Towards Human-Centred Job Design

for Grassroot Innovation:

A Case Study on the Quality of Work in SMEs.

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Master Thesis Organisational Design and Development

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30.09.2025

Abstract

For companies to remain relevant in the future, innovation is a key driver for survival and adapting to societal change. With technological progress advancing automation, the question of the role and purpose of the human worker has become increasingly relevant. This case study examines a company in the metal finishing industry, analysing its work design through the lens of quality of work (QoW), human-centred job design, and grassroots innovation. This qualitative research explores different roles within the organization, identifying how various work design structures either hinder or enable innovation from a social- technical design perspective. Using sensitizing concepts from the KOMPASS method and Self-determination Theory (SDT), the study highlights key elements such as communication channels, job creation, autonomy, and transparency, along with psychological needs of the workers as crucial drivers for grassroot innovation in Dutch small and medium-sized enterprises (SMEs). The study concludes that to effectively navigate todays fast changing environment of physical work, deliberate and intentional human-centred job design is vital to achieve a complementary system that aims for high quality of work. Focusing on the development of the worker as a central change agent is essential for grassroot innovation to thrive.

Keywords: Human-Centred Job Design, Grassroot Innovation, Quality of Work, KOMPASS, Self-determination Theory

Acknowledgement

Foremost, I would like to express my sincere appreciation and thanks to my first supervisor, Prof. Dr. Kristina Lauche, guidance regarding possible avenues of research, as well as her continuous support, guidance, and constructive feedback throughout the writing process, enabling me to produce this master thesis. I am also grateful to Julia Borgers, my second supervisor, for her insightful feedback and support.

Secondly, I would like to thank the case company for their openness and generosity in allowing us to conduct interviews with their welcoming workforce and for giving us the opportunity to gain insights into the inner workings of their process lines and work design structures.

Additionally, I am thankful to my research partner Dylan Suers for greatly assisting me in the production of the Dutch transcripts.

Last but certainly not least, I extend my thanks to the FRAIM research group for inviting us to one of their sessions on the Future of Work. It was an eye-opening experience that truly highlighted the multifaceted nature of work design and its crucial role in shaping a better future.

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Introduction

Capitalising on the possibilities of new technologies in modern-day work processes is essential for companies' survival (Cefis & Marsili, 2006) and addressing societal challenges like worker shortages, sustainability, and the need for greater efficiency (Lauche, 2024; Sauter et al., 2021). However, many ventures in automation and technology adoption prove too ambitious, resulting in investments being wasted and a return of tasks to human workers. Even big companies like Tesla struggle with full automation, as machines cannot yet match a human operator's adaptability to disturbances (IMD Business School, 2025).

Many scholars agree that fully automating work processes can be counterproductive, creating more disruptions than it resolves (Grote et al., 2000; Beckert et al., 2016). Central to this case study is the way line workers interact with the main process of metal finishing and how this process shapes their jobs. The set of tasks involved in a full production cycle, in this case from hanging the product for treatment to the final quality checks, is referred to as the **primary process.**

While human-centred job design has long been discussed in management research, its integration with automation is becoming increasingly crucial. As we advance automation, especially in physical work, more routine tasks are increasingly managed by machines, leaving more complex and monitoring based tasks for the human operator creating a complementary system (Grote et al., 2000). As companies seek to automate it becomes necessary to incorporate the expertise, experience, and knowledge of employees in the primary process to ensure automation is both successful and practical (Dhingra et al., 2017; Gagné et al., 2022).

Gagné et al. (2022) describe employee motivation as the vital driver for effective innovation and technology adoption. Thus, a human-centered design approach where employees can openly and transparently be part of innovation processes is preferred to achieve better adoption and goal orientated supplementation of work.

In the Netherlands, small and medium-sized enterprises (SMEs) are not only the backbone of the economy, accounting for 62% of the value added in 2019 (European Commission, 2019) but also the main employer, accounting for ~64% of the Dutch workforce in 2019 (Centraal Bureau voor de Statistiek, 2021). Fostering innovation in the Netherlands, the Dutch government provides support for companies, encouraging innovation on a grand scale (Ministerie van Economische Zaken, Landbouw en Innovatie, 2023). However, there is

a misfit between innovation possibilities and the ability to implement innovations on the ground floor (TU Delft et al., 2024) leading to new technologies not used in there intended role or not used at all.

In this context, Gagné (2022) highlights that there is still limited understanding of how cooperative human–machine systems influence the motivation of individual workers. By applying the KOMPASS method in combination with self-determination theory, this interplay is examined within the physical work and employment industry. Furthermore, Stremersch (2022) emphasizes the need for more research in varied contexts, such as specific countries or organizational forms like SMEs. In particular, the role of organizational structures, diffusion processes, and coordination mechanisms in enabling or hindering grassroots innovation remains a largely unexplored phenomenon.

While a “one-size-fits-all” job design is neither desirable nor achievable, designing human-centred jobs that actively encourage and enable innovation through voluntary, employee-driven initiatives offers significant benefits for both workers and companies (Hossain, 2016). Allowing workers working the primary process to be part of internal innovation and improving the work system is also known as grassroots innovation. Introducing a bottom-up approach to optimization and innovation and widely recognized by many multinational leaders, including those at Microsoft and Google, grassroots innovation contrasts with a top-down approach (Stremersch et al., 2022). Grassroot innovation has been established as being of great value for companies, outperforming companies that do not initiate in such practices. These practices empower employees and enhance autonomy, skill development, and opportunities for relatedness (Stremersch et al., 2022). These characteristics align closely with the goals of human-centred job design, helping shape future jobs in unison with technology (Hossain, 2016).

This case study will piece together some of the puzzle and investigate how human-centred job design can enable and drive grassroot innovation in SMEs in the Netherlands by applying theories from work psychology and organisational design to get a sense of good practice examples and find problems that potentially hindering innovation.

The overall goal of this research is to identify opportunities in job design that enable SMEs to foster grassroot innovation, contributing to over all faster and better adoption of the possibilities of new technologies and process optimisations. To this end the following research question will be answered:

How can human-centered job design contribute to grassroot innovation in SMEs in the Netherlands?

To answer the above research question three sub-questions will be addressed:

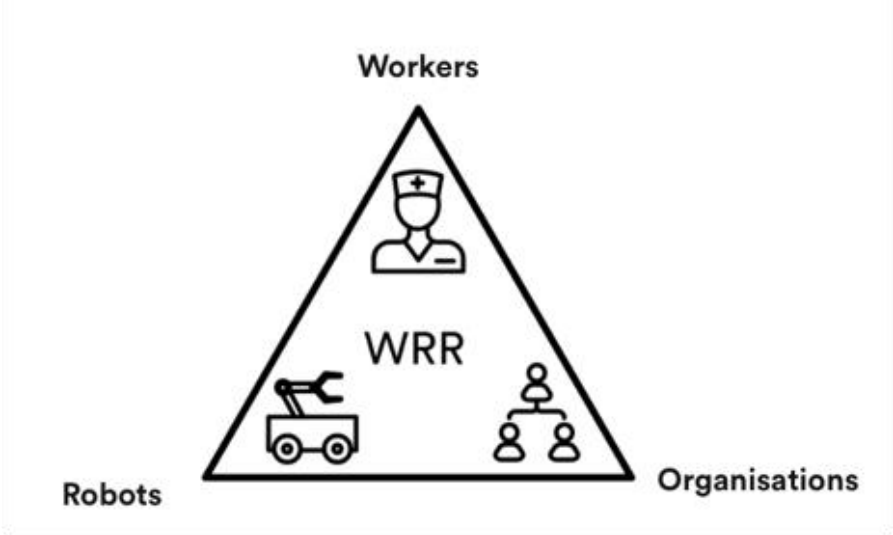
- What elements of human centred job design are present in the case company?
- How does job design and quality of work influence grassroot innovation processes in the case company?
- What opportunities can be identified to foster grassroot innovation processes in SMEs in the Netherlands?

This Case study was written in collaboration with FRAIM (Shaping the Future of Work) as part of a study on SMEs funded by the Ministry of Economics Affairs. FRAIM is a transdisciplinary research and innovation centre at TU Delft that focuses on rethinking the future of physical work in ways that are meaningful, just, and sustainable (*FRAIM: Shaping the Future of Work, 2025*). The findings of this research will contribute to the research of FRAIM and their ambitions to help SMEs to achieve large-scale application of innovation, contributing to higher labour productivity.

Below, the Workers-Robots-Organizations (WWR) model displays how the future of work is shaped by the dynamic interplay between workers, robots, and organizations *(FRAIM: How We Work, 2025)*. Workers bring essential skills, creativity, and human demands, while robots represent automation and AI technologies that increasingly take over repetitive, routine, or physically demanding tasks. Organizations act as the framework within which this collaboration unfolds, shaping policies, structures, and strategies that determine how humans and machines coexist and can complement each other. At the centre of the model lies the space where these three forces converge, highlighting the need for careful alignment to ensure that technological advances enhance, rather than undermine, human work.

Figure 1:

The WWR model



By focusing the attention of SMEs on key elements in job design, established through this case study, SMEs are encouraged to reconsider their job design and approaches to innovation. Finally, the result of this research will add to the body of literature concerning job design and grassroots innovations, establishing a possible blueprint for academics to further do research into human centred – job design and its impact on innovation.

Theoretical Framework

As societal and environmental changes create new demands for adaptation at work, grassroots innovation has become an important way to secure effective and lasting improvements (Cefis & Marsili, 2006). Central to this process are two interrelated elements: (employees) work orientation and the work design. Together, these elements shape not only a worker's willingness to engage in grassroot innovate but also creates opportunities to engage in process optimization and improvement. This chapter introduces first what its means for companies to innovate, followed by the specific innovation strain of grassroot innovation and subsequently the idea of job crafting as grassroot innovation. Two complementary perspectives for understanding such innovation in organisational structures are introduced as self-determination theory, detailing the psychological needs of workers and the need for deliberate work design, through human-centred job design and quality of work. The later being operationalised through the method KOMPASS detailing structural forms in work design.

Innovation in Companies

In todays fast-changing work environment, simply doing things like they have always been done is not enough and firms need to continually adapt and reinvent themselves. To do this effectively, organizations should design and develop internal structures that allow them to innovate existing operations while also searching for entirely new opportunities. Lin et al. (2012) describe these two paths as exploitation and exploration.

Exploitation refers to incremental, step-by-step improvements within a company's current operations. This could mean making a production line more efficient, reducing costs or improving the quality of existing products. Exploitation is about using what the company already knows and refining it so that it runs as smoothly and cost effectively as possible (Lin et al., 2012).

Exploration, by contrast, is about venturing into new territory. It includes experimenting with entirely new technologies, creating breakthrough products, or entering markets the company has never served before. Exploration is riskier than exploitation, because not all experiments succeed, but when they do, they can "change the game" by opening up new sources for expansion and competitiveness (Lin et al., 2012).

The challenge is that these two approaches, exploitation and exploration, often pull in opposite directions. Focusing only on exploitation can make a company very efficient in the short term, but over time it may become stuck in its ways, unable to keep up with change, as business as usual continues the company can lose its competitive edge. On the other hand, focusing only on exploration can generate novel ideas, but without the discipline and stability of exploitation, those ideas may never gain traction (Lin et al., 2012).

To solve this dilemma, scholars and practitioners talk about ambidextrous organizations. Ambidextrous companies can pursue both exploitation and exploration at the same time (Lin et al., 2012). In practice, this often means designing the organization so that different parts of the company focus on different goals. For example, a firm might have one division dedicated to refining and improving current operations, while another division experiments with new technologies or business models. At the top leadership level, these efforts are integrated so that the company can balance efficiency improvements and innovation creating structural ambidexterity (Birkinshaw & Gibson, 2004).

Research shows that ambidextrous designs strengthen a company's ability to innovate (Tushman et al., 2010). This demonstrates how deeply organizational design and innovation

are interconnected: Organizational design is not merely an internal configuration but a strategic lever that can enhance innovation performance and adaptability in the environment of the company (Lin et al., 2012).

Grassroot innovation

This case study specifically focuses on grassroot innovation referring to bottom-up solutions developed by individuals, employees, or local communities to address context-specific needs (Stremersch et al., 2022). Organizational designs that empower grassroots innovation should deliberately create conditions that satisfy these needs (Stremersch et al., 2022). For example, decentralized decision-making structures and flexible work arrangements provide autonomy, skill development opportunities and feedback systems support competence, and collaborative team-based designs, strengthening bonds between employees, enhancing relatedness.

When these elements are embedded into work design, individuals are more likely to feel motivated to experiment, share ideas, and engage in innovative behaviour. Kesting and Ulhøi (2010) suggest that an open work environment, providing autonomy to the workers, creating channels through which ideas from the worker on the shop floor of the organisation can be recognised, adopted and implemented while removing the us (employees) vs. them (managers) tension are key points to enhance bottom-up innovation. By deliberately designing participatory structures, organisations not only empower workers but also increase their capacity for effective and inclusive innovation (Kesting & Ulhøi, 2010). Thus, the organisational design of a company contributes greatly to the enabling and application of grassroot innovation and creativity (Stremersch et al., 2022). It is however important to mention that not all employees share the same enthusiasm concerning innovation and process improvements that are outside of their job description (Kesting & Ulhøi, 2010). Recognising this, possibilities like job crafting could be a suggestion for innovative employees to innovate while carving out their dream job.

Job crafting as Grassroot innovation

Jobs can be and mostly are designed through a top-down approach by management. (Hackman & Oldham, 1976; Parker et al., 2017). Problematic with this approach is that often jobs are designed in a one- size fits all way, overlooking the individual needs of workers and not considering the idiosyncratic work situation as this is not part of the scope for management. In other words, one size does not fit all. Alternatively, to meet workers

idiosyncratic work situation, employees can be encouraged to redesign their jobs under their own initiative (Wrzesniewski & Dutton, 2001). Allowing workers to change their tasks, way of thinking and developing new skills they use at work is called “job crafting” (Bindl et al., 2019).

Job crafting can be understood as both a form of process optimisation and a source of innovation, depending on the scope and impact of the changes it generates. At the individual level, job crafting often involves incremental adjustments to tasks, relationships, or perceptions of work, through which daily processes are improved. This process could be seen as exploitation on an individual level. However, when these changes introduce completely new approaches to how work is performed, job crafting extends beyond optimisation to function as a form of grassroots innovation or exploration. In this sense, job crafting serves as a bottom-up mechanism through which employees not only enhance their own work experiences but also contribute to wider organisational development and innovation in an ambidextrous way.

According to Wrzesniewski & Dutton (2001) crafting a job involves shaping the task and relational boundaries of the job (physically and/ or cognitively). Changing task boundaries means shifting the number of tasks and/or form of tasks performed at work, while from a cognitive standpoint it’s about changing how workers perceive their work (e.g. separate tasks or and a complete task). Changing relational boundaries refers to who a worker has to interact with to work the primary process. Allowing a worker to change any of these elements, will change the job design of that worker, effecting the work identity as well as the meaning of work for the individual. The meaning of work and one's work identity are core ingredients in the creation of a job over time. In this sense, employees are not passive recipients of job design but active agents who evaluate possibilities for crafting before engaging in changes that enhance the fit between themselves and their work.

Benefits of job crafting as described by Wrzesniewski and Dutton (2001) include enhanced meaning of work, strengthening identity, and fostering a sense of purpose, as workers can align their roles more closely with their idiosyncratic work. Additionally, personal fulfilment, job crafting can also promote higher levels of engagement, motivation, and resilience, as employees experience greater autonomy and control over their work. Ultimately, these benefits extend to the company itself as job crafting can lead to improved performance, stronger commitment, and more adaptive, innovative behaviour.

Motivation to Innovate: Self-determination Theory

From an organizational psychology perspective, grassroots innovation is closely linked to individual motivation and psychological needs as explained by self-determination theory (SDT) (Gagné et al., 2022; Stremersch et al., 2022). Building on the central role of motivation in driving innovation and work performance, Gagné et al. (2022) argue that work design is intrinsically connected to SDT. They show that the way jobs are structured has direct implications for whether employees' psychological needs are satisfied, which in turn shapes their motivation, job satisfaction, and overall well-being.

According to Gagné et al. (2022), SDT centres on three universal psychological needs: autonomy, the experience of volition and agency in one's actions; competence, the sense of effectiveness and mastery in dealing with challenges; and relatedness, the feeling of meaningful connection with others. The satisfaction of these needs' fuels vitality, well-being, and high-quality performance, while their frustration predicts strain, stress, and demotivational outcomes. Importantly, Gagné et al. (2022) emphasise that motivation exists on a continuum: ranging from amotivation (a lack of intention to act), through controlled forms of motivation driven by external pressures, to increasingly autonomous forms rooted in genuine interest and personal endorsement. This continuum is not static but is shaped by the social and organisational context.

In their review, Gagné et al. (2022) stress that supportive work environments are key to moving employees toward more autonomous forms of motivation. They highlight three contextual factors in particular: autonomy support (providing choice and meaningful rationale), structure (clear goals, expectations, and feedback), and involvement (a sense of care, respect, and inclusion). When these conditions are present, organisations cultivate not only higher-quality motivation but also sustainable performance. A major contribution of their work is the distinction between need satisfaction and need frustration: satisfaction drives flourishing, whereas frustration produces active harm, undermining engagement and well-being. This distinction underscores that motivation is not only about providing positive resources but also about minimising contexts that thwart human needs, such as excessive control, unclear expectations, or social exclusion.

Table 1:

SDT categories

Competence	Employees should be confident in their role and feel that they can effectively deal with their work environment.
Autonomy	Employees should be agents of their own behaviour and not be controlled like a "pawn" top down.
Relatedness	Employees should be confident in their role and feel that they can effectively deal with their work environment.

Translating these insights into practice, Gagné et al. (2022) point to organisational structures, such as leadership styles, job design, and feedback systems, as key levers for motivating employees in their work. Work systems that enable autonomy, build competence, and foster relatedness can encourage employees to bring energy and creativity to their roles. By contrast, designs that constrain autonomy, fail to recognise employees' skills, or isolate them socially are likely to result in disengagement and resistance to change. For organisations seeking to remain adaptive and innovative, embedding SDT principles into work design is therefore not an optional enhancement but a strategic necessity.

Human-centred job design: Aiming for Quality of Work

Job design, as a core element of organisational design, is central to motivating employees and enabling innovative behaviour (Stremersch et al., 2022). Organisational design is concerned with how work is divided, coordinated, and structured, and job design translates these higher-level choices into specific roles and tasks (Parker, S. K., 2014). Decisions about how primary processes are split into tasks, grouped into roles, and supported with autonomy or resources must align with the wider organisational strategy and structure (Trist & Bamforth, 1951). Within this context, job design influences the quality of employees' work experiences (Trist & Bamforth, 1951) and their motivation to engage in performance improvement and innovation (Holman et al., 2011).

Earlier approaches to job design, such as Taylorism, treated employees as replaceable cogs in a machine, with work broken down into simple, repetitive tasks to reduce complexity and increase efficiency (Fleischman, 2000). While this method enhanced output in the short term, it often ignored the human workers psychological needs, as described in SDT

(Fleischman, 2000), leading to alienation and demotivation towards work. In contrast, later models such as Hackman and Oldham's Job Characteristics Model (1976) began to highlight the importance of task variety, significance, autonomy, and feedback in driving motivation and performance. This shift enabled a more human-centred approach to job design, in which employees are seen as active stakeholders rather than passive executors of tasks (Parker et al., 2017).

Human-centred job design prioritises the needs, capabilities, and well-being of employees while also meeting organisational goals (Bakker & Demerouti, 2017; Parker, 2014). This perspective reflects the socio-technical design thinking, which emphasises the joint optimisation of human and technical factors. In practice, a human-centred job design may involve providing autonomy, establishing meaningful feedback mechanisms, and creating opportunities for skill use and development, all of which contribute to motivation and well-being (Bakker et al., 2005). Importantly, as technological innovation, automation, and robotisation continue to reshape work, maintaining a focus on the human worker is necessary to prevent the dehumanisation that arises from purely efficiency-driven approaches (Bakker & Demerouti, 2017).

This growing concern for the human dimension of work is reflected in the concept of Quality of Working Life (QWL). Scholars argue that alongside the drive for efficiency, organisations must also ensure high-quality work that supports both performance and employee well-being (Kozlowski & Ilgen, 2006). Grote and Guest (2017) show that rising demands combined with reduced individual control over work have increased stress, absenteeism, and poor health outcomes across Europe, establishing employee well-being as a vital component of organisational performance. QWL, therefore, provides a framework for achieving "mutual gains" translating to better work experiences for employees and improved organisational outcomes.

From an organisational design perspective, Quality of Work (QoW) integrates motivating job characteristics with wider organisational conditions and configurations, focusing on work design characteristics and less dimensions such as work-life balance and ergonomics. For this case study QoW will be the focus. Hackman and Oldham's (1980) model emphasises the role of skill variety, task identity, autonomy, and feedback in creating meaningfulness, responsibility, and knowledge over results. Complementing this job-level lens, De Sitter (1997) highlights internal conditions such as manageable work pressure,

involvement, and opportunities for development and learning as foundations for organisational survival. Extending further, Grote and Guest (2017) conceptualise QoW as multidimensional, encompassing not only job content and design but also social context (supportive leadership, justice, employee voice), health and safety, workload and flexibility, employment conditions (pay, fairness, security), and career development opportunities.

To achieve QoW that facilitates efficiency and process optimisation as well as empowering employees, job design is used to enable organisational designers to create structures that defines roles, tasks and responsibilities (Parker et al., 2001). Taken together, these perspectives highlight that human-centred job design is not solely about efficiency or productivity but about creating meaningful, empowering, motivating and sustainable work environments. By considering both psychological needs and organisational requirements, it enables employees to thrive, strengthens their motivation to innovate, and contributes to long-term organisational adaptability and survival. Summarizing three references used for defining QoW (De Sitter, 1997; Hackman & Oldham, 1980; Grote and Guest, 2017), five dimensions can be identified.

Table 2:

QoW Dimensions:

Dimensions	Description	Key Elements and Reference
Meaningful and Motivating Job Content	Work should be designed in an engaging and motivating way allowing employees to see the purpose of their contributions.	Hackman & Oldham (1980): skill variety, task identity, task significance Grote and Guest (2017): complete tasks, skill use.
Autonomy and Regulatory Potential over Work	Employees should have decision-making authority over how work is performed and the ability deal with disturbances in the primary process.	Hackman & Oldham (1980): autonomy. De Sitter (1997): controllable stress. Grote and Guest (2017): predictability/flexibility, workload management.
Feedback and knowledge over Work Process Results	Clear and transparent information about performance to enable learning and adjustments.	Hackman & Oldham (1980) feedback. Grote and Guest (2017): open two-way communication, justice.
Social and supportive organisational structures	A work environment that supports, fairness, collaboration, and opportunities for involvement in decisions.	De Sitter (1997): employee involvement. Grote and Guest (2017): supportive leadership, justice.

A concept described across a wide range of human-centered job design literature, is the importance of a “complete task” (Grote et al., 1999; Parker et al., 2001; Hacker, 2003). In job-design terms, a complete task is an end-to-end chunk of work the person (or team) is in

control of. Understanding the goals, plans, execution, monitoring, adjusting and evaluation/ development of the full work process, they are responsible for. By increasing decision making power and regulatory potential needs for autonomy and competence are also satisfied relating back to SDT (Gagné et al., 2022). In short, don't leave workers executing basic single movements and watching alarms, rather ensuring that a job is a coherent, goal orientated task is vital. In his paper Hacker (2003) describes how through Action Regulation Theory efficiency can be improved as job design becomes humanized. More specifically, a job design allowing the employee to engage in a "comprehensive action sequence" including activities such as planning, execution and providing feedback will allow the employee to utilize their full skillset and knowledge, contributing to a meaningful and motivated work ethic.

Within human-centred job design it is therefore a necessity to be aware of the completeness of an employee's job, as employees have a better understanding of the purpose of their activities in the primary process, leading to better responses to disturbances and possible opportunities for innovation. Additionally, psychological empowerment or self-determination is vital for an improved work satisfaction further increasing the workers sense of belonging (Parker et al., 2001).

Analysing Organisational Structure: KOMPASS

As a company is a complex social structure a researcher must set boundaries for the scope of research, therefore the study KOMPASS (Komplementäre Analyse und Gestaltung von Produktionsaufgaben in soziotechnischen Systemen) is applied as a methodology, providing dimensions that help to operationalise and allow for the analysis of the psychological needs. KOMPASS is a method that helps to design work systems where humans and technology support each other, ensuring that technology serves both productivity and quality of work (Grote et al., 1999). KOMPASS enables the evaluation of technological innovation not only in terms of operational efficiency but also through the lens of quality of work. To be able to analyse the case company from a structural perspective the philosophy of KOMPASS, perceiving the company through three different levels is applied to gain a holistic understanding of the firm's internal structures.

Table 3:

Method KOMPASS Dimensions

Work System	Determining the broader organizational and operational context in which worker with technology is implemented.
Job Design	Focusing on the structuring of individual and collective tasks, roles, and responsibilities, which stresses the importance of hierarchically and sequentially complete tasks as a foundation for developing individual competence and supporting job motivation.
Human Maschine System	Examining the interaction between employees and technological systems, including usability, and decision-support functions. The described interaction is measured in degrees of comprehension of the system, the predictability and subsequently the influence of the human operator on the technical system.

To get a holistic view of the studied company and effectively define how work system, job design and human- machine system are designed and interact with each other in the company, the method KOMPASS and its criteria will be used to the extend that relates to the psychological needs of a worker.

Synthesis

Brining together the psychological and the design literature of human-centred job design, links can be established between the core characteristics of each theory, allowing for the analysis of "job design" focused on the psychological aspects of a job and its operationalisation to enable and promote internal innovation.

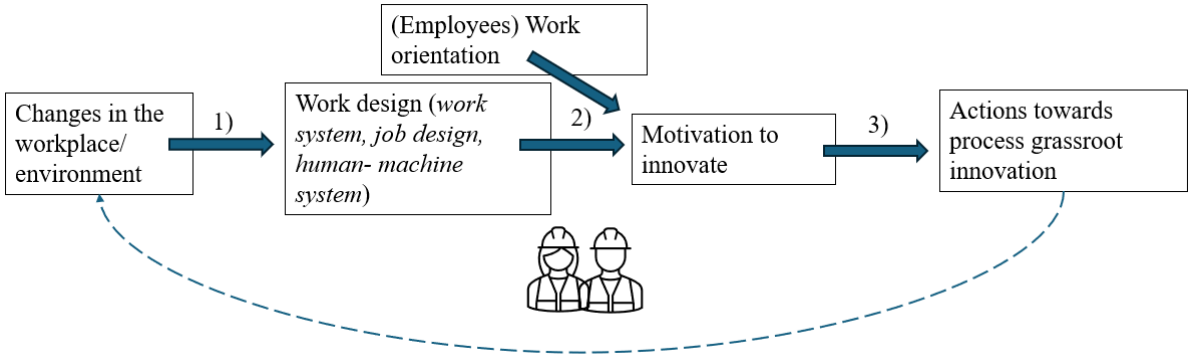
Tabel 4:

Combining SDT and Method KOMPASS

Self-determination theory→ KOMPASS↓	Competence	Autonomy	Relatedness:
Work system	The work system of a company depends on human operators competent in their roles	Autonomy allows employees to deal with disturbances in the work system in a fast and efficient manner	A work system that provides a sense of purpose and which employees can relate to will create a motivated work force
Job design	A well-designed Human work task should first allow for a worker to become competent and later on feel competent in their role	Human work tasks should allow for autonomy for the worker to perform according to their strengths, provides discretion, control, and freedom in task execution	Human work tasks should provide the worker with a sense of pride or relatedness that makes them aware of why they are performing a certain action and what consequences this action has
Human- machine system	Empowers skillful action and learning through intuitive, supportive systems	Disturbances can be fixed more efficiently if the employee is qualified and authorised to address them	The greater the comprehension and predictability in the interaction between human and machine, the more influence workers can enact and the stronger their sense of relatedness to the work process.

Model:

Grassroot innovation cycle



The model conceptualises innovation in the workplace as a process shaped by the interplay between environmental conditions, work design, and employee motivation. Constant changes in the workplace and its broader environment 1) affect the design of the work system, job design, and the human–machine system. Job design as well as individual orientations towards their work, influence the motivation to innovate 2), which acts as a central driver of employees' willingness 3) to engage in improvement activities and grassroot innovation. Motivation is a prerequisite for grassroots initiatives and job crafting. These innovation activities in turn feed back into the workplace and environment, generating new changes and

restarting the cycle. In this way, the model highlights how organisational design and individual motivation interact dynamically to enable or hinder innovation.

Methodology

Qualitative Research Design

To be able to capture and analyse the unique work environment of the case company and its innovation processes the design of a single-case case study was chosen, which allows for the studying of a contemporary phenomenon in its real-world context, capturing contextual conditions such as social aspects including culture and motivation (Yin, 2009).

Selecting a single-case case study is a strategic decision grounded in the purpose and context of the research. According to Yin (2009), a single-case design is appropriate when the case represents something critical or unique, or revelatory. In this case the company studied unique in its variety of the primary process and therefore lends itself well to a single-case case study. Companies with less complex work systems will be able to adopt findings from this research. Yin (2009) also highlights the value of revelatory cases, where the researcher gains access to a phenomenon or data that were previously inaccessible, making the case an opportunity to shed new light on an underexplored issue, in the case study this phenomenon is job crafting as a type of grassroot innovation.

In short, a single-case case study is most valuable when one case can serve as an example to test a theory, explore a phenomenon or capture something unique, providing the researcher with the chance to investigate a phenomenon in depth and in context (Yin, 2009).

This case study is grounded in multiple peer-reviewed academic publications that together provide the theoretical framework for exploring grassroots innovation in companies, driven by job design and employees' work orientation, with particular emphasis on the theory of quality of work and SDT. These sources formed the foundation for developing the semi-structured interview questions and the sensitizing concepts applied in the data analysis. While the research began from a deductive foundation, it adopts an abductive research design along the way, applying techniques such as context mapping to allow insights to emerge from the data (Visser et al., 2005). The complexity and variety inherent in the analytical process demands a dynamic approach that a linear design could not capture. Therefore, a flexible, emergent research design was adopted, enabling the researchers to respond and adapt to developments and insights along the way. Although inductive research has traditionally

provided such flexibility, abduction's dynamic and iterative process is especially well applicable in this context (Van Hulst et al., 2025).

The Case Company and Primary Process

The case company was selected within the context of FRAIM and appointed to this research. Operating in the metal finishing industry, the case company specialises in a wide variety of metal surface finishing, for a wide variety of different products and an extensive portfolio of different clients ranging from machinery parts, automotive parts and chip production. Subsequently a wide range of process capabilities from workers and technical systems (automated systems) is required to deal with a high variability of products as well as accommodating varying amounts of volume and specific requirements from clients. This product strategy creates a rather complex work system of different capabilities which lend itself and almost requires innovation to keep up with varying demands. As the company does not specifically produce something from raw resources its primary production process resembles a company providing a service to its clients.

The company operates five processing lines, each capable of handling a wide range of product types, sizes, and customer-specific requirements, such as black or blue perforation. Two of these lines are fully automated. A full primary process begins in the logistics centre, where incoming quality checks are carried out before products are counted and stored in the warehouse. Production planning then assesses the feasibility of processing each order, considering customer specifications and the necessary steps. This information is passed on to the production manager, who calculates the cycle time or evaluates whether the requested delivery deadline is feasible. The data is then entered into the Enterprise Resource Planning (ERP) system, which determines how much time is needed to fulfill the order. Finally, tasks are distributed to the production lines via Excel sheets that detail the daily workload.

On the shop floor, workers begin their tasks with a printed Excel sheet listing products and due dates. Products are manually hung on custom racks in specific ways to ensure proper processing, a task that varies in complexity depending on size, weight, and precision requirements. Smaller items, such as bolts, are collectively processed in a drum. Each processing line also receives sheets from the process preparation team, containing barcodes that provide the "recipe" for the automated technical systems by setting the required parameters for metal treatment. Once the automated process is completed, workers perform superficial quality checks, while more detailed inspections, such as measuring perforation thickness, are handled by quality control staff. If products do not meet requirements, they are

reintroduced into processing. If they pass quality demands, they are dried, repacked, and prepared for delivery, completing one product cycle.

In the past, the company has implemented several improvements to its process lines, investing in technology to reduce cycle times and enhance the primary process. Efforts have included exploring better ERP systems, introducing service robotics and automation, and experimenting with different bath compositions. These innovations have contributed to greater efficiency, improved sustainability, and enhanced overall work safety.

The company employs 35 workers, with 45% of total work hours allocated to production and 55% to managerial or administrative tasks. As an SME, it faces stiff competition from large metal surface finishing companies, as well as the growing trend of clients outsourcing production to lower-cost providers in China, further motivating innovative drive. To remain competitive, the company differentiates itself through high end-product quality accustomed to client wishes and specific needs, short production cycle times of approximately 5- 10 days, high quality customer service, and a commitment to sustainable work processes.

Data Collection

The primary data source for this case study were 12 semi structured interviews, conducted mostly on-site and in person. Participants were selected to represent a broad cross-section of the organization, encompassing various roles and responsibilities, with a focus on shopfloor work activities and structures. This ensured a holistic understanding of the company and allowed for cross validation of insights between respondents. Additionally, aliases were given to each participant to ensure protection of privacy.

Table 5:

Overview of participants and roles

Worl system level	Role in Company
Management	1 Operations manager (Alex) 1 Head of sales (Taylor)
Process engineering	2 Process preparation (Morgan, Jamie) 1 Quality control managers (Nils) 1 Maintenance engineer (David)
Shop floor	3 Team leaders (Jordan, Avery, Miguel) 2 Shop floor workers (Lukas, Riley) 1 Quality control (Jonas)

Interviews were conducted in the language most comfortable for each respondent (Dutch, English, or German) to facilitate open and accurate communication. All interviews except one were conducted face-to-face at the respondents' workplace, ensuring a familiar and private setting that encouraged a free discussion. One interview was conducted via Microsoft Teams. With prior consent, all interviews were recorded for later transcription and analysis.

For all shopfloor employees, interviews began with an informal observational component, during which the respondent provided a brief tour of their work environment and explained aspects of their daily routine. This helped to contextualize the later discussions. On average the interviews lasted around one hour. Interviews were mostly conducted by all three researchers as a team allowing for effective communication and mitigating language-related challenges such as defining certain theoretical terminology into "appropriate and understandable Dutch".

Three interview guides were developed to target the respondent's specific position in the company: one for shop-floor employees, one for process engineering, and one for management (*see Appendix 1*). Academic language, such as "quality of work" or "job design," were intentionally avoided, proactively as to not cause confusion. The interview format allowed for follow-up questions based on topics raised by participants.

After the first round of eight interviews, a context-mapping exercise was conducted to identify key themes and guide adjustments to the second interview round. This iterative

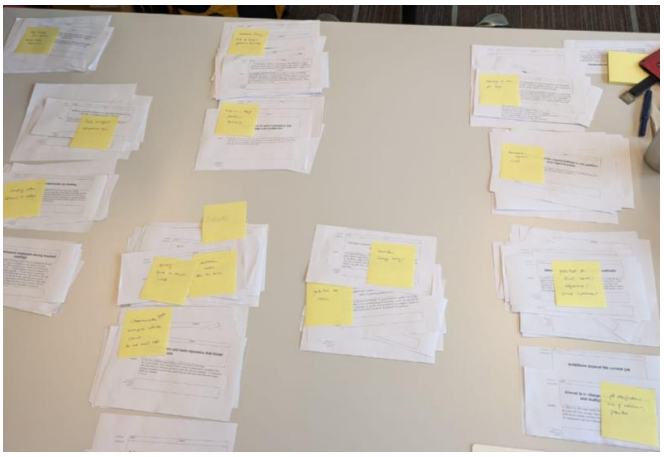
approach allowed for refinement of focus areas and improved alignment between the interviews and the evolving research questions.

Data Analysis with Sensitizing Concepts

To get an overview of what is included of the data collected, context mapping (Visser et al., 2005) was applied *(see Figure 2)*. This process requires the selection of especially interesting quotes from the interview transcripts and paraphrasing them. Having around 15 quotes from each transcript selected, in collaboration with the other team members we bring together our quotes and through consensus order them according to codes that emerge form the data.

Figure 2:

Context mapping



Subsequently a preliminary code book was created. The gathered codes were then matched to the codes that were established in the theoretical framework. After this axial coding was applied to identify connections between categories (Strauss & Corbin, 1998). In the final stage, selective coding was used to integrate and refine core categories that explained the central phenomenon under investigation (Saldaña, 2021).

Adapted form Gagné et al., (2022), Stremersch et al. and (2022) and Grote et al. (1999) Table 6 lists the sensitizing concepts for the data analysis. An explanation of the individual items is available in Appendix 3. The full code book is available in Appendix 4.

Tabel 6:

Sensitising Concepts from KOMPASS and SDT

Self-determination theory→ KOMPASS↓	Competence	Autonomy	Relatedness:
Work system	• Polyvalence of work system members • Learning • Work process complexity	• Coordination • Priorities • Ability to deal with complexity	• People management • Sharing
Job design	• Learning from complete task • Learning Opportunities • Work Resources	• Autonomy through complete task • Influence over working conditions • Variety • Job crafting	• Teamwork • Recognition • Regulatory potential • Task significance
Human- machine system	• Process transparency • Practice	• Decision authority • Flexibility	• Dynamic coupling

Table 7:

Code book – exemplary extract

Code book				
Related concept	Theme	Code	*Definition*	Exemplary quotes
Worksystem	Relatedness	People management	*The way that interactions and communication channels are set up to support a work system that encourages collaboration and belongingness/ connection to their work.*	*I: "In terms of teamwork and teamdynamic, Are you happy about how your team is working?" R: "Meer dan blij" (Miguel) . R: "Ja, wat loopt er goed? Ik denk dat de dagelijkse productie over het algemeen gewoon prima verloopt, zeg maar. En dat op dit moment de sfeer binnen de groep over het algemeen wel heel goed is. Je hebt natuurlijk altijd wel incidentjes tussen mensen, maar die zijn over het algemeen vrij snel opgelost. Daar gaan we dan gewoon even mee in gesprek. Ja. En dan lost dat meestal zichzelf wel op" (Alex).*

Research Ethics

Conducting qualitative research through semi-structured interviews requires ethical and methodological considerations. Prior to each interview, participants were fully informed about the research topic, the broader study context, and the purpose of data collection. They were assured of anonymity and confidentiality to protect their privacy and to create an open space for honest sharing. Participation was entirely voluntary, and informed consent was obtained before any recording or data collection commenced, aligning with ethical guidelines for qualitative research (Shaw, 2008). Furthermore, aliases were given to each interviewee to help protect the identities of the individuals while ensuring readability in the Result section.

Reflexivity was an essential component of this study, requiring continuous reflection on how the researcher's assumptions, position, and choices shaped the research (Finlay,

2002). Both personal reflexivity, reflecting on how my background as a researcher may have shaped interview dynamics and epistemological reflexivity, considering how theoretical and methodological decisions, such as the choice of semi-structured interviews and coding strategies influenced the studies direction, were actively considered (Dodgson, 2019). Important to mention here is that my background in management studies and organisational design is focused on the managerial part of structures and how different components work together from a psychological standpoint, therefore understanding of the primary processes that are present at the case company was some what limited yet through validation with employees and asking follow- up questions this lack of underrating was reduced. Additionally, meetings within the thesis circle were used to challenge potential biases and validate analytic decisions, enhancing both transparency and trustworthiness.

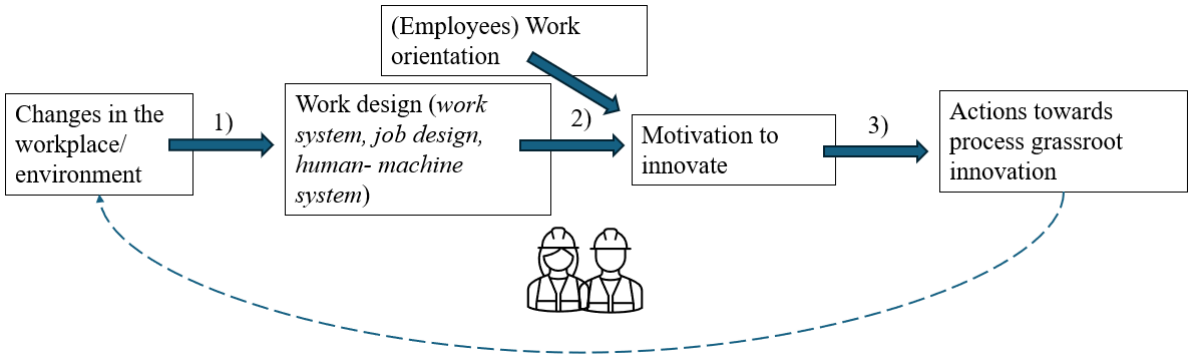
This research adopted a qualitative research design, combining semi-structured interviews across different organizational levels with preliminary context mapping and thematic analysis conducted using ATLAS.ti. The software supported systematic coding, which provided a clear train of thought and enhanced reflexivity with the data. Importantly, ATLAS.ti was employed as a supportive analytical tool, not a substitute for the interpretation of data. The rigor of the study depended on critical engagement with participants narratives and careful situating of findings within the broader organizational system. Through these combined ethical considerations, reflexive practices, and methodological strategies, the research aimed to ensure that findings remained firmly grounded in participants experiences while maintaining transparency, integrity, and analytical depth.

Results

This section presents interview findings in relation to the theoretical frameworks of the KOMPASS model (Grote et al., 1999) and SDT (Gagné et al., 2022). Based on the findings and the literature mentioned above, I developed the integrated model, demonstrating how a continuous cycle of workplace innovation. Organizational changes require workplace adaptation, which is enabled through work design Constant changes in the workplace and its broader environment 1) affect the design of the work system, job design, and the human–machine system. Job design as well as individual orientations towards their work, influence the motivation to innovate 2), which acts as a central driver of employees' willingness 3) to engage in improvement activities and grassroot innovation.

Model:

Grassroot innovation cycle



This section summarizes the data that emerged from the interviews concerning the three work levels described by Grote et al. (1999) and the motivational dimensions outlined by Gagné et al. (2022). The **work system** level addresses the organization's primary processes and their inherent complexity, including challenges related to overall system effectiveness. **The job design** level focuses on employees' spans of responsibility, demands, and working conditions. The **human–machine system** level highlights how employees interact with technologies in the execution of their work tasks. At each level, the motivational drivers of *competence, autonomy, and relatedness* are examined.

Findings regarding Work system

The work system as described by Grote et al., 1999, contextualizing the context in which workers and technology are implemented, displays work processes which experience a wide variety of products and fluctuating volumes of work, increasing the inherent complexity for worker and technology. Workers as well as technology requires a high degree of flexibility and know how to deal with the variety of products.

Competence regarding Work system

While the technology of the primary process took over most of the tasks required, workers still could and were expected to fulfill a range of tasks from hanging products in the right way, to monitoring the products to simple quality checks, contributing to a **polyvalence of work system members**: *"We then receive the job card, which contains all the information. So, in principle, we just have to scan it and submit it. But of course, we also check all the steps. We make sure everything is correct" (Lukas).*

The primary process provided some **results and feedback** but mainly at the end of the process:

"Only at the end of the process can we truly assess whether it's good or not. And then, based on that, we decide whether it can be redone or whether it needs to be completely stripped before we treat it again. Because sometimes you can just add another layer and it's good. But sometimes, if you've applied a layer and it still doesn't adhere, you'll have to strip it. Clean it completely and then treat it again" (Lukas).

To keep meetings manageable, they are split into two groups, allowing employees to receive feedback focused on their specific line *(Alex).*

Learning from results and feedback from the machines and more experienced workers was a vital component to train workers in the line of work: *"25 years ago they still had a school in the Netherlands that gave lessons in [metal finishing] technology. The MBO here in [the city] specifically for this kind of thing. But there were too few people" (Nils).*

"Yes, the girl is new. Yes, one year. And the other one is two, two and a half years here. But like I said, it's too many different things. And you always must have a helicopter view "(Miguel). The lack of prior education meant that new employees were less involved in the work process as parts of the processes becomes a black box, making it difficult for workers to improve their skills:

"Because you have to learn specifics. They could identify what causes defects, before and after the acid bath, for example. That's why I've thought a lot about this. So manual work gives a better understanding. With automation, you just see what goes in and what comes out" (Avery).

The inherent variety of products contributes to a **work process complexity** that required workers to actively consider reprocessing products and think critically:

"Sometimes, if it's already too far along in the process, you have to sound the alarm, because there might already be some kind of layer that needs to be removed. So sometimes you correct it yourself, but sometimes you just pass on the message, like, look, if it's not too far along yet, if it's still in the pretreatment baths, then it matters. It doesn't always matter, sometimes it does, depending on the material, but then it doesn't matter much. But if it's already in the processing baths, then there might already be a wrong layer" (Lukas).

Autonomy regarding Work system

As the work system has an influx of many different products, treatment times, hanging and drying requirements, workers had to **priorities** certain products over others to be able to meet expected cycle times:

"For example, a thing with 300 small things and two very large ones, then I would first put those two large ones in the line, then you have more time, and that way you can easily stick to your schedule and make sure everything is ready on time" (Morgan).

The individual process lines were independent and operated all according to their own schedule. However, sometimes teams had to **coordinate** collaboratively. This process appeared to be a rather informal one: Interviewer*:*

"Do you communicate a lot with other people from other lines? Or is it really your own system, your own team?" Respondent: "*Yes, yes, often enough."* Interviewer: *"So you [work in your] own ecosystem?"* Respondent*: "Yes, often enough. It happens sometimes that you might have to communicate with the other department. Because A) maybe a pretreatment and can't be done in this line. It might be done in another line or in the other team. So yes, sometimes we do that. But it doesn't happen very often" (Lukas).*

However, there was enough **autonomy** for workers to try out things and optimize the primary process to **deal with complexity** of the work system: *"I want to try. For this product delivery date is 28th of May so I have enough time to make test. After this cycle I will call quality control. They will check everything" (Avery).*

Contributing to **work complexity** were tight cycle times. To be able to deal with the time constraints of the cycle time workers and teams had to decide which product processes to priorities, while the individual tasks of a product process were set due to recipe constraints:

"We have a daily planning list and from that planning list we work in order. (…) Yes, we determine that (the order in which product processes are carried out), from how we are going to make it on that division. Because maybe if we have to nickel many rods, then we don't just do that one after the other, but then we also do combination with other products that need to get another treatment." (Miguel).

Further increasing work **complexity** were delicate composition of variables, vital for appropriate metal finishing that needed to be checked and analysed by specialists: *"What we do in our laboratory is check them, right? Based on composition. So, for example, if you look*

at a disinfection bath, we determine how strong it is, how much of that chemistry is still in it, and whether any needs to be added" (Nils).

Relatedness regarding Work system

The **people management** of the company appeared as a main driver for long time worker retention. Workers who had been working for the company for 10 plus years, all shared the same insight about how the colleagues and familiarity create a sense of belongingness: *"Yeah, I like the colleagues themselves. Look, you always have a few who might not be quite right. But yeah, that doesn't matter" (Jonas).* Interviewer: *"In terms of teamwork and team dynamics, Are you happy about how your team is working?* Respondent: *"More than happy" (Miguel).*

However, a reoccurring theme seemed to be frequent **communication** issues, leading to frustration amongst workers: *"Only in terms of communication, things sometimes go past each other. That is really something to pay attention to, I think" (Morgan).*

"Change? [...] Maybe just that thing, the communication" (Miguel).

A mix between verbal and electronic **communication channels** lead to an overload of messages that spreads confusion:

"Sometimes there is so much email traffic about it that I no longer have an overview, is it rejection, or is it not rejection? [...] I sometimes run into that where I think 'Hey, how was this and that agreed and why don't I know anything about it? [...] Yes. And that is mainly because it is kind of verbal, and no one tells it or adds it" (Morgan).

Sometimes also orders disappeared or were not **communicated** appropriately. When asked what went wrong with an overdue product, the worker explained: *"Well, they received it maybe a month ago, but in the [warehouse]. I received it only four days ago. They could have bring me like a week before and it would have been much easier. Because I have a list with planning and I have to work according to the list. [...]No, they renewed the list. Maybe they forgot to write it earlier or I don't know" (Riley).*

Problems between employees were handled internally and, on an eye -level manner which allowed for conflicts to be solved quickly: *"Yes, what's going well? I think the daily production is generally going well, so to speak. And the atmosphere within the group is generally very good at the moment. Of course, there are always incidents between people, but*

they're generally resolved fairly quickly. We just have a quick talk about it. Yes. And then it usually resolves itself" (Alex).

Sharing of knowledge and experiences was supported by management but driven by team leaders or workers themselves*: "I talked to the owner, and the first impression was positive, people wanted to learn. I even brought a book about the process and started discussing it with them" (Avery).*

Findings regarding Job design

As described by Parker (2001) job design is the intentional structuring of work system to define roles and responsibilities to enhance employee motivation, performance, and well-being. The previously described work system as a complex system with high variety in products and fluctuating volumes is reflected in the job design of the company displaying a wide variety of roles and structures.

Competence regarding Job design

Competence building through working the primary process of the company was the main mode of developing. However, most workers were not working a **complete task** as they were missing the necessary background knowledge to deal with disturbances and do quality control effectively: *"You learn step by step. You have to pay attention to that. You don't really do it in general, but just explain small things […] Yes, it's more of a hands-on learning experience." (Lukas).*

"Absolutely. Many of us don't have a deep understanding of the processes. Technical training would be valuable. There was a course last year, but only a few people could attend, and language barriers also play a role" (Riley).

Alternatively, to **developing competence through learning from complete tasks**, the company offered limited **learning opportunities**, preferring self-education due to costs:

"There are possibilities, but... Yes. The boss thinks all that... Yes. I've asked a few times [to get a] course in drawing, reading or surface calculation and then I get an A4. Oh, well, it's also on Google. Ah, ok" (Morgan). "I also think it might be a cost issue, because once I get all my papers... Then Morgan's salary will be a bit higher, of course. […] But I think, if you really, really need a specific education, then... Sure. Of course that's possible, because I also got my [metal finishing education] here" (Morgan).

Generally **learning** from operating the primary process seemed to be the overall mode for competence building, as formal educations seemed to be not demanded: *"There are some [Learning opportunities], I did that too. Unfortunately, I failed by one point. So, unfortunately. I did it but just missed the mark. But I think if you follow along with someone who has experience, copy well, and just really imitate them, you'll go very far"(Jordan).*

The **learning opportunities** initiated by the company was mainly based on a worker's personal motivation to develop*: "As with the performance reviews, we ask annually if there is still a need for training. But also, if someone has just come in and is doing well, we also want to ask in between" (Alex).*

W**ork resources** such as **time and equipment** to appropriately carry out the primary process were to some extend available. Throughout the fiscal year, the company experienced fluctuations of high intensity times and less intense, periods*:*

"No, it's not really busy right now. It's actually very quiet. I even left early on Friday because there wasn't much going on. Back then, you're just standing around. You know, so I said, "Yeah, I'll take a few hours early." So right now, it's really just a matter of seeing what's available and then working from there. But it's not much" (Lukas).

"Yes, and if it suddenly gets busier, I'll naturally try to scale up. This includes working overtime or shifts, or something similar. But you often see that it takes some time to arrange things. If I ask for it this week, even before this week, I often get a lot of resistance. Then it's often starting next week. And even if you have those ten days, you're still on time with most things" (Alex).

Time constraints can become a problem as no buffers were present in the primary process: *"No, we don't really have a buffer, because we only have one set of all those racks. So we don't really have any spare racks to hang more, so we can only continue immediately. I think that's where we want to go in the future" (Taylor).*

Additionally, exacerbating **time** constraints were quality check that required quality control workers: *"If we wait for someone for quality control that will take to much time" (Avery).*

For products that require heavy physical work, **lifting equipment** was provided: *"We do prefer to lift with tools. We have a stacker, an electric stacker. So yes, and sometimes it*

really isn't possible. Those products might be so complicated that you can't even handle them. Then you'll have to lift them or something" (Lukas).

However, sometimes required **safety equipment** was missing as well as knowledge about the hazards:

"In terms of safety, I think we could use more information. There are around 40 tanks with different chemicals, and I don't always know which ones are dangerous. I don't touch anything unless I'm sure, but it would help to have more clarity. Sometimes it's hard to find safety glasses or other PPE. We rarely use masks, and equipment can be limited" (Riley).

Autonomy regarding Job design

Each team leader seemed to be in a role that resembles a **complete task** job design, providing much **autonomy** to the teams itself. Workers working for a team are then instructed through the team leader reducing autonomy on the individual worker level:

"Here I'm like team leader for the group of some people from people of this line and one guy from the Trommel line. My position is quite difficult to explain because I'm charged for people, for products, for process, for equipment and also, I discussed with laboratory [for quality control]" (Avery).

The worker had limited **autonomy** to check for product quality: *"Yes, sometimes. For example, if white stripes appear where it should be black, I have to redo the process. This happens a lot with black conservation finishes. I usually notice it myself and redo it, but for things like thickness, I need help from the quality team because it's not visible to the naked eye. Some customers are more particular than others." (Riley).*

More experienced workers in "higher-up" positions possessed more responsibilities, resembling a complete task, in turn also providing more autonomy to the worker: *"So yeah, well, that's basically my job in a nutshell. Spider in the web, so to speak" (Nils).*

Team leaders also had some **influence over working conditions** in terms of prioritising tasks and overall work structure:

"But in principle you get your schedule in the morning and then you have to stick to it a bit. But [my college] can judge for himself, well, I'll be working on this a bit longer, I'll be working on that a bit longer. I didn't always agree with it either, how much time I got for things, or you know, there are all kinds of urgent things in between, well, you make a choice,

because I can't finish it in one day anyway. Or do I have to work overtime for it, how important is that delivery date?" (Morgan).

The wide range of customers and products for processing results in a high **variety** of different products kept work somewhat interesting as most processes stay the same just with varied products: *"Because if it is the same routine, then it also becomes monotonous, then it also becomes boring. And if you have a bit of a challenge, then you also keep thinking along" (Miguel).*

However, for some of the process lines, daily work, even with a high **variety** in products, became monotonous and tedious as the same tasks were required for most products: *"We have one product that is galvanized. That is about this big [makes 5cm distance with fingers], it all has to be hung up. Then we go 1800 on one rack and then a million of them come per year" (Alex).*

"There is enough variety in products to keep it somewhat interesting but ultimately it is the same process each time. It can get boring" (Riley).

Mainly long-time employees, have out of self-interest specialised themselves to become expert for a particular function in the work system, engaged in **job crafting**. The respondents mentioned how a personal passion of them or a dysfunctional part of the primary process needed extra attention and through the possibilities of informal job crafting were able to specialise themselves into roles such as, the in-house engineer or quality control *(Lukas, Avery, Miguel, Jonas, David).*

The process manager explained how some driven employees were motivated to engage in further education and develop themselves within the company, laying the groundwork for **job crafting** and encouraging such behaviours:

"If someone is motivated, then we want to try it (develop the worker), so to speak. That is also a bit dependent on the current situation of course. [...] But if someone has the will, then we want to put the energy into learning things, so to speak. And also, to possibly do some training through us. [...] As with the performance reviews, we ask annually if there is still a need for training. But also if someone has just come in and is doing well, we also want to ask in between" (Alex).

Relatedness regarding Job design

Teamwork was one of the main factors for long time employment, creating a welcoming atmosphere also to newer workers. When asked about what makes work fun, the

respondent answered:" *Yes [teamwork], colleagues. Things like that. But yeah, that's more than it is. I'm just enjoying myself. Yes, enjoyable work" (Lukas).*

Additionally, across hierarchies' familiarity added to workers relatedness and team belonging: *"I think people [here] can really get along with each other. I experience that myself. [...] No, I think you approach work a little differently then. If you're enjoying yourself, I'm enjoying it. [Work colleagues] is still on vacation, but he's really my buddy. I get along really well with Alex." (Jamie).*

However, when asked about team building exercises: *"No, we barbecue sometimes, maybe once a year. But not too often" (Lukas).* It appeared that team dynamics are mainly kept to a professional level: *"Yes, I like the colleagues themselves. Look, you always have a few who are perhaps a little less comfortable. But yes, that doesn't matter. You always have that" (Jonas).*

Additionally, while hierarchical structures existed, the atmosphere of the company reflected **familiarity** even at the highest levels: *"And here, the company itself is very easy, let me say. "The boss" is not a difficult person. As long as things are going well, you don't hear from him. A little stiff [if something goes wrong], then you will hear from him" (Miguel).*

Recognition was mostly handled through feedback to the employees in monthly meetings that discussed topics such as upcoming projects and complaints. Additionally, a Q and A round to involve the employees was conducted: "*Yes, company-wide meetings. They usually start with customer complaints, so we can learn from mistakes, and then cover financial updates and improvements" (Riley).*

"[Complaints]from customers, but also internal reworks. What we ourselves have already rejected and had to rework. So that kind of thing. And a bit of what comes up further. But also... At the end there is also a round of questions. Where everyone can ask or share his or her ideas or questions" (Alex).

On a day-to-day basis recognition is handled informally: *"Most of it is indeed just in between. But I also have one weekly moment with all the foremen, so to speak. And where things can be discussed. That also includes the pool management and maintenance" (Alex).*

Due to a need for certification to fix parts of the process, disturbances had to be fixed by a professional, leaving little **regulatory potential** to the line workers: *"They all want that [deal with disturbances]. All OK, because that is another problem. They cannot be held*

responsible when they make a mistake, the boss cannot come. [...] Because he is not trained in that profession. We have to have it in a business management policy somewhere" (David).

As many of the primary process tasks were automated, **disturbances** could be difficult to determine and, over time, "sneak" into the system causing slight deviations that require expert knowledge and monitoring to be resolved:

"Yes, that monitoring, right? We just have to apologize, and then you're stuck there for hours, sometimes three hours straight, but the error doesn't show up. Two hours earlier, three rods had fallen. Then you wonder why? Someone must have not pushed that rod in quite properly. [...] Yes of course you can through automation you can quickly build causality chains here, but you can through monitoring of the automation you can also ultimately follow back that causality chain of what has happened? For example, I come when we have a problem with a rod" (David).

In terms of **dealing with disturbances concerning quality** of end-product regulatory potential was rather limited. When asked: *"Who do you ask for help [in terms of quality control]?"* the respondent answered:

"*Usually Jonas from quality control, or sometimes Alex or Nils. But it would be great if I could measure thickness myself instead of chasing people down. [...] Many of us don't have a deep understanding of the processes. Technical training would be valuable. There was a course last year, but only a few people could attend, and language barriers also play a role" (Riley).*

Considering **task significance** and knowledge over what the workers were working on, no or limited information to the worker/ teams:

"No, that is not said. Only the customer and what needs to be done with it. And that is sometimes a shame. Because you do not know, if you know a product and you know what it is used for. Then you can much more easily know that is important, that is important" (Jonas).

Furthermore, due to a lack of theoretical knowledge about the automated work processes, some of the workers were not aware of how certain tasks contribute to the overall production process, further reducing **task significance**:

"Because you have to learn specifics. They could identify what causes defects, before and after the acid bath, for example. That's why I've thought a lot about this. So manual work gives a better understanding. With automation, you just see what goes in and what comes out" (Avery).

Findings regarding Human-machine system

The human-machine system as described by Grote et al. (1999) is concerned with the interaction between employees and technological systems. While the extend of technical systems vary widely between the different process lines, generally the interaction between human and technology seems to be rather limited and has the intended goal of automating all standardized practices to make space for the human operator to deal with the variety of the production process which technology is unable to handle.

Competence regarding Human-machine system

The increasingly automated primary process leads to less and less **process transparency,** especially if workers do not possess an education in metal finishing:

"Because you have to learn specifics. They could identify what causes defects, before and after the acid bath, for example. That's why I've thought a lot about this. So manual work gives a better understanding. With automation, you just see what goes in and what comes out" (Avery).

The complexity as well as **transparency** of the primary process also changed from line to line. The most complex line was the Chrome line: "*And for example in batch chrome plating I think you have 150 variables that all have to be right. If that goes well and also has the desired quality. So, if something goes wrong, just look at which of those 150 are not right" (Alex).*

Monitoring was vital as the slights deviations overtime can cause great disturbances on the line:

"Yes of course you can through automation you can quickly build causality chains here, but you can through monitoring of the automation you can also ultimately follow back that causality chain of what has happened? For example, I come when we have a problem with a rod" (David).

Subsequently, the line worker mostly **monitored** the process of the automated process. During one observation interview one of the machines was beeping, when asked about the alarm the employee explained: "*Right now all the pellets are in our baths so I have time until they are all finished*" *(Riley).*

As mostly new workers were trained directly on the job with no prior education **practice** was reduced to learning through working the primary process: *"Most of it (practicing) is just done by the (our) people, yes, the experienced people on the floor, so to*

speak. Or by the foremen. So that's where they actually learn the most practical things. And in terms of theory, we have a number of courses through the trade association, which we then try to offer if they want that" (Alex).

Autonomy regarding Human-machine system

Considering **decision authority** between human and machine it becomes apparent that the primary process did not allow for efficiency driven changes as the production manager explained:

"Well, one operation takes longer than the other. And you also have different layer thickness requirements, so to speak. So 20 microns of processing [metal finishing] takes twice as long as 10 microns. So in that sense there is a small variation in time. But the standard process takes about the same time" (Alex).

However, some workers were none the less pushing for primary process refinement for more efficiency, creating to some extend their own **decision authority***: "I can change it, but I still don't have enough knowledge about this software. [...] I worked with a different company, and for me, their software was better suited for tin plating" (Avery).*

When asked if workers had the **flexibility** to change the required recipe and system parameters themselves, production planning explained: *"No, usually they come here, and then we adjust the technology here" (Morgan).* Usually for the primary process to change its system parameters a few incidents had to occur: *"So when it's complex things that happen for the first time, second time, sort of, to fine-tune everything, so to set the pretreatment right or to see if things still need to be changed to see if the quality on the work card, for example, is described correctly or if the suspension on the work card is described correctly" (Nils).*

Relatedness regarding Human-machine system

The workers were not **dynamically coupled** with their technological counterpart as the idea for innovation within the company relies on replacing, reoccurring work tasks through automated systems leaving the worker dealing with products that do not follow standardized requirements and required human worker intervention:

"That cobot is really going to hang a specific product, for example if it is going to hang that product of a million a year, then that is actually a stable flow. Where that goes, they are also delivered to us in a stable flow. So that is really a loop. […] So especially when it's busy, it's nice to have all your people available for the other products. […] Yes, robotizing our

production isn't really possible. So, you look at which small parts we can automate. We have one product that's galvanized. It's about this big, and it all needs to be hung. We'll put 1800 on one rack, and then we'll produce a million of them per year. If a robot could do that hanging, that would save us a lot of time" (Alex).

However, in response to the workers, the company ensured that their job are safe for now with some workers more open to innovation then others:

"Well, we've already told them not to be afraid for their jobs. But I'm very curious to see how they're going to react (talking about a new cobot). I think there will definitely be a number of people who will welcome it with open arms and who will also find it great to experience. But there will also be a number who will say, well, that's completely out of my league" (Alex).

Discussion

The literature applied in this case study already describes how work design influences the motivation of workers to engage in grassroot innovation. The aim of this case study was to determine what take aways can be established from an SME that already has some experience with innovating. *How can human-centered job design contribute to grassroot innovation in SMEs in the Netherlands?* To answer the research question three sub-questions will be addressed:

What elements of human centred job design are present in the case company? To appropriately answer the question the following paragraph, with the bold indicated terms, will refer to Table 2 and its dimensions. The case company offers its employees a work environment that enables **motivated** individuals to **develop** themselves and pursue their interests, provided these align with the company's goals. Combined with a **social**, familiar, and **supportive** work culture, this contributes to long-term employee **well-being**, as demonstrated by some staff remaining with the company for more than 20 years. The company's primary process is, depending on the production line, more or less closed, and involves rather repetitive tasks, albeit across a wide range of products. **Feedback and knowledge** about the production process remain limited, since most products can only be assessed at the end of production by quality control specialists. As a result, especially younger workers, who require no prior education for the job, gain little insight into the overall process and receive limited feedback, as most of the main workflows are automated.

In terms of **autonomy and regulatory potential**, the job design allows teams to prioritize projects, engage in planning, and even make suggestions for changes in the primary process. However, due to the lack of deeper regulatory potential, most employees cannot be considered to perform complete tasks. The absence of information sharing about the products being processed further reduces the **meaningfulness** of the work. Some employees perceive their tasks as highly repetitive, which contributes to a work environment that in terms of purpose is not very **motivating**. This stands in contrast to very experienced and knowledgeable employees, who remain motivated to improve and develop.

Overall, while the company provides a high QoW in terms of a supportive and familiar environment. However, the combination of dwindling expertise, limited theoretical knowledge, and a lack task significance suggests that there are important parts missing to achieve a human-centered job design.

How does job design and quality of work influence grassroot innovation processes in the case company? As depicted by Kesting & Ulhøi (2010) not every employee shares the same enthusiasm for innovation. Therefore, the job design should enable and motivate such initiatives by fulfilling the employees' psychological needs contributing to QoW. In the case company we found that most communication follows top-down communication channels, including communication about innovation and the implementation process. From a job design and QoW perspective, this one way of communicating hinders the development of workers competence, autonomy and relatedness. The competence of workers is hindered in the way that their expertise is valued limitedly, diminishing the motivation and need to build more competence. The autonomy is restricted as decision are mainly top-down driven, and relatedness is restricted as the worker is a "bystander" to the changes in the company and its primary process. In terms of grassroot innovation (mainly job crafting), the company displays interest in developing motivated employees, which indicates that there are work design structures that support competence, autonomy and relatedness as some employees actively engage in job crafting. However, since there are no explicit structures and these initiatives are seemingly progressing slowly over time and in an informal way, I do not consider these opportunities as part of the deliberate job design of the case company.

The job design and QoW of the case company currently mostly support a top-down approach, as information and communication channels are mainly set up in this way.

However, aspects like retention of experienced workers or job crafting speak for a high QoW job design which if made more explicit could foster great potential for grassroot innovation.

What opportunities can be identified to foster grassroot innovation processes in SMEs in the Netherlands? As grassroot innovation is still an unexplored way of innovating and many companies as of now do not see the potential it has, changing structures is a complex process. I believe, before enacting meaningful structural change an opportunity to at least leave more space for bottom-up approaches is the opening of communication channels that allow for an exchange of information top-down as well as bottom-up, allowing for debating and discussion.

Additionally, many companies (management) pride themselves on having flat hierarchies while the reality on the ground looks different. Rigid and outdated work systems often only incorporate top-down communication channels providing little agency to its workers. Instead, low power distance structures should provide a complete task, that provides workers with competence, autonomy and relatedness (Bakker & Demerouti, 2017; Parker, 2014). Most companies would consider this a cost factor that is not viable, while wondering why retention rates are low. The fact is that human-centred job design for (grassroot) innovation requires an investment in the worker, just like innovation initiatives require investments.

An interesting opportunity for grassroots innovation in SMEs in the Netherlands is the practice of job crafting. Since there is no “one-size-fits-all” job design that will appeal to every worker, allowing workers to shape their roles can have a significant impact on overall motivation (Wrzesniewski & Dutton, 2001). This is particularly valuable for employees who might otherwise view their work mainly as a means of earning money and be inclined to switch jobs if higher wages were available elsewhere.

Scientific contribution

This case study contributes to the understanding of how increasingly automated primary processes influence job design and subsequently the psychological needs of the workers. The results depict how work system and job design should be intentional and deliberate to create a human-centred approach to job design while also describing the necessity of meaningful, collaborative and complete tasks work (Gagné, 2022). Additionally, this case study contributes to the body of literature in the context of physical work within the

Netherlands and how organisational structures and design support or hinder grassroot innovation in SME's (Stremersch, 2022).

Additionally, we found that job crafting acts as a form of grassroots innovation, boosting motivation, satisfaction, and long-term retention. Furthermore, relatedness and task significance are essential for all employees, as even less motivated workers value complete and meaningful tasks over fragmented ones. Additionally, as job design or even less QoW are commonly referred to concepts in contemporary work management, merely engaging in discussions about these topics reveals alternative thinking that company management might currently be still unaware of, therefore also hampering any possible change. The scientific contribution in this case is that academia and society should work closer together.

Practical implications

This section is intended to provide advice to the case company on how to support and foster grassroot innovation within the company. Changing elements of the work system, job design and human- machine system towards a human centred job design that increases competence, autonomy and relatedness as drivers for innovation.

In the past communication throughout the **work system** in the company were mostly defined through top-down communication channels. In terms of innovation, the workers were informed that new technology would be introduced though monthly meetings, leaving the worker with little agency to include their experience and expertise in working the primary process. While top-down channels are essential for providing direction and purpose, bottom-up channels are just as important for realizing the full potential of the workforce. The practice of "knocking on the bosses' door" and indicating possible innovations has been on- going and effective, even if it requires multiple attempts, indicating that bottom- up communications channels, if only so far informal, do have purpose and are being explored by workers within the company. Actions to **strengthen communication and foster grassroot innovation practices**:

- Implement a structured suggestion system (digital or physical) to capture and track employee innovation ideas, ensuring visibility and accountability. This will not only motivate the workers to learn and engage critically with the primary process but also strengthen their sense of relatedness to their work.
- Balance communication channels:
    - Use top-down channels to provide clarity, direction, and purpose.

    - Establish bottom-up channels that allow employees to contribute ideas and feedback systematically. This might resemble the suggestion box seen in the cafeteria designed specifically for innovation and a clear indication of source.
- Promote transparency by communicating innovation decisions early and involving employees even before trial phases where possible.
- Make use of less busy times to innovate by for example hosting brainstorm sessions.

Additionally, while out of the direct scope of grassroot innovation, **communicating to workers the background on what product or for what company they are currently processing parts for** is an absolute necessity considering a worker's task significance and their purpose in the company, influencing heavily the relatedness of a worker to their role. Ultimately, a system that keeps track of communications in an open manner is more to manage but vital for an integrated, functional and collaborative human centred job design.

In terms of **job design** the company offers autonomy to its motivated workers by allowing for exploration of different roles in the company, in an informal manner. Many long-time workers have worked multiple lines and eventually settled in a role that best suited them and their competences, in turn the worker became an asset to the company, sometime working 20 plus years at the company. These practices formally known as job crafting are already of great benefit for the company, for example crafting an in-house engineer, reducing waiting times and costs. However, if job crafting as a practice would be made explicit within the company more benefits like attracting more motivated workers, providing perspective for less motivated workers and further increase relatedness. Action to **embed job crafting into job design:**

- Integrate job crafting discussions into application and performance interviews by asking employees what they excel at, what interests them, and what skills they wish to develop within the metal finishing industry.
- Introduce role rotation programs, especially for younger or newer employees, to broaden experience and strengthen organizational knowledge.
- Introduce job crafting as an official company value, making it clear that self-initiated development is encouraged and supported. This also requires dedicated contact persons to help the worker with such initiatives.

In terms of the **human-machine system** the company displays a curious interplay of easy, sometimes monotones work that does not require much knowledge over the primary

process, to an absolute necessity of knowledge about the primary process and its inner workings once a disturbance occurs or quality requirements demand special attention. Ensuring that your workforce in on-top of what is happening in the primary process is vital to ensure a complementary fit between human worker and technology even as automation keeps improving and becoming more reliable (Grote et al., 2000).

In this context, competence, especially amongst newer workers is mostly established through learning on the job and step by step, while it remains questionable how much the individual worker understands of the inner workings of the primary process, mostly relying on specialists within the company to resolve disturbances. This leads to a situation where the system risks becoming a “black box” for most workers. The only way to counteract this phenomenon is through deliberate development and education. By viewing employees as more than a simple cost–benefit factor, the company opens new possibilities that support a more human-centered job design. Actions towards **employees becoming strategic assets**:

- Address the “black box” risk of automation by deliberately training employees in both technical processes and its theoretical background by making education mandatory.
- Shift mindset from cost to asset: recognize that investment in workers yields long-term organizational capability, innovation, and resilience.

Boundary Conditions

Case studies in general suffer from the problem of studying a very specific context which interferes with generalising findings to the greater environment. However, case studies rely on analytic generalization, where findings are used to expand or refine theoretical propositions rather than to represent a larger population. Yin (2009) argues that the strength of a single case rests on a strong rationale for its selection, such as the case company with its unique work environment, because its insights are expected to inform theory rather than provide population-level conclusions. This enables a single-case case study to have broad relevance, but its contribution is to theory-building and testing rather than numerical generalizability.

The relatively short five-month timeframe allocated to the research, combined with uncertainty regarding the case company, this resulted in data collection being conducted under considerable time pressure, which may have constrained opportunities to develop a deeper understanding of underlying organizational dynamics.

From a critical realism perspective, it is important to recognize that the interviews discuss the respondent's subjective reality. Therefore, the data cannot be assumed to represent an objective truth, but rather multiple perspectives shaped by individual experiences and social contexts.

Lastly, the language diversity during interviews (Dutch, English, and German) raises questions about interpretation accuracy and sensemaking. Misunderstandings may have occurred despite careful attention to language clarity, but the final validation of findings with the company served as an important consensus point. Feedback from the company's leadership, including the owner, confirmed that the description of organizational dynamics was considered accurate.

Future research

In the immediate context of our case company, a new robot was introduced just as our research was concluding. Examining the effects of this implementation on job design and quality of work could extend the findings of this study, as the full process of development, adoption, and integration could be observed. In this regard, it would also be valuable to explore why and how employees eager to develop and innovate differ from those who are not, and how distinct roles for both groups could be established, one driving grassroots innovation and the other focusing on reliably performing the primary process as intended.

As discussed, autonomy is a key factor in enabling innovation. Yet an important question remains: how can companies ensure that the autonomy granted to workers aligns with organizational goals and contributes positively to innovation? While the answer may vary depending on organizational context, a multiple-case study examining how different companies balance autonomy with strategic objectives could yield valuable insights into structures that support, rather than constrain, grassroots initiatives.

Finally, a deeper investigation into job creation and role rotation among production workers could open new perspectives on positions traditionally seen as replaceable. Rethinking these roles may well be the first step toward creating the human-centered jobs of the future.

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Appendix

1- Interview Guide

Section 1: Work Design (Worker Perspective)

1. Can you describe your role here at “the company”?
   (Goal: Understand job structure and task variety.)
2. How much autonomy do you feel you have in how you perform your tasks?
   (Goal: Assess decision-making freedom and control.)
3. Do you feel your work is clearly structured and well-organized? Why or why not?
   (Goal: Evaluate clarity and efficiency in work design.)
4. How well do you think your skills and strengths are utilized in your current role?
   (Goal: Examine alignment of job roles with employee capabilities.)
5. What challenges do you face in your daily work, and how are they typically addressed?
   (Goal: Identify barriers and coping strategies within work design.)
6. Do you have opportunities to collaborate across departments? How does that impact your work?
   (Goal: Explore horizontal coordination and integration.)

Section 2: Innovation (Worker Perspective)

1. Have you seen or participated in any recent innovations or improvements in work processes at “the company”? Can you describe one?
   (Goal: Explore firsthand experiences with innovation.)
2. How are suggestions for improving the work process received and addressed by management?
   (Goal: Gauge the company's receptiveness to innovation.)
3. Do you feel there is a culture of continuous improvement in the company? Why or why not?
   (Goal: Assess the mindset and values around innovation.)
4. What kinds of support (tools, training, leadership, time) would help you or your team be more innovative?
   (Goal: Identify enablers or gaps in the innovation infrastructure.)
5. Can you think of a moment where a small change led to a big improvement? What made it successful?
   (Goal: Highlight grassroots innovation and effective implementation.)

6. *Which developments in the metal industry do you see as most promising for* "the company"*? What should future innovations focus on?*
   (Goal: Elicit a strategic vision for innovation from your role.)

Strategic Management:

Section 1: Work Design (Strategic Perspective)

1. What kind of job is "the company" trying to provide to its employees? What principles guide it?
   (Goal: Explore intentional design choices from a leadership viewpoint.)
2. In what ways do you assess whether current job roles and structures are aligned with business goals?
   (Goal: Understand strategic alignment between roles and company objectives.)
3. What systems are in place to ensure cross-functional collaboration and knowledge sharing? How do the different levels of hierarchy communicate with each other?
   (Goal: Evaluate structural enablers of coordination and communication.)
4. Have there been recent changes to job design or team structures? What prompted these, and how were they implemented?
   (Goal: Gain insight into adaptability and responsiveness in work design.)

Section 2: Innovation (Strategic Perspective)

1. How does "the company" define innovation at the strategic level? Is it focused on processes, products, culture—or all of the above?
   (Goal: Clarify the organization's innovation orientation.)
2. What is your role in fostering a culture of innovation across departments?
   (Goal: Understand leadership's influence and actions.)
3. How are innovative ideas identified, evaluated, and introduced within the company?
   (Goal: Explore innovation management and pipeline.)
4. Have there been any recent innovations?

   (Goal: set up next set of questions)
5. What challenges do you face in integrating innovation into daily operations without disrupting production?
   (Goal: Identify strategic tensions and coping strategies.)
6. How do you measure the success of innovation initiatives at "the company"?
   (Goal: Understand evaluation and feedback mechanisms.)
7. *Which developments in the metal industry do you see as most promising for* "the company"*? What should future innovations focus on?*
   Goal: Elicit a strategic vision for innovation from your role.

Process preparation

Section 1: Work Design (Process preparation)

1. *What does a typical day look like for you in work preparation? Which steps—from quotation through to production—do you engage with most?*
   (Goal: Map out task sequence, workload, and variety.)

2. *To what extent can you decide how to create schedules, bills of materials, and work orders? Where do you perceive the limits of your decision-making authority?*
   (Goal: Understand levels of independence and ownership.)

3. *Which software or methods do you rely on to prepare documents and plans? In which situations do they work best, and where do you encounter limitations?*
   (Goal: Identify technical and process bottlenecks in the work design.)

4. *How do you coordinate with machine operators, fitters, and the engineering department? Are there formal structures that facilitate or hinder information flow?*
   (Goal: Explore horizontal linkages and communication flows.)

5. *How do you evaluate after the fact whether a schedule or work order was successful?* Is a culture of continuous improvement present in your job? *What feedback loops do you use to continuously refine your own work design?*
   Goal: Uncover mechanisms for self-directed improvement and process optimization.

Section 2: Innovation (Process preparation)

1. *Can you share an example of an innovation or process change that originated in work preparation? What was your role, and what did you learn?*
   (Goal: Surface “bottom-up” innovation experiences.)

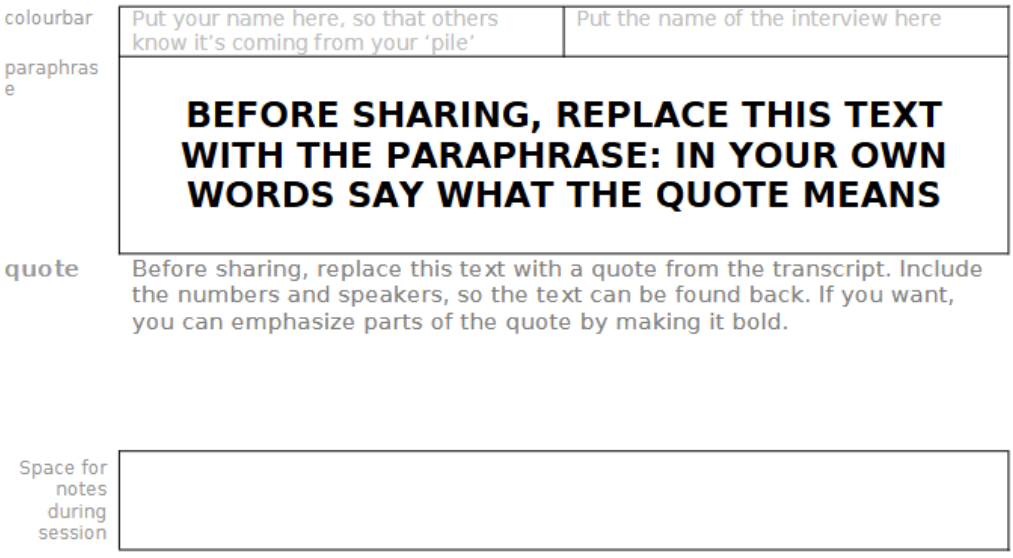
2. *How do you introduce new ideas (e.g., automation steps, digital work instructions)? How are these ideas evaluated and by whom?*
   (Goal: Reveal the idea intake and prioritization process.)

3. *What resources (time, budget, training) are available for you to explore new tools or methods? Is there room for experimentation?*
   (Goal: Map out the framework and constraints around experimentation.)

4. *How do you assess whether a new practice or tool truly improves the primary process?*
   (Goal: Identify success metrics and evaluation methods.)

5. *Which developments in the metal industry do you see as most promising for “the company” work preparation function?*
   (Goal: Elicit a strategic vision for innovation from your role.)

2 - Template Context Mapping Card



3 – KOMPASS and SDT items with explanation

Work system

WS_COMP1 – Polyvalence of work system members: Workers have skills for multiple tasks.

WS_COMP2 – Learning: Results and feedback are provided and thus help workers improve.

WS_COMP3 – Work process complexity: Work process complexity enables workers to develop new competences.

Autonomy

WS_AUTO1 – Priorities: Workers can decide which products process/ tasks should be done first.

WS_AUTO2 – Coordination: Workers can choose how to align/cooperate.

WS_AUTO3 – Regulation fit: Workers can influence how to manage variances and disturbances.

WS_AUTO4 – Ability to deal with complexity: workers have sufficient autonomy to deal with work complexity.

Relatedness

WS_REL1 – People management: The way that interactions and communication channels are set up to support a work system that encourages collaboration and belongingness/ connection to their work.

WS_REL2 – Sharing: Knowledge and experiences are exchanged to.

WS_REL3 – Work significance: Workers know how their work contributes to larger goals.

Job Design

Competence

JD_COMP1 – Learning from complete task: Tasks allow for competence development by enabling learning from outcomes through feedback.

JD_COMP2 – Learning opportunities: Jobs support developing new skills.

JD_COMP3 – Work Resources: Workers have enough tools and time.

JD_COMP4 – Task significance: Tasks contribute to team/organizational goals.

Autonomy

JD_AUTO1 – Autonomy through complete task: workers can manage their own tasks including planning, execution, control, repair.

JD_AUTO2 – Influence over working conditions: Workers can adjust order and timing of tasks.

JD_AUTO3 – Variety: Jobs require diverse methods, tools, materials, people.

JD_AUTO4 – Job crafting: Workers can shape roles to fit strengths.

Relatedness

JD_REL1 – Teamwork: Jobs involve meaningful contact with colleagues.

JD_REL2 – Recognition: Workers/ Teams receive positive feedback and recognition for their efforts (e.g., meetings).

JD_REL3 – Regulatory potential: Workers can deal with disturbances.

Human–Machine System

Competence

HM_COMP1 – Process transparency: System allows for clear monitorization/ explanation for decisions.

HM_COMP2 – Practice: Workers can rehearse or simulate tasks.

Autonomy

HM_AUTO1 – Decision authority: The system, through transparency, can allow the worker to influence the current work process in terms of efficiency while not sacrificing safety.

HM_AUTO2 – Flexibility: Workers can adjust system parameters.

Relatedness

HM_REL1- Dynamic coupling: Workers are connected to the automated system in a way that does not make them to distant or to encompassed by the system to still be engaged by the work process while also not doing the entire work by themselves.

4 - Code Books

Code Book

Code book				
Related concept	**Theme**	**Code**	***Definition***	**Exemplary quotes**
Work system	**Competence**	Polyvalence of work system members	*Workers have skills for multiple tasks.*	Wij krijgen dan de werkkaart en daar staat alle informatie op. Dus in principe hoeven wij hem alleen maar te scannen en dan op te geven. Maar ja, natuurlijk controleer je ook alle stappen. Kijken of alles gewoon klopt. Maar in principe geeft de klant door wat ze willen. En dan voeren wij het uit (Lukas).
		Learning	*Results and feedback are provided and thus help workers improve.*	Nee, pas aan het eind van het proces. Pas aan het eind van het proces kunnen we echt beoordelen of het goed is of niet. En dan, aan de hand daarvan besluiten we of het opnieuw kan worden gedaan of moet het helemaal gestript worden voordat we het weer gaan behandelen. Want soms kun je het gewoon weer een laagje erop zetten en dan is het goed. Maar soms, heb je er een laagje op gezet en dan is het toch niet hechtend, dan zal je moeten strippen. Helemaal schoonmaken en dan opnieuw behandelen (Lukas).
		Work Process complexity	*Work process complexity enables workers to develop new competences.*	Nee, soms neem ik mezelf voor. Maar soms, als het te ver in het proces al is, dan moet je toch even aan de bel trekken, want misschien zit er dan al een of andere laag op wat dan toch eraf moet gehaald worden. Dus soms corrigeer je het zelf, maar soms geef je het toch even door van, kijk, als het nog niet te ver is, als het nog in de voorbehandelingsbaden is, dan maakt het verder. Niet altijd uit, soms wel, dat hangt er van af wat voor materiaal het is, maar dan maakt het niet heel veel uit. Maar als het al in de procesbaden is, dan zit er misschien al een verkeerde laag op (Lukas).
	Autonomy	Priorities	*Workers can decide which products process/ tasks should be done first*	Ja, tuurlijk. Ja, wat ik zeg, dan heb je bijvoorbeeld een dingetje met 300 kleine dingetjes en twee hele grote, dan zou ik eerst die twee grote in de lijn, dan heb je meer tijd om, en zo kun je je makkelijk aan je planning houden en zorg dat alles op tijd klaar komt (Morgan).
		Coordination	*Workers can choose how to align/cooperate.*	I: Doe je ook veel met andere mensen van andere lijnen te communiceren? Of is het echt je eigen systeem, je eigen team? R: Ja, ja, vaak genoeg. I: Dus je eigen ecosysteem? R: Ja, vaak genoeg. Het komt wel eens voor dat je even misschien moet communiceren met de andere afdeling. Omdat A) misschien een voorbehandeling niet in de chromerij gedaan kan worden. wordt het misschien even in de zinkerij gedaan of in de stripteam. Dus ja, soms doen we dat wel. Maar het gebeurt niet heel vaak (Lukas).
		Ability to deal with complexity	*Workers have sufficient autonomy to deal with work variety of work*	R: Yes, sometimes. For example, if white stripes appear where it should be black, I have to redo the process. This happens a lot with black conservation finishes. I usually notice it myself and redo it, but for things like thickness, I need help from the quality team because it's not visible to the naked eye. Some customers are more particular than others. I: Who do you ask for help? R: Usually Jonas from quality control, or sometimes Alex or Nils. But it would be great if I could measure thickness myself instead of chasing people down. (Riley).
	Relatedness	People management	*The way that interactions and communication channels are set up to support a work system that encourages collaboration and belongingness/ connection to their work.*	I: In terms of teamwork and teamdynamic, Are you happy about how your team is working? R: Meer dan blij (Miguel). Ja, wat loopt er goed? Ik denk dat de dagelijkse productie over het algemeen gewoon prima verloopt, zeg maar. En dat op dit moment de sfeer binnen de groep over het algemeen wel heel goed is. Je hebt natuurlijk altijd wel incidentjes tussen mensen, maar die zijn over het algemeen vrij snel opgelost. Daar gaan we dan gewoon even mee in gesprek. Ja. En dan lost dat meestal zichzelf wel op (Alex).
		Sharing	*Knowledge and experiences are exchanged*	"I talked to the owner, and the first impression was positive, people wanted to learn. I even brought a book about the process and started discussing it with them" (Avery).

Job design	**Competence**	Learning from complete task	*Tasks allow for competence development by enabling learning from outcomes through feedback*	"Maar ja, bij stap bij stap wordt het geleerd. Hier moet je op letten. Je doet het niet echt globaal, maar gewoon kleine dingetjes leg je dan uit" (Lukas).
		Learning opportunities	*Jobs support developing new skills*	"Absolutely. Many of us don't have a deep understanding of the processes. Technical training would be valuable. There was a course last year, but only a few people could attend, and language barriers also play a role" (Riley).
		Work resources	*Workers have enough tools and time.*	"Het liefst, ja, tillen we graag met hulpmiddelen. We hebben een stapelaar en een elektrische stapelaar" (Lukas).
	Autonomy	Autonomy through complete task	*Workers can manage their own tasks including planning, execution, control, repair.*	I: "Maar die lijst per dag, daar kun je wel aan passen? R: Ja, tuurlijk. Ja, wat ik zeg, dan heb je bijvoorbeeld een dingetje met 300 kleine dingetjes en twee hele grote, dan zou ik eerst die twee grote in de lijn, dan heb je meer tijd om, en zo kun je je makkelijk aan je planning houden en zorg dat alles op tijd klaar komt" (Morgan).
		Influence over working conditions	*Workers can adjust order and timing of tasks.*	I: "Ja. Ja, dus ja. En je zei dus fijn dat ze daar flexibel zijn, maar als het dan weer drukker wordt, dan is er ook de verwachting dat jij dan ook flexibel bent. R: Ja, dan is dat ook de verwachting, hè. Klopt. Ja. En soms wordt er wel iets te veel verwacht. Maar ja, dat mag altijd, hè. Ze zeggen ja, heb je, ja heb je, nee, kan je krijgen. Dus ja, ze vragen dat altijd. I: Ja, en dat is dan in de zin dat je op korte termijn gevraagd wordt, kun je wat langer werken. R: Ja, precies. Dat soort, ja. Ja, ja, ja. Zoals dat. Ja" (Lukas).
		Variety	*Jobs require diverse methods, tools, materials, people to process different products*	"There is enough variety in products to keep it somewhat interesting but ultimatly it is the same process each time. It can get boring" (Riley).
		Job crafting	*Workers can shape roles to fit strengths.*	"I started on the other line, mainly assisting the shift leaders. Then, an engineer came to work here for a few weeks. I asked him if I could learn this line, and he helped train me" (Riley).
	Relatedness	Teamwork	*Jobs involve meaningful contact with colleagues.*	R: "Ja, wat maakt het leuk? Wat het vooral leuk maakt is de flexibiliteit sowieso. Collega's. I: Teamwork. R: Ja, collega's. Dingen zoals dat. Maar ja, dat is het meer. Ik heb het gewoon aan mijn zin. Ja, gezellig werk" (Lukas).
		Recognition	*Workers/ Teams receive positive feedback and recognition for their efforts(e.g., meetings).*	"Wat is er niet goed gegaan, maar uiteraard ook wat er wel goed is gegaan. Maar klachten worden dan inhoudelijk besproken om ze de volgende keer te voorkomen natuurlijk" (Alex).
		Regulatory potential	*Workers can deal with disturbances.*	I: "Also da gibt es Mitarbeiter auf der Line die fixen gerne selber Probleme? Das kommt öfters mal vor? R:Dat wollen se allemal. R:Alle OK, want Dat is weer een probleem. Ze kunnen niet verantwoordelijk gesteld worden op het moment dat ze een fout maakt, de de de Baas kan niet komen. R: Je hebt een fout gemaakt ook een Duitser niet. R: Want Hij is in die vak niet opgeleid. We moeten ergens in een
		Task significance	*Workers know how their work contributes to larger goals.*	I: "De deel die Manu daar over het kijkje ging doen. Is dat een deel van een motor? Weet je welke deel dat is? Die zware? Ja, ja. Hij was benieuwd. Weet je welke deel dat is? Is dat een deel van een motor? R: Nee, dat wordt niet gezegd. Alleen de klant en wat er mee moet gebeuren. En dat is wel eens jammer. Omdat je niet weet, als je een product kent en je weet waar het voor gebruikt wordt. Dan kun je veel makkelijker weten van dat is belangrijk, dat is belangrijk. I: Ja, maar dat weten jullie eigenlijk bijna nooit. R: Heel vaak niet. Dat is wel eens mijn werk wat er uitkomt. Dat ik niet weet of het een beetje bijgespoten mag worden. Wat voor kwaliteitseisen de klant vraagt. Dat zijn dingen dat ik dan af en toe Nils bel of Alex bel. Alex is de bedrijfsleider. Die heeft meer contact met klanten" (Jonas).

Human-Machine System	**Competence**	Process transparency	*System allows for clear monitorization/ explanation for decisions*	"Het is qua rust voor het personeel, het is wel beter. Maar het probleem is, het is wat je hebt gevraagd. Kan je tijdens het proces constateren dat het fout is gegaan? Met een full automatisch niet, maar als je erachter loopt. Dan zie je het meteen al. Dan beoordeel je elke stap, dan beoordeel je het zelf van hoe of wat. En dat was de pluspunt van met de hand, laat ik het zo zeggen"
		Practice	*Workers can rehearse or simulate tasks.*	"Het meeste gebeurt gewoon door de mensen, ja, de ervaren mensen op de vloer, zeg maar. Of door de voormannen dan. Dus daar leren ze eigenlijk de meest praktische dingen van. En qua theorie hebben we dan een aantal cursussen via de brancheverenigingen, die we dan proberen aan te bieden als ze dat willen"(Alex).
	Autonomy	Decision authority	*The system, through transparency, can allow the worker to influence the current work process in terms of efficiency while not sacrificing safety*	R: "Yeah, they have a good softw are for the machine. I: You need to do anything with it? When it was beeping or? R: Right now all the pellets are on our zinc baths and these are zinc nickle baths so I have time until they are all finished. I: Ah, OK. So that takes18 more minutes or 29 more minutes or? R: Uh, normally it's it depends on the thickness. For example this this customer wants minimum 8 microns, so it has to stay 4000 seconds, yeah. I: But it doesn't countdown here also like you cannot see that when you it's automatically right, it just comes out again? R: Oh, yeah, yeah. But this is lower thickness. So it's only 3000 seconds"
		Flexibility	*Workers can adjust system parameters in the primary process.*	"Ja, en we hebben ook nog speciale met, speciale opgave, zeg maar. Dat wordt dan eerst getekend door Erik normaal gesproken. En dan, dat zijn speciale orders waar we extra op moeten letten" (Jonas).
	Relatedness	Dynamic coupling	*Workers are connected to the automated system in a way that does not make them to distant or to encompassed by the system to still be engaged by the work process while also not doing the entire work by themselves.*	"Ja, onze productie robotiseren dat gaat niet eigenlijk. Dus ga je kijken welke kleine onderdelen daarvan kunnen we wel automatiseren. We hebben één product die w at verzinkt wordt. Dat is zo groot ongeveer, die moet allemaal opgehangen worden. Dan gaan we 1800 aan één rek en dan komen er een miljoen van per jaar. Als een robot dat ophangen kan doen, dat scheelt heel veel tijd voor ons zeg maar" (Alex).

Preliminary Code Book

Context Mapping Results				
Related concept	Theme	Code	*Definition*	Exemplary quotes
	Issues	Workfloor safety issues	*Missing information and knowledge causes uncertainty during work as well as possible harm to workers*	"In terms of safety, I think we could use more information. There are around 40 tanks with different chemicals, and I don't alw ays know which ones are dangerous. I don't touch anything unless I'm sure, but it would help to have more clarity. Sometimes it's hard to find safety glasses or other PPE. We rarely use masks, and equipment can be limited " (Riley).
		Communication issues	*A combination of many different communication channels, high quantity of messages regarding planning and specific customer requirements and a mix between official and informal communication causes confusion and making every day work processes more difficult*	"Soms wordt er zoveel mailverkeer erover, dat ik geen overzicht meer heb, is het nou afkeur, of is het nou niet afkeur?" (...) "Alleen qua communicatie gaat het hier wel eens langs elkaar heen. Dat is toch echt wel een aandachtspuntje, vind ik." (...) " Daar loop ik best wel eens tegenaan dat ik denk van 'Hè, hoe is dat en dat afgesproken en w aarom weet ik daar niks van?" I: "Ja. En dat is dan vooral omdat het een soort mondeling loopt en het niemand ergens of doorvertelt of erbij zet." "Ja." (...) "En dan denk ik van, oh, je had me ook al eerst even een mailtje kunnen sturen van 'Nou, dat komt binnen, let even op, of het is afkeur, of ik heb met de klant afgesproken, of zoiets. En zo verloopt de communicatie wel eens niet naar mijn wensen" (Morgan).
		Product quality issues	*The extend to which customers are not happy with the final quality of the product, which is often topic in the monthly meetings and solutions are being discussed*	"Dus we krijgen al gemiddeld zes à zeven klachten per maand. (...) Ja, dat is ook lastig. Want stel er hangen 500 producten aan de stang. Om ze alle 500 te controleren, dat duurt gewoon te lang. Dus dan ga je hem steekproefsgewijs, ga je ze allemaal nalopen. En ook in de producties, als ze ze afhalen, kijken ze ze wel na. Maar om ze alle 500 nou echt heel goed controleren, is natuurlijk lastig. Maar w at ook kan gebeuren is, of onderdelen zijn nog een beetje nat. Of er zit toch ergens een blind gat of een hoekje met een kuipje w aar vloeistof in blijft staan. Dat dan in een doos eruit komt lopen en dat er dan vlekken ontstaan. Dus ja, er zijn ook dingen w aar we inderdaad niet zo heel veel aan kunnen doen. Ook bijvoorbeeld lasnaden die niet helemaal goed dicht zijn gelast. Daar gaat ook vloeistof onder zitten, komt er later weer uit kruipen. Daar kunnen we eigenlijk weinig aan doen, w ant als we ze opnieuw behandelen, gebeurt er eigenlijk precies hetzelfde. " (Taylor).
		Work Process complexity	*Due to a high number of different recipes products and wishes of customers the overview can cause problems in communication and product quality*	"Ja, dat de laag loslaat. Dat is bijvoorbeeld een probleem. Of hij is niet helemaal gedekt, dat je kale plekken ergens hebt. En bijvoorbeeld in charge verchromen heb je denk ik wel 150 variabelen die allemaal goed moeten staan" (Alex).
	Operational knowledge	Tacit knowledge	*Due to the high variety of products, high number of process steps and quality requirements, the work on the line but also, during planning and administration (customer contact etc.) requires a lot of practical experience accumulated over years of working*	"Ja, dat vind ik persoonlijk hier heel veel. Het is heel veel ervaringswerk. Ik heb natuurlijk de ervaring vanuit de productie. Dus eigenlijk de dingen die binnenkomen voor de elektrisch polijstlijn. Dat is gew oon voor mij dan weer makkelijk. En voor Arno denk ik misschien iets w at lastiger. Om te kijken naar ophanging. We hebben bepaalde stroomdichtheid die je aan moet houden. Maar als ik al zie dat het dun materiaal is, dan kan ik wel de standaard stroomdichtheid erop zetten. Maar dan weet ik zeker dat het verbrandt. Dus dat is mijn ervaring weer. Dus dat is wel. Ja, zo heeft hij weer ervaring in hele andere dingen " (Morgan).
		Education	*Due to the high variety of products, high number of process steps and quality requirements, the work on the line but also during planning more training in addition to a general education on the process of different lines is wished for by employees in all positions, as this would allow for competent employees*	"Yes. In manual lines, we see the first and last stages. But there are 35 steps in between. I talked to the owner, and the first impression w as positive—people wanted to learn. I even brought a book about the process and started discussing it with them " (Avery).
	Primary process of the c	Variety	*The large amount of variety between orders and c*	"We hebben niet voor ieder product specifieke artikelen, omdat het zo divers is w at we krijgen" (Alex).
	How the compnay is beir	People management	*The way that realtionships are manged within the company*	"We hebben een tijdje geleden een incident gehad op een afdeling. Daar werken maar twee personen. En die botsen qua karakter en qua werkethiek. Daar hebben we mee gesproken en die hebben we uit elkaar gehaald" (Alex).
		Interpersonal issues	*The problems between collegues*	"They don't understand that work-life-balance doesn't mean you get money for less work.... 15 min break if these 6 all take 5 minutes extra I lose not 5 minutes but an extra 30 minutes... That is my point of view" (Avery).
		Hierachy	*The way the culture within galvarne is described*	"Ik denk dat het een vrij platte organisatie is. Op papier hebben we natuurlijk al die lagen, maar iedereen kan met iedereen binnen lopen. Ja, echt een beetje het familiegevoel misschien. Dat denk ik" (Alex).
		Montly meetings	*What is discussed at the monthly meetings*	"Wat is er niet goed gegaan, maar uiteraard ook w at er wel goed is gegaan. Maar klachten worden dan inhoudelijk besproken om ze de volgende keer te voorkomen natuurlijk" (Alex).
		Communication structures	*In what way do different departments communicate with each other*	"Het meeste is inderdaad gew oon tussendoor. Maar ik heb ook wel een wekelijks moment met alle voormannen" (Alex).
	Technological innovatio	Potential for robots	*How do employees think about the future with robots*	"Daar hebben we gew oon mensen handen voor nodig, dat zou je denk ik nooit een robot kunnen laten doen, vooral niet w at wij hier in de chromerij krijgen" (Morgan).
		Past technological innovations	*What technical innovations has Galvarne implemented in the past*	"Het liefst, ja, tillen we graag met hulpmiddelen. We hebben een stapelaar en een elektrische stapelaar" (Lukas).
		Advantages of innovations	*What are the benefits of current and future innovations*	"En voorheen moesten ze gew oon die code typen... Maar dan wordt er nog wel eens een foutje gemaakt, zeg maar. En in sommige gevallen kan dat gelijk fataal zijn" (Alex).

	Job design	Monotony	*The extent to which daily tasks require the same movement and thinking for many cycles*	"There is enough variety in products to keep it somewhat interesting but ultimatly it is the same process each time. It can get boring" (Riley).
		Task completness	*The extend to which employees are in control of their entire work process.*	"Yes, sometimes. For example, if white stripes appear where it should be black, I have to redo the process. This happens a lot with black conservation finishes. I usually notice it myself and redo it, but for things like thickness, I need help from the quality team because it's not visible to the naked eye. Some customers are more particular than others. I: Who do you ask for help? R: Usually Mano from quality control, or sometimes Luc or Eric. But it would be great if I could measure thickness myself instead of chasing people down"
		Past innovation	*Employeees can come up with process improvemnts which are being considered and implemneted*	"I realized we had a problem. Before, the bars waited in pretreatment, we have multiple stages there: degreasing, first stage anodic bites, and last stage anodic. The bars would wait halfway through and didn't want to continue. We discussed it several times "Can it go? Can it go?" and we solved it. Now I still have a few troubles with different codes, but I think we can solve those here in the company without Icom" (Avery).
		Well- being	*The extend to which the company is concerned of their employees mental, physical and geneal work/ life balance*	"Nou, uiteindelijk is dat onze verantwoordelijkheid natuurlijk als bedrijf. Dus wij proberen ze in ieder geval alle hulpmiddelen te bieden die daarvoor nodig zijn. Ze hebben overal van die elektrische pompwagens, dat ze de bakken waar die in zitten, in ieder geval op hoogte. Dus ze staan wel altijd recht met het oppakken. Dus daar zijn wij in ieder geval verantwoordelijk natuurlijk " (Alex).
		Job- rotation	*The exetnd to which the company allows for job r*	"I started on the other line, mainly assisting the shift leaders. Then, an engineer came to work here for a few weeks. I asked him if I could learn this line, and he helped train me" (Riley).

5- Research Integrity Form

Name: Janic Rabe	Student number: s1021971
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Thesis title: Towards Human-Centred Job Design for Grassroot Innovation: A Case Study on the Quality of Work in SMEs
Brief description of the study: A qualitative case study that analyses the organizational structures through the lens of human centred job design and quality of work in Dutch SMEs to encourage grassroot innovation.

It is my responsibility to follow the university's code of academic integrity and any relevant academic or professional guidelines in the conduct of my study. This includes:

providing original work or proper use of references;

providing appropriate information to all involved in my study;

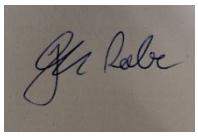
requesting informed consent from participants;

transparency in the way data is processed and represented;

ensuring confidentiality in the storage and use of data;

If there is any significant change in the question, design or conduct over the course of the research, I will complete another Research Integrity Form.

Breaches of the code of conduct with respect to academic integrity (as described / referred to in the thesis handbook) should and will be forwarded to the examination board. Acting contrary to the code of conduct can result in declaring the thesis invalid

Student's Signature: 

Date: 30.09.2025

To be signed by supervisor

I have instructed the student about ethical issues related to their specific study. I hereby declare that I will challenge him / her on ethical aspects through their investigation and to act on any violations that I may encounter.

Supervisor's Signature:

Date: