Enhancing Work Performance Consistency: The Role of Job Instruction in Reducing Variability

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Abstract

In recent years, the Netherlands has encountered a labor market shortage and has responded by hiring workers with diverse educational backgrounds and language capabilities. Consequently, it is crucial to have adequate work instructions in place to equip employees with the necessary information for performing their tasks effectively. However, the effectiveness and clarity of these instructions can vary, leading to different interpretations by workers. This variation results in inconsistencies in both the quality and speed of their work, known as work performance inconsistency. Introducing job instruction before and during work instructions could help mitigate these inconsistencies. However, companies are not always certain about the exact training needs or the root causes of inconsistency. This leads to the research question: What are the training needs of assembly workers, and can these needs be addressed by implementing job instruction to reduce work performance inconsistencies?

To address this question, a multiple case study involving eight companies was conducted, incorporating interviews and observations. The study aimed to establish the current training needs within these companies and understand how these needs contribute to inconsistency. A comparative analysis was then conducted to identify common themes and differences among the companies. Finally, a linkage to job instruction was explored to assess its potential in addressing these training needs and reducing inconsistency. The findings reveal significant training needs in several areas, including training for new workers, error management, tricks, and understanding unknown terms. Job instruction emerged as a standardized training approach that effectively addresses these elements. It also helps mitigate challenges related to knowledge transfer, particularly in the context of an aging workforce. Job instruction helps to achieve consistent task performance, thereby minimizing inconsistencies within companies.

Keywords: job instruction, work instruction, inconsistency, training within industry, assembly workers

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1. Introduction

In today's competitive business environment, the Netherlands faces a shortage of MBO students, putting pressure on the labor market (van Coevorden, 2024). To fill these positions, companies are increasingly hiring workers distanced from the labor market, who now make up a significant portion of job seekers (Nederlandse Arbeidsinspectie, 2022, p.10). Additionally, 35% of the workforce in 2022 comprised young workers without the necessary education, and 21% had language deficiencies (Nederlandse Arbeidsinspectie, 2022, p.72). Effective instructions are crucial to ensure that these diverse workers consistently perform high-quality, standardized work.

If instructions are unclear or leave room for interpretation, employees' work performance decreases, leading to a higher likelihood of errors in their work, or in extreme cases even fatal accidents (Haug, 2015). This inconsistency in work performance can manifest in various ways, such as differences in the quality of finished products compared to the expected standards set by the company (Jozsef & Blaga, 2015). Additionally, unclear instructions may result in variations in task duration, as employees may interpret the instructions differently, leading to different approaches and time requirements for completing tasks. A company does not desire inconsistency in time and quality and managers prefer that workers are consistent in their work performance. Therefore, to guide employees through their work steps and enable standardized work, instructions must be precise, clear, and of good quality.

Instructions come in the form of job and work instructions (WI). WI provides detailed task information and required instruments (Jozsef & Blaga, 2015) and can be in visual, text, or sound formats. Job instruction (JI), a method within Training with Industry (TWI), trains new employees to perform tasks correctly and safely (Dinero, 2019). This method combines training and demonstrations to ensure adherence to standardized working methods (Slenders et al., 2020), and promote consistent work performance (Pimminger et al., 2021).

As of 2022, the Netherlands is dealing with a shortage of employees on the technical side including a shortage of assemblage workers (EURES, 2023). Therefore, companies frequently hire employees with significantly different backgrounds, leading to an increased risk that individual differences among workers may lead to misinterpretation of the WI provided. When instructions are unclear or incomplete, employees are forced to rely on their

own judgment or make educated guesses to proceed (Haug, 2015). Consequently, each worker may interpret the task differently, leading to variations in the quality of the product and potentially reducing customer satisfaction if products are not standardized (Haug, 2015). To avoid this undesirable outcome, companies must take proactive measures to address the issue of instructions. While factors such as ability, work experience, and age play crucial roles in determining work performance, companies often have limited influence over these aspects (Prasetya, 2018). However, companies can control the format and content of the WI to ensure they are understandable to employees with diverse skills.

To reduce inconsistencies in work performance, this research aims to explore not only the necessity of training but also the specific content of the training. Although the TWI provides some guidance as to what should be included in JI, suggesting factors such as job complexity, task requirements, individual needs, and organizational goals for standardization, quality, and efficiency (van Elde, 2021; Slenders et al., 2021), there is a notable absence of research specifically investigating this aspect in relation to inconsistencies. Van Ede (2021) notes that companies often struggle with deciding which elements to include in JI and WI. Moreover, companies are often unaware of the needs and goals of their workers (Müller & Misiurek, 2020). To address these issues this thesis will answer the following research question: *"What are the training needs of assembly workers, and can these needs be addressed by implementing job instruction to reduce work performance inconsistencies?"*

To answer this research question, a multiple case study approach was used, and the research was structured into three phases. The first phase involved sketching the current situation of the eight companies through observations and interviews with workers, team leaders, and creators of WI or JI. This phase determined whether training was necessary and if it had the potential to reduce inconsistencies within the company. In the second phase, a comparative analysis was conducted, comparing the companies against each other and categorizing them based on contextual factors. This phase determined whether there was a universal need for training specific elements to reduce inconsistency. The third phase linked companies 1 to 6 with companies 7 and 8, which had implemented JI. Based on the interview answers from all companies, it was assessed whether the companies without JI would benefit from implementing them.

It was found that there was a significant training need in all the companies. Managers and workers had very different views on training, with workers often stating that they never received any formal training and expressing a desire for it. There was a particular need for training new employees, tricks training, error training, and unknown terms training. Since the companies did not have training programs in place, there was significant inconsistency, especially in time completion, quality, and the sequencing of steps. It was determined that JI could address these training needs by providing a task analysis sheet where the company can outline what is important to be taught, ensuring that everyone works according to a standardized method.

The purpose of this paper is twofold: firstly, to provide practical guidance to companies regarding the implementation of JI, including an assessment of which areas of WI could benefit from additional training, thereby helping companies reduce work performance inconsistency. Secondly, this research aims to contribute academically by exploring the relationship between JI, and WI in relation to work performance inconsistency, thereby enriching the existing literature with actionable insights.

The thesis proceeds with a theoretical background and methodology. The outcomes of the first, second, and third phases will be discussed in sections 4, 5, and 6, respectively, followed by a discussion and conclusion.

2. Theoretical Background

2.1 Training Within Industry

2.1.1 Training Within Industry

Introduced in 1940 by the United States Department of War, TWI has been widely used by different companies. TWI is often described as a 'dynamic program of hands-on learning and practice,' which means they teach in person the necessary skills for supervisors, managers, or anyone who directs the work of others (Dinero, 2013). Teaching these skills will support continuous improvements and create an environment where workers are effectively trained to do their jobs (Slender et al., 2020). There are three widely known modules: Job Relations (JR), Job Instruction (JI), and Job Methods (JM). Recently, a fourth module called Job Safety (JS) was added to address daily preventive measures for incidents and accidents (Slenders et al., 2020). JI centers on standardizing task execution through effective training. Before delving into JI, it is essential to first understand work instructions, which are more commonly employed, and see why they might fall short in certain aspects.

2.1.2 Work Instructions

Work Instructions (WI) are detailed documents that offer information regarding the task at hand and the instruments to be used (Jozsef & Blaga, 2015). These instructions can be presented in digital or analog formats and may consist solely of text or include a combination of text and visuals. The information presented in the WI should be laid out in a step-by-step assembly cycle (Södderberg et al., 2014). Additionally, the WI should be easily accessible to avoid wasting time searching for the necessary information to complete the tasks (Söddeberg et al., 2014). WI benefits from having arrows, lines, equal colors, and a typeface to present the steps. This also helps employees link the information to each other.

Effectiveness of work instructions

The effectiveness of various WI can vary based on factors such as clarity, relevance, and accessibility (Li et al., 2018). Research indicates that instructions are generally well-received by both users and managers (Letmathe & Rößler, 2022). Well-designed and properly implemented WI can help standardize workflows within a company, reducing time duration by eliminating the need for operators to refocus or remember tasks (Berlin & Adams, 2017).

By providing a uniform set of steps for employees to follow, WI establishes a standardized approach to tasks, even across different assembly lines within the company (Berlin & Adams, 2017). Additionally, WI facilitates a shorter learning period for new employees or when introducing new product variants, making employees feel more supported and confident in their work.

2.1.3 Job Instruction

This research does not focus on constructing training methodologies but rather on identifying the specific information that should be included in the training. Therefore, when discussing training and/or demonstration, reference is made to the TWI development of 'Job Instruction' (JI). The terms JI and training will be used interchangeably. The purpose of JI is to train employees in a standardized manner that reduces work performance variation (Slenders et al. 2020). Before engaging in independent task executions, employees typically require training. Common methods include solely explaining the tasks, although this approach often results in employees retaining minimal information (Slenders et al., 2020). JI prioritizes instructional effectiveness by using a combination of demonstrations, visuals, explanations, and hands-on practice (Slenders et al., 2020).

There are different ways to structure a training or a demonstration to teach employees the tasks. TWI, however, uses a specific JI, where there is one-on-one training with four steps to be followed (Slenders et al., 2020). This leads to a better understanding of the employee's progress and better insights into where they might still need more help. Appendix A gives a short oversight of the four steps of the TWI definition of JI.

Definition of training within a company

When examining the training practices within a company, it is important to clearly define what constitutes training. This study describes training within the context of assembly work as a process aimed at improving the skills and knowledge of employees, enabling them to perform their tasks more effectively this includes learning to use new machines or equipment or handle new products. Other examples of such training include task-specific training, safety training, problem-solving training, and quality training. This definition also includes the training provided for new employees to learn the tasks, which can be summarized as 'Training provided for new employees'.

Effectiveness of Job instruction

The goal of JI is the same as that of WI: making sure that tasks are taught consistently to all employees, leading to standardized work practices across the organization (Slenders et al, 2020). TWI believes that WI alone are insufficient JI is needed to familiarize the employee with the tasks at hand. Research by BalaSeshan and Reddy (2020) established that training for assembly industries is necessary to provide employees with additional knowledge that they previously lacked. They developed a framework for an instructional video for training purposes. The video included a detailed view of the step-by-step assembly of the components. This research has prompted questions about whether one-size-fits-all instructional videos adequately address the diverse learning needs and preferences of individual learners. There should be greater opportunities for employees to ask questions and actively engage with the work activities during training sessions. Slenders et al. (2020) highlight that when information is solely presented through showing and explaining, 35% of it is lost after just three days. Meanwhile, with the implementation of JI, 92% of the information is retained after three days ensuring that employees perform the task correctly at once (Slenders et al., 2020). This highlights the improved understanding of employees after JI implementation.

Peltokorpi et al. (2023) conducted research closely related to WI, focusing on the effects of different forms of WI on employees with disabilities in assembly factories. They mention the concept of "Pre-Training" and its impact on individuals. Pre-training could help individuals become acquainted with interfaces, tools, and processes, ultimately reducing the initial cognitive load during task execution. Although the study focused on individuals with disabilities, it would be intriguing to explore how training could benefit non-disabled individuals in similar contexts.

2.1.4 Interaction between Job instruction and Work instructions

It must be reminded that JI is not a replacement for WI but rather an addition to WI. The content in JI and WI must not be the complete same but must also not contradict each other. JI can assist WI by laying the fundamental knowledge and skills for the employees, while WI can offer further refinement and detail to guide the sequence of the tasks. Together they can mitigate the inconsistency of work performance. Research by Li et al. (2018) suggests that

initial face-to-face information can enhance comprehension of documented instructions, underscoring the utility of JI in the understanding of WI. Söddeberg et al. (2014) found that instructions should be presented in two different phases, planning and presentation. JI plays a crucial role during the planning phase by ensuring that employees understand the sequence of assembly steps and know where to locate the required parts, thereby facilitating their task execution.

2.1.5 Task Analysis Sheet

Training according to the JI method can take place once the work standard has been elaborated on a task analysis sheet (Slenders et al., 2020). This task analysis sheet does *not* represent WI but is rather meant for the instructor who will train the employee on how to do the job through JI (Slenders et al., 2020). The task analysis sheet consists of all the relevant information needed to perform the task well and deliver a standardized form of quality (Slenders et al., 2020). When constructing the task analysis, there needs to be an agreement on the adopted standardized work, because only then do the instructors know what needs to be trained (Slenders et al., 2020). The task analysis is the standard that serves as a guideline during JI but can also serve as a control instrument in daily work (Slenders et al., 2020). The task analysis sheet includes all relevant content and information that must be addressed or trained during the JI, which is the primary focus of this research. The question remains, which specific elements, content, or information are required to be included in the task analysis sheet? Slenders et al. (2020) contribute to this discussion by highlighting the importance of incorporating tricks training developed by experienced workers. They emphasize the value of this training in transferring essential knowledge and practical insights to new employees. BalaSeshan and Reddy (2020) contribute by identifying key information to be included in instructional training videos as clear problem labels, coherent explanations, step-by-step procedures, effective use of visuals, an engaging tone, and interactive features. Although their definition of training does not completely correspond to the definition of JI by the TWI, it provides a good starting point for identifying the required material to be included in training programs.

2.2 Measurements

2.2.1 Variation in Work Performance

When employees receive WI that are unclear, imprecise, or of low quality, it allows for free interpretation, leading to variations in their executions. These variations may manifest in different ways, such as differentiated interpretations of the sequence of steps or skipping steps altogether. Consequently, this can result in inconsistencies in the quality of finished goods or variations in the time duration required by different workers to complete tasks. This research will specifically examine these two aspects of work performance inconsistency. Consistency entails the organization's ability to maintain a consistent level of performance and enhance reliability and predictability over time (Price, 2023).

2.2.3 Standardized work

To provide employees with WI, there must first be standardization of the finished product. Standardized work is a detailed documented and visual system of sequenced steps within a process to achieve the most efficient level of production (Graupp, 2023). The goal is to create and maintain consistency for the finished products. Standardized work reduces waste, creates stability, and increases uptime (Graupp, 2023). Standardized work is used by companies to limit process variability, lack of detailed work procedure sequences, and overall work performance variability (Tapia-Cayetano et al., 2020).

Having a clear standardized worksheet will create a continuous flow that reduces waste and increases efficiency (Santos et al., 2021). A standardized worksheet serves as a structured format for organizing information consistently across various scenarios. It is employed to collect data illustrating the assembly line process, such as the duration of specific activities. When employees adhere to standardized instructions, they are more likely to achieve consistent results (Olson & Villeius, 2012). Although at first a standardized worksheet and work instruction sound very similar, they do differ. A standardized worksheet is a structured document used for capturing and organizing data consistently, while WI provides detailed guidance on how to perform specific tasks or activities effectively.

2.3 Elements

The detailed analysis of elements crucial to both WI and training programs has been summarized in Table B.2, including their categorization and associated references. This information has been relocated to Appendix B.

2.4 Conceptual Model

To provide a clearer understanding of the concepts discussed, a simple conceptual model is developed. The independent variable represents the implementation of JI based on the need for training, which can be manipulated to observe its effects on the dependent variable. The dependent variable, work performance (in)consistency, reflects the outcome variable and is affected by the company's training methods. It indicates whether the company has incorporated JI, how this relates to WI, and its impact on work performance (in)consistency. Contextual factors, such as job complexity and employee characteristics (e.g., experience, IQ), may determine where the training needs of workers lie, thereby influencing their work performance. Moreover, the adoption of standardized work practices can affect how the implementation of JI takes shape in alignment with standardization requirements. Conversely, it may also impact the (in)consistency of worker performance. Implementing standardized work practices could potentially improve work performance consistency, highlighting the dual impact of standardized work usage.
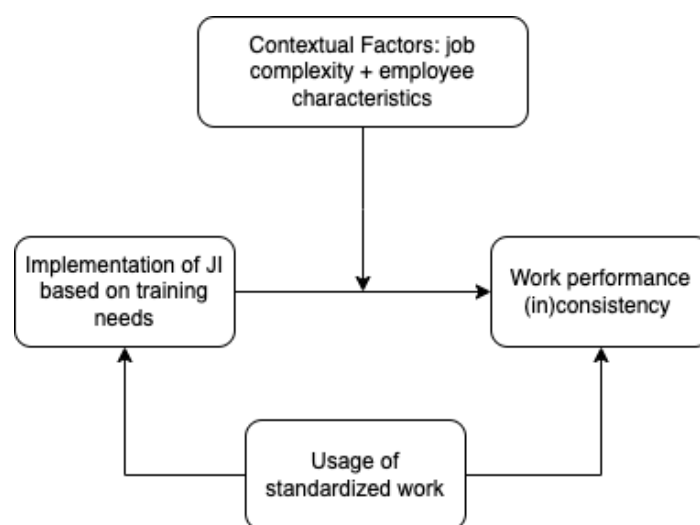

Figure 1: Conceptual Model for Job Instruction

3. Methodology

3.1 Multiple case study

This study utilizes a multiple case study approach, of which the main advantage is the facilitation of an extensive comparative analysis (Hunziker & Blankenagel, 2021). A multiple-case-study approach allows for stronger and more reliable findings than a single-case-study approach (Gustafsson, 2017). The former is particularly well-suited for this study, as it aims to identify the training needs necessary to reduce inconsistency across various companies. The methodology will adopt an inductive approach, starting with data collection followed by analysis to form conclusions.

The research will start with a multiple case study approach, involving interviews and observations conducted at the companies. Having multiple cases instead of single cases increases external validity and prevents observer bias (Voss et al., 2015). This qualitative method provides valuable insights into real-world contexts, behaviors, and relationships. The descriptive nature of the case study will allow for an exploration of what occurs concerning JI and WI, as well as how employees perceive the impact of these factors on performance (in)consistency. By conducting interviews with employees, team leaders, and creators of WI or JI the study aims to identify the need for training and how these needs could influence the consistency of work performance. Moreover, any necessary details identified through observation can inform the need for training or the level of inconsistency at the company.

Through the multiple case studies, the current practices within organizations will be outlined and compared to those of other companies. The purpose of the case study is to analyze the current work inconsistency in multiple companies and to gain insight into how the consistency could be improved by potentially implementing JI.

3.2 Case selection

To accomplish the first objective of the case study which implies a comprehensive description of the current situation, it is essential to make careful selections when choosing the companies to be examined. A total of six companies will be chosen for the interviews and

observations. Within each company, approximately one to six interviews will be conducted. A total of 15 interviews is sufficient for qualitative research (Guest et al., 2016). These interviews will involve employees who are subject to WI, supervisors responsible for assessing employee performance, and instruction creators. Unfortunately, the selected six companies did not currently employ JI. Therefore, two additional companies were added that had implemented JI. Due to time constraints, conducting observations at companies 7 and 8 was not feasible.

To facilitate a meaningful comparison, the selected companies need to share certain characteristics, although they do not have to operate within the same industry. As outlined by Voss et al. (2015), the selection process should consider control variables that must remain constant between the selected companies while other variables may vary between companies. Key characteristics to be considered include being medium-sized, the presence of WI, and similar operational characteristics. Another aspect to consider is the company's policy when hiring a new employee. It is useful to examine what training and/or instruction is provided to new hires to familiarize them with their work, thereby establishing the current situation.

3.3 Data collection

Eight companies were selected to contribute to this research, each sharing similarities with one another. Via multiple cases and existing literature, this study uses validity to ensure that it accurately measures what it intended to (Voss et al., 2015). Notably, three of these companies operate as social employment companies, employing workers who face significant challenges in integrating into the traditional job market. An oversight of the characteristics of the companies has been provided in Table 1. The darker shaded grey represents the social employment companies. To foster a comfortable environment and encourage candid responses, interviews at social employment companies were often conducted with two workers simultaneously. In summary, 26 interviews were conducted, involving thirteen interviews with workers, three with creators of WI/training, six with team leaders/supervisors, two interviews about JI, and two follow-up interviews with companies seven and eight. The interview protocol is provided in Appendix C. This allows for

transparency and reliability, ensuring that the study can be replicated through a standardized interview protocol (Voss et al., 2015).[1]

	Type of company	Company Size	Workers interview	Team leader interview	Creator WI/T Interview	JI interview	Date interviews conducted
C1	Air suspension manufactory	200+-	4	1	1		07-05-2024
C2	Metalworking and electromechanically assembly	950+-	2 (at the same time)				08-05-2024
C3	Mechatronics manufactory	200+-	2	1			13-05-2024
C4	Assemblage line and co-packing	200+-		1	1		14-05-2024
C5	Lift manufactory	160+-	4	1	1	2	16-05-2024
C6	Assemblage line and co-packing	300+-	4 (2 at the same time)	2		2	17-05-2024
C7	Industrial manufactory	900+-				2	13-05-2024 & 03-06-2024
C8	metal distributor	900+-				2	22-05-2024 & 05-06-2024

Table 1: Companies characteristics

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[1] The interview protocol is derived from a larger study, this thesis primarily incorporates data and questions from sections 1.1, 1.2, 2.1, 2.3, 2.4, 2.5, 2.9, 4.1, and the entirety of section 3 except for 3.4.

3.3.1 Exceptions

During the visit to C2, which operates as a social employment company, adjustments were made to accommodate workers who may face challenges due to their distance from the labor market. Consequently, interviews were streamlined to be shorter and easier to follow. Unfortunately, interviews with the creators of WI or team leaders couldn't be arranged during this period due to vacation schedules. Nonetheless, extensive observation rounds provided opportunities for informal discussions with floor supervisors, other workers, and a manager. At C4, which also involves a social employment company, two interviews were conducted— one with the team leader and another with the creator of the WI. Since conducting semi- structured interviews with workers was not allowed, an observation round accompanied by an experienced worker was opted for, allowing questions to be asked while inspecting different stations. C6, another social employment company, lacked formal work instructions. Instead, the floor supervisor provided verbal instructions. Due to these circumstances and the low cognitive abilities of the interviewed workers, their responses were not included in the analysis.

3.4 Analyze data

The qualitative data, which is obtained from interviews and observations, will be transcribed and used for thematic analysis.[2] The analysis is done in the program Atlas-ti. Recurring themes will be identified and refined through discussion and comparison to the literature. The themes will be organized into categories representing the elements that affect JI, WI, or work performance (in)consistency. Subsequently, these findings and patterns will be interpreted to form the companies' current practices to observe the company's training needs and how may reinforce inconsistency.

Following this, a comparative analysis will be conducted to assess similarities and differences in practices and outcomes observed across different companies. The comparative analysis will focus on the need for training and where this need for training stems from. Subsequently, a linkage will be established between the data obtained from companies 1 to 6 and the findings from companies 7 and 8. Ultimately, conclusions will be drawn regarding whether

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[2] For access to the transcriptions, please contact the author directly.

the implementation of JI could effectively address the training needs and mitigate inconsistency.

4. Results - The current situation

4.1 Company 1

4.1.1 Current structure of Work instructions

C1 currently uses paper WI with text and pictures to guide workers through the assembly of the product. A general instruction outlines the overall process, with experienced workers primarily using specific instructions found in a blue binder. In all general or specific instructions, green check marks highlight critical steps for final quality control checks, with every product undergoing inspection upon completion. Currently, C1 is transitioning towards digital instructions, although these have not yet been implemented at the workstations. The reason for reducing the level of detail is to promote flexibility in the WI. Instead of specifying the tools to be used, the focus is now on training employees on tool usage to compensate for the reduced reliance on text. This training will demonstrate the tasks but will not follow the TWI method's definition of JI.

4.1.2 Inconsistency

In C1, workers identified more inconsistencies than the team leader did. The workers attributed these inconsistencies to their observations of colleagues, noting significant variations in task completion times and differing station preferences. Some workers struggled with certain tasks but sorted out among themselves who should be placed at which station. In contrast, the team leader focused solely on the percentage of good-quality end products, overlooking the underlying inconsistencies reported by the workers. The team leader did acknowledge some inconsistency among workers but attributed it to differences in skill levels and individual thought processes. The inconsistency stemmed from the sequencing of steps, with some workers following all the steps from A to Z very rigidly, while others preferred a different sequence that seemed more logical to them.

Although it primarily aims for flexibility and independence, the current WI structure may inadvertently contribute to inconsistencies in work performance. These differences were observed in the different speeds at which workers completed tasks and the sequencing of steps. Some stations require more complex tasks, leading some employees to exhibit errors

and inconsistent completion times. Employees do not receive formal training for new workers; therefore, they are often left to figure out tasks independently or through ad hoc demonstrations. Furthermore, the introduction of new products or variations poses challenges, particularly when WI are not updated to reflect these changes. It was found that employees faced challenges with the introduction of new products due to the absence of WI and training, leading to numerous errors and extended completion times.

4.1.3 Identifying training needs

Although C1 does not follow the TWI method, they plan to 'train' supervisors who will demonstrate tasks to workers. This concept is called 'train the trainer'. While the WI creator has indicated that they do not quite perceive it as training, but rather as 'communication', they express a desire to focus on achieving consistent training for all employees in the future. The creators of the WI emphasized fostering independent thinking, making the instructions less detailed. Thereby, they encouraged employees to think for themselves. The engineering department wants employees to learn the product from A to Z and find the most efficient assembly methods independently. However, it is unclear who will be responsible for this training. And, when interviewing the employees, they all mentioned they had never received formal training provided for new employees. One respondent, when asked about training provided for new employees, answered:

"I think they could handle that a little better. The man standing over there started yesterday, but he often gets placed there. And there is someone who has done it once or twice before standing by. And then it is like, just watch and see. Somewhat left to fend for himself... Yes, ideally you would have someone accompany a new person for a day. There should be a bit more, I think personally."
- Worker 1 at C1

Most workers recognized that beginning employees have been left to fend for themselves, indicating that training provided for new employees needs more attention from the company. The current format of merely demonstrating tasks may not be sufficient for effective learning. Another significant area is training for new products or variations in products. The company frequently introduces new products or produces some items only twice a year, and workers

have reported feeling lost when faced with these new products, especially when the WI are not updated.

There is a notable need for training on handling errors, specifically, what to do when mistakes are made and how to address commonly encountered errors. Additionally, workers suggested that training should include tricks that experienced workers employ to be faster and more efficient. Unknown terms training is another necessary area, as some workers, especially those without a technical background, are unfamiliar with specific terminology used in the job.

4.1.4 Potential impact of training on inconsistency

The company occasionally provides quality training to teach workers how to assess product quality themselves, aiming for consistency in their evaluations. This training has improved work performance consistency, with the team leader noting a close percentage of good quality products and a more consistent approach among workers. Therefore, providing training helps workers move towards achieving consistent work performance. The 'training' creator emphasized that standardization ranks among the company's top priorities. They aim for uniformity in task execution to uphold product quality consistently. Hence, they advocate for reinstating workers' independent thinking about their tasks while ensuring they understand what they are doing.

4.2 Company 2

4.2.1 Current Structure of WI

C2 uses paper WI and smart beamers at some workstations. At the start of a (new) product, the workers and supervisor walk through the manual, whether on paper or a smart beamer. However, most employees rely on the engineering drawing, which shows the final product with measurements but no detailed instructions. Team leaders explained that before issuing WI, they typically demonstrate the steps and sequencing to employees, emphasizing aspects not covered in the WI. In sections of the company with a high number of international

workers, WI relies heavily on pictures due to language barriers, with limited text instructions available.

4.2.2 Inconsistency

During the interviews, both workers acknowledged the inconsistency in work performance among their colleagues. They noted variations in how tasks were approached, often attributed to differences in experience and individual preference for sequencing the steps. The manager who conducted the observations also highlighted the inconsistency among workers, attributing it primarily to differences in skills and backgrounds. Despite acknowledging cognitive limitations, the manager emphasized the importance of following the provided instructions to maintain product quality. The manager explained that they struggled with maintaining a standardized level while also allowing their workers to find their own approach to the work.

4.2.3 Identifying training needs

Despite the company offering a wide range of training programs, workers reported minimal training in interviews. Workers stated they primarily learned through hands-on experience, often accompanied by experienced colleagues. Workers interviewed in other sections reported a lack of training, indicating a potential disconnect between workers and team leaders regarding training perceptions. Training provided for new employees, involving demonstrations and practical exercises, was described by the manager but inconsistently observed on the work floor. When asked about training a worker replied that they mostly must rely on their own intuition rather than an official training.

"Last year, I was figuring out a whole new cabinet with palms. Then we got a drawing and we just had to figure it out."
- Worker 2 at C2

The workers mostly rely on the technical drawing that is provided with each product. Although the manager mentioned training to learn to read engineering drawings the worker

replied that some struggle with reading a technical drawing despite having worked here for several years.

"Some should go to school to learn how to read drawings. They've been working here for 35 years. I find that so strange here."
-   Worker 1 at C2

Two other instances were identified as indicating a need for training during the interviews. First, workers expressed a need for better demonstrations of new products. Second, there was a perceived lack of training regarding tool usage, with workers indicating that information about tools was not provided in the WI and instead relied on knowledge from colleagues. This might raise an issue for a new worker with no prior knowledge.

4.2.4 Potential impact of training on inconsistency

The manager mentioned multiple training sessions, but workers did not perceive any training. If there were any trainings, it suggests that they have not effectively reduced inconsistencies on the work floor. Specific training is needed for tool usage and technical drawing interpretation to equip workers with essential skills for consistent and accurate task performance. Improved terminology training would also ensure that all employees, irrespective of their backgrounds, can comprehend and adhere to WI efficiently. Recognizing the diverse skill sets among employees and providing targeted training tailored to individual needs could substantially diminish inconsistencies within the company.

4.3 Company 3

4.3.1 Current structure of WI

The WI are universal throughout the entire company. The WI are text with pictures. During the interviews, opinions on the WI were divided. One worker expressed satisfaction, particularly appreciating the digital format, despite occasional missing elements. In contrast, the other worker was dissatisfied, suggesting that the WI required a complete overhaul to be effective.

4.3.2 Inconsistency

There is a significant difference in work performance among the workers. The team leader highlighted that there is, in fact, a considerable inconsistency in task performance. He noted that the workers' performance varies greatly. One worker provided an interesting perspective on time inconsistency between themselves and their colleagues:

"I think knowledge. And, how they approach the work. I have a good example with those IPB boxes. A small box with wires. One person takes boxes of cables and measures each wire with a tape measure, wire by wire. And I mix them using a cutting machine. Then I cut everything at once, attach all the contacts at once, and then insert them all at once. And then I am fifty percent faster than the others. That is why sometimes there are significant time differences. And, of course, the knowledge."
- Worker 2 at C3

Worker 2 notes that their knowledge gives them an advantage that others do not have. The company currently lacks a proper way of transferring knowledge from experienced workers to (new) workers, limiting the flow of valuable insights. Bridging these (time) inconsistencies would benefit the company by ensuring that all workers are on the same page when performing their tasks. The company must share such knowledge to prevent it from being lost. Currently, this worker has no structured opportunity to share their findings with colleagues.

4.3.3 Identifying training needs

Several training needs were identified. One worker pointed out that some employees struggle to read schematics, which are crucial for understanding the job. They suggested that workers would benefit from training on how to interpret these schematics:

"You need photos and text. And possibly 'schematics', but people need to be able to read schematics. If people cannot read schematics, then you do not know what they are reading, and you do not know what they are making."

- Worker 2 at C3

Additionally, a worker mentioned difficulties with understanding the company-specific terminology. They noted that the company uses specific terminology for tools and components that were unfamiliar to them. The worker acknowledged that new employees without prior knowledge would find it challenging to understand the WI.

"That is especially the case when you are new. Here they call a threaded insert a "draadbus." They call a crimp terminal a "kabelschoen," It's different at every company."
- Worker 2 at C3

The lack of training for new employees at C3 is compounded by insufficient training in tricks, tools, and terminology. New hires are not provided with adequate training upon arrival, causing them to struggle during their first few months. This gap in training hinders their ability to adapt quickly and perform efficiently.

4.3.4 Potential impact of training on inconsistency

C3 appears to lack any formal training initiatives since neither the workers nor the team leader mentions such programs. Consequently, there is no indication of how training may affect the (in)consistency within the company. However, based on feedback from workers and the team leader, it could be deduced that introducing JI, especially for new employees, might reduce inconsistencies. For instance, Worker 2's wire-cutting efficiency trick could be formally integrated into training, ensuring consistency across the workforce and minimizing time inconsistencies among workers.

4.4 Company 4

4.4.1 Current Structure of WI

WI are either on a tablet (if available) or paper, following a highly structured format with text on one side and corresponding pictures on the other. The WI creator stressed the importance of achieving standardized production through uniform WI, ensuring consistency across all

documents. During the observations, it became evident that most employees did not actively utilize the WI, except for the assembly line dedicated to fat bikes.

4.4.2 Inconsistency

Given that the workers may face cognitive challenges, it is not surprising for the team leader and supervisors to observe significant inconsistencies among them. To manage this, the company implements a system where each worker's corresponding personal work number is attached to the product they assembled via a sticker. If the external company identifies any flaws in the received product, they can contact C4 to determine which worker was responsible for the error. This allows the company to address recurring mistakes by re-teaching the employees the tasks that went wrong. The primary issues with inconsistency among employees are attributed to their varying skill sets, which are reflected in both the quality of the products and the time taken to complete tasks.

"Time duration, the skills of the person, that is always very different. I must admit the quality is also different from one person to another, although I think we are at a good level."
  - Team leader at C4

Since C4 operates as a social employment company, standardization plays a crucial role in its operations. By ensuring that every worker follows a standardized method of working, the company can create a uniform approach applicable to all employees. Through this standardized document, they aim to provide clear WI. However, they occasionally observe instances where the instructions are not clear enough, leading workers to interpret them differently or mix up steps. As a result, the creator must revise the WI often to ensure they are detailed sufficiently to prevent errors or deviations.

4.4.3 Identifying training needs

The company provides extensive developmental coaching as part of its commitment to being a teaching organization, aiming to prepare its employees for eventual reintegration into the broader workforce. Although considered training by the company, these sessions focus more on employees' psychological development and reintegration rather than task-related skills.

Consequently, these aspects will not be included in the analysis. Additionally, the workers' limited recollection of past training sessions was a notable observation during the visit.

During the interviews and observations, several areas were identified that could benefit from training, such as tools and tricks training, as well as areas already being addressed in existing training programs. One such area is the 'unknown terms' element. The WI creator noted that they consider the possibility that employees might not know the (technical) names of tools or components and try to teach these terms beforehand. Additionally, the team leader and WI creator highlighted that some 'sensory things' cannot be effectively included in the WI. These sensory elements refer to actions that need to be felt and cannot necessarily be described in the text and therefore must be taught through hands-on training.

"A sensory thing that you cannot express in the work instructions. Some things are a feeling. When you turn, you must keep turning until it clicks. And that feeling, it just must feel that click. So those kinds of things you cannot add, but you cannot add everything."
   - Creator WI at C4

"We have a process for mounting the GPS on the back of the bike. That is a matter of feeling. You cannot describe that well on a document. But people are trained for that You can include a lot of photos. As many as possible. But then you must give extra attention to the training part. Where the person gets the feel for what needs to be done and how it needs to be done."
   - HRM/organization at C4

4.4.4 Potential impact of training on inconsistency

Standardization is a primary strategy employed at C4 to address inconsistencies in work performance. Currently, C4 'trains' their first employee, who has a leadership role on the work floor, and then it becomes this employee's responsibility to train others as they see fit. The team leader no longer oversees this process, leading to new employees being taught different methods by different first employees. This results in varied training and demonstrations across the workforce, causing inconsistencies in work performance, such as in the sequencing of steps.

However, this company emphasizes 'feeling training' to explain certain aspects that cannot be covered in WI. According to the WI creator, this approach helps workers understand tasks better and make fewer errors. They also recognize the need to train workers in unfamiliar terms, acknowledging that their workforce may not have the right educational background. The team leader does not mention any problems with these elements but notes that most inconsistencies arise from the actual performance of tasks, particularly in the sequencing of steps. Workers prefer to assemble the product in their own way, leading to errors, lower quality, and time inconsistencies. While the company is close to recognizing the need for specific training, it lacks control over how these trainings are implemented in practice.

4.5 Company 5

4.5.1 Current structure of WI

C5 utilizes entirely digital WI. Workers select the product they are assembling and follow the displayed steps, occasionally receiving pop-up warnings for certain tasks. The WI are highly detailed and written in simple, straightforward language to ensure clarity for all employees. However, this level of detail has caused dissatisfaction among experienced workers, who find the instructions overly detailed and unnecessary.

The team leader explained that the detailed WI are intended primarily for new hires to ensure they know what to do. However, he acknowledged that having such detailed instructions over time might lead to employees becoming too reliant on them, potentially hindering their ability to work independently. This reliance on detailed instructions could, in the long run, reduce the workers' engagement and problem-solving skills.

" But in terms of sequence, I do not know. Or that at some point you might get dumber from it and think less and less for yourself. Sometimes you see things and then you think, did you not think about it yourself? You sometimes experience that yourself as well."
- Team leader at C5

4.5.2 Inconsistency

While workers report minimal inconsistency in performance compared to colleagues, variations in the sequencing of steps exist, reflecting individual approaches. The team leader highlighted that they recently started using Power BI to analyze work performance due to noticeable time inconsistencies among workers. Despite this, they have not yet identified the specific issues causing these differences. They suspect some workers might still struggle with certain tasks but are reluctant to admit difficulties when asked about them. Addressing this issue is on the list, but the exact problem remains too unclear for the company to deal with.

4.5.3 Identifying training needs

One significant challenge facing this company is its aging workforce. As employees grow older and the labor market becomes increasingly competitive, the company has started hiring individuals without prior experience but with a willingness to learn. Workers highlighted a particular gap in tool usage training. Since this is not explained in the WI, the absence of tool usage, led to difficulties for those lacking prior education. Two out of the four interviewed workers expressed a positive view on implementing training for new employees, especially those without a technical background.

Additionally, workers identified several areas where additional training could be beneficial, including familiarizing themselves with unknown terms, mastering tricks, and managing errors effectively. These training needs were associated with the varying skill levels among workers, recognizing that not all employees possessed the same level of expertise. Almost all workers emphasized the importance of tricks training, citing instances where innovative techniques significantly improved task efficiency. For example, the WI creator noted one instance where a worker employed a trick from a movie, resulting in a significant reduction in task completion time by an hour, while his colleagues remained stuck on the same step.

4.5.4 Potential impact of training on inconsistency

The company currently implements safety training effectively through digital toolboxes, ensuring consistent adherence to safety protocols across the work floor. This success

demonstrates the impact of the safety training program, as uniform safety standards are maintained when all workers follow the training. Given the positive feedback from workers and the beneficial impact of safety training, it may be worth considering additional training programs. According to the team leader, there is little inconsistency in product quality due to the standard nature of the product. The greatest inconsistency lies in time completion, with some workers taking one day to complete a product while others take almost two days. The source of this inconsistency is uncertain but is believed to follow from workers not fully understanding their tasks.

4.6 Company 6

4.6.1 Structure of the WI

The WI includes a step-by-step explanation on the first page and pictures on the following page to illustrate the packing process. C6 has a unique structure where there is a dedicated team creating WI, but these instructions are not directly accessible to the workers on the floor. Instead, the WI is given to work guides, who are one step below the supervisors, and these work guides then verbally instruct the workers. As a result, the workers do not receive written instructions. The team leader mentioned that one of their main struggles with the WI is the uncertainty about who the intended audience is.

4.6.2 Inconsistency

Considering the cognitive challenges of the workers, inconsistency is an ongoing issue that the company continuously grapples with. They recognize the diversity within their workforce and understand that each worker has unique strengths and limitations. The team leader attributes inconsistencies among workers partly to varying professional skills. These differences in literacy and language skills complicate communication and training processes. Additionally, the team leader mentioned that workers also struggle with social skills, which further impacts their ability to perform consistently. The team leader stated that one of the biggest challenges is determining what each worker is capable of and effectively communicating this to them. Given their diverse backgrounds and abilities, they struggle to deliver a uniform message that resonates with all workers.

4.6.3 Identifying training needs

The team leader highlighted the need to implement training provided for new employees and continuous training programs, particularly to increase the number of workers who can operate machines. Currently, if the skilled machine operators are absent, the production line comes to a halt. Additionally, the team leader expressed concerns about the company's aging workforce and the potential loss of valuable knowledge as these experienced workers retire. They aim to find ways to transfer this knowledge to new hires, ensuring that essential skills and expertise are not lost. However, there are doubts about the feasibility of this, given the cognitive challenges faced by many of the current workers.

"Each year, between 70 and 100 people leave or retire. And then you see that the older generation has a lot of knowledge and skills. And if you do not transfer that, you lose it. And then you need to decide what you want to transfer."
- Team leader at C6

Another point raised by the team leader is the challenge of creating WI that are never directly seen by the workers but instead are used by the work guides. The absence of WI on the work floor increases the pressure on work guides, who must continuously explain tasks to the workers. This ongoing need for verbal instructions, whether due to new hires or workers forgetting the tasks, results in work guides spending significant time, often fifteen minutes or more, explaining the same instructions repeatedly. This approach is inefficient and adds to the work guides' workload, highlighting the need for a more direct and accessible method of conveying instructions to the employees.

4.6.4 Potential impact of training on inconsistency

The team leader reports significant inconsistencies in quality, time, and task performance, understanding that these differences stem from the diverse backgrounds and skill levels of the workers. Currently, C6 does not provide any training, although there may be openness to the idea. The company faces challenges in communicating and implementing such training. Although, providing initial and ongoing training could enhance the workers' skill sets,

especially in machine operation, an area where the company currently lacks sufficient expertise.

4.7 Company 7 & 8

4.7.1   Company 7

4.7.1.1 Work instructions and inconsistency
The WI in C7 is a blend of text and pictures. When developing JI, they review the WI and design the training accordingly. Initially, the company observed inconsistencies in quality, time, and step sequencing with just the WI in place. This led them to seek a more standardized work approach. Since implementing JI, the WI has become less detailed in some areas, yet they remain essential for guiding workers. The training programs are designed to ensure workers adhere to the standardized methods. Previously, there was no way to verify if workers read the WI, but currently, with JI, the company can better monitor and direct workers in their tasks, ensuring consistency and control.

4.7.1.2 Job instruction and inconsistency
To structure the training, C7 follows the JI method, which involves identifying and emphasizing key points. These key points outline the critical aspects of the training and the reasons behind them, particularly focusing on how to perform the steps correctly and safely. Experienced employees provide input on what should be included as key points and why, ensuring that the training content is relevant and comprehensive. The JI creator emphasized that the training includes company-specific terminology, recognizing that not all workers have prior knowledge about the job. This helps new employees get up to speed more quickly and reduces confusion.

C7 has adopted a structured approach to training using a TWI matrix, also known as a training matrix. This matrix provides an overview of all employees and the training they need to complete this, which also considers the varying skill levels of its employees. Team leaders can access the matrix, select an employee, and request specific training, which the JI department then coordinates. This approach has garnered positive feedback from team leaders, who note that new hires are better prepared upon entering the work floor. Even

experienced workers find the training beneficial, although some admit it posed initial challenges.

"For new employees, it is very good their work performance, because we hear from the shift supervisors that the new employees who come in are already a bit more experienced than before. And for existing employees, sometimes it is just a matter of checking if you are performing the tasks correctly or if we need to adjust them a little."

- Creator JI at C7

The implementation of JI has notably enhanced consistency across operations. The JI creator has remarked on observing fewer errors and an increase in quality since its integration. This is evidenced by employees adhering more closely to the correct sequence of steps, thus ensuring consistent outcomes. The JI creator pointed out that new employees, who are now more proactive, have adapted well to this structured approach. They have also seen a reduction in questions directed to the floor supervisor, which eases the supervisor's workload. Overall, C8 expresses great satisfaction with the implementation of JI, observing a marked improvement in consistency and standardization across their workflows.

4.7.2   Company 8

4.7.2.1   Work instructions and Inconsistency

In C8, WI follows a universal format consisting of text and pictures. Despite the implementation of JI, some WI are still utilized, particularly concerning "Packaging specifications." The rationale behind this decision is to alleviate the burden of memorizing numerous specifications for workers, focusing instead on training the workers properly. Since JI implementation is still in its early stages at C8, their current emphasis is on machine training and training for new employees. Therefore, there is also no structural difference noticeable in WI. However, the JI creator observed a decrease in the use of machine instructions as workers now understand the tasks. She went on to note that the current WI sometimes lacked detail, prompting the documentation of such details in the JI. Consequently, not all information in the JI is duplicated in the WI, emphasizing the operator's knowledge. Previously, when C8 solely relied on WI, each operator had their unique approach, contributing to inconsistency. Moreover, due to the absence of formal training for

new employees, they were exposed to diverse work methods from different workers, leading them to adopt new methods that they perceived as better fitting, leading to higher inconsistency. This inconsistency affected workflow, quality, and error rates.

4.7.2.2 Job Instruction and Inconsistency

Before the implementation of JI, new workers at C8 relied on shadowing experienced colleagues for training provided for new employees. However, with the introduction of JI, a structured training provided for new employees' program was established. Additionally, specialized training, including crane operation, now follows a standardized process, complete with separate certification. Training sessions are scheduled systematically and if an employee expresses interest in learning a new aspect, such as operating a new machine, they can approach their supervisor. The supervisor assesses the employee's potential for the new task and arranges training accordingly.

The team leaders have some knowledge about these employees, who want to grow. Or who wants to be trained on a new machine or certain skills. And then the team leaders decide. We also want to address future safety issues in the future. Or quality problems in certain tasks, which they will be trained on earlier. We have planned for the coming months how we can lead those people who want to be trained.
- Creator JI at C8

The company actively involves experienced workers in developing training materials, recognizing the importance of passing down their knowledge to new hires. The decision to prioritize training over written instructions stemmed from the need to standardize operations and capture critical knowledge, particularly with many employees nearing retirement and an aging workforce. Adopting the TWI method facilitated one-on-one training, ensuring all workers adhere to a standardized approach and enabling the transfer of expertise from seasoned employees.

Just like C7, Company 8 also incorporates key points on the task analysis sheet and reasoning into its JI process to ensure that critical aspects are addressed consistently. The JI creator at C8 emphasized that error training is included in their process. If a particular error occurs frequently, it is incorporated into the training. Additionally, the training includes tricks from

experienced workers to handle common tasks more efficiently. For more complicated tasks, the company includes additional key points and ensures these tasks are practiced more frequently.

Another significant aspect addressed by JI was the need to reduce inconsistency among workers. Previously, new workers were assigned to multiple persons to shadow, leading to varied approaches and confusion among new employees. With JI, tasks are documented on standardized tasks analysis sheets, providing clarity for all workers and ensuring consistent training and execution. Although C8 does not yet have formal performance metrics in place, they do plan evaluation meetings with workers to gather feedback on the training. Employees who experienced both the old and new methods reported feeling calmer and benefiting from the structured approach. This has reduced the variety of work methods within the company, as everyone now follows a standardized approach. Over time, the company anticipates that this standardization will also lead to improvements in quality, and error rates. While it is still too early to observe significant differences, there is optimism about the positive impact of these changes.

5 Comparative analysis

5.1 Common themes

Table 5 presents the percentage of interviewees within each company (C1 to C6) who identified each training element as a need. For instance, in C1, 83% of interviewees highlighted a high need for training when the work floor receives a new product, whereas in C3, only 33% of respondents expressed this need. C1 shows the highest demand for training overall. While no single training need was mentioned by all companies, the most frequently cited need is training for new employees. This gap is felt by both team leaders and workers, who often find that new employees do not receive sufficient training. Another often-mentioned training need involves training to address using tools, tricks, and unfamiliar terms.

Need for training	C1	C2	C3	C4	C5	C6
Difficult to see on WI	50%			50%	17%	
Error training	50%			50%	83%	
Training new employees	100%		67%	50%	50%	50%
Machine training	50%					50%
New product	83%	100%	33%			
Tools training	67%	100%	33%	100%	50%	
Tricks training	83%		33%	50%	50%	
Unknown terms	67%		33%	50%	33%	
Variation in products	17%					50%
Different skills	67%		33%	100%	33%	100%

Workbench familiarity					17%	

Table 2: Frequency of mentions of elements by interviewees

5.2 Differences among the companies

First, the contextual factors are constructed to determine if external elements influence how employees view the need for training. In Appendix D, a summary of contextual factors can be accessed, presenting average worker responses from each company.[3] This summary includes insights into the relationship between age demographics and perceived training needs among employees.

In Appendix E, a quadrant displays the levels of inconsistency relative to the volume of operations for each company. Not surprisingly, companies with higher product volumes, such as C6, C2, C4, and C3, tend to exhibit higher levels of inconsistency. Conversely, companies with lower product volumes, like C1 and C5, demonstrate lower inconsistency levels. This trend suggests that managing numerous products and instructions may lead to losing oversight and the need for workers to frequently switch tasks, resulting in increased inconsistency and errors. In contrast, workers in companies with fewer products to manage can potentially memorize procedures more easily and improve task performance due to the reduced need for frequent product switching. Interestingly, C1 and C5 have the highest mentions of needing error training in their company, which seems unexpected. However, this may be explained by the fact that C1 and C5 produce relatively more complex products, while some companies in the other group engage primarily in co-packing, a relatively simpler task.

C1 and C4 show the highest degree of need for training. Notably, these companies employ a structure where higher-ups train one supervisor on the tasks for a (new) product, and it then becomes the supervisor's responsibility to train other workers on the floor. This approach has not been effective, as most workers still recognize a need for training in multiple areas. This method may therefore not be ideal because the message gets diluted as it passes through multiple channels, and supervisors might demonstrate the tasks differently from one another.

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[3] C4 and C6 are excluded as no worker interviews were conducted there.

The company loses control by not having formal training or at least a training sheet to standardize the training and demonstrations.

6 Linkage to Job Instruction

Companies participating in this research have a significant training need and would benefit from implementing JI into their operations. A common challenge across these companies is an aging workforce, with many experienced employees nearing retirement, prompting the companies to seek ways to preserve valuable knowledge. Companies that have adopted JI cite this as a primary reason, for using experienced employees to create standardized training formats that ensure consistent operations.

Companies 1 to 6 require assistance with tricks training, error management, and understanding unknown terms. JI addresses all these issues. Companies 7 and 8 incorporate these areas into their task analysis sheets, emphasizing their training focus. Error training can alleviate the heavy workload of floor supervisors. Currently, when mistakes occur, workers often need to ask supervisors for help, even for common errors. If training addresses how to handle these frequent mistakes (a key point), workers will be better equipped to resolve issues independently. This is crucial as companies face a shrinking labor market, often hiring workers with limited experience. Improved training can help new hires learn tasks efficiently, reduce supervisor workload through error training, and improve quality consistency.

However, detailed WI can limit independent thinking and lead to automatic, error-prone behavior over time. With JI, companies can opt for less detailed WI, as the necessary knowledge is already imparted during training. This is evident in JI companies, where their WI either become less detailed or were already less detailed, with the specifics taught during training.

JI is not solely meant for new hires, it offers ongoing training for workers needing extra help or wanting to excel. JI allows workers to express interest in more challenging roles, such as operating heavy machinery, ensuring they receive the necessary training. Additionally, if workers are afraid of admitting they do not fully understand a task, the one-on-one attention in training ensures they fully grasp the task at hand. With JI, companies gain more control over task performance, reducing inconsistencies in the sequence of steps. This ensures that all workers perform tasks consistently and follow the same sequence of steps.

Part of the JI method involves evaluating the skill sets of employees. Many team leaders and supervisors already track the skills of their workers. As noted by several companies, supervisors understand which employees are capable of specific tasks and can identify potential in workers that may go unnoticed. Now, with formalized training programs available, supervisors can link workers to the appropriate training to develop their potential.

Implementing JI in social employment companies may present unique challenges. In C2, where workers generally have better cognitive abilities, implementing training provided for new employees and continuous training would likely be beneficial. However, for C4 and C6, the impact may be less clear. These workers may have difficulty focusing on extensive training sessions, and the tasks in these companies, particularly in C6, are often less complex, reducing the need for elaborate training programs. There is also uncertainty about whether these workers have the cognitive capacity to retain the information as intended by the JI method. The approach may need to be tailored to fit the specific context and needs of these companies.

Importantly while this research focused on eight companies, the benefits of JI could potentially apply to a broader range of organizations. Other companies facing similar challenges with an aging workforce, inexperienced employees, or the need for standardized training, could also benefit from implementing JI.

7 Discussion

7.1 Discussion of the Results and Theoretical Implications

The main objective of this research was to evaluate the current situation of the participating companies and assess the need for training, aiming to address inconsistency through the implementation of JI. The criteria for identifying training needs were based on existing literature related to WI and training. To address the research question, this study employs within-case analysis and comparative analysis. It also integrates the JI analysis presented in previous sections. This section will summarize the findings and compare them with previous research to validate or refine the assertions made in the literature.

Contextual factors, including employee characteristics such as age and experience, were examined to understand their impact on the responses provided. According to Wolfartsberger et al. (2019), as workers gain experience, their reliance on detailed WI decreases, and they are less prone to errors. However, despite many workers having extensive experience, there was still a strong call for error training, indicating ongoing mistakes. This may be attributed to the high level of job complexity, an aspect that deserves more attention. As highlighted by Kraiger and Ford (2021), before assigning workers complex tasks, job complexity should be assessed while considering worker's skills. If job complexity is high, then companies should provide more support to maintain a consistent level of work performance. While this study mentions the potential usefulness of JI in learning complex tasks by breaking them down into steps, it has not explored the variations in inconsistency between complex and simpler tasks within a company. Interestingly, Kraiger and Ford (2021) suggest assessing the learner's expertise level before designing training, a principle reflected in JI. This is also acknowledged in companies 1 to 6, where it is recognized that a significant portion of the inconsistency arises from differences in skill levels among workers. Some workers may struggle with more complex tasks due to insufficient skills. However, this suggests that with time and suitable training techniques, workers can develop the skills to handle more complicated tasks effectively.

Chapter four presented the current situation of the companies, highlighting their identified training needs, which were categorized into specific elements drawn from existing literature.

Research by BalaSeshan and Reddy (2020) emphasizes the necessity of equipping new employees with essential knowledge, aligning with this study's findings where "Unknown terms" and "No prior knowledge" were frequently cited as training priorities. With assembly lines facing a shrinking labor market, many companies are hiring employees with limited background knowledge, underscoring the need for tailored training programs. Slenders et al. (2020) also stress the importance of transferring expertise from experienced workers during JI, a sentiment echoed by employees across all companies in this study, particularly regarding the transmission of sensory-based tricks that defy simple written instruction.

For Companies 7 and 8, which followed the JI method developed by the TWI, training adhered closely to the principles outlined by Slenders et al. (2020). Experienced workers facilitated training sessions, ensuring the continuity of knowledge transfer. Both companies utilized key points and task analysis sheets derived from the expertise of experienced workers. These standardized formats guided trainers in teaching employees, promoting consistency among workers. This assertion is further supported by Kraiger and Ford (2021), who argue that workers benefit from introductory material that offers a structured framework, or example of what will be covered in the training. Such material aids in clarifying what needs to be learned and provides a reference point that workers can refer to when necessary (Slenders et al., 2020; Kraiger & Ford, 2021). By providing this structured approach, new employees are empowered to execute tasks accurately and consistently alongside their colleagues.

During the assessment of companies 1 to 6 and those implementing JI, the study explored the origins of inconsistencies and examined whether implementing JI could mitigate these issues. This issue aligns with findings from Slenders et al. (2020), who highlighted that companies adopting JI often struggle with standardization and task training. Inconsistencies in product quality and employee performance can stem from inconsistent or inadequate training in company standards, leading to variations in quality, procedural deviations, and disparities in time management (Slenders et al., 2020), all of which were observed in companies 1 to 6 during interviews. Moreover, companies with ambiguous or absent standards may inadvertently encourage misinterpretations, compounding inconsistency issues (Delin & Jansson, 2015). Many of companies 1 to 6 lack standardized worksheets, resulting in employees relying on personal interpretations, further exacerbating inconsistencies. Standardization emerges as a practical solution to promote uniformity across different

stations within a company, ensuring tasks are executed consistently regardless of location (Delin & Jansson, 2015). Companies 7 and 8 exemplify this approach by utilizing task analysis sheets developed by TWI, which comprehensively outline key training points to ensure a standardized approach across all workers.

In addressing the research question, implementing JI proves effective in combating inconsistency within companies. JI can effectively meet current training needs by providing structured and standardized task analysis sheets. These sheets outline essential key points, ensuring workers adhere to established procedures and minimize operational inconsistencies. Engaging experienced workers in constructing these sheets helps preserve critical knowledge across different generations, particularly with an aging workforce. Implementing JI reduces variability in task performance among workers, thereby improving consistency in both quality and task completion times. Moreover, supervisors can more effectively assess employee skill sets and potential, aligning them with suitable training sessions.

7.2 Practical implications

This study provides a comprehensive overview of the elements requiring training and investigates whether addressing these needs through JI implementation can reduce existing inconsistencies. This approach explores a gap not yet addressed in the current literature.[4]

Secondly, companies can use these results to inform their decision on implementing JI. This study provides compelling reasons for adopting JI, demonstrating how addressing training needs correlates with reducing inconsistencies. By implementing JI, companies can structure their training programs, ultimately fostering standardized work practices. This transition does not need to be immediate, they can start gradually, like C8, which recently adopted JI. This study demonstrates that identifying specific training needs and developing structured programs accordingly would be advantageous for maintaining consistent work performance.

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[4] To the best of the researcher's knowledge.

7.3 Limitations and future research

This research is subject to several limitations. One of these limitations stems from the uneven distribution of interviews among the participating companies, resulting in a lack of sufficient data for a coherent comparative analysis. This inconsistency arose primarily because three of the visited companies were social employment companies, significantly impacting the research's scope and comparative analysis. Ideally, having the same number of interviews at companies with similar contexts would have facilitated a better comparative analysis. Furthermore, future research could benefit from delving deeper into the context of social employment companies to determine if the implementation of JI would be effective in such settings.

Another limitation relates to the interview questions themselves, as not all workers fully grasped the questions, leading to varied and sometimes divergent responses. This unintentionally introduced biases into the interview data, affecting the accuracy and reliability of the findings. Additionally, a limitation arose from the inability to conduct in-person visits with the JI companies, necessitating online interviews due to time constraints. Conducting in-person visits and interviewing workers directly would have provided a deeper understanding of the role and effectiveness of JI in the companies.

Furthermore, there is a risk of personal biases influencing the interpretation of the interview results. The researcher's personal biases or preconceptions may inadvertently shape the interpretation of the data, potentially influencing the findings. In future studies, involving multiple researchers could enhance the reliability and validity of the findings by limiting personal biases and incorporating various perspectives.

Throughout the study, task completion times were mentioned, indicating how long workers took to complete their tasks. However, the optimal task completion time was never established. Future research could explore the relationship between assembly time and the best methods for performing tasks. This could provide more insight into the connection between time inconsistency and work performance.

8 Conclusion

This research addresses the question: *What are the training needs of assembly workers, and can these needs be addressed by implementing job instruction to reduce work performance inconsistencies?* Observations and interviews with six companies that solely relied on work instructions revealed multiple training needs, including tricks training, tools training, terminology training, error training, and new employee training. Additionally, inconsistencies were observed in time, quality, and sequencing of steps, often attributed to differences in workers' skill sets, preventing uniform performance levels. Subsequent analysis of companies 7 and 8 that implemented job instructions showed that job instruction helped concentrate and structure the knowledge and information necessary for effective training. It facilitated training for new employees and continuous training for workers with varying skill sets. The findings indicate that job instruction can address significant training needs and help reduce inconsistencies. Overall, job instruction offers a structured approach to training that can standardize operations and preserve essential knowledge. While the implementation of job instruction may require adjustments to suit specific company contexts, its potential benefits in reducing inconsistencies and improving training effectiveness are clear.

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Appendix

Appendix A Job instruction four-step method by TWI

Steps	Explanation	Actions
Step 1: Prep the Employee	The instructor preps the employee on the task they are about to learn.	- Reassure the person. - Investigate what the person already knows. - Put the person in the right position to perform the task.
Step 2: Present the Task	The instructor presents the task three times each time with additional information.	- Explain, demonstrate, and elaborate: one important step at a time. - Repeat with emphasis on the core points.
Step 3: Execute the task	The employee will execute the task at least four times.	- Let the person perform the task, immediately correct errors. - Have the task performed again and explain important steps. - Have the person explain the why of the core points while performing the task again.
Step 4: Follow-up	Instructor and employee make agreements regarding the follow-up of the training.	- Allow the person to perform the task independently. - Inform them who they can turn to for help. - Encourage the person to ask questions. - Regularly check the progress.

Table A.1: Job Instruction four-step method by TWI institute. (Slenders et al., 2020 p.42-43)

Appendix B Elements table

The previous section discussed various elements and their inclusion in training programs versus work instructions. Before proceeding, it is essential to clarify what specific elements are being referred to. To achieve this, the literature was reviewed to identify recurring elements commonly found in either work instructions or training programs. This review will form the foundation for the relevant considerations in the later stages of the research.

Elements were grouped into content categories to identify overarching themes. The first category, "Instruments," covers workbench familiarity, assessing workers' familiarity with their workstations, and tool/object usage, focusing on tools needed for product assembly. The second category, "Task Execution," examines how workers utilize their work instructions and can help identify areas where the instructions may lack clarity.

The category "structural presentation" assesses work instruction structure. Complexity evaluation considers how instructions address complex tasks and workers' need for additional guidance. Interpretation examines workers' interpretations of instructions, if there is extensive interpretation this could potentially lead to inconsistency in workers' work performance (Delin & Jansson, 2015). Time duration and error rates serve as performance indicators, reflecting workers' competency and adherence to instructions. Time duration refers to workers' adherence to task completion timelines, while error rates measure how often mistakes happen.

Lastly, the "Knowledge" category explores how companies accommodate workers with diverse skill sets. It considers whether instructions adapt to varying employee backgrounds and whether technical terms are adequately explained in instructions. Table 2 presents the list of elements along with their corresponding references.

Content / Elements definition		Reference
Instruments	Workbench familiarity	Eversberg & Lambrecht, 2023; Uva et al., 2016; Lai et al., 2020
	Tool/object	Eversberg & Lambrecht, 2023; Uva et al., 2016
	Tools position	Funk et al., 2017; Lai et al., 2020
Task Execution	Sequencing of the steps	Södderberg et al., 2014; BalaSeshan & Reddy, 2020
	Relationship/Connections (between objects)	Kraiger & Ford, 2021; Södderberg et al., 2014
	Deviations	Wolfartsberger et al., 2019;
	Tricks	Kraiger & Ford, 2021; Slenders et al., 2021
Structural presentation	Level of detail	Vanneste et al., 2023;
	Complexity	Wolfartsberger et al., 2019; Kraiger & Ford, 2021
	Interpretation	Delin & Jansson, 2015
Performance Metrics	Time Duration	Kraiger & Ford, 2021; Funk et al., 2015; Willschut et al., 2019

	Error (Training)	Kraiger & Ford, 2021; Samopa et al., 2017
Knowledge	New vocabulary	Kraiger & Ford, 2021; BalaSeshan & Reddy, 2020
	Different Skill sets	Vanneste et al., 2023; Wilschut et al., 2019

Table B.1: Elements table

Appendix C Interview Protocol

1	**Gesprek met werkleider/teamleider van de werkplekken die geobserveerd worden.**

Inleiding:

Ten eerste, heel erg bedankt voor uw bereidheid om deel te nemen aan dit onderzoek. Het doel van dit gesprek is om meer helderheid te krijgen over hoe binnen jullie organisatie wordt omgegaan met training en werk instructies. Als u geen verdere vragen heeft, kunnen we nu van start gaan. De identiteit van de respondenten blijft anoniem en de inhoud van het interview zal vertrouwelijk worden behandeld. Mag ik tot slot dit gesprek opnemen?

1.1 Work performance inconsistency

1. Zijn er aanzienlijke inconsistenties (volgorde van taken, tijdsduur, kwaliteit) in de uitvoering van het werk indien verschillende werknemers worden vergeleken die hetzelfde werk doen, en zo ja, wat denkt u dat de oorzaken daarvan zijn?
2. Denkt u dat de werkinstructies zorgen voor consistentie in de werkuitvoering'? Waarom wel/niet? (Inconsistentie in snelheid, kwaliteit)

1.2 Standardized werk procedures

--> Definitie: Gestandaardiseerd werk (SW) is een nauwkeurig gedocumenteerd en visueel systeem van stappen die in een bepaalde volgorde worden uitgevoerd om zo efficiënt mogelijk te produceren. Het doel is om consistentie te creëren en te behouden voor de eindproducten (Graupp, 2023, definitie van de TWI).

1. Zijn er gestandaardiseerde werkprocedures binnen uw organisatie? (SOP, TAS)
2. Helpen deze gestandaardiseerde werkprocedures bij het begrijpen van de werkinstructies?

1.3 Beheer van de werk instructies

1. Wie hebben er een rol bij het opstellen en beheren van werkinstructies?
2. Welke rol speelt technologie bij het opstellen, uitvoeren en beheren van de werkinstructies binnen u organisatie?
3. Hoe wordt de volgorde van assemblagetaken momenteel bepaald?
4. Zijn er keuzes betrokken bij het vaststellen van de volgorde van assemblagetaken? Indien ja, welke factoren beïnvloeden deze keuzes?
5. Hebben deze keuzes consequenties voor de prestaties van de assemblage? Zo ja, op welke manieren?

1.4 Ontvangst en opvolging van werkinstructies

1. Hoe ontvangt u de werkinstructies voor de medewerkers?
2. Wat zijn de meest voorkomende obstakels die u tegenkomt bij het handhaven van de instructies op de werkvloer? En hoe lost u dit op?
3. Begrijpen werknemers de logische volgorde en prioriteiten in werk instructies?

1.5 Afstemming met training en ontwikkeling

1. Worden er trainingen gegeven aan medewerkers?
   1.1. Zo ja, Hoe zorgt u ervoor dat de werkinstructies aansluiten bij de trainingen en ontwikkelingen van de medewerkers?
2. Hoe gaat u om met situaties waarin de werkinstructies niet aansluiten bij de behoeften en/of de kundigheid/expertise van de medewerker?

1.6 Aanpassing en evaluatie van werkinstructies

1. Kunnen de werknemers de werkinstructies veranderen nadat ze er problemen mee ervaren?
   1.1. Zo ja, hoe worden werkinstructies bijgesteld/gewijzigd op basis van feedback van de medewerkers?
2. Hoe worden medewerkers op de hoogte gesteld van de wijzigingen in de werkinstructies?
3. Hoe wordt de effectiviteit van de werkinstructies in de gaten gehouden en geëvalueerd?
   3.1. Is het mogelijk om de effectiviteit te verbeteren door het aanpassen van de vorm of logische volgorde van werkvoorschriften?

2	Interviews met workers

Inleiding:
Ten eerste, heel erg bedankt voor uw bereidheid om deel te nemen aan dit onderzoek. Het doel van dit gesprek is om meer helderheid te krijgen over hoe binnen jullie organisatie wordt omgegaan met training en werk instructies. Als u geen verdere vragen heeft, kunnen we nu van start gaan. De identiteit van de respondenten blijft anoniem en de inhoud van het interview zal vertrouwelijk worden behandeld.. Mag ik tot slot dit gesprek opnemen?

2.1 Contextuele vragen
1. Wat is uw leeftijd?
2. Wat is uw hoogst voltooide opleidingsniveau?
3. Hoe lang werkt u al binnen deze organisatie en binnen uw huidige functie?
4. Hoeveel jaar werkervaring heeft u tot nu toe opgebouwd, inclusief eerdere banen?
5. Heeft u naast uw opleiding nog andere specifieke trainingen of cursussen gevolgd die gericht waren op het beter uitvoeren van uw werk?
6. Heeft u ooit moeite gehad met het begrijpen van geschreven werk instructies vanwege uw taalvaardigheid?
7. Heeft u ooit gemerkt dat begrijpend lezen u hindert bij het correct uitvoeren van taken op basis van geschreven instructies?

2.2 Verantwoordelijkheid en presentatie van werk instructies:

1. Wie is er verantwoordelijk voor het maken en verspreiden van de werkinstructies binnen uw afdeling?
2. Hoe ontvangt u werkinstructies / Hoe worden de werk instructies aan u gepresenteerd? (Tekstuele vorm, visueel, als audio-instructies) en met welke technologie (papier, beeldscherm, projectie, …). Wat vindt u van deze manier?
3. Zijn de werkinstructies die u ontvangt specifiek afgestemd op uw behoeften (gepersonaliseerd), of krijgt iedereen dezelfde werkinstructie?
4. Wat is het eerste wat u doet na het ontvangen van een werkinstructie en waarom?
5. Welke soorten werkvoorschriften heeft u gebruikt? Heeft u een voorkeur?
6. Verschilt uw voorkeur voor de presentatie van werkinstructies nog in bepaalde omstandigheden? Bijvoorbeeld bij nieuwe / bekende producten? Of naar aanleiding van uw ervaring binnen het bedrijf? Dus in het begin andere voorkeuren dan nu?
7. Wat voor verschillen merkt u tussen de verschillende vormen? Wat zijn voordelen / nadelen van deze vormen?

2.3 Structuur en elementen van werk instructies:

1. Is er een vaste structuur voor de inhoud van werkinstructies die u ontvangt?
   1.1. Zo ja, wat zijn de gebruikelijke elementen die daarin voorkomen en in welke volgorde staan ze meestal? (Elementen = stapsgewijze instructies, gereedschappen, stuklijsten, kwaliteitschecks)
   1.2. Kunt u voorbeelden geven van de typische elementen die u tegenkomt in werkinstructies?
2. Wat is voor u een prettige verhouding tussen afbeelding en tekst?
3. Wat zijn de verschillen tussen instructiestappen en controlestappen?
4. Welke andere soorten stappen zijn er naast instructiestappen, controlestappen en eventueel afstelstappen? (afstellen/instellen van waardes op eventuele machine).
5. In hoeverre komen er in de instructies "nieuwe" handelingen / processen voor? Bepaalde acties waarvoor de instructie echt nodig is / waar de instructie de handeling als het ware aanleert?
6. Worden de instructies gekoppeld aan een specifiek product, werkplek of activiteit?
   6.1. Worden ze bijvoorbeeld meegeleverd met het product of zijn er aparte werk instructies voor verschillende werkplekken of activiteiten?
7. Staat in de werk instructies de optimale tijdsduur voor het uitvoeren van taken? (zoals takt time of cyclustijd)
8. Staat in de werk instructies technieken om fouten te identificeren en/of te behandelen?
9. Staat in de werk instructies gebruik van tools of specifieke objecten die nodig zijn voor het uitvoeren van taken? (Denk hierbij aan aspecten zoals kennis van de werkomgeving, hoe tools worden gepositioneerd of gebruikt, en andere objectspecifieke informatie)
10. Hebben de werkinstructies altijd benodigdheden?
11. Is er een onderscheid in verschillende soorten benodigdheden? (Denk aan materiaal en gereedschap).
12. Staan benodigde materialen altijd vooraan een werkinstructie? Of door de hele werkinstructie heen, bijvoorbeeld bij elke stap?
13. Welke rol speelt technologie bij het gebruiken van de werkinstructies binnen u organisatie?
14. Hoe zou u deze indeling en inhoud beoordelen? Zijn er delen die als overbodig zouden kunnen worden beschouwd of zijn er delen die missen?

2.4 Level of detail van de werk instructies

1. In hoeverre krijgt u ruimte voor eigen interpretatie bij het hanteren van de werk instructies? E.g. Moeten de instructies precies worden opgevolgd of worden er ook wel eens trucjes gebruikt door de werknemer om het proces sneller te maken?
   1.1. In hoeverre zijn de werk instructies gedetailleerd? Biedt de beperktheid aan details ruimte voor interpretatie?
2. Worden er ook quality checks gedaan tussen het produceren door?
3. Zijn er handelingen/ verplichtingen/ inhoud in de instructies die het werk voor u juist belemmeren / moeilijker maken? Zo ja, wat? (Voorbeelden)
4. Hoe zou dit makkelijker/ beter gedaan kunnen worden?

2.5 Algemene meningen over de instructies en Feedback:

1. Wat is in het algemeen uw mening over de werkinstructies die worden gebruikt binnen het bedrijf?
2. Wat zijn voor u aspecten /wensen/ verwachtingen die u graag binnen een instructie ziet?
3. In hoeverre voldoen de huidige instructies aan uw wensen en verwachtingen? Waarom deze verwachtingen?
4. Wat doet u als iets in een werkinstructie niet klopt, onvolledig is, anders of beter kan?
5. Is er een mogelijkheid in u bedrijf om feedback of verbeterpuntjes door te geven?
6. Worden jullie betrokken in het maakproces van de werkinstructies? Zo ja, op welke manier?
7. Hoe ontvangt u wijzigingen of updates in de werkinstructies? En hoe gaat u hiermee om?

2.6 Gebruik en afwijking van werkinstructies

1. Hoe gaat u aan de slag met het in elkaar zetten/maken van een product? Gebruikt u hierbij de werkinstructie? Zo ja, hoe? Zo nee, wat doet u dan?
2. Wat is uw leerproces voor werkinstructies?
3. Wijkt u weleens af van de werkinstructies? Wat zijn situaties of redenen waarom u afwijkt van de werkinstructies?
4. Welke ondersteuning, techniek of aanvullende informatie heeft u nodig bij het gebruiken van de werkinstructies?
5. Wat is volgens u het doel van de werkinstructies?
6. Hebben de instructies voor u nut tijdens de werkzaamheden? Waarom wel / niet?
7. In welke mate heeft u de instructies nodig voor het begrijpen van de werkzaamheden? Nodig voor de handelingen (taken) of voor proces (volgorde)? Of iets anders?
8. Weet uof er verschillen in voorkeuren zijn tussen collega's voor hoe instructies worden weergegeven?

2.7 Omgaan met externe & interne factoren

1. Hoe gaat u om met tijdsdruk in uw werk?
2. Hoe gaat u om met afleidingen of onderbrekingen tijdens uw werk/het volgen van de werkinstructies?
3. Hoe gaat u om met onduidelijkheden in de werkinstructies?
4. Ervaart u op dit moment moeilijkheden bij bepaalde stappen of handelingen van de werk instructies die duidelijker hadden moeten worden uitgelegd?
   4.1. Zo ja, kunt u aangeven wanneer deze moeilijkheden zijn ontstaan, bijvoorbeeld toen u net begon met dit proces, of bij de introductie van een nieuw product, of nieuwe instellingen, of …?
   4.2. En hoe verschilde dit van uw ervaring toen u net begon in deze functie?
5. Hebt u ooit nieuwe of onbekende termen of taalgebruik aangetroffen in werk instructies of in de beschrijving van gereedschap?
   5.1. Zo ja, heeft u daarbij problemen ervaren bij het begrijpen of uitvoeren van taken? Kunt u voorbeelden geven?

2.8 Standardized werk procedures
☐ Definitie: Gestandaardiseerd werk (SW) is een nauwkeurig gedocumenteerd en visueel systeem van stappen die in een bepaalde volgorde worden uitgevoerd om zo efficiënt mogelijk te produceren. Het doel is om consistentie te creëren en te behouden voor de eindproducten (Graupp, 2023, definitie van de TWI).

1. Zijn er gestandaardiseerde werkprocedures binnen jouw organisatie? (SOP, TAS)
2. Helpen deze gestandaardiseerde werkprocedures met het begrijpen van de werk instructies?

Section 2.9
Training (indien aanwezig)
☐ Definitie: Trainingen binnen het kader van assembly werk zijn gericht op het verbeteren van de vaardigheden en kennis van werknemers om hun taken effectief uit te voeren, evenals het leren omgaan met nieuwe machines of apparatuur die relevant zijn voor hun werkzaamheden. Voorbeelden van trainingen:
  i.   **Taakspecifieke-training:** Training gericht op het aanleren van specifieke taken binnen het assemblageproces, zoals het monteren van onderdelen, solderen, of kwaliteitscontroles uitvoeren.

ii. **Machine en apparatuur-training**: Training om werknemers te leren hoe ze verschillende machines en apparatuur moeten bedienen en onderhouden die worden gebruikt in het assemblageproces, zoals robots, CNC-machines, of specifieke gereedschappen.

iii. **Veiligheidstraining:** Training gericht op het veilig uitvoeren van taken binnen het assemblageproces, inclusief het gebruik van persoonlijke beschermingsmiddelen, veilig omgaan met gevaarlijke materialen en het herkennen van veiligheidsrisico's.

iv. **Probleem oplossing-training**: Deze training richt zich op het effectief identificeren, analyseren en oplossen van problemen die zich kunnen voordoen tijdens het assemblageproces. Het leert werknemers vaardigheden zoals het herkennen van afwijkingen, het stellen van de juiste vragen en het implementeren van oplossingen om herhaling van fouten te voorkomen.

v. **Kwaliteits-training:** Training om werknemers te leren hoe ze de kwaliteit van producten kunnen waarborgen tijdens het assemblageproces, inclusief het identificeren van defecten, het uitvoeren van inspecties en het volgen van kwaliteitsrichtlijnen.

Algemene Training Informatie:
1. Worden deze bovenstaande trainingen gegeven binnen uw werkafdeling?
   1.1. Wat voor soort trainingen worden gegeven en door wie?
2. Wanneer worden de trainingen gegeven en hoe vaak?

Aanpassing aan Werkplek en Taken:
1. Op welke manier worden de trainingen afgestemd op de taken en verantwoordelijkheden van werknemers op de werkplek?
2. Worden de trainingen gekoppeld aan een specifiek product, werkplek, activiteit of aspect?
   1.1. Welke onderwerpen worden behandeld op deze trainingen? Wat voor leerdoelen worden behandeld op deze training?

Detailniveau en Instructies:
1. Hoe gedetailleerd zijn de trainingen vergeleken met de werkinstructies?
   1.1. Heeft u het gevoel dat na de trainingen de werk instructies op het gebied van de training minder gedetailleerd zouden kunnen zijn? (Zoals op het gebied van instellen van een tool)
2. Werden er tijdens de trainingen richtlijnen gegeven met betrekking tot de optimale tijdsduur voor het uitvoeren van taken? (zoals takt time of cyclustijd)

Specifieke Trainingstechnieken:
1. Welke specifieke technieken of methoden werden tijdens de training behandeld om fouten te identificeren en/of te behandelen die u anders niet zou hebben geweten als u direct op de werkplek was begonnen aan het product?
2. Werd er tijdens de training aandacht besteed aan het gebruik van tools of specifieke objecten die nodig zijn voor het uitvoeren van taken, en hoe verschilt dit van wat u zou hebben geleerd als u direct op de werkplek was begonnen?
3. Werd tijdens de training aandacht besteed aan het niveau van detail dat nodig is bij het uitvoeren van taken, en hoe verschilt dit van wat u zou hebben geweten als u direct op de werkplek was begonnen?
4. Worden er tijdens de training trucjes of handige tips aangeleerd om stappen sneller onder de knie te krijgen, die anders niet zouden zijn overgebracht als u direct op de werkplek was begonnen?

Evaluatie en Verbetering:
1. Heeft u tijdens de training moeilijkheden ervaren bij bepaalde stappen of handelingen die duidelijker hadden moeten worden uitgelegd?
2. Heeft de training nieuwe concepten of procedures geïntroduceerd die niet zijn behandeld in de werkinstructies?

3. Zijn er tijdens de training specifieke tips of best practices gedeeld die niet worden genoemd in de werkinstructies?

Work performance inconsistency
1. Zijn er aanzienlijke inconsistenties (volgorde van taken, tijdsduur, kwaliteit) van het werk onder de werknemers, en zo ja, wat denkt u dat de oorzaken daarvan zijn?
2. Denkt u dat uw werkinstructies zorgen voor consistentie in de werkuitvoering'? Waarom wel/niet? (Inconsistentie in snelheid, kwaliteit)
3. Welke specifieke effecten heeft de training gehad op de uitvoering van uw werkzaamheden?
    1.1. Heeft u bijvoorbeeld gemerkt dat uw snelheid of kwaliteit van werken is verbeterd na de training?

3	Interview met makers van werkinstructies en/of trainingen

Inleiding:
Ten eerste, heel erg bedankt voor uw bereidheid om deel te nemen aan dit onderzoek. Het doel van dit gesprek is om meer helderheid te krijgen over hoe binnen jullie organisatie wordt omgegaan met training en werk instructies. Als u geen verdere vragen heeft, kunnen we nu van start gaan. De identiteit van de respondenten blijft anoniem en de inhoud van het interview zal vertrouwelijk worden behandeld. Mag ik tot slot dit gesprek opnemen?

Algemene vragen:
Kunt u uzelf kort voorstellen en benoemen wat uw achtergrond is en huidige positie?

3.1 Contextuele factors vragen:
1. Wat is uw hoogst voltooide opleidingsniveau?
2. Hoe lang werkt u al binnen deze organisatie en binnen deze functie?
3. Hoeveel jaar werkervaring heeft u tot nu toe opgebouwd, inclusief eerdere banen?
4. Heeft u naast uw opleiding nog andere specifieke trainingen of cursussen gevolgd die gericht waren op het beter uitvoeren van uw werk?

Maker van Werk instructies
3.2 Trainingen en Werkinstructies:
1. Worden er binnen het bedrijf trainingen gegeven? (e.g. Taakspecifieke-training, Machine en apparatuur-training, Veiligheidstraining, Probleem oplossing-training, Kwaliteits-training)
2. Wie is verantwoordelijk voor het ontwikkelen en verzorgen van trainingen binnen de organisatie?
3. Is de persoon die verantwoordelijk is voor de trainingen ook betrokken bij het opstellen van werkinstructies?

3.3 Ontwikkeling van Werkinstructies:

1. Hoe komt de aanvraag voor het ontwikkelen van een werkinstructie binnen? En vanuit wie komt deze aanvraag? Of besluit de opsteller dat zelf?
2. Wanneer u werk instructies ontwikkelt, baseert u deze dan op persoonlijke ervaring door de handeling zelf uit te voeren, of vertrouwt u voornamelijk op andere bronnen voor het verzamelen van informatie?
    2.1. Hoe verzamelt u informatie om werkinstructies te maken? Baseert u zich voornamelijk op persoonlijke ervaring, input van experts, observaties op de werkvloer of andere bronnen?
3. Worden de werk instructies op maat gemaakt voor specifieke functies of afdelingen binnen het bedrijf, of zijn ze universeel en van toepassing op alle werknemers?
4. Houdt u bij het maken van werkinstructies rekening met trainingen die aan medewerkers worden gegeven?
5. Hoe lang bent u meestal bezig met het opstellen van een werkinstructie?

6. Is de presentatievorm altijd hetzelfde, of hangt dat af van bepaalde factoren? Zo ja, waar hangt dat dan vanaf?
7. Hoe zou u een goede werkinstructies definiëren?
8. Hoe wordt de effectiviteit van de werkinstructies in de gaten gehouden en geëvalueerd? En zou u de instructies dan later nog aanpassen?

3.4 Technologie en Werkinstructies:

1. Welke technieken, software of hulpmiddelen zet u in bij het ontwikkelen van werkinstructies? Zijn er richtlijnen voor bijv. taalgebruik, het gebruik van afbeeldingen, zijn er templates beschikbaar waarin de instructies gemaakt kunnen/moeten worden?
2. Welke rol speelt technologie bij het opstellen, uitvoeren en beheren van de werkinstructies binnen uw organisatie?

3.5 Inhoud en Personalisatie van Werkinstructies:

1. Op welk gedeelte van het proces richt de werk instructies zich? (Het volledige proces, Taken, Activiteiten). En waarom wordt hiervoor gekozen?
2. Hoe zorgt u ervoor dat de werkinstructies begrijpelijk zijn voor verschillende niveaus van ervaring en vaardigheden bij de operators?
3. Worden de instrumenten voor de handelingen uitgelegd in de werkinstructies? Waarom niet of wel? (Denk hierbij aan aspecten zoals kennis van de werkomgeving, hoe tools worden gepositioneerd of gebruikt, en andere objectspecifieke informatie)
4. Welke elementen worden meegenomen in de werk instructies en waarom zijn juist deze belangrijk? (Denk aan tijdsindicatie, volgorde, errors, nieuw taalgebruik)
5. Kunt u de volgorde van elementen/informatie beschrijven binnen een werkinstructie, van het meest tot het minst belangrijke?

3.6 Uitvoering en Flexibiliteit van WerkInstructies:
1. Hoe gaat u om met situaties waarin werknemers afwijken van de werk instructies?
2. Zijn er momenteel kwaliteitscontroles opgenomen in de werkinstructies? Zo ja, waarom? Zo nee, waarom niet?
3. In hoeverre krijgt de werknemer ruimte voor eigen interpretatie bij het hanteren van de werk instructies? Bijvoorbeeld, moeten de instructies worden gevolgd of mogen er ook trucjes worden gebruikt om het proces sneller te maken?
   3.1. In hoeverre zijn de werk instructies gedetailleerd? Biedt de beperktheid aan details ruimte voor interpretatie?

3.7 Aanpassing en Criteria van Werk Instructies:
1. Hoe komen de werkinstructies bij de operators op de werkplek terecht? Wat voor techniek wordt hiervoor ingezet?
2. Hoe communiceert u eventuele wijzigingen of updates binnen de werkinstructies naar de operators?
3. Geeft u werknemers de mogelijkheid om werkinstructies te wijzigen of te verbeteren? Heeft u overwogen om werknemers deel van de werkinstructie zelf te laten maken, of gebeurt dat al?
4. Nadat u een werkinstructie hebt voltooid, besteedt u dan tijd aan het analyseren en verbeteren van de werkinstructie op basis van de prestaties van de werknemer? Hoe ziet de feedbackloop eruit?

3.8 Standardized work procedures
1. Welke rol speelt standaardisatie in het ontwikkelen van werk instructies? Hoe zorgt u ervoor dat de instructies consistent zijn en dezelfde resultaten opleveren, ongeacht wie ze uitvoert?

2. Hoe worden standaardwerkmethoden vastgesteld en gedocumenteerd binnen uw organisatie?
3. Hoe wordt de naleving van gestandaardiseerde werkmethoden gemeten en gecontroleerd op de werkvloer?

Section 3.8
Informatie Verzamelen en Analyse:
1. Hoe verzamelt u informatie om trainingen te maken? Baseert u zich voornamelijk op persoonlijke ervaring, input van experts, observaties op de werkvloer of andere bronnen?
2. Hoe zorgt u ervoor dat de trainingen aansluiten bij de werk instructies van de werknemer?

Inhoud en Structuur van Trainingen:
1. Hoe bepaalt u de inhoud en structuur van de trainingen?
2. Op welke manier identificeert u de trainingsbehoeften van werknemers voordat u begint met het ontwikkelen van trainingsmateriaal?

Trainingsbehoeften:
1. Worden de trainingsbehoeften van werknemers op individueel niveau geïdentificeerd, of worden er algemene behoeften vastgesteld die van toepassing zijn op alle werknemers binnen een bepaalde afdeling?
2. Als er individuele trainingsbehoeften worden geïdentificeerd, op welke manier worden deze bepaald?
3. In hoeverre zijn de trainingen gedetailleerd? Biedt de beperktheid aan details ruimte voor interpretatie?

Instrumenten en Elementen in Trainingen:
1. Worden de instrumenten voor de handelingen uitgelegd tijdens de trainingen? Waarom niet of wel? (Denk hierbij aan aspecten zoals kennis van de werkomgeving, hoe tools worden gepositioneerd of gebruikt, en andere objectspecifieke informatie)
2. Welke elementen worden meegenomen in de trainingen en waarom zijn juist deze belangrijk? (Denk aan tijdsindicatie, volgorde, errors, nieuw taalgebruik)
3. Tijdens de trainingen wordt er gedacht aan de complexiteit van bepaalde stappen/handelingen? Wordt er meer aandacht besteed aan moeilijkere stappen?
4. Worden er tijdens de trainingen trucjes (kneepjes van het vak) aangeleerd die werknemers helpen om de taken sneller en efficiënter uit te voeren?

Work performance inconsistency
1. Zijn er prestatie-indicatoren of andere maatregelen die worden gebruikt om de impact van de instructies te evalueren?
2. Zijn er aanzienlijke variaties in de uitvoering van het werk onder de werknemers, en zo ja, wat denkt u dat de oorzaken daarvan zijn?
3. Wat was de impact van werk instructies op de werk uitvoering? (inconsistentie in snelheid, kwaliteit etc)
4. Wat was de impact van training op de werk uitvoering? (inconsistentie in snelheid, kwaliteit etc)

Personaliseerde trainingen en/of werk instructies

1. In hoeverre wordt personalisatie overwogen bij het ontwikkelen van werk instructies en/of trainingen binnen uw organisatie?
   1.1. Als er geen gebruik wordt gemaakt van personalisatie waarom niet?

1.2. En als er wel gebruik wordt gemaakt van personalisatie op welke variabelen wordt de personalisatie dan op gebaseerd? (E.g. Specifieke methoden die worden gebruikt om de werk instructies en trainingen aan te passen aan de individuele behoeften en vaardigheden van werknemers)

2. Welke persoonlijke kenmerken zijn relevant voor het personaliseren van werk instructies (bijvoorbeeld leeftijd, werkervaring, kwalificaties, enzovoort)?

   2.1. En voor trainingen?

3. Wordt personalisatie beschouwd als een prioriteit bij het ontwikkelen van trainingsprogramma's, of wordt het eerder als optioneel beschouwd?

4. Zijn er voorbeelden waarbij het implementeren van gepersonaliseerde werk instructies of trainingen heeft geleid tot verbeterde prestaties of betrokkenheid van werknemers?

5. Hoe wordt de balans gevonden tussen het bieden van gepersonaliseerde instructies en het behouden van consistentie en uniformiteit binnen het bedrijf?

6. Als bedrijven personalisatie willen implementeren, geven ze dan de voorkeur aan op maat gemaakte werkinstructies, individuele trainingen, of een combinatie van beide?

7. Wordt er tijdens het maken van de werkinstructies gedacht aan de complexiteit van bepaalde stappen/handelingen? Wordt er meer aandacht besteed aan moeilijkere stappen?

8. Hoe incorporeert u de moeilijke stappen in de werk instructies

4	**Follow-up interview met makers van job instruction**

Section 4.1

1. Wordt er binnen jullie organisatie nu nog veel gebruik gemaakt van werk instructies?

2. Wat was voorheen de inhoud en structuur van de werk instructies? En nu?

3. Was er veel variatie in de werkuitvoering van de werknemers toen het bedrijf alleen gebruikmaakte van werk instructies?

4. Hoe is het gebruik van Werk Instructies veranderd na het inzetten van Job Instructies?

   a. Is het gebruik/detail van werk instructies verminderd nu dat er training zijn?

5. Wat zijn de effecten van Job instruction op de structuur en inhoud van de werk instructies?

6. Wat zijn de effecten van Job Instruction op de variatie van werk uitvoering van de werknemers? (inconsistentie in snelheid, kwaliteit, volgorde etc)

7. Wat is het grootste verschil in de variatie van werkuitvoering tussen de tijd dat jullie alleen werk instructies gebruikten en nu, met het gebruik van Job Instruction?

Appendix D Contextual factors table for companies 1 to 6

There is a slight variation in the ages of workers across the companies. However, C1 and C5 employ the oldest workers, while C3 and C2 have the youngest workforce. This age discrepancy may impact responses regarding the use of WI and the willingness to undergo new training initiatives. Older workers recognize the need for training more acutely, as they observe how lost newer workers can be and reflect on their own experiences. They note that current workers would benefit from training, as they are now performing tasks differently than initially demonstrated. Additionally, they support the idea that companies should incorporate more input from experienced workers to guide younger employees.

Contextual factors Average	Workers	C1	C2	C3	C4	C5	C6
Age	51,18	59,66	52,5	27	x	56,2	x
Job title	Production /Assemble Employee	Assemble employee	x	Production Employee	x	x	x
Education	LTS	MAVO	LTS/Timmermans	MBO	x	LTS/MBO	x
Work experience (years)	7,6 years	5,5	14,25	6 jaar	x	9	x
Total work experience (years)	29,125	41	x	10,5	x	32,5	x
Language skills	None trouble with their language	None trouble with their language	None trouble with their language	None trouble with their language	x	None trouble with their language	x
Reading skills	Little trouble with their reading	None to little trouble with reading	Little trouble with reading	No trouble with reading	x	None to little trouble with reading	x

Table D.1: Contextual factors workers C1-C6
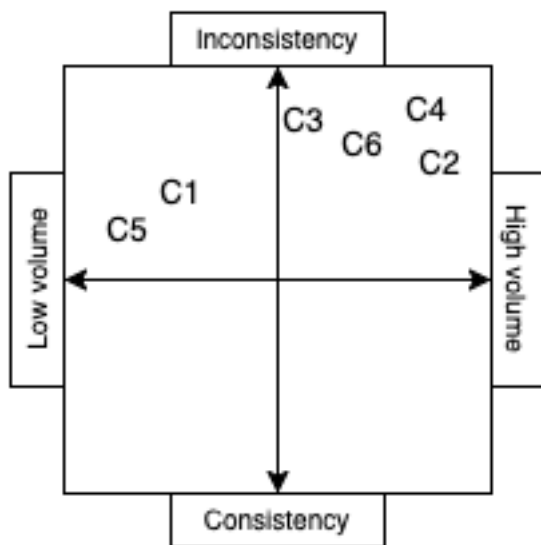
Appendix E Quadrant of inconsistency and volume of companies 1 to 6

Figure E.1: Inconsistency and volume quadrant