job enrichment & little RPA	-.13
	Job enrichment & much RPA	-2.13*		Job enrichment & much RPA	-2.73*
Cost reduction & much RPA	Cost reduction & little RPA	-.80	Cost reduction & much RPA	Cost reduction & little RPA	2.67*
	Job enrichment & little RPA	-1.80*		Job enrichment & little RPA	2.53*
	Job enrichment & much RPA	-2.93*		Job enrichment & much RPA	-.07
Job enrichment & little RPA	Cost reduction & little RPA	1.00	Job enrichment & little RPA	Cost reduction & little RPA	.13
	Cost reduction & much RPA	1.80*		Cost reduction & much RPA	-2.53*
	Job enrichment & much RPA	-1.13		Job enrichment & much RPA	-2.60*
Job enrichment & much RPA	Cost reduction & little RPA	2.13*	Job enrichment & much RPA	Cost reduction & little RPA	2.73*
	Cost reduction & much RPA	2.93*		Cost reduction & much RPA	.07
	Job enrichment & little RPA	1.13		Job enrichment & little RPA	2.60*
Dependent variable: New tasks provided		**Mean difference (I-J)**	**Dependent variable**: Substitution of repetitive work		**Mean difference (I-J)**
Scenario condition (I)	**Scenario condition (J)**		**Scenario condition (I)**	**Scenario condition (J)**	
Cost reduction & little RPA	Cost reduction & much RPA	.80	Cost reduction & little RPA	Cost reduction & much RPA	-2.80*
	Job enrichment & little RPA	-1.20*		Job enrichment & little RPA	-.07
	Job enrichment & much RPA	-2.27*		Job enrichment & much RPA	-2.53*
Cost reduction & much RPA	Cost reduction & little RPA	-.80	Cost reduction & much RPA	Cost reduction & little RPA	2.80*
	Job enrichment & little RPA	-2.00*		Job enrichment & little RPA	2.73*
	Job enrichment & much RPA	-3.07*		Job enrichment & much RPA	.27
Job enrichment & little RPA	Cost reduction & little RPA	1.20*	Job enrichment & little RPA	Cost reduction & little RPA	.07
	Cost reduction & much RPA	2.00*		Cost reduction & much RPA	-2.73*
	Job enrichment & much RPA	-1.07*		Job enrichment & much RPA	-2.47*
Job enrichment & much RPA	Cost reduction & little RPA	2.27*	Job enrichment & much RPA	Cost reduction & little RPA	2.53*
	Cost reduction & much RPA	3.07*		Cost reduction & much RPA	-.27
	Job enrichment & little RPA	1.07*		Job enrichment & little RPA	2.47*

Note: N=15; Significant * at P<0.01

4.3 Population

The total population applicable for this study consists of departments that (1) have implemented RPA, (2) are currently working on the implementation of RPA, (3) have acknowledged that they are interested in implementing RPA in the (near) future, or (4) where RPA is applicable for their current business processes. As discussed in Chapter 2, RPA is applicable to various departments in multiple industries. For example, RPA is integrated into administrative back office work (Ruiz *et al.*, 2022) in areas such as banking, accounting, human resource, insurance, and finance (e.g. Aguirre & Rodriguez, 2017; Eikebrokk & Olsen, 2020; Gupta *et al.*, 2019; Lu et al., 2018; Mendling *et al.*, 2018; Plattfaut et al., 2022; Suri *et al.*, 2017). Based on these findings, the current study includes the following departments; DAF bookkeeping, DAF accounts payable, DAF accounts receivable, DAF salary, DAF sales, DAF IT finance and services, DAF purchasing, DAF HR people and services, PACCAR financial Europe, and DAF marketing pricing and positioning. For a complete overview, see Table 3.

Table 3: Population study

Department	**RPA status**	**# of employees**
DAF - Bookkeeping	Implemented	10
DAF - Accounts Payable	Implemented	20
DAF - Accounts Receivable	Implemented	4
DAF - Salary	Implemented	2
DAF - Sales	Implemented	1
DAF - IT Finance & Services	Interested	16
DAF - Purchasing	Interested	4
DAF - HR People Services	Applicable	14
Paccar - Financial Europe	Implemented	11
DAF – Marketing Pricing and Positioning	Applicable	3
Total		**85**

4.4 Data collection procedure

To test the hypotheses, this study collects its data through an online questionnaire, as a Vignette study proposes. The entire process prior to distributing the questionnaire took around six weeks and consisted of building, testing, introducing, and launching the survey. The survey is pre-tested with a manager of one of the departments presented, one DAF employee working in one of the departments, and one external not working for DAF. It is essential to conduct a pre-test for the data collection instruments since respondents, for example, misunderstand words, which can lead to easily given answers rather than well-thought responses. Researchers, therefore, need to check for "misunderstandings, incomplete concept coverage, inconsistent interpretations, satisficing, context effects, and so on" (Collins, 2003, p. 231). Overall, the entire survey is considered to be clear and well-understood. However, minor changes are made based on the provided feedback.

After processing the feedback, the distribution process of the survey started. First, an online Microsoft Teams meeting was held with the managers and those responsible for DAF bookkeeping,

accounts payable, accounts receivable, and salary and sales to clarify the study's purpose and importance. The elaboration of the study for the managers of purchasing, HR, PACCAR financial, and marketing is done via e-mail. All managers introduced the survey to their employees to stimulate cooperation from DAF employees. Second, all DAF employees received a personal e-mail with an anonymous survey link. We choose to contact the employees individually with a personal e-mail to enhance the change of participation since, among others, Heerwegh *et al.* (2005) report results that personalized e-mail invitations to studies significantly increase the response rate. In addition, to enhance the response rate, the invitation e-mail communicated to all employees that a donation of €1 for every complete response would be made to the charity of KWF kankerbestrijding. Finally, after both week one and week two, a participation reminder via e-mail was sent to all employees to reach a sufficient response.

4.5 Sample Characteristics

In total, 85 DAF employees across ten different departments were invited to participate in the study, of which 66 started the survey. None of the participants declined participation based on provided information in the consent form, which can be found in Appendix D. The respondents are randomly assigned to either the cost reduction strategy condition (n = 22) or the job enrichment strategy condition (n = 26), resulting in a total survey completion of 48 times and a response rate of 57.1 percent. Most participants who participated in the study were 46 years of age or older (45.8 percent). Additionally, the sample group is predominantly male (75 percent). Finally, 39,5 percent of the respondents answered that their current work design contains five or fewer percent of repetitive work. 37.5 percent indicates that the degree of repetitive work is between 6 and 25 percent while 23 percent answered that their current work tasks consist of at least 26 percent of repetitive work. The survey included an attention check question to remove careless respondents from the sample group (Kung *et al.*, 2018). One question was added to the marker variable items, with the opposite question regarding previous items. This study includes a marker variable to test for common method variance, which will be elaborated on in Chapter 4.7.3. None of the respondents provided conflicting answers (i.e. all questions were answered with agree or disagree). Hence, none of the responses are removed based on the attention check. See Table 4 for an overview of the sample characteristics.

Table 4: Sample characteristics

Sample characteristics	
# of employees received the survey invitation	85
# of employees started the survey	66
# of employees finished the survey	48
Excluded based on attention check	0
Responses used for analyses	48
Net response rate	57.1%
Predominantly gender: male	75%

4.6 Measures of constructs

Participants were first introduced to the identical baseline scenario for both conditions. The baseline scenario provided contextual background information about the situation in which their concerning company experimented and tested with RPA for a while. Next, participants were informed that the time has come for the company to implement RPA into the work design of their employees. Thereafter, participants received the first vignette depending on the assigned condition. At the beginning of every vignette, the participant is asked to read the scenario carefully and try to imagine themselves in the described situation as vividly as possible. Regardless of the assigned strategy condition, the first vignette presented an RPA implementation that had limited direct effect on the participant's work design. The second vignette, instead, referred to an RPA implementation that had a significantly direct effect on the participant's work tasks. Thus, in both strategy conditions, the vignettes introduced a scenario in which RPA has a very limited direct effect, followed by the second scenario in which RPA

had a significant direct influences on their jobs. This results in the manipulation of the independent variable. After both vignettes, all the dependent variables are measured. In other words, the dependent variables are measured twice. See Figure 5 for a visual representation of the survey flow. The measurement of the dependent variables are based on existing measures and adapted to make them applicable to the RPA implementation context. All dependent variables are measured using a 7-point Likert-type scale, ranging from 1= strongly disagree to 7= strongly agree. See Appendix E for an overview of the answer possibilities and results for all categorical (control) variables.

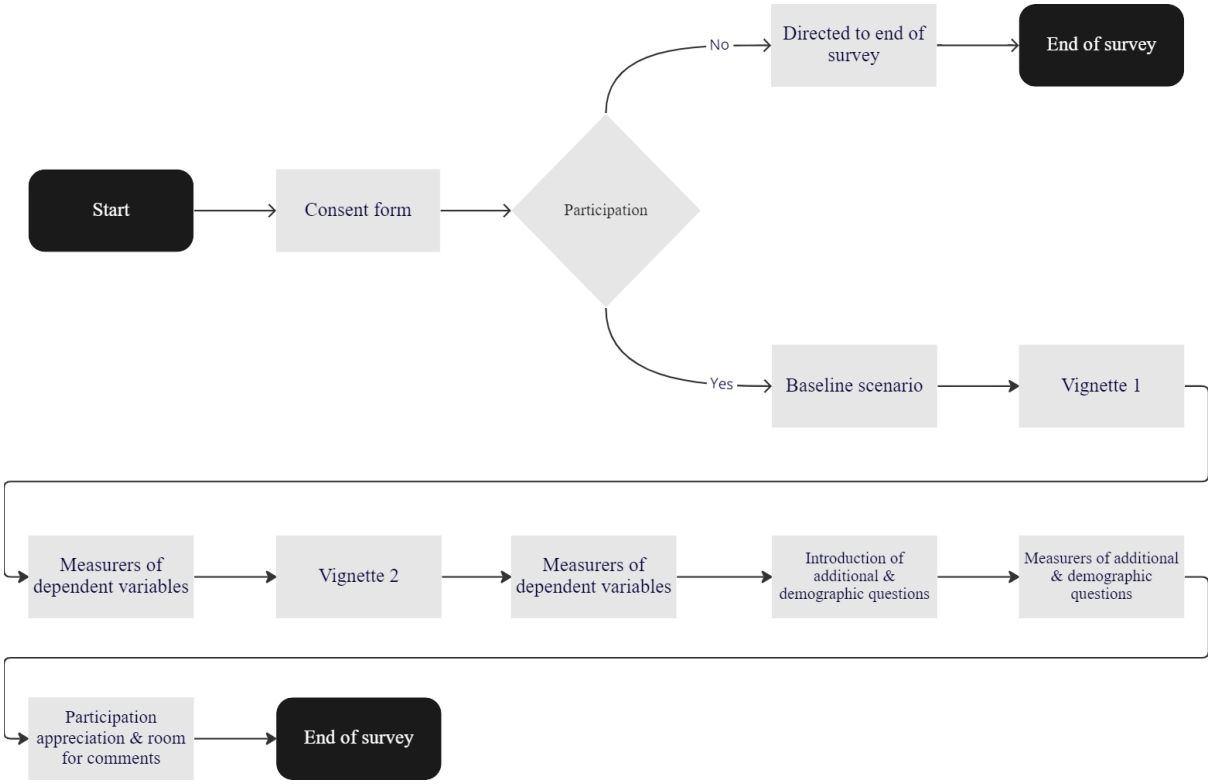

Figure 5: Questionnaire flow

4.6.1 Dependent & independent variables

Job insecurity is measured based on 4 items, adapted from De Witte (1999). These items capture how employees fear for the continuity of their jobs due to RPA, depending on the scenario presented ($\alpha_{\text{Almost no work taken over by RPA}} = 0.78$, $\alpha_{\text{almost all work taken over by RPA}} = 0.92$). A sample item is *"Based on the presented scenario, I think with the current implementation of RPA that I will be able to keep my job".*

Job complexity is measured based on 4 items, adapted from Morgeson and Humphrey (2006). These items will measure if employees expect their job will be more complex with the implementation of RPA ($\alpha_{\text{Almost no work taken over by RPA}} = 0.88$, $\alpha_{\text{almost all work taken over by RPA}} = 0.92$). A sample item is *"Based on the presented scenario, I think with the current implementation of RPA that my job will require me more frequently that I do only one task or activity at the time" (R)*.

Information processing is measured using 4 items adapted from Morgeson and Humphrey (2006). These items measure how much information employees expect have to attend and process based on their work design ($\alpha_{\text{Almost no work taken over by RPA}} = 0.95$, $\alpha_{\text{almost all work taken over by RPA}} = 0.84$). A sample item is *"Based on the presented scenario, I think with the current implementation of RPA that my job require me to analyse more information".*

Job autonomy is measured using 3 items adapted from Morgeson and Humphrey (2006) ($\alpha_{\text{Almost no work taken over by RPA}} = 0.89$, $\alpha_{\text{almost all work taken over by RPA}} = 0.87$). These items focus on decision-making autonomy and a sample item is *"Based on the presented scenario, I think with the current implementation of RPA that my job will allow me to make more decisions on my own".*

Task variety is captured using 4 items adapted from Morgeson and Humphrey (2006). These items aim to measure how many tasks are required to perform after the implementation of RPA,($\alpha_{\text{Almost no work taken over by RPA}} = 0.97$, $\alpha_{\text{almost all work taken over by RPA}} = 0.92$). A sample item is *"Based on the presented scenario, I think with the current implementation of RPA that my job will require me to perform a wider range of tasks".*

Work engagement is measured using the ultra-short version of the Utrecht Work Engagement Scale, consisting of 3 items from Schaufeli *et al.* (2019) ($\alpha_{\text{Almost no work taken over by RPA}} = 0.90$, $\alpha_{\text{almost all work taken over by RPA}} = 0.92$). Prior research provides evidence that using the ultra-short version does not lead to a significant loss of information regarding work engagement (Schaufeli *et al.*, 2019). To reduce the length of the survey, this 3 item scale is used. A sample item is *"Based on the presented scenario, I think with the current implementation of RPA that I will be more enthusiastic about my job"*.

Employee learning orientation is measured using the 6 items adapted from Elliot and Church's (1997) learning orientation scale ($\alpha = 0.90$). A sample item is *"I desire to completely master my job"*. All items are measured using a 7-point Likert-type scale, ranging from 1= strongly agree to 7= strongly disagree.

4.6.2 Moderation variables

Organizational strategy is used as a condition within the vignettes and therefore not measured directly.

Job relevance is measured based on a self-constructed item due to the lack of an existing item scale. This item measures how much time on average an employee spends on repetitive work tasks during the week. The questions specifies to what repetitive work refers to and is asked as follow: "During my current work week, I spend on average X% of my time on repetitive work tasks". The question is measured as a multiple choice questions, containing five answer possibilities ranging from 0-5% to 76%-100%.

4.6.3 Control variables & marker variable

Age is measured based on a self-constructed item. The questions ask to select one's age. The question is measured as a multiple choice questions, containing six answer possibilities ranging from <18 years old to >56 years old.

RPA familiarity is measured based on a self-constructed item. Respondents are asked how familiar they are with RPA on a 5-point Likert-type scale, ranging from 1=not familiar at all to 5= extremely familiar.

RPA influence is measured based on a self-constructed item. Responders are asked if RPA already influenced their current work design. The question is measured as a multiple choice questions, containing two answer possibilities, namely; yes, or no.

The m*arker variable* is measured using 7 items adapted from Miller and Simmering (2022) ($\alpha = 0.94$). A sample item is "I like the color blue". All seven items are measured using a 5-point Likert-type scale, ranging from 1= strongly disagree to 5= strongly agree.

4.7 Analyses

4.7.1 Missing data & construct validity

Prior to the hypotheses testing, we examined the data on missing values (Hair *et al.*, 2014). We used IBM SPSS version 28.0 to examine the data for missingness. The dataset contains missing values in four cases. The little's missing completely at random (MCAR) test shows that the missing data is insignificant ($\chi 2 = 8.094$, DF = 363, $p = 0.99$), meaning that the cases with missing data are identical to those with no missing data. In other words, the missing data is completely random, and there is no observed bias in the data (Hair *et al.*, 2014). To deal with the missing data in all analyses, we favour

using an all-available data approach (i.e. PAIRWISE deletion) above a complete case approach (i.e. LISTWISE method) due to the limited complete cases within the current study (Hair *et al.,* 2014).

To translate the measured variables into higher-level constructs and to ensure that the measured items generate adequate loadings on their construct of interest, we executed a factor analysis (i.e. explanatory factor analyses) and a scale reliability test. Before doing so, we recoded all reversed variables to prevent variables with positive and negative values from being cancelled out (Hair *et al.*, 2014). Furthermore, the values of employee learning orientation are recoded since the answer possibilities ranged from agree to disagree, which is the opposite of the other variables. Finally, the control variable RPA familiarity and moderation variable job relevance are regrouped due to the low frequencies for some answer possibilities. Specifically, the answer possibilities *"very familiar"* and *"extremely familiar"* for the control variable RPA familiarity are recoded into one answer possibility. The answer possibilities that indicate for job relevance (i.e. degree of repetitive work) how much time an employee weekly spends on repetitive work are regrouped such that the answer possibilities *"51%-75%"* and *"76%-100%"* become one group. For the factor analysis, we used an orthogonal rotation (varimax) since this method is proven successful for explanatory factor analyses (Hair *et al.,* 2014). As Hair *et al.* (2014) and Hair *et al.* (2021) propose for indicator reliability, we require a minimum loading of 0.50 on the construct for our factor analysis. For the internal consistency reliability, we consider Cronbach alpha values (α) of 0.6 to 0.7 as the lower limit for the scale reliability, while the composite reliability (CR) test score requires a minimum score of 0.7 (Hair *et al.,* 2021; Hair *et al.,* 2014). Finally, to assess the construct's convergent validity, we wield a minimum average variance extracted (AVE) score of 0.5 (Fornell & larcker, 1981; Hair *et al.,* 2021).

All work characteristic variables in the first condition (i.e. RPA takes over almost none of the repetitive work) except for job complexity met the criteria. Therefore, only item job complexity one is removed from the analyses due to the low factor loading. No items are deleted for all other variables, as can seen in Table 5. In the second condition (i.e. RPA takes over almost all of the repetitive work), job complexity did again not meet the criteria. Hence, item job complexity one is excluded from further analyses. Regarding employee learning orientation, items one and four of learning orientation have been removed from the analyses due to the low factor loadings. This increased the AVE score from 0.53 to 0.69 and Cronbach alpha from 0.87 to 0.90. Finally, we compared cross-loadings, which refer to a variable with more than one significant loading (Hair *et al.,* 2014). Information processing item two loads significantly on its component (0.66) and on the component of task variety (0.56). However, the example provided by Hair *et al.* (2014) indicates that when there is a fairly large difference in loadings, such that the variable loads higher on the construct of interest, the item can be assigned to its original component. Hence, no other items are deleted. See Table 5 for an overview of the factor loadings, average variance extracted, and composite reliability for the dependent, influencing, and control variables.

Table 5: Construct validity

		Vignette 1: Almost no RPA			Vignette 2: Almost all RPA		
Item	**Construct**	**Factor loadings**	**AVE**	**CR**	**Factor loadings**	**AVE**	**CR**
	Based on the presented scenario, I think with the current implementation of RPA that….						
	Job insecurity (De Witte, 1999)		**0.50**	**0.80**		**0.75**	**0.92**
JI_1	I will be able to keep my job (R)	0.56			0.70		
JI_2	There is a risk I will lose my present job in the near future	0.64			0.84		
JI_3	I feel uncertain about the future of my job	0.69			0.92		
JI_4	I will lose my job in the near future	0.91			0.97		
	Job complexity (Morgeson & Humphrey, 2006)		**0.69**	**0.87**		**0.75**	**0.90**
JC_1	My job will require me more frequently that I do only one task or activity at the time (R)	-			-		
JC_2	My tasks on the job will be more simple and uncomplicated (R)	0.75			0.79		
JC_3	My job will contain relatively more uncomplicated tasks (R)	0.86			0.96		
JC_4	My job will involve relatively more simple tasks (R)	0.88			0.83		
	Task variety (Morgeson & Humphrey, 2006)		**0.90**	**0.97**		**0.73**	**0.92**
TV_1	My job will involve a greater deal of task variety	0.95			0.81		
TV_2	My job will involve doing more different things	0.90			0.82		
TV_3	My job will require me to perform a wider range of tasks	0.98			0.86		
TV_4	My job will require me to perform a greater variety of tasks	0.96			0.93		
	Job autonomy (Morgeson & Humphrey, 2006)		**0.69**	**0.86**		**0.59**	**0.80**
JA_1	My job will give me a greater chance to use my personal initiative or judgement in carrying out the work	0.55			0.59		
JA_2	My job will allow me to make more decisions on my own	0.97			0.95		
JA_3	My job will provide me with more significant autonomy in making decisions	0.90			0.72		
	Information Processing (Morgeson & Humphrey, 2006)		**0.71**	**0.88**		**0.53**	**0.77**
IP_1	My job will require me to monitor a greater deal of information	0.80			0.87		
IP_2	My job will require me to engage more in a large amount of thinking	0.83			0.67		
IP_3	My job will require me to analyse more information	0.90			0.63		
	Work Engagement (Schaufeli *et al.*, 2019)		**0.61**	**0.82**		**0.65**	**0.85**
WE_1	I will feel more bursting with energy at work	0.83			0.74		
WE_2	I will be more enthusiastic about my job	0.85			0.85		
WE_3	I will be more immersed in my work tasks	0.64			0.82		
	Employee learning orientation (Schaufeli *et al.*, 2019)		**0.69**	**0.77**			
ELO_1	I desire to completely master my job	-					
ELO_2	I prefer tasks that really challenge me so I can learn new things	0.79					
ELO_3	I want to learn as much as possible from my job	0.90					
ELO_4	It is important for me to understand the content of the job as thoroughly as possible	-					
ELO_5	I prefer tasks that arouses my curiosity, even if it is difficult to learn	0.83					
ELO_6	I hope I gain more knowledge out of my job	0.81					

Table 5 continued

Item	Construct	Factor loading	AVE	CR
	Marker variable (Miller & Simmering, 2022)		**0.78**	**0.96**
MV_1	Blue is a beautiful color	0.90		
MV_2	Blue is a lovely color	0.88		
MV_3	Blue is a pleasant color	0.82		
MV_4	The color blue is wonderful	0.88		
MV_5	Blue is a nice color	0.89		
MV_6	I think blue is a pretty color	0.92		
MV_7	I like the color blue	0.83		

4.7.2 Normality & construct descriptive statistics

This section reports kurtosis and skewness values to check the data on normality. Kurtosis measures the peakiness or flatness of the data compared to a normal distribution. The positive kurtosis values report a peaked distribution, while negative values indicate a flat distribution. The Skewness values, instead, check for the symmetry of the data compared to a normal distribution. Positive values indicate a tail off to the right, while negative values indicate a tail off to the left (Hair *et al.*, 2014). Normality during SEM is assumed when skewness values are between -3 and +3 and kurtosis values are between -10 and +10 (Weston & Gore, 2006). While PLS-SEM handles non-normal data with high levels of skewness well (Hair *et al.*, 2021), the cut-off values for both kurtosis and skewness are not exceeded, as can be seen in Table 6. The data is therefore considered to be normally distributed. Furthermore, Table 7 reports the correlation matrix for the endogenous, moderation, and control constructs.

Table 6: Normality check

Variable	Observed Min	Observed Max	Kurtosis	Skewness
RPA not implemented				
Job insecurity	3.00	7.00	-0.573	0.419
Job complexity	2.00	7.00	-0.661	-0.375
Task variety	2.00	6.00	-1.131	-0.411
Job autonomy	2.00	6.00	-1.249	-0.008
Information processing	2.00	7.00	-1.202	-0.417
work engagement	2.00	6.00	-1.110	-0.078
RPA implemented				
Job insecurity	2.00	7.00	-1.103	-0.114
Job complexity	2.00	7.00	-0.966	-0.480
Task variety	2.00	7.00	1.735	-1.381
Job autonomy	2.00	7.00	-0.101	-0.494
Information processing	2.00	7.00	2.355	-1.571
work engagement	2.00	7.00	-0.636	-0.494
Employee learning orientation	1.00	6.00	4.047	1.801
Job relevance	1.00	4.00	-0.255	0.831
Control & marker variable				
Age	2.00	6.00	-1.198	-0.091
RPA familiarity	1.00	4.00	-0.771	-0.083
RPA influence	0.00	1.00	-1.516	0.718
Marker variable blue	1.00	5.00	1.561	-0.907

Table 7: Descriptive statistics & intercorrelation among study variables

Variable	***M***	***SD***	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*
1. Job insecurity	3.30	1.15	--										
2. Job complexity	4.81	1.31	-.32**	--									
3. Information processing	4.83	1.38	.13	.03	--								
4. Job autonomy	4.30	1.35	-.02	-.14	.55**	--							
5. Task variety	4.77	1.40	-.03	.12	.74**	.51**	--						
6. Work engagement	4.43	1.31	-.12	.10	.67**	.61**	.69**	--					
7. Employee learning orientation	5.77	.95	-.29**	.10	.10	.19	.10	.32**	--				
8. Job relevance	1.94	.97	-.04	.14	.13	-.12	.22*	.05	-.10	--			
Controls													
9. Age	4.37	1.23	.16	.03	-.19	-.23*	-.11	-.32**	-.50**	-.10	--		
10. RPA familiarity	2.58	.91	-.35**	.07	.00	.16	.11	.27**	.47**	-.12	-.40**	--	
11. RPA influence on prior work tasks (dummy)	.33	.47	.02	-.13	.16	.05	.09	.05	-.04	-.09	-.15	.32**	--

Note: N = 48. * p < 0.5; **p < 0.01 (two-tailed)

4.7.3 Common method bias: procedural & statistical remedies

The study might suffer from common method variance (CMV) since the survey contains self-reported data on employees' personalities, behaviours and perceptions of situations (Tehseen *et al.,* 2017). CMV can lead to unwanted responses in the form of socially desirable answers, the tendency to provide extreme answers (e.g. extremely disagree on every statement)), or consent with every question (Podsakoff *et al.,* 2012). This can cause a bias in the impact of one variable on the other since the survey measures both the independent and dependent variables (Tehseen *et al.,* 2017). The appearance of common method bias is problematic since it can affect the hypotheses testing, lead to incorrect perceptions, and diminish the scale's discriminant validity (Podsakoff *et al.,* 2012). Therefore, to prevent common method bias from arising, we included procedural and statistical remedies.

Procedural remedies:

First, we guaranteed respondents anonymity when they participated in the study and clarified that there was no right or wrong in answering the questions. Both procedures should result in respondents not answering socially desirable answers (Podsakoff *et al.,* 2003; Tehseen *et al.,* 2017). Second, we tried to improve scale items by avoiding vague concepts and providing examples with the questions, and we aimed to keep the questions specific and straightforward across the survey (Podsakoff *et al.,* 2003; Tehseen *et al.,* 2017). Finally, we used positively and negatively worded scale items to balance the variance (Podsakoff *et al.,* 2012).

Statistical remedies:

For a statistical remedy, we choose to include a measured latent marker variable (MLMV) at the end of the survey since it can control and correct for common method bias (Tehseen *et al.,* 2017). We included a construct level correction (CLC) in our models to observe the impact of the common method variance on the path coefficients (Abdi *et al.,* 2013; Tehseen *et al.,* 2017). To do so, we used a 7-item unrelated to the study marker variable proposed by Miller and Simmering (2022) for our analyses since their results prove the functionality of this marker variable. The conceptual model, depicts eight main constructs. Hence, we included the marker variable eight times since the number of control constructs needs to equal the number of main constructs in the model for CLC (Chin *et al.,* 2013; Tehseen *et al.,* 2017). The results, as can be seen in Table 8, indicate that the biggest change in path coefficients occurred between (1) employee learning orientation and work engagement with values of 0.12 and 0.14 respectively ($\beta\Delta = 0.02$), (2) the implementation of RPA and job complexity with values of 0.41 and 0.40 respectively ($\beta\Delta = 0.01$), (3) job complexity and work engagement with values of 0.15 and 0.14 respectively ($\beta\Delta = 0.01$), (4) information processing and work engagement with values of 0.27 and 0.26 respectively ($\beta\Delta = 0.01$), and (5) employee learning orientation and job insecurity with values of -0.23 and -0.22 ($\beta\Delta = 0.01$). Likewise, the t-value parameter did not change significantly either, as can be seen in Table 8. These results indicate that there is no significant difference between the model with and without a marker variable. We, therefore, conclude that CMV is not present in this study. Henceforth, as proposed by Tehseen and colleagues (2017), we excluded the marker variable from further analyses for the sake of simplicity.

Table 8: Results test for CMV

Relation	Path coefficients without CLC (β)	Path coefficients with CLC (β)	t-value without CLC	t-value with CLC
RPA -> Job insecurity	0.72**	0.72**	3.887	3.873
RPA -> Job complexity	0.41*	0.40*	2.074	2.181
RPA -> Information processing	0.61**	0.61**	3.319	3.333
RPA -> Job autonomy	0.70**	0.70**	3.842	3.824
RPA -> Task variety	0.61**	0.61**	3.337	3.332
Employee learning orientation -> Job insecurity	-0.23**	-0.22*	2.667	2.419
Job insecurity -> work engagement	-0.04	-0.04	0.504	0.493
Job complexity -> work engagement	0.15	0.14	1.985	1.790
Information processing -> work engagement	0.29*	0.29*	2.130	2.101
Job autonomy -> work engagement	0.22*	0.23*	2.403	2.397
Task variety -> work engagement	0.32*	0.32*	2.289	2.266
Employee learning orientation -> work engagement	0.12	0.14	1.307	1.506

*Note: * = p<0.05 **= P<0.01 (two-tailed)*

4.7.4 Method of hypotheses testing

To test the conceptual model and its corresponding hypothesis, we use a structural equation modeling (SEM) technique (Hair *et al.,* 2014). Overall, SEM is more sensitive to sample size than other multivariate techniques. Therefore, Hair and colleagues (2014) argue that a model with five or fewer constructs already requires a sample size of 100 responses. One drawback of this study is the limited sample size available. We, therefore, choose to use a variance-based SEM technique. More specifically, we use partial least squares (PLS) path modelling, in SmartPLS v4, as the appropriate method to conduct the analyses since this technique deals, according to Hair *et al.* (2021) and Henseler *et al.* (2009), better with analysis who have a small sample size available. Hair and colleagues (2021) argue that partial least squares structural equation modeling (PLS-SEM) is the preferred method when sample sizes are particularly small since the method provide higher levels of statistical power, even when the model is considered to be complex.

The result of an insufficient sample size might prevent the analysis from revealing effects that are present within the population. Consequently, the findings are not generalizable to other samples from the same population (Hair *et al.,* 2021). Although it is considered to be a rough guideline, a method to calculate the minimum sample size for a PLS-SEM analysis is multiplying the maximum number of arrows connecting to one latent variable anywhere within the PLS-SEM model by ten (Hair *et al.,* 2021). Taking this guideline into account, the current study's conceptual model is too complex for assessing all relationships at once. Therefore, we try to prevent the consequences of an insufficient sample size by analyzing the relationships of the model in several steps. Consequently, we build four different main SEM models to analyze the hypothesized relationships. The first model analyses the effect of the exogenous construct (i.e. RPA implementation & employee learning orientation) on the endogenous constructs (i.e. the work characteristics from the baseline model and the additional work characteristics of job insecurity and job complexity). In the second model, we estimate the moderation effects separately. In other words, the moderation effects are estimated in four different submodels (2A, 2B, 2C, and 2D), for every work characteristic individually without work engagement included. The third model analyses the direct effects of job demands, job resources, and personal resources on employee work engagement. Finally, the fourth model investigates mediation effects. Since the factors are formative in nature, all analyses are done via a standard bootstrapping algorithm, with a bias-corrected and accelerated (BCa) bootstrap confidence interval method with the proposed by Hair *et al.* (2021) 10,000 bootstrap samples. Missing values are corrected via a pairwise deletion.

5.Results

This chapter reports the results of the SEM-PLS analyses. Table 9 presents the results of the direct relationships between RPA and the baseline and additional work characteristics. In addition, Table 9 presents the results of the moderation effects of organizational strategy and job relevance on the RPA and job demands-resources relationships. Table 10 instead reports the findings of the work characteristics and work engagement relationships and the indirect effects between RPA and work engagement through job demands and resources. Figure 6 presents an overall visual representation of all four SEM models' results, and Table 11 summarises the hypotheses' findings. Path coefficients (β) are standardized, and all values fall between the range of -1.0 to +1.0. Results close to +1 indicate a strong positive relationship, and values close to -1, on the other hand, indicate a strong negative relationship (Hair *et al.,* 2021).

The multicollinearity presence is checked using the variance inflation factor (VIF) values. High VIF scores indicate a high degree of (multi)collinearity among the independent variables (Hair *et al.,* 2014). Hair and colleagues (2014) propose that all VIF scores below 10 are tolerance values, while Hair *et al.* (2021) argue that for PLS-SEM specific, VIF values below 5 are acceptable. Instead, Kock (2015) argues that VIF scores greater than 3.3 present (multi)collinearity in PLS-SEM among the independent variables. Consequently, we wield a 3.3 cut-off point. The models are tested on (multi)collinearity, and none of the VIF scores exceeded the cut-off score of 3.3. We, therefore, conclude that (multi)collinearity is not an issue within this study.

When conducting SEM-PLS analyses, measuring only the fit of single relationships is incorrect; we must accept or reject the entire model (Hair *et al.,* 2014). To do so, we used the Standardized Root Mean Square Residuals (SRMR) value for all four main models built to test the hypothesized relationships. An SRMR value of 0.00 suggests a perfect model fit (Hair *et al.,* 2021). Hair and colleagues (2014) argue that SRMR values over 0.1 indicate a problem with the model fit. Hu and Bentler (1999), on the other hand, argue for a cut-off SRMR value close to 0.08. However, model complexity and sample size can affect the suitable cut-off values. In other words, when accepting or rejecting the overall model fit, cut-off values are not solely determined by a predetermined cut-off point (Hair *et al.,* 2021). Wielding 0.08 as a cut-off score can result in incorrect rejection of the model when the model is complex or when the sample size is small (Hair *et al.,* 2021). Due to this study's limited sample size, we wield a 0.10 SRMR value as the cut-off point. The SMRS values for all SEM models are reported in Tables 9 and 10. As seen in Table 9, the first model, with only the direct relationships from RPA to the job demands and resources, has an SRMR value of 0.061. Model 2A to model 2D with all moderation effects have SRMR values of 0.083, 0.093, 0.089, and 0.082. Finally, models three and four, presented in Table 10, report SRMR values of 0.062 and 0.061, respectively. Hence, none of the moderation models exceeds the SRMR value of 0.10. While some of the SRMR values are close to the cut-off point, all models show a sufficient model fit.

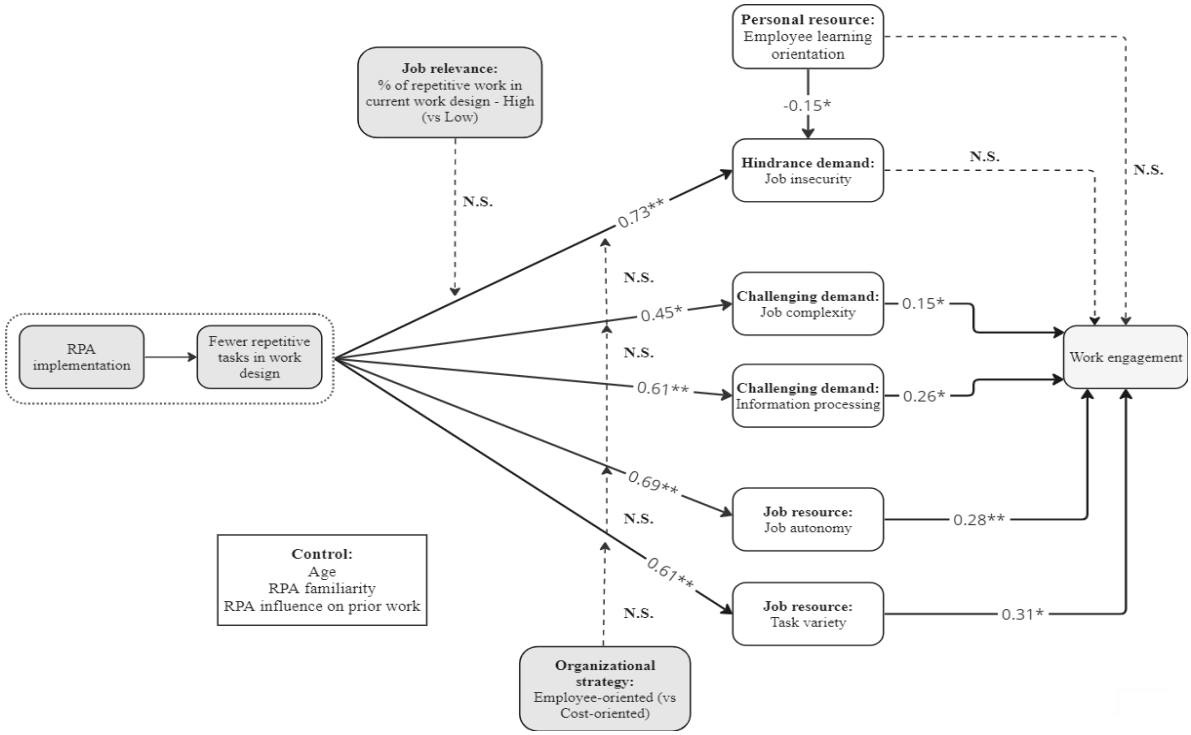

*Figure 6: Conceptual model, results included; *P<0.05, **P<0.01 (one-tailed)*

5.1 RPA & work characteristics: direct effects baseline model

We support hypothesis 1a and 1b that the perceived job autonomy and task variety would be higher with the implementation of RPA. Model 1 in Table 9 shows a significant positive relationship between RPA and job autonomy (β= 0.69, p<0.01) and task variety (β= 0.61, p<0.01). Furthermore, model 1 reveals a significant positive effect between RPA and information processing (β= 0.61, p<0.01), which supports hypothesis 2. Consistent with hypothesis 3, the relationship between RPA and job complexity is positive and significant (β= 0.45, p<0.05). The findings prove that RPA is positively related to job insecurity (β= 0.70, p<0.01), which supports hypothesis 4. Finally, employee learning orientation directly reduces perceived job insecurity (β= -0.15, p<0.05), which supports hypothesis 7.

5.2 RPA & job demands-resources relationships: moderation

We argued that organizational strategy and job relevance moderate several RPA and job demands-resources relationships. Consequently, we created four different models (model 2A – 2D) to calculate the interaction effect of the moderation constructs, which results can be found in Table 9. We hypothesized that the organizational strategy would moderate the relationship between RPA and job resources. In other words, we expected that organizational strategy would moderate the relationships between RPA, job autonomy, and task variety. However, as can be seen in Table 9, models 2A and 2B, the data provide non-significant interaction results for the relationships between RPA and job autonomy (β= -0.32, P>0.05) and RPA and task variety (β= -0.42, P>0.05). We, therefore, reject hypotheses 5a and 5b. Furthermore, in line with the expectations, the simple slope analysis in Figure 7 indicates that an employee-oriented strategy strengthens the relationship between RPA and job complexity compared to a cost-oriented strategy. However, as the results in Table 9; model 2C indicate, organizational strategy has no significant interaction effect on the relationship between RPA and job complexity (β= 0.43, P>0.05). Thus, hypothesis 5c is not supported.

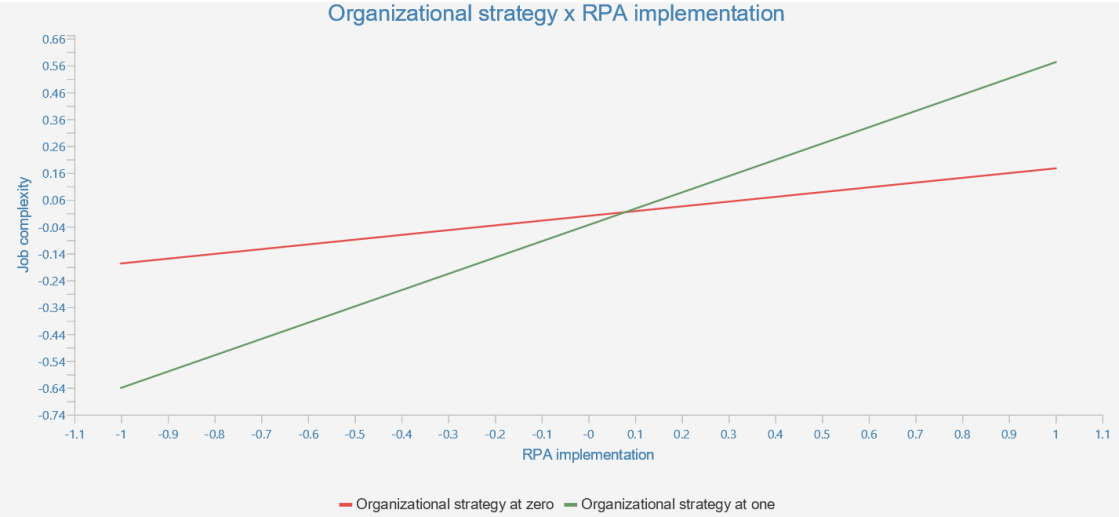

*Figure 7: Simple slope analysis Organizational strategy*RPA --> Job complexity; 0 is reference group (cost reduction)*

Finally, we expected that the organizational strategy would moderate the relationship between RPA and job insecurity, such that an employee-oriented strategy would result in a diminished feeling of perceived job insecurity compared to a cost-oriented strategy. While the simple slope analysis in Figure 8 indicates that the organizational strategy (employee-oriented) indeed results in lower perceived job insecurity, the results in model 2D reveal a non-significant interaction effect (β= -0.19, P>0.05). Hence, no support for hypothesis 5d is found.

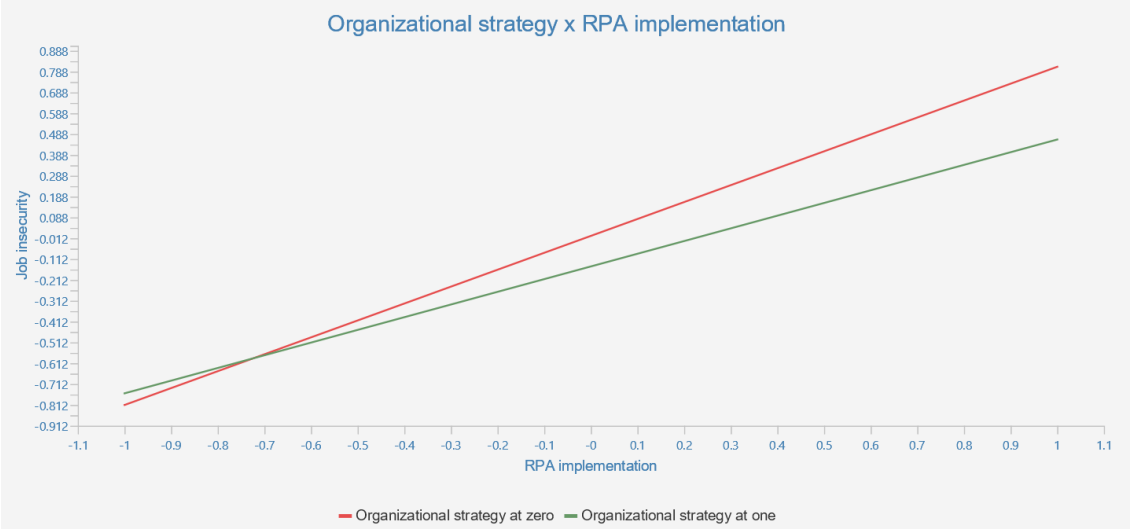

*Figure 8: Simple slope analysis Organizational strategy*RPA --> Job insecurity; 0 is reference group (cost reduction)*

Regarding the moderation of job relevance, Table 9, model 2D presents the results of the moderation effect. We hypothesized that high on job relevance (i.e. high degree of repetitive work) would result in a stronger feeling of perceived job insecurity. Against the expectations, the results in model 2D, Table 9, indicate no significant interaction effect of the degree of repetitive work between RPA and job insecurity (β= -0.08, P>0.05). Hypothesis 6 is, therefore, not supported.

Table 9: Results analyses model 1 & 2A-D

		Model 1		Model 2A		Model 2B		Model 2C		Model 2D	
Hypothesized relation	**Hypothesis**	**β**	**t**	**β**	**t**	**β**	**t**	**β**	**t**	**β**	**t**
RPA --> Job autonomy	H1a	0.69**	3.797								
RPA --> Task variety	H1b	0.61**	3.323								
RPA --> Information processing	H2	0.61**	3.347								
RPA --> Job complexity	H3	0.45*	2.192								
RPA --> Job insecurity	H4	0.73**	3.937								
Employee learning orientation --> job insecurity	H7	-0.15*	2.210								
RPA --> Job autonomy				0.86**	3.150						
Org. strategy*RPA --> Job autonomy	H5a			-0.32	0.843						
RPA --> Task variety						0.83**	3.011				
Org. strategy*RPA --> Task variety	H5b					-0.41	1.037				
RPA --> Job complexity								0.44*	2.234		
Org. strategy*RPA --> Job complexity	H5c							0.42	1.022		
RPA --> Job insecurity										0.77**	2.848
Org. strategy*RPA --> Job insecurity	H5d									-0.19	0.497
Job relevance*RPA --> Job insecurity	H6									-0.08	0.404
Significant control variables											
RPA familiarity --> Emp. learning orientation		0.19*	2.082								
RPA familiarity --> information processing		-0.25*	2.041								
RPA familiarity --> job insecurity		-0.27*	2.250							-0.33**	2.877
RPA influence on prior work --> information processing		0.44*	1.972								
Age --> job autonomy		-0.21*	2.088	-0.21*	1.925						
Age --> Emp. Learning orientation		-0.26**	2.648								
Age --> information processing		-0.22*	2.075								
SRMR		0.061		0.083		0.093		0.089		0.082	

Note: *†= P<0.1 * = p<0.05 **= P<0.01 (one-tailed); Org. strategy = organizational strategy; Job relevance = degree of repetitive work; Emp. = Employee*

5.3 RPA, work characteristics, and work engagement: indirect effects

Concerning the direct effect of employee learning orientation to work engagement, the data does not support hypothesis 8. The data in model 3, Table 10, indicates, be it close to significance, a positive non-significant relationship between employee learning orientation and work engagement (β= 0.10, p<0.10). We, thus, reject hypothesis 8. Furthermore, the data in model 3 does not support a direct negative relationship between job insecurity and work engagement (β= -0.05, p>0.05). Therefore, we reject hypothesis 9. Finally, model 3 shows a significant positive effect from job autonomy (β= 0.28, p<0.01), task variety (β= 0.31, p<0.05), information processing (β= 0.26, p<0.05), and job complexity (β= 0.15, p<0.05) to work engagement. Therefore, we support hypotheses 11a, 11b, 11c, and 11d.

The results provide evidence for a positive indirect effect of RPA on work engagement through job autonomy (β= 0.20, p<0.05), thereby supporting hypothesis 12a. Furthermore, supporting hypothesis 12b, the indirect effect between RPA and work engagement through task variety is significant and positive (β= 0.18, p<0.05). In addition, we support hypothesis 12c, that RPA indirectly positively affects work engagement through information processing (β= 0.17, p<0.05). The data does not support a significant indirect effect between RPA and work engagement through job complexity (β= 0.06, P<0.10) and job insecurity (β= -0.03, P>0.05). Hence, we reject hypotheses 10 and 12d.

Table 10: Results analyses model 3 & 4

		Model 3		**Model 4**	
Hypothesized relation	**Hypothesis**	**β**	**t**	**β**	**t**
Employee learning orientation --> work engagement	H8	0.10†	1.576		
Job insecurity --> work engagement	H9	-0.05	0.632		
Job autonomy --> work engagement	H11a	0.28**	2.894		
Task variety --> work engagement	H11b	0.31*	2.341		
Information processing --> work engagement	H11c	0.26*	1.902		
Job complexity --> work engagement	H11d	0.15*	1.944		
RPA --> Job autonomy --> work engagement	H12a			0.20*	2.202
RPA --> Task variety --> work engagement	H12b			0.18*	1.839
RPA --> Information processing --> work engagement	H12c			0.17*	1.837
RPA --> job complexity --> work engagement	H12d			0.06†	1.315
RPA --> job insecurity --> work engagement	H10			-0.03	0.556
Significant control variables					
RPA influence on prior work --> information processing		0.45*	1.888	0.45*	2.017
RPA familiarity --> Emp. learning orientation		0.20*	2.118		
RPA familiarity --> information processing		-0.25*	1.964	-0.26*	2.098
RPA familiarity --> job insecurity		-0.25*	1.842	-0.25*	2.021
Age --> job autonomy		-0.20*	1.900		
Age --> Emp. learning orientation		-0.27**	2.691		
Age --> information processing		-0.23*	1.983	-0.22*	1.703
SRMR		0.062		0.061	

***Note:** †= P<0.1 * = p<0.05 **= P<0.01 (one-tailed); Emp. = Employee*

Table 11: Summary hypotheses support

	Hypothesis	Finding
H1	*The automation of work tasks by RPA is positively related to the (a) perceived job autonomy and (b) task variety*	Supported
H2	*The automation of work tasks by RPA is positively related to the perceived information processing*	Supported
H3	*The automation of work tasks by RPA is positively related to the perceived job complexity*	Supported
H4	*The automation of work tasks by RPA is positively related to the perceived job insecurity*	Supported
H5	*Organizational strategy moderates the relationship between RPA and the perceived (a) job autonomy, (b) task variety, (c) job complexity, and (d) job insecurity, such that the job enrichment strategy strengthens the relationship between RPA and job autonomy, task variety, job complexity, and diminishes the relationship between RPA and job insecurity compared to the cost reduction strategy*	Not supported
H6	*Job relevance strengthens the relationship between RPA and perceived job insecurity, such that the perceived job insecurity is higher for employees with more repetitive work in their current work designs*	Not supported
H7	*Employee learning orientation is negatively related to perceived job insecurity caused by RPA*	Supported
H8	*Employee learning orientation is positively related to work engagement*	Not supported
H9	*Job insecurity is negatively related to work engagement*	Not supported
H10	*The negative effect of RPA on work engagement is fully mediated through job insecurity*	Not supported
H11	*(a) Job autonomy, (b) task variety, (c) information processing, and (d) job complexity are positively related to work engagement*	Supported
H12	*The positive effect of RPA on work engagement is fully mediated through (a) job autonomy, (b) task variety, (c) information processing, and (d) job complexity*	Partially supported

6.Discussion

The primary emphasis of this study was to examine how organizational strategy, job relevance, and employee learning orientation influence the relationship between RPA and work engagement through the JD-R theory lens. More specifically, the current study examined whether the organizational strategy and job relevance moderate the RPA and job demands-resources relationships. Additionally, we investigated if employee learning orientation reduces job demands caused by RPA and increase work engagement directly. Hence, this study aimed to gain more insights into how organizational strategy and job relevance influence the relationships between RPA and job demands and resources and, in addition to that, employees' work engagement. While this study focused particularly on the effects of organizational strategy, job relevance, and employee learning orientation, it also addressed the unexplored distinction of challenging (i.e. job complexity) and hindrance demands (i.e. job insecurity) on work engagement in an RPA context.

As predicted by the baseline model, our results confirm the positive relationship between RPA, task variety, job autonomy, and information processing. In addition to the baseline model, we found a positive relationship between RPA, job complexity, and job insecurity. Both work characteristics expand the baseline model and confirm prior research that work automation technologies can increase job complexity (e.g. Autor, 2015; Beer & Mulder, 2020; Parker & Grote, 2020) and job insecurity (Nam, 2019). Additionally, as the primary emphasis of this study, we expected the relationships between RPA and these work characteristics to be moderated by organizational strategy and job relevance. Based on work design literature, we expected that an employee-oriented strategy would diminish the RPA job demand relationship and strengthen the RPA job resources relationship. Since we differentiated between challenging (i.e. job complexity) and hindrance (i.e. job insecurity) demands, we could better estimate the hypothesized effects of organizational strategy on both job demands. We argued that the employee-oriented strategy would strengthen rather than diminishing the relationship between RPA and challenging job demands. As expected, the simple slope analyses indicated a diminished effect of RPA on hindrance job demand (i.e. job insecurity) and a stronger relationship on challenging job demand (i.e. job complexity) with an employee-oriented strategy. Surprisingly, no significant effect was observed. The same holds for the moderation of organizational strategy on job resources (i.e. job autonomy and task variety). Therefore, in contrast to propositions from prior work design literature (e.g. Parker & Grote, 2020), no significant moderation effect of organizational strategy on the RPA job demands-resources relationship is found. In addition to the moderating effect of organizational strategy, we hypothesized that employees with a high job relevance (i.e. degree of repetitive work) would be more insecure about the continuity of their job. In other words, we expected a moderating effect of job relevance on the relationship between RPA and job insecurity. Surprisingly, no effect was observed on perceived job insecurity. This finding implies that regardless of the job relevance, all employees perceive RPA as an equally significant threat to their current jobs which contradicts prior work design literature (e.g. Fréour *et al.,* 2021; Parker & Grote, 2020).

Finally, as expected, employee learning orientation reduces the perceived job insecurity caused by the substitution of repetitive work by RPA. However, no direct positive relationship is found between employee learning orientation and work engagement. Taken together, the results do not support a moderation effect of organizational strategy and job relevance on the RPA job demand-resource relationships. However, employee learning orientation as a personal resource reduces employees' perceived job insecurity, caused by RPA. The following sections elaborate in detail on the theoretical implications, managerial implications, and limitations of this study and provide fruitful areas for future research.

6.1 Theoretical implications

While prior RPA scholars mainly focused on the positive effects of RPA (Wewerka & Reichart, 2020) and primarily presented case studies and experiences applicable to higher-level management (Syed *et al*., 2020), more evidence is needed on employee-related consequences. Therefore, the current study focuses on employee-related consequences and extends the RPA literature by investigating

organizational strategy and job relevance as two potential moderators of effects in the RPA and job demands-resources relationships. Furthermore, this study develops previous insights by including employee learning orientation as a personal resource and provides insights that employee learning orientation affects job insecurity as a hindrance demand. All in all, the current study aims to provide additional insights into the effect of RPA on employee-related consequences such as work engagement since more knowledge on the effect of RPA on work engagement is desired (Siderska, 2020).

6.1.1 Baseline model & additional work characteristics

First, the results demonstrate a significant positive relationship between RPA, decision-making job autonomy and task variety. Moreover, decision-making job autonomy and task variety mediate the relationship between RPA and work engagement such that RPA has a positive relationship with work engagement through task variety and job autonomy. These findings align with the baseline model's hypotheses, proposed by Peeters and Plomp (2022). In other words, employees experience an increase in the amount of tasks they perform and more decision-making autonomy with the work automation by RPA, which increases the work engagement of employees. Furthermore, unlike the baseline model, our results report a significant increase in perceived information processing when RPA performs almost all repetitive work. Moreover, information processing mediates the relationship between RPA and work engagement, such that RPA has an indirect positive relationship with work engagement through information processing. These findings support that information processing is a challenging demand, which aligns with the findings from Humphrey and colleagues (2007). The rationale behind the positive relationship between information processing and work engagement is that challenging demands trigger positive emotions, wherefore employees are more willing to invest in themselves. Therefore, challenging demands are anticipated to affect work engagement positively (Crawford *et al*., 2010).

Second, we included two additional work characteristics to the baseline model. Therefore, we expand the RPA literature and answer two recent calls to examine further the relationship between RPA and job demands (Peeters & Plomp, 2022) and the need for more research towards the RPA and work engagement relationship (Siderska, 2020). Prior research argued that the automation of work could increase the complexity of jobs (e.g. Beer and Mulder, 2020; Parker & Grote, 2020). In addition, many RPA scholars argued that RPA might lead to more problem-solving and value-creation work tasks (e.g. Ågnes, 2022; Asquith & Horsman, 2019; Eikebrokk & Olsen, 2020; Mendling *et al.*, 2018). Our results align with these expectations and found a positive relationship between the automation of repetitive work by RPA and perceived job complexity. In addition, our findings present a positive relationship between job complexity and work engagement, which confirms the expectation of job complexity being a challenging demand. Furthermore, we confirm the assumptions from prior research that automation of work can cause feelings of job insecurity among employees (Nam, 2019). More specifically, RPA literature argues that RPA might lead to a perceived threat to job continuity (e.g. Ågnes, 2022; Fréour *et al.*, 2021; Suri *et al.*, 2017; Wewerka & Reichart, 2020). Our findings complement existing RPA literature with the findings that the automation of repetitive work by RPA positively relates to perceived job insecurity. For this hypothesis testing, RPA familiarity controls negatively for job insecurity. This is consistent with our theory-based expectation that RPA familiarity enables employees to understand the technology's strengths and weaknesses. Moreover, it can give employees the confidence to work with RPA and pursue new opportunities (Ågnes, 2022). Surprisingly, compared to work design literature (Guarnaccia, 2018), this study did not find a significant negative relationship between job insecurity and work engagement. The reason for the lack of significance might be explained by the findings that job insecurity can lead to job strain (Näswall *et al.*, 2005), which, according to Bakker and Demerouti (2017), mediates the relationship between job demands (e.g. job insecurity) and motivation (e.g. work engagement). This could explain why no direct significant negative relationship is observed.

6.1.2 Moderation of organizational strategy & job relevance

Although prior work design literature argued that the organizational strategy and job relevance could moderate the relationship between work automation technologies and work characteristics (Parker & Grote, 2020) and that the degree of routine in jobs might be a moderating factor on the effects of RPA

on work characteristics (Fréour *et al.*, 2021), prior RPA literature did not investigate both construct specifically in a moderating role on the RPA and job demands-resources relationships.

The distinction between challenging and hindrance demands is made to better estimate the moderating effects on the RPA and job demands relationships. On the one hand, we expected that an employee-oriented strategy would diminish the relationship between RPA and hindering demand. On the other, causing a stronger relationship between RPA and challenging demand. A diminishing effect on the relationship between RPA and job insecurity is observed, what is in line with the expectation and significant negative correlation between organizational strategy and job insecurity, as can be seen in Appendix F. In addition, an employee-oriented strategy strengthens the relationship between RPA and job complexity. Surprisingly, no significant effect was observed for both moderation effects. The lack of significant findings is surprising, especially since the work design literature asserts that a new technology's effects on work characteristics can depend on the organizational strategy (Parker & Grote, 2020). Additionally, RPA studies found results that the utilization of RPA differs among organizations (Eikebrokk & Olsen, 2020) which resulted in, on the one hand, more pleasurable work for employees (Asquith & Horsman, 2019; Fréour *et al.*, 2021); on the other, a replacement of employees by RPA (Eikebrokk & Olsen, 2020). A potential explanation for the lack of significance might lie in the insufficient power of the statistical analyses. The small sample size might have caused insufficient power to observe effects which are present within the population (Hair *et al.*, 2021).

Furthermore, contrary to the positive correlation between organizational strategy and task variety in the correlation matrix presented in Appendix F and prior RPA literature that organizations who utilize RPA to provide more meaningful work for employees (Asquith & Horsman, 2019; Fréour *et al.*, 2021), no significant moderating effect of an employee-oriented strategy on the RPA job resources relationships is observed. Instead, we found a negative rather than positive moderating effect on the RPA-task variety and job autonomy relationships. A possible explanation for this surprising diminishing effect might be explained by the fact that the investigated organization works with a headcount target. This hampers the intake of new employees. Participants might expect that when the aim is to reduce costs, more employees will be let go compared to the employee-oriented strategy. Therefore, the remaining employees must perform the work RPA cannot execute. In other words, the participants in the cost-oriented strategy might expect that with a smaller workforce, the non-repetitive work needs to be performed with the reaming workforce, which increases the variety of tasks. This might explain the stronger relationship between RPA and task variety in the cost-oriented strategy. Taken together, the results indicate that the organizational strategy does not moderate the RPA and job demands-resources relationships, which contradicts our expectations. However, the insignificant findings regarding the moderation of organizational strategy indicate that the effects of RPA on job demands-resources are independent of the organizational strategy. Our results align with the findings from Lacity and Willcocks (2015), who found mainly similar implications after the implementation of RPA among several studied organizations. Although the authors did not mention a differentiation in organizational strategy among the studied organizations, the effects of RPA on FTE savings, reallocation of employees, and restructuring work designs with higher-value work were very similar for all organizations (Lacity & Willcocks, 2015).

Finally, against the expectations, the current research found an insignificant moderation effect of job relevance on the relationship between RPA and job insecurity. By explanation, job relevance does not affect the relationship between RPA and job insecurity. This finding aligns with the correlation matrix in Chapter 4, section 4.7.2, Table 7, where job relevance does not correlate with job insecurity. A potential explanation based on the literature for the insignificant finding might be that employees' exposure to robots physically or psychologically leads to increased job insecurity, also for employees who are not directly threatened by robots (Yam *et al.*, 2022). In other words, even when RPA cannot substitute a significant amount of someone’s work tasks, employees still consider RPA a threat to the continuity of their job. Another explanation for the insignificant finding based on literature might lie in the results that employees do not expect their jobs to become completely obsolete with the automation of RPA. As seen in Appendix F's correlation matrix, the perceived job insecurity's means with the substitution of repetitive work by RPA increases from 2.84 to 3.76, respectively. Thus, participants

generally do not strongly agree that their jobs become obsolete. The findings from a recent study towards the effects of job characteristics on job insecurity can explain this rationale. According to Coupe (2019), employees with repetitive jobs are generally more concerned about being replaced by automation technologies. However, employees with repetitive jobs are not associated with greater concerns about the existence of their jobs in the long run. Although employees with repetitive jobs might be more concerned about the replacement by automation technologies, they might expect that their jobs will not become completely obsolete with the implementation of RPA. Thus, employees with (highly) repetitive jobs are not more concerned than employees who perform low-repetitive jobs about the existence of their jobs in the long run. Hence, this might explain why there is no significant difference in perceived job insecurity among employees regarding their job relevance. Taken together, the perceived job insecurity is not depending on the job relevance. Moreover, based on our data, it is likely that none of the employees expects their jobs to become completely obsolete. This aligns with the findings that employees can identify RPA as a threat. However, employees might rather focus on identifying opportunities and capability development while implementing RPA (Ågnes, 2022).

All in all, our finding contradicts previous findings in two aspects. First, prior research towards job insecurity argues that job insecurity is a subjective phenomenon and that perceived job insecurity differs among individuals exposed to the same threat (Sverke & Hellgren, 2002; Sverke *et al*., 2002). Second, a recent study towards the modifications of work characteristics by digital technologies argues that employees who perform a large amount of repetitive work are more likely to be insecure about the continuity of their jobs since automation technologies are more likely to substitute these workers (Fréour *et al.,* 2021). The findings of this research do not report such differences among individuals in the relationship between RPA and job insecurity. To conclude, concerning the first part of the research question, our findings do not lend support that the organizational strategy and job relevance moderate the RPA job demands-resources relationships. The difference why some employees experience RPA as something positive (Fréour *et al.,* 2021) while others experience work impoverishment by the hand of RPA (Peeters & Plomp, 2022) is according to our results, not determined by organizational strategy and job relevance.

6.1.3 Personal resources

Concerning employee learning orientation as a personal resource, JD-R literature asserts that personal resources can buffer the unwanted effects of job demands and positively influence one's work engagement (Bakker & Demerouti, 2017). The current study extends the baseline model and RPA literature by including employee learning orientation as a personal resource in the investigation of the effects of RPA on work engagement. Against the expectations, this study found an insignificant positive relationship between employee learning orientation and work engagement. This finding contradicts the, in Chapter 7, section 4.7.2., Table 7 presented significant positive correlation between both constructs and the finding that learning-oriented employees are generally more engaged in their work due to the intrinsic motivation they possess (Jones *et al.,* 2017). In line with the expectations, this study found a significant negative relationship between employee learning orientation and job insecurity. Overall, the significant negative relationship between employee learning orientation and job insecurity aligns with prior research, which argues that learning-oriented employees consider technological innovation an opportunity to develop themselves (VandeWalle *et al.,* 1999) and that employees who consider robotization as an opportunity for personal and skill development rather focus on the benefits of the technology than considering robotization as a threat (Ågnes, 2022). Therefore, learning-oriented employees consider changes in the status quo not as undesirable (Jones *et al.,* 2017). Consequently, encouraging employees in their learning orientations is essential since it can help employees to cope with the changing work design (Zahoor *et al.,* 2022) caused by the extensive substitution of repetitive work by RPA. Moreover, it can help employees consider work automation as an opportunity for personal development, thereby reducing the threat of robotization. Hence, managers might do well by encouraging and increasing learning-oriented behaviours.

To conclude, our findings provide evidence which aligns with the results from Smids *et al.* (2020) and Parker and Grote (2020), who argue that the effects of technologies on work design are

not predetermined but rely on aspects, such as individual factors. Therefore, this study contributes to RPA literature by providing evidence that employee learning orientation as a personal resource can directly reduce job insecurity as hindering job demand but does not stimulate work engagement directly, which answers the second part of the research question. By explanation, according to our findings, personal resources (i.e. employee learning orientation) can reduce job demands but do not stimulate work engagement directly. Thereby, as expected, we provide evidence that RPA's characteristics do not solely determine the effect of RPA on work engagement.

6.2 Managerial implications

The research aim was to investigate if the constructs, organizational strategy, job relevance, and employee learning orientation affect the RPA and work engagement relationship. Additionally, this study's goal was to provide implications for practitioners who aim to keep employees engaged in their daily tasks with the implementation of RPA. Therefore, to better implement RPA, we provide managerial implications in the following section. From a managerial perspective, our results contribute to practitioners who are, or will be, implementing RPA in their business processes, affecting their employees. Overall, from this research, we can conclude that employees perceive RPA as a positive addition to their work designs. The substitution of repetitive work by RPA can help managers increase work engagement among employees through work characteristics categorized as challenging job demands and job resources. Our findings indicate that RPA enables managers to provide higher-value work to the employees in terms of a more variety of complex work with more job autonomy for employees. The following paragraphs elaborate on two key managerial implications that can be drawn, particularly based on this study.

First, concerning the perceived risks of the continuity of one's job. This study shows that the substitution of repetitive work by RPA causes an increase in perceived job insecurity among employees. Companies and managers should be aware that employees' job relevance and organizational strategies do not affect the RPA and job insecurity relationship. Therefore, we point out to practitioners who implement RPA in their departments that the perceived job insecurity among employees will likely increase regardless of the organizational strategy and how much repetitive work employees currently perform. In other words, although managers who use RPA to relieve employees from the burden of repetitive work and aim to provide more meaningful work, managers need to be aware that the perceived job insecurity will likely increase among employees, also for those whose current work design possesses little repetitive work. Since job insecurity is considered one of the most harmful job stressors, we advise managers to help employees cope with the changing work design and increasing job insecurity. Therefore, managers should invest in learning activities and encourage learning-oriented behaviour among their team members. Employees who generally rather keep the status quo and are not actively working on improving their competencies are more likely to benefit from learning-oriented opportunities. Hence, managers should map out, if still need to be done, which employees in their teams are learning-oriented and who require additional attention. Increasing learning-oriented behaviour helps employees to evaluate the change initiated by RPA as a personal development opportunity and not a threat. Learning opportunities can be provided, for example, by offering training, coaching, and other development initiatives to employees. Managers could use the time saved with the execution of repetitive work by RPA to organize learning-oriented training and other development initiatives.

Overall, It would be wise to align the development initiatives with the implications of RPA and, therewith, familiarize employees with the technology. The findings show that RPA familiarity controls for job insecurity. Employees familiar with RPA will likely be better at estimating the strength and weaknesses of the technology. Consequently, this gives employees more confidence and an affinity to work with the technology, which can positively contribute to implementing RPA. Finally, managers control, to some extent, the composition of their teams. Therefore, it might be helpful if managers consider potential employees' learning orientation during future recruitment. According to our findings, learning-oriented employees are less insecure about technological change and rather see innovation as an opportunity for further development. Those who are learning-oriented are likely to cope better with

technological changes in the future. This can help managers successfully implement other (automation) technologies.

Second, although we encourage managers to help employees cope with the increased perceived job insecurity with the execution of repetitive work by RPA, our findings indicate that employees are concerned to some extent about the continuity of their jobs. However, the findings do not indicate that employees expect their jobs to become obsolete. Moreover, our findings indicate that employees experience RPA rather as an aid tool for repetitive work which can contribute to the enrichment of their jobs. Therefore, instead of focusing particularly on reducing the threat to employees, managers should also focus on the changes in work designs due to RPA. Managers should become aware that the organizational strategy does not influence the relationship between RPA and challenging job demands and resources. Therefore, regardless of the organizational strategy, employees are confronted with a changing work design, especially with an increasing job complexity with the implementation of RPA. In turn, job complexity increases work engagement. Hence, managers must consider one's expertise and qualities with the increasing job complexity. By explanation, job reclassification needs to be aligned with employees' skills and expertise. From this perspective, it could be helpful for managers to analyze upfront if employees possess the competencies for more complex work. Managers can do this, for example, by using their weekly meetings with employees to discuss the work content. This way, managers can determine if the employee can perform the more complex work. If employees require additional skills or knowledge, managers need to ensure that employees gain the necessities for the increasing complexity by providing, for example, training or other skill enrichment activities.

6.3 Limitations & future research

Due to the hypothetical scenarios, the EVM methodology made it possible to address the sensitive topic of RPA implementation. Additionally, it provided the possibility to address the topic of the substitution of repetitive work while the implementation of RPA for most participants had yet to occur. Hence, the current study provides valuable insights into the effects of RPA on employee-related consequences literature which is still in its explorative phase. However, the current study is also subjected to limitations. The following section discusses the limitations, together with the opportunities these limitations enable for future research.

First, our study limits the generalizability of the research findings. The data of the study is collected from a single organization within the automotive industry. In addition, the sample size of the current study is particularly small and does not meet the criteria of sufficient responses (Hair *et al.*, 2014). Consequently, while some path coefficients for the interaction effects are substantially high and some relatively close to significance, the statistical power may have needed to be stronger to discover additional significant interaction effects. For example, Hair and colleagues (2021) argue for a minimum sample size of 155 respondents for discovering significant path coefficients between 0.11-0.20, assuming a power level of 80% and a significance level of 5%. Hence, the limited sample size might have caused significant effects to remain undiscovered. On top of that, an EVM study limits in general the external validity and generalizability of the findings since the results are based on hypothetical scenarios (Atzmüller & Steiner, 2010), meaning that the respondents might evaluate the hypothetical scenarios differently than real-life cases. Therefore, we temper the generalizability of our findings and encourage scholars to examine and extend our findings in real-life settings with larger sample sizes.

Second, a limitation of this research is the way of measurement and the fact that it is only measured at one point in time. The measurements of the work characteristics when RPA substitutes ***almost none***, and ***almost all*** of the repetitive work might oversimplify reality. Due to the prespecified levels of RPA, the possibility of omitting essential values of RPA is high (Aguinis & Bradley, 2014). Therefore, our results might limit the representation of real-life scenarios, influencing our findings regarding the direct, indirect, and moderation effects. Additionally, our results only provide insights into the perceived effects of RPA at a single moment. Given that people adapt over time (Parker & Grote, 2020), it would be interesting for future research to experience the effect of time and exposure

to RPA. As Ågnes (2022) mentioned, once employees deepen their understanding of robots and their potential, they are confident to work with the robot and take on new tasks. In other words, the effect of time could determine to what extent employees see robots as a threat. We, therefore, encourage future research for conducting a longitudinal experimental study comparing employees affected and not affected by RPA during the pre-and post-implementation of RPA. It would be interesting to include multiple organizations implementing RPA for different reasons and to differentiate among employees regarding their job relevance. While this study did not find an effect of job relevance on the relationship between RPA and job insecurity, it is arguable that job relevance influences to what extent employees receive, for example, new tasks. As we mentioned, the substitution of tasks by RPA is significantly higher for employees with a high job relevance. In other words, the effect of RPA on task variety might significantly differ among employees with highly repetitive jobs compared to those low on job relevance. Hence, it would be interesting to uncover how a variety of new tasks influence skill development. Employees who are left with the exceptions "must mobilize their knowledge and expertise and process information about the problem to complete the situation" (Fréour *et al.,* 2021, p. 6). Therefore, a great avenue for future research is to conduct a longitudinal study, which will provide better insights into the effects of RPA on work engagement through work characteristics.

Third, the study limits in the included interaction constructs. The results of this study indicate that job relevance and organizational strategy do not moderate the RPA and job demands-resources relationships. However, work design literature argues for potential moderators of effects on the relationship between technologies and work design (Parker & Grote, 2020). Given the variety of potential interaction effects, a fruitful area for future research would be to investigate other potential moderators of effects. For example, on a macro-level, laws and regulations might influence these relationships (Parker & Grote, 2020). During the study, it came to our attention that, for example, Sarbanes Oxley (SOX) business processes require additional controls performed by employees to address potential fraud in financial reporting. Therefore, the level of automation by RPA within this area could be limited, which might diminish the effects of RPA on these business processes. Another interesting interaction construct could be the presence and absence of organizational support. Many scholars, among them Platfautt *et al.* (2022), point out the importance of organizational support for changing work characteristics. For example, increased job complexity requires employees in many cases to obtain new skills (Bhargava *et al.,* 2021). Hence, the presence or absence of organizational support which provides these upskilling opportunities might determine how engaged employees remain. Therefore, it would be interesting for future research to investigate how other interaction constructs influence the relationship of RPA on work engagement through work characteristics.

Fourth, this study limits in controlling for fixed and random effects. We choose to analyse our data via a variance-based SEM technique (i.e. PLS path modelling) since this method copes better with small sample sizes (Hair *et al.,* 2021; Henseler *et al.,* 2009). Although the EVM methodology enabled us to test the hypothesized relationship, our mixed-subject design caused a two-level data structure; namely, the vignette level and the respondents level. Therefore, researchers should take both levels simultaneously into account when performing the statistical analysis (Aguinis & Bradley 2014; Atzmüller & Steiner, 2010). Therefore, we encourage future research, using an EVM for exploring the effects of RPA, to control for the statistical dependence of the data by performing multilevel analysis.

Fifth, the current study limits in the used test type. Although we controlled for the directions of the path coefficients, our final results are one-tailed tested only. By doing so, the width of the confidence interval and the calculations of the p-values are affected. The reason behind this choice was the limited sample size available, while some relationships were close to significance. To provide more input for the implications, we decided to report the one-tailed tested results. However, future research should test the same relationships with a bigger sample size and two-tailed, to see if the significance still holds.

Sixth, our conceptual model limits in the exclusion of a job strain construct in the relationship between hindrance job demands (i.e. job insecurity) and work engagement. This might have caused the absence of a significant result between job insecurity and work engagement (Bakker & Demerouti, 2017). Therefore, the results limit to some extent the explanation of the effects of RPA on work

engagement. Hence, we encourage future research investigating the relationship between RPA and work engagement through job insecurity to include a job strain construct, such as job-related anxiety.

Finally, our study limits to counterbalance for the vignette order presenting the implementation of RPA. We chose for every participant to receive first a vignette wherein RPA had a minimal impact on the work design since this represents, for most participants, the current situation. We made this decision since the research design was already rather complicated, and we did not want to increase the complexity of the design by adding an additional experimental factor. However, we need to consider that participants might have learned from the first situation what can influence their response to the second one. In addition, while we aimed to randomly assign participants to a condition so that every condition has the same amount of judgements, our study limits in the absence of balanced vignette data (Atzmüller & Steiner, 2010). Due to the unfinished survey attempts, our job enrichment condition is judged slightly more than the cost reduction condition. Therefore, in line with the first and second limitations, an avenue for future studies is to verify our findings in real-life settings among multiple organizations that differ from the intentional use of RPA.

6.4 Closing statement

Overall, this study did not find evidence that organizational strategy and job relevance affect the relationship between RPA and work characteristics labelled as hindrance demands, challenging demands, and job resources. Therefore, the data does not support that organizational strategy and job relevance determine why employees, on the one hand, experience RPA as something positive, while on the other, employees report that RPA leads to job impoverishment. Still, the findings of this study provide some valuable insights into the effects of RPA on employee work engagement. The current study expanded the baseline model with job insecurity and job complexity. Hence, we provided additional insights into that employees fear for the continuity of their jobs, regardless of one's job relevance and organizational strategy. Encouraging one's learning orientation will likely reduce perceived job insecurity and help employees with personal and skill development for the opportunities RPA entails. Therefore, we provide evidence that the technology does not solely determine the effects of RPA on work engagement. In addition, since our results do not indicate that employees expect their jobs to become completely obsolete, managers should align job complexity with one's capabilities and skills. If the increasing job complexity does not match one's competencies, it could be helpful for managers to provide the necessities for the more complex work. Finally, we provided interesting avenues for future research. For example, future scholars can focus on conducting a longitudinal study to provide better insights into the effects of RPA on work engagement.

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8.Appendixes

A. Interviewee I

The questions below are initiated to gain insights in the current RPA situation within DAF. Hence, the main goal is to determine the current situation of the RPA initiation, development, implementation, usage, and refinement stage. The name of the interviewee is left out on purpose and indicate with X.

(1) RPA initiation:

- Based on what conditions is determined if a process might be applicable for RPA, and the orientation phase is started? (e.g. amount of work, type of work, etc.)

It is determined based on the type of work and the amount of work. If a certain tasks needs to happen often/ a lot, it is ideal for RPA. The main goal is to relieve people from reputable work.

- Who receives these initiation requests?

As for now, there is no system behind it. Most of the RPA requests are received by me (X). However, if a request is received, the condition that someone on the department has to work with RPA needs to be met.

- Who determines if the process is eligible for future investigation? (e.g. is there a central team or is this responsibility assigned to one or two persons)

For now, the main RPA builders determine if RPA is possible for a business process. Sometimes it is required that certain processes within the process needs to be standardized more, since RPA only functions well on highly standardized and structured processes. However, the RPA builder should not be responsible for the internal process update of other departments. So their intern processes needs to be updated first before the RPA builder starts to work further on RPA solutions for their department.

- Based on what criteria is determined if the RPA solution is built/ prioritized for a certain process? (e.g. ROI time, hours saved per month, software dependent, task dependent, # of times a task needs to be executed, building time, combination of factors)

Overall, the manager from a certain department decides on which processes to work on regarding RPA solutions. What the manager considers as most important, is done first. Probably, ROI, hours saved etc. are good indicators for determining which process to robotize first.

- Once RPA for a certain process is initiated, is this communicated with the employees who will be working/ affected by/with RPA? If yes, how so? If not, why not?

Employees are involved from the beginning. It is crucial that employees are involved from the beginning. The end-user needs to know how the robot is working, therefore they are involved from the beginning. Furthermore, the end-user needs to show the RPA builder how the current process is working/ which steps are taken.

- What are frequently made mistakes/ things that were encountered during the initiation phase during the past two years?

Overall, RPA is still very new for the organization. However, if we want to implement it wider into the organization, we should establish "change management". Furthermore, clashes exist between our department and control & finance. Our aim is to enhance jobs, and make work life more easy. However, finance & control are more looking at time savings, cost savings, FTE reduction, etc. Our interest differ really from theirs. That is what we encounter most.

(2) RPA development:

- Based on what criteria is a RPA development process assigned to a certain developer?

There is none. For now there are limited RPA builders. However, the aim is that every department has his own RPA builder.

- What is the development phase alike? (which steps does the development phase require)

First there is the moment in which the RPA builder makes a process description with the customer/ end-user. Second, the RPA builder starts to build the process. Next, the builder goes back to the end-user to test the RPA solution. Based on this test, additions are made. However, during the first building phase, you try to build in exceptions as much as possible already. If necessary, the solution is tested again.

- Is the process owner/ customer involved in the development phase? If yes, how?

Yes, as can be seen in the answer above.

- Based on what criteria does a certain initiative gets priority over another initiative?

Again, this is decided by the manager from a certain department. As RPA builder, we have no saying into this.

- What are frequently made mistakes/ things that were encountered during the development phase during the past two years? How did you resolve these?

Overall none. It is also a work of try and error. Main things encountered is the different interest with other departments as already mentioned.

(3) RPA implementation:

- What are the steps during the implementation phase?

Since the development of the RPA solution is based on co-creation (builder & end-user), many tests are already done. Once the solution is considered to be okay, the solution is just implemented and used.

- Is support given from the developer to the customer during the implementation?

Support from the builder is given. especially the first few weeks. This is done to improve the solution, and help the end-user work with it.

- Is there a difference between the customer and end-user? Or is this always the same person?

Yes, mostly the manager comes with the request to check with the end-user what the possibilities are regarding RPA. The RPA builder starts to investigate with the end-user if and how RPA can be used and implemented.

- What factors do you need to take into account before you want to implement RPA. Which factor take you into account to smooth the awareness/implementation process?

This really depends on the type of process. If the process is really important, everything needs to be tested extensive before. With processes errors are less important, the testing phase is shorter and less extensive.

- How does the testing process look alike? Is this a continue manual process and do you compare normal results with the RPA results? What kind of testing data is available?

Yes we definitely check the RPA data with the normal results, especially with critical processes. So normal data and RPA data are compared. Uipath can make logs to store data, however only if you build this log storage in. so logs are made, but it depends on the process if the builder has built it in yes or no.

(4) RPA usage:

- Who is responsible once the RPA process does not function well/ mistakes are made?

The RPA builder is responsible. However, no concrete rules are made for this. The mistake can also be at the end-user who didn't provided the RPA builder with sufficient information. It depends on the situation, but for now, no concrete rules are established.

- How do employees experience RPA usage so far?

As positive. In the beginning multiple employees were skeptical and afraid for some job lose etc. Employees rather kept the status quo. They didn't see the urge to change, and rather kept the situation as it was. However, further on in the process, people start to become enthusiastic as they see it can really help them to create a better work space.

- Does RPA require employees to obtain new skillsets?

For now, this is not the case within DAF, since only small processes are automated. Just to make the working day of an employee a little bit easier. It is "nice to have". So the proportions of the reductions are small that there is no need for new work and new skills. However, if you do this on a large scale, I presume this will be definitely the case. We already see that there are some examples where we expect to reduce someone's job by 75%. In this case, this person really needs to do something else, and thus probably obtain a new skillset.

- To what extend does RPA affect current jobs? (both positive & negative aspects)

For now, I see mainly only benefits. It reduces reputable work and enhances the job in general. The main goal for now is to make the working day for employees easier. However, in the future it might lead to some job loss. But my expectation is that the jobs will just change and people have to do other type of tasks. I don't think the main focus should lie on job loss.

- According to you, might RPA lead to a "fear of job loss"?

Based on my experience so far, this is definitely the case. Especially in the beginning. People are not familiar with RPA and do not directly see how it can benefit them. However, once you explain it to end-users and involve them in the process, this feeling weakens.

- Do you experience some aversion when you introduce RPA to the employees? If yes, what do you do to reduce this aversion? Do they react differently after?

Yes, which is in line with my previous answer. You have to include the end-user in the process. This aversion reduces once some uncertainty is taken away. We really need to convince the end-user.

- Does the current process require multiple employees to work with RPA on a daily base? Or is one person per department responsible for RPA usage? (or does this depends on the department?)

This depends. The larger robots are used on separated laptops, which are only used to let the robot do his job. However, smaller robots are used on employee's their laptops. It depends on the task how frequent the robot is used. Not all tasks can be automized. Within my department about 50% of the employees work with RPA on a daily base.

- Is it correct that RPA for now needs an initial start sign, and thus does not function autonomously yet? If yes, why only attended for now? (e.g. unattended versus attended)

An initial start sign has to be given. The end-users determine which robot when is deployed and used.

(5) RPA refinement:

- Are there continuous improvement initiatives present for RPA processes? If yes, how does this initiative look like?

Not specifically. Based on errors that occur we make improvements. Improvements are then automatically placed in the correct folder to make sure end-users always use the latest version of the software bot.

- What kind of data is stored to monitor RPA success, RPA errors,

See answer above. The RPA builder installs log in the coding such that errors occur. The end-user can then see what is going wrong. However, this is not always the case. The RPA builder needs to install this in the coding. The logs for the end-user are simple, so it is easy to understand. For the builder the logs are more advanced, this eases the building process.

- According to you, what is necessary implement RPA on a larger scale within DAF? Think about, a central RPA department, change management, how existing and current business processes should be redefined/ determined?

Involve the end-user is crucial/ very important. You want them to be in control of the robot. They need to understand what the bot is doing and why. If they do not understand the process, they will come back to the builder for small topics they do not understand. This is not desirable for the RPA builder. So end-user is very important. Furthermore, it is desirable every department has his own RPA builder. If I want to build for another department, I always encounter restrictions which hampers me in the building of RPA processes for other departments. Departments need someone who is constantly working on RPA.

B. Interviewee II

The questions below are initiated to gain insights in the current RPA situation within DAF. Hence, the main goal is to determine the current situation of the RPA initiation, development, implementation, usage, and refinement stage. The name of the interviewee is left out on purpose and indicate with X.

(1) RPA initiation:

- Based on what conditions is determined if a process might be applicable for RPA, and the orientation phase is started? (e.g. amount of work, type of work, etc.)

First, I always look at the work itself. What do you do normally, how do you do it, and what is the exact process. After that I am going to look how much work it is, how much does it gain DAF, and it is possible to automize it.

- Who receives these initiation requests?

Both me and X. The manager eventually decides who will develop the bot (depending on how much work we already have).

- Who determines if the process is eligible for future investigation? (e.g. is there a central team or is this responsibility assigned to one or two persons)

We determine if it is possible, the manager determines eventually if it is worthwhile for further investigation.

- Based on what criteria is determined if the RPA solution is built/ prioritized for a certain process? (e.g. ROI time, hours saved per month, software dependent, task dependent, # of times a task needs to be executed, building time, combination of factors)

See above

- Once RPA for a certain process is initiated, is this communicated with the employees who will be working/ affected by/with RPA? If yes, how so? If not, why not?

From the start of the process I always include the customer. I check what the customer currently faces. I will include the end-user in the process and try to show him/her the benefits of RPA

(2) RPA development:

- Based on what criteria is a RPA development process assigned to a certain developer?

Depending on who is available, the past, experience, who build what in the past

- What is the development phase alike? (which steps does the development phase require)

First the request is received. Second, what is the exact process. Third, which profits do we gain from it. Fourth, together with the end-user, determining the exact current process. If this is clear, the process is divided into parts. First part A is made, second part B, etc..

- Is the process owner/ customer involved in the development phase? If yes, how?

Yes, see questions above

- Based on what criteria does a certain initiative gets priority over another initiative?

Based on ROI etc.

- What are frequently made mistakes/ things that were encountered during the development phase during the past two years? How did you resolve these?

You are responsible from the input of the end-user. Limited or wrong issues influence de quality of the RPA bot.

(3) RPA implementation:

- What are the steps during the implementation phase?

Depends on the type of bot. sometimes you have to go life, you cannot always test everything. External programs are not the same with the live environment/ test environment.

- Is support given from the developer to the customer during the implementation?

Yes there is. However, the customer is responsible for providing data if support is needed.

- Is there a difference between the customer and end-user? Or is this always the same person?

Depends on how you classify customer or end-user. Customer can also be the one who receives data provided by RPA. More quality, faster answers, etc. are generally generated by RPA. The end-user on the other hand is likely the person who uses RPA for their work tasks. If the person asks for RPA to do work tasks for him/her can also be the customer. So it depends on how you classify this.

- How does the testing process look alike? Is this a continue manual process and do you compare normal results with the RPA results? What kind of testing data is available?

Yes, the results are compared as much as possible. However, this is not always possible. Testing takes place mostly before the go-life phase. If it turns out not to go well during the life phase, the robots are shut down in order to prevent them to do things which they are not supposed to.

(4) RPA usage:

- Who is responsible once the RPA process does not function well/ mistakes are made?

During the building phase, it is de customer who is responsible for delivering the right data and information about the processes. Regarding the output of the RPA bot, the builder is the one who is responsible.

- How do employees experience RPA usage so far?

In general, employees are considered to be positive regarding RPA. However, this holds for the robots who are of value for them. What if complete tasks/ jobs are replaced by RPA, will they still be positive?

- Does RPA require employees to obtain new skillsets?

When you look at the possibilities of RPA, and you want to use it to its full extension, many processes can be optimized then. This will thus definitely influence the skillsets of an employee. However, do employees still support RPA initiatives then? However, the change in skillset is for now not applicable (yet).

- To what extend does RPA affect current jobs? (both positive & negative aspects)

As for now, it is all still positive. It replaces some repetitive work and enables employees to have more time for other current tasks that require more cognitive skills. In my opinion on the other hand, RPA can have negative consequences as well in the future once it is implemented on a larger scale.

- According to you, might RPA lead to a “fear of job loss”?

As for now not, however the employees might be conscious of the possibility.

- Do you experience some aversion when you introduce RPA to the employees? If yes, what do you do to reduce this aversion? Do they react differently after?

So far I do not. When we focus on the benefits of RPA, people become enthusiastic. So providing them the positive aspects, the employees see only positive aspects in RPA thus far. Hence, it is important how you introduce RPA to the employee.

- Does the current process require multiple employees to work with RPA on a daily base? Or is one person per department responsible for RPA usage? (or does this depends on the department?)

It depends on the process time. Processes that take longer are done on a different computer. Shorter ones are done on the employees' computer.

- Is it correct that RPA for now needs an initial start sign, and thus does not function autonomously yet? If yes, why only attended for now? (e.g. unattended versus attended)

See answer above

(5) RPA refinement:

- Are there continuous improvement initiatives present for RPA processes? If yes, how does this initiative look like?

This depends on the internal customer. Whenever a request is received, the RPA builder will look at the process. However, the improvement of the process itself is the responsibility of the applicable department and not of the RPA builder.

- What kind of data is stored to monitor RPA success, RPA errors,

Uipath creates logs whenever it goes wrong. However, these are hard to understand for the customer. Therefore, we build logs by ourselves so that it is easier for the end-user to understand what goes wrong.

- According to you, what is necessary implement RPA on a larger scale within DAF? Think about, a central RPA department, change management, how existing and current business processes should be redefined/ determined?

The most important thing is to maintain support for RPA among the employees. Therefore, I think clear agreements have to be set in place. Meaning, that management needs to be clear what their goals and intentions are with RPA. For example, if one employee is reduced due to RPA, what will this do to other employees? Will they still be enthusiastic about RPA? Hence, support for RPA is crucial. Once this is damaged, it will not come back easy. Therefore, the human aspects is considered by me as an important aspect.

C. Baseline scenario & Vignettes

Baseline scenario:

Dear respondent, in the following, a general scenario concerning a new technology implementation within your organization is described. Please take your time to read this carefully. Imagine you being in the situation described. Try to position yourself in the scenario and imagine the situation as realistically and vividly as possible.

You switched from DAF to "Beta Industries" as your new employer some time ago. Even though you liked your job at DAF, you decided to change for forensic reasons. Since you enjoyed your career at DAF, you applied for a similar position at "Beta Industries". Therefore, the work tasks you are performing now for Beta Industries match almost identically with those you were serving for DAF. However, when you applied for the job, you were unaware that "Beta Industries" was experimenting and testing with Robotic Process Automation (RPA).

RPA is a helpful technology to take over structured and repetitive work. For example, RPA can extract, combine, and synthesize data from different systems and automatically encode the extracted information into the system. This implies that RPA can become your technological colleague who will perform all the repetitive work within your work design and provides data for other non-repetitive work tasks. Now, the time has come for "Beta Industries" to implement RPA within multiple departments. However, the management team has different opinions about the purpose and the best way to use RPA. These different views on how to use RPA would directly affect you in your current work position.

Vignette 1 (Cost-oriented strategy):

Please, read the following specific scenario carefully. Take your time and imagine being in the situation described. Please, after reading the scenario, answer the presented statements. Note there is no right or wrong. Choose what is most applicable to you.

For Beta Industries' higher management, reducing the increased operating costs caused by the high energy prices is essential. After testing and experimenting with RPA for a while, the management decided to implement RPA. With RPA, they aim to reduce the amount of repetitive work employees perform. This implies that RPA will replace employees for repetitive work. The management expects that this will increase the current process efficiency and enables them to reduce the headcount and staffing costs. In your situation specifically, RPA will perform **almost none/ almost all** of the repetitive tasks in your department. This means you will perform **almost all/ almost none** of the repetitive tasks you are performing right now. Overall, with the implementation of RPA, Beta Industries hopes to reduce costs and keep up with the increasing energy expenses.

Vignette 2 (Employee-oriented strategy):

Dear respondent, read the following specific scenario carefully. Take your time and imagine being in the situation described. Please, after reading the scenario, answer the presented statements. Note there is no right or wrong. Choose what is most applicable to you.

For Beta Industries' higher management, it is essential to develop jobs for their employees so that they are pleasurable to perform. Therefore, with the help of RPA, the management aims to reduce the repetitive work that employees must complete. With this, the management expects to free employees from repetitive work tasks. This would enable the management to provide new roles for their employees, including alternative tasks that are more challenging, cognitively demanding, and do not include repetitive work. Consequently, the "Beta Industries" management board encourages employees to learn new skills for new tasks by offering courses and e-learning programs. Via this way, "Beta Industries" hopes to ensure job continuity and job enrichment for their employees. In your situation specifically, RPA will perform **almost none/ almost all** of the repetitive tasks in your department. This means that from now on, you will perform **almost all/ almost none** of the repetitive tasks you are performing right now. Overall, with the implementation of RPA, Beta Industries hopes to provide a more enjoyable work environment for its workers.

D. Consent form

Dear respondent,

Welcome to this survey; your response matters!

For many years, new Information Technologies have been introduced into the work environment. These introductions mean that employees constantly face changes in their job requirements and work designs. One of these Information Technologies is Robotic Process Automation (RPA). RPA is well known for performing structured and pre-defined repetitive work tasks. This implies that unstructured, not pre-defined, and more cognitively demanding work tasks do not apply to the technology. Here, at DAF, we want to understand how our employees face the change in job requirements and work designs due to RPA, aiming to provide better support for our employees. Therefore, this topic will be studied in a master thesis by me, Tom van Teeseling. I am a graduate student of the master of Innovation Management at the University of Technology, Eindhoven. Since I highly appreciate your participation in this survey, I will contribute €1.- on your behalf to the charity of KWF Kankerbestrijding for every completed survey.

Before you start with this survey, I would like to inform you that it is essential to get yourself familiar with the following aspects of the study:

The obtained data will be held in confidence and will not be passed on to third parties. In addition, the survey is entirely anonymous. This means that no data is collected that can reveal your identity. Moreover, all the results will be processed anonymously. The thesis will discuss only summary findings; thus, no individual responses will be presented in the thesis or presentations.

Note that your participation in this survey is entirely voluntary. This means that you can quit at any time in the survey. If you decide to continue later, the survey will pick up where you left off. Additionally, there is no right or wrong in answering the questions within the survey. The best answer to the questions is the answer that is the closest to your perception and experience.

The survey consists of three parts. The first part elaborates on a baseline scenario. The second part presents a hypothetical written scenario with corresponding questions twice. Thus, you will read two different scenarios, and six questions are presented after both scenarios. In the end, the survey will ask general questions about your background. In total, the survey will consume approximately 15 minutes of your time.

Please, feel free to contact me if you have any questions or comments about the survey. This can be done via e-mail at t.v.teeseling@student.tue.nl or give me a call during office hours at +31 6 24 60 49 60. If there are any general complaints about the study, please get in touch with Eric Janssens via eric.janssens@daftrucks.com. Based on the information above, do you consent to participate in this survey?

- o Yes, let the study begin
- o No, I do not wish to participate

E. Output categorical (control) variables

Variable	Answer possibilities	Frequencies	Percentage
Gender	Male	36	75%
	Female	9	18.8%
	Other	0	0%
	Prefer not to answer	3	6.2%
Age	<18 years old	0	0%
	18-25 years old	2	4.2%
	26-35 years old	12	25%
	36-45 years old	10	20.8%
	46-55 years old	11	22.9%
	>56 years old	11	22.9%
	Prefer not to answer	2	4.2%
RPA familiarity	Not familiar at all	6	12.5%
	Slightly familiar	16	33.3%
	Moderately familiar	18	37.5%
	Very familiar	6	12.5%
	Extremely familiar	2	4.2%
RPA influence (on prior work tasks)	Yes	16	33.3%
	No	32	66.7%
Degree of repetitive work (job relevance)	0-5%	19	39.5%
	6-25%	18	37.5%
	26-50%	6	12.5%
	51-75%	2	4.2%
	76%-100%	3	6.3%
	Prefer not to answer	0	0%

F. Correlation matrix data separated

Variable	*M*	*SD*	*1*	*2*	*3*	*4*	*5*	*6*	*7*	*8*	*9*	*10*	*11*	*12*	*13*	*14*	*15*	*16*	*17*	*18*
RPA almost no effect on repetitive work																				
1. Job insecurity	2.84	1.16	--																	
2. Job complexity	4.78	1.25	-.27**	--																
3. Information processing	4.42	1.54	.13	.06	--															
4. Job autonomy	3.84	1.38	.04	-.17	.47**	--														
5. Task variety	4.34	1.48	.08	.15	.70**	.35**	--													
6. Work engagement	4.08	1.31	-.07	.14	.69**	.53**	.65**	--												
RPA significant effect on repetitive work																				
7. Job insecurity	3.76	1.55	.42**	-.30**	.16	.02	-.13	-.08	--											
8. Job complexity	4.85	1.37	-.23*	.97**	.14	-.08	.21*	.20	-.26*	--										
9. Information processing	5.25	1.05	-.14	-.04	.25*	.08	.13	.26*	.24*	-.03	--									
10. Job autonomy	4.77	1.14	-.23*	-.15	-.04	.17	-.05	.32**	.02	-.14	.56**	--								
11. Task variety	5.19	1.17	-.21*	.08	.13	.07	.04	.15	.15	.09	.75**	.60**	--							
12. Work engagement	4.78	1.21	-.27**	.02	.02	.04	-.07	.25*	-.02	.04	.59**	.63**	.67**	--						
13. Employee learning orientation	5.77	.95	-.36**	.11	.05	.19	.06	.28**	-.16	.09	.20	.25*	.16	.39**	--					
14. Job relevance	1.94	.97	.02	.14	.29**	-.03	.33**	.22*	-.08	.14	-.08	-.24*	.10	-.14	-.10	--				
15. Organizational strategy	.54	.50	-.13	.01	.19	.16	.24*	.21*	-.23*	.05	.25*	-.01	.05	.15	.19	.11	--			
Controls																				
16. Age	4.37	1.23	.25*	.06	-.16	-.14	-.04	-.28**	.04	.00	-.30**	-.39**	-.21*	-.40**	-.50**	-.10	-.33**	--		
17. RPA familiarity	2.58	.91	-.45**	.07	-.12	.01	.00	.14	-.18	.07	.18	.35**	.26*	.42**	.47**	-.12	.18	-.40**	--	
18. RPA influence on prior work tasks (dummy)	.33	.47	-.11	-.13	.09	-.03	.02	-.05	.11	-.14	.28**	.15	.18	.15	-.04	-.09	.21*	-.15	.32**	--

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