

**Idea development on the shop floor:
A case study on a digital employee suggestion system**

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Abstract

Purpose – Although employee suggestion systems (ESS) have been studied, little is known about shop floor workers' participation in a digital ESS in the context of limited digital access. Therefore, this study aims to investigate which factors shape the participation of shop floor workers in a digital ESS.

Design/methodology/approach – The author conducted a single case study with 20 semi-structured interviews, observations, and desk research.

Findings – The study finds several factors that shape shop floor workers' participation in a digital ESS. Digital access is found to be a necessary but not sufficient condition for successful participation in an ESS – also digital skills matter. Furthermore, it seems to be group access that matters instead of individual digital access. Generally, idea generation is found to be a group activity that can be enabled by supervisor support, training opportunities, face-to-face communication and by having dedicated idea generation experts, so-called ESS representatives, in a team. Also, the environmental and organizational context, such as the working environment or the Covid-19 pandemic influence the participation in a digital ESS.

Practical implications – The results of this study offer practical insights for organizations that aim to foster shop floor workers' participation in a digital ESS.

Originality/value – A conceptual model is introduced that summarizes the findings and outlines the factors that shape shop floor workers' participation in a digital ESS.

Keywords - Employee suggestion systems (ESS), Idea management, digital access, corporate digital divide, shop floor innovation

1. Introduction

Current trends in the manufacturing sector - such as the focus on productivity, environmental protection, and efficient use of energy - make innovations driven by shop floor employees more critical than ever (Høyrup, 2010; Thom, 2015). Innovations driven by shop floor employees have several advantages for companies. For instance, research has shown that it is essential to use employees' knowledge and ideas for continuous improvement processes (CIP) (Galeazzo & Furlan, 2021). In addition, employees can not only be a source for incremental innovations and cost savings, but also for more radical innovations that help the business remain competitive (Lasrado, Gomiseck & Uzbeck, 2017). Many large organizations use idea management programs to profit from innovative ideas by their normal employees instead of only focussing on R&D for innovation. For instance, case studies about of firms such as Allianz, SAP, and Shell show that idea management programmes are important sources of innovation for companies (Banbya & Leidner, 2018; Fairbank et al., 2003; Van Dijk & Van den Ende, 2002). The benefits of such programs are manifold; advantages range from financial benefits, such as cost savings and higher productivity and profitability levels, greater satisfaction among employees and customers, to higher safety and security standards (Gerlach & Brem, 2017; Lasrado et al., 2016). For instance, Banbya and Leidner (2018) estimate that Allianz UK has generated a £20 million annualized benefit with its idea management program that has generated more than 41.000 ideas (Leidner & Banbya, 2018). These figures demonstrate how powerful an idea management program can be. Yet it is often not on the radar of top executives. Hence, using suggestions by employees is a powerful yet often undervalued management tool (Du Plessis, 2016).

Researchers from different backgrounds have developed a variety of concepts to describe and analyse how employees can contribute to innovations within companies – including employee driven-innovation (EDI), innovative work behaviour (IWB), internal crowdsourcing, idea management, and employee suggestion systems (ESS) (Du Plessis, 2016; Fairbank & Williams, 2001; Gerlach & Brem, 2017; Høyrup, 2010; Lasrado et al., 2016; Leidner & Banbya, 2018). Although these different research streams essentially deal with similar issues, they have emerged relatively independent from each other. This study draws on the literature on idea management (Gerlach & Brem, 2017, Thom, 2015) and employee suggestion systems (Fairbank & Williams, 2001; Lasrado et al., 2016) to find out what stimulates shop floor workers to participate in a digital ESS. The focus on the two literature streams is chosen because these streams specifically deal with the structured handling of suggestions for improvements by employees. In this study, the term shop floor worker (or blue-collar workers) refers to employees who do operative production work in a factory, often including the work on machines. In contrast, office workers (or white-collar workers) rather do computer-related tasks in an office. Although ESS have been studied in detail before, the perspective of shop floor workers in this process has been largely neglected so far. This is especially crucial as research has recognized the importance of shop floor workers in innovation processes (Axtell et al., 2000). In addition, the role of shop floor workers is of prime importance since they often have limited digital access to the IT infrastructure and

communication channels of a company (Warnhoff & de Paiva Lareiro, 2019). This is problematic if a suggestion system is used that is only available with digital access.

Whereas EDI, IWB, and internal crowdsourcing are more general approaches to analyse employees' innovations, idea management can be seen as a formalised-system that deals with ideas for improvements proposed by employees of a company in a systematic matter. It can be defined as “a managerial device designed to enable and motivate employees to make suggestions as to how to improve corporate processes and products. The suggestions submitted are evaluated by expert reviewers and, if judged appropriate, put into practice” (Thom, 2015, p. 238 as cited in Brem & Gerlach, 2017). In the past, companies might have used an old-fashioned idea suggestion box. Employees could then submit hand-written ideas for suggestions into such a box. Nowadays, such boxes have mostly been replaced by digital suggestion tools. So-called electronic or digital employee suggestion systems (ESS) make use of advanced software tools that help to organise the whole process from idea collection over evaluation to implementation (Benbya & Leidner, 2018). Therefore, it is important to study idea management systems by considering digital ESS.

Some studies have dealt with the design of an idea management program, while others studied “success factors” in the different phases of an idea management program, such as the idea generation or evaluation phases (Gerlach & Brem, 2017; Lasrado, Arif, Rizvi, & Urdzik, 2016). Often, research focuses on individual, organizational, or work environmental factors that can enhance employee innovation (Buech, Michel, & Sonntag, 2010; Fairbank & Williams, 2001; Gerlach & Brem, 2018; Lasrado et al., 2016). For instance, research has shown that organizational factors, such as HRM activities, can support employee-driven innovation processes (Bos-Nehles, Renkema, & Janssen, 2017; Renkema et al., 2021). Although it is known that shopfloor workers who are close to the actual production processes contribute many ideas, there is a knowledge gap about the factors that matter, especially for shop floor employees with limited digital access. Yet, this issue is of prime importance as most companies nowadays use digital ESS. While little is known about this specific context, ESS have been studied intensively in more general contexts (see Gerlach & Brem, 2017; Lasrado, Arif, Rizvi, & Urdzik, 2016). Building on these findings, this study goes a step further and aims to study ESS in the context of digitally limited shop floor workers. By studying the specific field of employees with limited digital access, insights can be gained about what it is that motivates shop floor employees to participate in an (digital) employee suggestion system. How can shopfloor workers with limited digital access be stimulated to participate in a digital employee suggestion system? How can companies support shop floor workers in using a digital ESS? By providing new insights to these questions, this study aims at contributing to the existing literature.

Therefore, this thesis fills this research gap by studying digital ESS in the context of shop floor workers with limited digital access. This study aims to explore which factors are crucial for making an idea management program that is enabled by a digital ESS attractive for shop floor employees. An in-

depth case study of a German multinational chemical company that aims at improving its employee suggestion scheme is presented. Therefore, the research question of this thesis can be stated as follows:

“Which factors shape the participation of shop floor workers in a digital ESS?”

By answering this question, several dimensions need to be considered – for instance, what is the role of HRM activities in such a process? Which social, technical, and organizational factors need to be considered? The thesis explores ESS in the context of the chemical industry. In this industry, shop floor employees typically strictly have to follow rules and procedures to ensure safety, which might not be ideal for fostering creativity or radical innovations (Fairbank et al., 2003). However, continuous improvement programs (CIPs) and idea management programs that focus on small improvements have a relatively long tradition in the manufacturing and chemical industry (Galeazzo, Furlan, & Vinelli, 2021).

This study contributes to the academic literature in various ways. It investigates a real-life case about an ESS at a multinational company. By doing so, this study extends and complements studies on ESS (Fairbank et al., 2003; Gerlach & Brem, 2017; Lasrado et al., 2016) by focussing specifically on the role of shop floor employees. Furthermore, this study contributes to the literature on the digital divide (Scheerder, van Deursen, & van Dijk, 2017) by providing new insights into the digital divide between shop floor workers and white-collar workers in an enterprise context. Hereby, digital divide refers to the divide between people who have ICT (or internet) access and those who have only limited or no access (Srinuan & Bohlin, 2011). Although this is highly relevant for businesses, not much is known about digital divides at an organizational level so far (Lythreatis et al., 2021; Shakina et al., 2021). This study aims to fill this knowledge gap by combining the digital divide literature with the one on ESS. Finally, this study provides valuable insights for practitioners who aim at designing an idea management program with a digital employee suggestion system in the manufacturing sector where shop floor workers play a crucial role in improving processes.

2. Theoretical framework

As noted earlier, several literature research streams have developed that deal with innovations by employees relatively independently from each other. For instance, there are streams focussing on employee-driven innovation (EDI), internal crowdsourcing, or creativity and innovation, whereas others focus on idea management or suggestion schemes. Some scholars also use the terms idea management and suggestion systems merely as synonyms (Lasrado et al., 2016). In contrast, others see employee suggestion systems rather as being part of an idea management program of a company (Gerlach & Brem, 2017). So far, research has not provided a clear distinction between the various concepts. However, this is not a surprise, given the fact that the concepts are highly interrelated: creativity among employees can lead to suggestions, which, in turn, can lead to employee-driven innovation (Lasrado, 2016). Although literature from other research streams, such as internal crowdsourcing (Benbya & Leidner, 2016; Zuchowski et al., 2016), deal with employee-driven innovation processes too, they yet have a different focus. Whereas ESS primarily deal with generating ideas (in an online or offline context), internal crowdsourcing is much more focussed on discussions and interactions between users via a digital crowdsourcing platform (Beretta & Søndergaard, 2021). Therefore, this study will primarily focus on ESS.

2.1 Introduction to Employee suggestion systems (ESS)

An ESS can be defined as a formalized procedure that encourages employees to submit ideas for improvements within their organization (Lasrado et al., 2016; Milner et al., 1995). The origins of employee suggestion programs date back to the 19th century or earlier where traditional suggestion boxes were used to hand in paper-written suggestions (Carrier, 1998). Hence, ESS have been used for a long time, although the topic gained academic attention only in recent decades (Gerlach & Brem, 2017). According to Thom (2015) modern ESS at a corporate level have the aim to “enable and motivate employees to make suggestions as to how to improve corporate processes and products. The suggestions submitted are evaluated by expert reviewers and, if judged appropriate, put into practice” (p. 238).

Most research studying suggestion systems has focussed on general factors that contribute to the success of such systems (Gerlach & Brem, 2017). Typically, a distinction can be made between individual factors, organizational or cultural factors, work environment factors, and factors concerning the features of the suggestion system itself (Buech, Michel, & Sonntag, 2010; Fairbank & Williams, 2001; Gerlach & Brem, 2018; Lasrado et al., 2016). More recently, scholars have also considered more technical system factors as suggestion systems nowadays make use of digital tools (Benbya & Leidner, 2018; Lasrado et al., 2016).

2.2 Success factors of ESS

Scholars focussing on “success factors” of ESS have used a variety of approaches (Gerlach & Brem, 2017). Some focus on developing process models that describe the different stages of the suggestion system or idea management process – typically ranging from an idea suggestion until

implementation (Fairbank et al., 2003; Frese, Cees, & Teng, 1999; Gerlach & Brem, 2017). Others focus on stakeholder groups instead (Benbya & Leidner, 2018; Lasrado et al., 2016). Both kinds of studies include factors that positively or negatively influence the process in the various stages of the idea management process or for different stakeholders involved. Next to that, there are studies specifically looking at how HRM activities can contribute to employee innovation.

2.2.1 Process and factor models of ESS

Van Dijk and Van den Ende (2000) developed a generic model of a suggestion system which distinguishes between three phases in the idea suggestion process: idea extraction, idea landing, and idea follow-up. Furthermore, they consider cultural and structural factors that influence the success of a suggestion system. These factors include encouragement, organizational support and committed resources (Van Dijk & Van den Ende, 2000).

More recently, Lasrado et al. (2016) used a similar but yet different approach to study success factors of an ESS. Instead of focussing on different phases of the suggestion process, they distinguish between the following dimensions: 1) *Individual attributes*, 2) *system features*, 3) *organizational and environmental factors*, 3) *barriers of the suggestion system* (Lasrado et al., 2016). *Individual attributes* are those that affect the ideator. For instance, individuals need to have a certain level of self-efficacy and openness to innovation in order to be willing to generate ideas for improvement (Axtell et al., 2000; Lasrado et al., 2016). *System features* of the ESS can be distinguished into several sub-features, such as the *effectiveness of the system* (Lasrado et al., 2016). Here, it is important that submitting ideas is easy and that the digital suggestion system provides certain usability features (Arif, Aburas, Al Kuwaiti, & Kulonda, 2010). Another factor concerning the effectiveness of the system is that ideators should receive feedback to their submitted ideas quickly (Van Dijk & Van den Ende, 2002). Especially relevant for shopfloor employees is not only potentially limited access to the digital suggestion scheme but also a lack of skills to use such a system (once access is provided) and to write a formal suggestion. Therefore, it is important that employees who are willing to submit an idea receive the necessary support in submitting it in the necessary format (Lasrado et al. 2016; Marx, 1995). Next to the effectiveness, the *publicity* of the systems matters as well. If employees are not aware of the existence of a suggestion scheme, they will not think about submitting ideas for improvements in the first place. Therefore, scholars have argued that it is crucial to advertise the program among employees. Other system features include resources, rewards, feedback and evaluation. Whereby, resources refer to have sufficient resources to be able to actually implement the suggested ideas (Lasrado et al., 2016). *Rewards* describe the benefits that employees can gain from suggestion ideas – let it be in the form of a monetary reward or other forms of recognition (Du Plessis et al., 2008; Fairbank & Williams, 2003). *Feedback and evaluation* refer to giving feedback to employees about their suggestions – regardless of whether they have finally been implemented or not. Many authors argue that especially feedback for non-implemented ideas is crucial to avoid that people feel not being valued (Du Plessis et al., 2008; Fairbank and Williams, 2001; Lasrado et al., 2016; Van Dijk and Van den Ende, 2002). Besides that, there are also

organizational and work environment factors, which include aspects such as *communication and information sharing, employee participation, top management support, supervision and co-worker support, organizational support, or empowerment* (Lasrado et al., 2016).

2.2.2 HRM and ESS

Next to the literature about general “success factors” of ESS, there is an own research stream about employee innovations from an HRM perspective. Human resource management (HRM) can be defined as a structured approach to the management of an organization’s employees (Armstrong & Taylor, 2020). HRM activities have been linked to innovation processes by employees more generally as well as to ESS in particular. For instance, there are studies that investigate the relationship between HRM activities and innovation in a more general context (Shipton et al., 2017). Other studies focus more specifically on HRM and innovative work behavior (Bos-Nehles et al., 2017); HRM and employee-driven innovation (Renkema et al., 2021); or HRM and ESS (Buettner, 2015; Du Plessis, 2016). According to Du Plessis (2016) an ESS can be seen as an HRM tool. Hence, HR managers play an important role in managing such systems, for instance by promoting and introducing the system among employees. Renkema et al. (2021) found that HRM activities can support innovations by employees, even in highly formalized business contexts. An ESS can be seen as an example of a so-called formalized route of employee-driven innovation. The authors found that HRM activities can contribute to the emergence of EDI in two ways. On the one hand, there are factors affecting the *content* of EDI, such as “training, rewards, job design, recruitment, participation, information sharing, and performance management” (Renkema et al. 2021, p. 21). On the other hand, there are factors that mainly affect the *process* of EDI, namely “training, job design, selection, involvement, and feedback” (Renkema et al. 2021, p. 21). In a similar context, Bos-Nehles et al. (2017) identified seven HRM practices that help encouraging innovative work behavior (IWB). These are training and development (ability-enhancing); reward and job security (motivation-enhancing); as well as autonomy, task composition, job demands and feedback (opportunity-enhancing) (Bos-Nehles et al., 2017). Additionally, Malhotra et al. (2019) found that HRM actions can also mitigate challenges that employees face when engaging in innovation processes.

2.2.3 Motivation to participate in an ESS

Since it is one of the main goals of HRM to keep employees motivated, an essential question in the literature on ESS is how employees can be motivated to participate in suggestion schemes in the first place (Thom, 2015). In this context, scholars often differentiate between intrinsic and extrinsic motivation when it comes to the question of what it is that motivates employees to participate in a suggestion scheme in the first place (Buech et al., 2010; Fairbank and Williams, 2001; Fairbank et al., 2003; Gerlach & Brem, 2017; Gonzalez-Gonzalez and García-Almeida, 2021). An example for intrinsic motivation might be that employees enjoy the process of contributing to change or to collaborate with co-workers. On the other hand, extrinsic motivation refers to monetary rewards. Therefore, many suggestion schemes make use of monetary rewards for successfully implemented ideas, for instance, in

form of a defined percentage of the cost savings generated from the idea (Fairbank et al., 2003). Typically, a combination of both kinds of motivation is necessary for a successful suggestion scheme (Fairbank & Williams, 2001).

However, it must be noted that motivation to participate is not independent of the other general success factors, but they are rather interrelated with each other: when employees are motivated, they will most likely suggest more ideas, which contributes to the success of the suggestion system. On the other hand, their motivation can be shaped by other features of the system, like usability aspects of the digital suggestion tool or quick feedback from experts who evaluate the ideas. Positive perceptions in these domains can strengthen motivation, whereas negative perceptions can harm the employee's motivation. Therefore, the other factors need to be considered as well when looking at the motivation to participate. Especially the technical factors, such as usability, play a crucial role when considering the limited digital access of shopfloor workers.

Buech et al. (2010) conducted research on the question of what motivates employees to suggest ideas. Using a social exchange theory approach, they were able to link interactional justice and the employees' motivation to suggest ideas. This relationship was mediated by the valence of the suggestion system (VSS). Hereby, interactional justice refers to the communication between idea givers and experts who evaluate the ideas. VSS refers to a positive attitude towards the system and the benefits associated with it. Consequently, the perceptions that an employee has about the system are important (Buech et al., 2010).

According to Fairbank & Williams (2001) and Fairbank et al. (2003) the employees' motivation to participate in the ESS mainly relies upon three key beliefs: First, the employees should have the feeling of being able to successfully suggest an idea via the system ("expectancy"). Second, the completion of the suggestion process should lead to a specific outcome ("instrumentality"). Third, the specific outcome should be desirable for the employee ("valence" or "value"). Here, the term valence refers to how attractive a reward is for the employees. According to the authors, a successful suggestion system must aim at maximizing all three components in order to maximize employees' motivation to participate in the system.

The described "success factors" in this section can be seen as more general factors that are helpful for the success of idea management systems. However, so far, there has not been a focus on the needs and demands of shop floor workers in particular. It can be assumed that most of the general success criteria that scholars have found are also applicable for shop floor workers. Nevertheless, there might be differences when it comes to the need for assistance and support by dedicated idea managers or HRM personnel. Also, there might be different needs when it comes to the technical features of the system, especially in regard to the usability of the digital ESS. This has to do with the fact that ICT skills might be unequally distributed among employees within a company (Leyer, Richter & Steinhüser, 2017; Warnhoff & de Paiva Lareiro, 2019). Therefore, an easy-to-use software that is usable with limited digital competences might be important, too.

2.3 Employee suggestion systems on the shopfloor

To the best of our knowledge, there are only few studies specifically looking at shop floor workers in the context of ESS. This is remarkable since many innovations – especially in the manufacturing industry – take place on the shop floor. As shop floor workers are surrounded by a completely different work environment than office workers, it can be assumed that the needs and wants of employees who work in a factory differ from those who work in an office. Especially the differences in digital access are crucial when companies use a digital ESS that is only accessible via a computer or mobile phone. Besides the limited digital access, also limited digital abilities or skills are important to consider. Whereas office workers are skilled to work with digital tools because they use them every day, shop floor workers may face difficulties here (Leyer, Richter & Steinhüser, 2017; Warnhoff & de Paiva Lareiro, 2019). For instance, Warnhoff and de Paiva Lareiro (2019) found that shop floor workers have less access to training opportunities when learning about new ICT applications. They also found that shop floor workers lack the autonomy to pursue self-directed learning approaches regarding ICT skills.

Axtell et al. (2000) relatively early specifically looked at shop floor workers in the context of ESS. They found that the submission of ideas was strongly related to personal and job characteristics. On the other hand, the actual implementation of ideas was highly related to group and organizational factors. Frese, Cees & Teng (1999) conducted a study on the predictors of submitting ideas among blue collar workers. Like other studies, they focused on a variety of factors, such as: personal variables, work characteristics, motives to participate, and system factors. They found that the most influential factors were “initiative at work, higher order need strength, self-efficacy, expected improvements in work and suggestion inhibitors” (Frese, Cees & Teng, 1999, p. 1139). Moreover, it is likely they might need some extra support from supervisors or co-workers in formalizing an idea that is merely in their head into a written suggestion that fulfils the criteria needed for submitting a suggestion into a digital ESS (Marx, 1995).

Leyer et al. (2019) found that ICT can support the structural empowerment of shop floor workers. According to them, employees are structurally empowered when they receive access to a) information (e.g., stored knowledge), b) resources (e.g., material, working time), c) support (e.g., guidance and feedback), and d) opportunities (e.g., learning opportunities or skills growth). All those dimensions can be enabled by ICT solutions. Although the authors studied empowerment in a different context, the approach may also be applicable to digital ESS.

2.4 The digital divide between shop floor and office workers

As already noted earlier, a distinction can be made between office workers and shop floor workers. Whereas the former group does administrative, knowledge-based, creative, or management tasks in an office environment, the latter group is involved in the production process in a factory. While office workers nowadays have access to computers in order to do their job, this is not necessarily the case for shop floor workers. The term “digital divide” emerged in the 1990s and can be defined as a “divide between those with access to ICTs and those without” (Srinuan & Bohlin, 2011, p. 5). ICT refers

to information and communication technology. More recently, the term has also been used to describe inequalities in access to the internet in particular (Mwim & Kritzinger, 2016). Similar concepts are “information richness” or “poorness” as well as computer and media literacy (Van Dijk, 2006). Digital inequalities can lead to knowledge and information divides (Mwim & Kritzinger, 2016) between people, organizations or countries. This means that access to information and knowledge is not equally distributed. In the current “information age”, access to knowledge (via ICT) can be seen as a key factor for someone’s personal development.

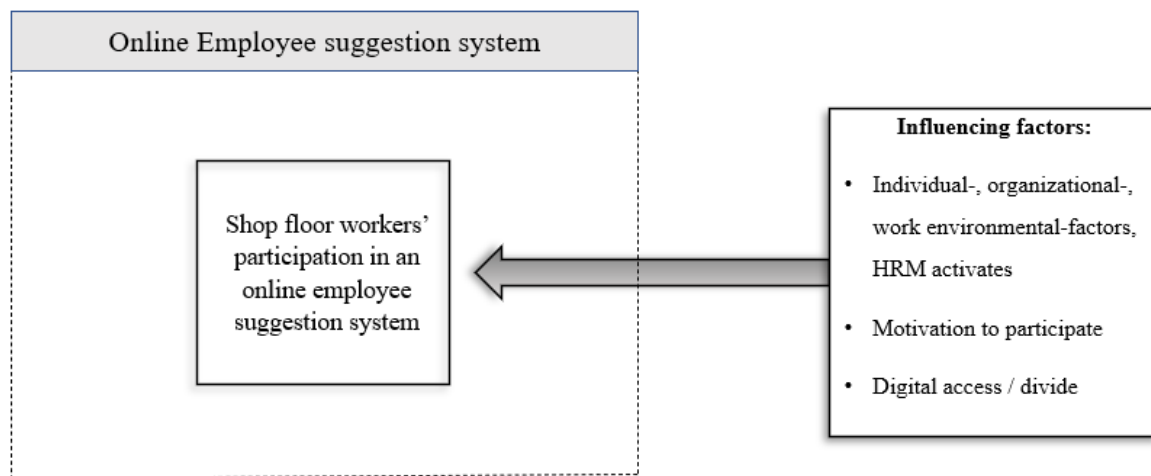
Scholars have categorized debates about digital inequalities into first-, second-, and third-level digital divides (Scheerder, van Deursen & van Dijk, 2017). The first-level digital divide refers to the distinction between access and no access to ICT. In this level, discussions about technological determinism played a major role, as many researchers expected that access to ICT in itself would be enough to overcome digital inequalities. However, it turned out that access alone is not enough but that there is a divide in digital skills and the way people use ICT, too. Hence, this shift in the discussion has been labeled as the second-level digital divide (Scheerder et al., 2017; Van Dijk, 2005). Thereby, the second-level digital divide refers to inequalities “in the ability to use ICT among users who have access” (Pejić Bach et al., 2013, p. 43). Finally, the third-level digital divide refers to whether the outcomes of ICT or internet use lead to beneficial results for the users of the ICT systems (van Deursen & Helsper, 2015).

Research about the digital divide is rather interdisciplinary; with most studies coming from the fields of information technology, social sciences and business studies (Srinuan & Bohlin, 2011). While many scholars have focussed on an individual or societal level (Grošelj et al., 2021; Scheerder et al., 2017; van Deursen, 2020), only little research has focussed on the digital divide at an organizational or firm level (Lythreatis et al., 2021). The digital divide at a company level has been labelled as the corporate digital divide (Shakina et al., 2021).

2.5 Towards a conceptual model

Figure 1 summarises the main factors that shape the participation of shop floor workers in a digital ESS. The model consists of several influencing factors that are discussed above: there are individual, organizational and work-environmental factors, and HRM activities as well as the motivation of shop floor workers to participate in the ESS. Furthermore, there are factors concerning the issue of digital access and abilities (digital divide). It should be noted that the factors are interrelated and that the influence of a factor can be positive, negative or neutral in nature.

Figure 1
Conceptual model



3. Methodology

In the following section, the methodological approach of this study will be outlined. The chosen research design, data collection and analysis will be described.

3.1 Research design

This study aims to answer the research question “*Which factors shape the participation of shop floor workers in a digital ESS?*” Since the context of shop floor workers with limited digital access and abilities is rather unexplored, a qualitative exploratory research design was chosen (Babbie, 2016). A qualitative approach is suitable for theory building in this new context about which not much is known so far. A single case study has been chosen to get an in-depth understanding of the phenomenon and to uncover the factors that influence shop floor workers participation in a digital ESS (Gustafsson, 2017). According to Yin (2009) the case study method is appropriate when studying a contemporary phenomenon embedded in a real-life context. Furthermore, the case study method is helpful when trying to answer “how” or “why” questions (Yin, 2009) as stated in the research question of this study. The chosen case organization can be regarded as a typical case for studying shop floor workers participation in an employee suggestion program (Yin, 2009).

3.2 Data collection

For this study, a business unit of a German multinational chemical company was selected. Hereafter, the company is referred to as “*ChemComp*”. The case study took place at a company site with around 2,000 employees. The organization is suitable to study ESS as there is a long history of idea management systems in the industry. The chosen company has experience in using an ESS for years. Therefore, the company is suitable “to capture the circumstances and conditions of an everyday or commonplace situation” (Yin, 2009, p. 48). Furthermore, the company has a large workforce of shop floor workers that uses the ESS. As such, the case company can be regarded as a typical or representative

case, meaning that the company represents “a manufacturing firm believed to be typical of many other manufacturing firms in the same industry” (Yin, 2009, p. 48). In this context, the single case study method can help to broaden the understanding of ESS on the shop floor and to develop a theory about it (Eisenhardt & Grabner, 2007). Particularly, in Germany suggestions for improvements by employees of a company are even regulated¹ (Thom, 2015).

The data collection took place from January until April 2022. In order to ensure triangulation, the data collection consists of semi-structured interviews, participant observations, and document analysis. As an intern, the researcher had the chance to get to know the company and the ESS. Informal conversations with employees and observations helped the researcher understand the ESS processes and procedures. In total, 20 semi-structured interviews were conducted. The focus was on shop floor workers (eleven interviews). Also, the shopfloor worker's supervisors were interviewed (four interviews). Furthermore, the ESS manager who is responsible for the ESS at the company was interviewed. Finally, also four members of an idea management committee were interviewed to get an in-depth picture of the process (three workers council committee members and one company representative member of the committee). The shop floor worker participants were selected from four different main divisions of the company so that every major division is represented in the sample. Since the four selected divisions have around the same number of employees, it was intended to conduct interviews with three workers from each division. However, in one division only two shop floor workers participated, whereas in another division one interview was conducted with two shop floor workers at the same time. The shop floor workers were selected randomly on the spot. The researcher visited the different divisions and asked the local supervisor for permission if interviews be made with shop floor workers and with the supervisor themselves. Then, the supervisor in charge was interviewed in his or her office. The shop floor workers were randomly selected by the researcher when they passed by a main floor in the factory. They were then asked if they were willing to participate in an interview. The interviews took place in a meeting room in the factory where a silent atmosphere was given. The non-shop floor participants (ESS manager and idea commission members) were approached directly via e-mail and asked if they were willing to participate. Due to the Covid-19 pandemic, the non-shop floor interviews took place online (via MS Teams). All interviews took place in German language. All interview participants were males. Before the start of the interview, participants were informed that the participation is voluntary, confidential, and anonymous. Participants were also asked if they agree to audiotape the interviews. Before the start of the interviews, participants were informed about the background and goals of the research. At the beginning of the recording, the researcher guaranteed confidentiality and asked the participants for their consent to participate. Afterwards the participants were asked to verify the

¹ Although not officially regulated by law, several court rulings in Germany have dealt with employee suggestions or inventions (Koblanck, 2021). A landmark court ruling has found that employees are entitled to a (monetary) bonus if three conditions are met: First, the idea must be an extra effort beyond the activities for which the employee is already being paid. Second, the company must use the idea or put it into practice. Third, the idea must benefit the company significantly (Koblanck, 2021).

transcribed interviews. On average, the interviews lasted 34:32 minutes. The interviews with shop floor workers took 29:28 minutes on average, whereas the interviews with non-shop floor participants took around 40:42 minutes. An overview of all interview participants is shown in Table 1.

The interviews were semi-structured and consisted open-end questions. Two different interview protocols were used – one version for shop floor workers and another version for supervisors and for non-shop floor employees (see interview guideline in Appendix A). The questions were used to generally set the frame of the interview, but participants were free to also talk about other aspect related to the ESS. Each interview was transcribed and anonymized by an individual label. The first letters of the label refer to the function of the participant. The second number refers to the division. And the third number refers to the individual person in a division. SF is used for shop floor workers. For instance, “SF_1_001” refers to the first shop floor worker in the first division. The same logic is applied for shop floor supervisors, which have the first letter GC. The non-shop floor participants are labelled differently. The workers council members are just labeled with the initial abbreviation WC, plus their individual number. The ESS representative is labelled IDM_001, whereas the idea commission representative is labelled IDM_002.

Table 1
Overview of interview participants

Code	Informants	Interviews	Length
	<i>Shop floor workers</i>	<i>11</i>	<i>5:24:16 hours</i>
<i>SF_1_001</i>	<i>Worker, FA 1</i>		<i>0:26:25 hours</i>
<i>SF_1_002</i>	<i>Worker, FA 1</i>		<i>0:49:30 hours</i>
<i>SF_2_001</i>	<i>Worker, FA 2</i>		<i>0:24:52 hours</i>
<i>SF_2_002</i>	<i>Worker, FA 2</i>		<i>0:42:46 hours</i>
<i>SF_2_003</i>	<i>Worker, FA 2</i>		<i>0:14:30 hours</i>
<i>SF_3_001</i>	<i>Worker, FA 3</i>		<i>0:19:30 hours</i>
<i>SF_3_002</i>	<i>Worker, FA 3</i>		<i>0:16:06 hours</i>
<i>SF_3_003</i>	<i>Worker, FA 3</i>		<i>0:24:14 hours</i>
<i>SF_4_001</i>	<i>Worker, FA 4</i>		<i>0:29:49 hours</i>
<i>SF_4_002</i>	<i>Worker, FA 4</i>		<i>0:27:21 hours</i>
<i>SF_4_003_a/b</i>	<i>Worker, FA 4; Worker FA 4</i>		<i>0:49:13 hours</i>
	<i>Shop floor supervisors</i>	<i>4</i>	<i>2:55:09 hours</i>
<i>GC_1_001</i>	<i>Supervisor, FA 1</i>		<i>0:40:00 hours</i>
<i>GC_2_001</i>	<i>Supervisor, FA 2</i>		<i>0:34:39 hours</i>
<i>GC_3_001</i>	<i>Supervisor, FA 3</i>		<i>0:32:41 hours</i>
<i>GC_4_001</i>	<i>Supervisor, FA 4</i>		<i>1:07:49 hours</i>
	<i>ESS manager</i>	<i>1</i>	<i>0:57:44 hours</i>
<i>IDM_001</i>	<i>Idea manager</i>		<i>0:57:44 hours</i>

	<i>Idea committee members</i>	4	<i>2:13:24 hours</i>
<i>WC_001</i>	<i>Workers council member</i>		<i>0:39:04 hours</i>
<i>WC_002</i>	<i>Workers council member</i>		<i>0:28:55 hours</i>
<i>WC_003</i>	<i>Workers council member</i>		<i>0:30:25 hours</i>
<i>IDM_002</i>	<i>Company representative member</i>		<i>0:35:00 hours</i>
	<i>Total</i>	20	<i>11:30:33 hours</i>

3.2.1 Procedure

The research process is structured according to the above-mentioned data collection methods. First, desk research and informal conversations were conducted to better understand the organization and its employees as well as the ESS in place. Second, the interviews with various stakeholders helped to get an in-depth understanding about the perceptions of the digital ESS and the factors that influence it. Finally, the results of the research were shared and discussed with employees from the organization in a panel meeting where the main results of the research were presented. Company representatives and people involved in the research were invited. These steps were also conducted to ensure transparency and trustworthiness. A triangulation approach was used. As an intern, the researcher spent several months on the company site. The researcher could get to know the company and the ESS during that time. For instance, in participant observations and non-formal conversations with employees and the ESS manager, the researcher could get an in-depth understanding of the functioning of the ESS. Also, the researcher had access to official documents concerning the ESS to understand the policies and procedures of the ESS at the company. Before the actual interviews started, the researcher conducted two test interviews to check if the questions were appropriate. For transparency reasons, the interview participants received the written transcripts. Also, the results of the study were discussed with the case company.

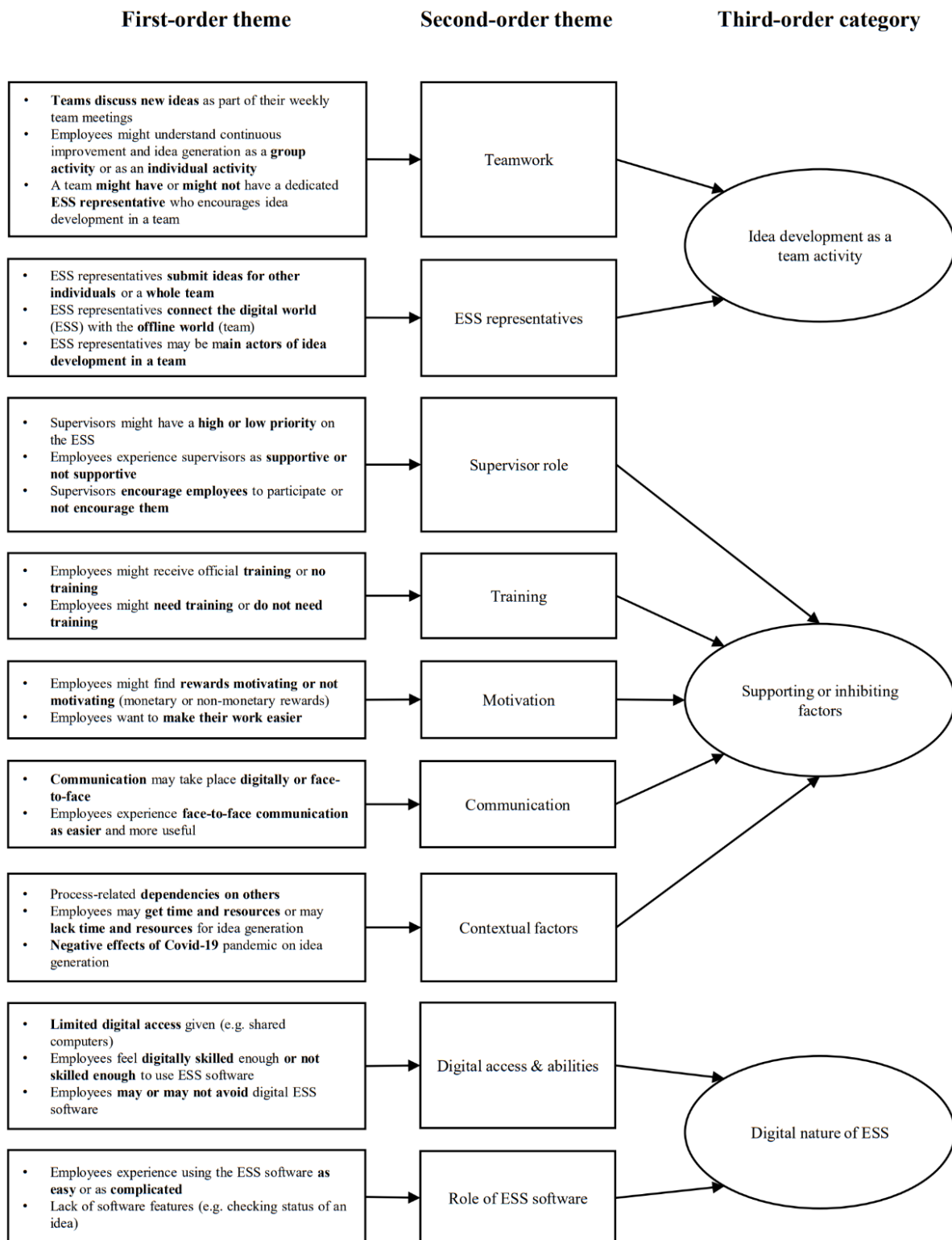
3.3 Data analysis

The chosen method is template analysis, which is a variation of thematic analysis (Brooks et al., 2015). It makes use of hierarchical coding with the “development of a coding template, usually on the basis of a subset of the data, which is then applied to further data, revised and replied” (King, 2012, pp. 426 – 427). Originally based in psychology research, template analysis has become relatively popular in organizational and management research as well (Brooks et al., 2015). Template analysis allows the researcher to select a set of a priori themes. Since there is already some (yet limited) knowledge about the study topic of this study, template analysis is a suitable method.

The analysis took place in the software Atlas.ti following an approach as used by Velthof (2021) and Weghorst (2021) based on King (2012). The approach consists of six steps that were applied. First, all transcribed transcripts were scanned to become familiarized with the data. Then, an initial set of five interviews (from shop floor and non-shop floor participants) were initially coded with open codes. This resulted in 216 initial first-order codes. In the next step, some codes were merged, and second-order

codes were created. These were based on the initial codes but also on some of the pre-given themes from the theoretical framework. For instance, the topics of digital access and digital skills were already defined. In the next step, more interviews were added to Atlas.ti and also coded. After 17 documents there were a total of 485 codes. Again, many codes were merged, and new second-order categories were created. In the next step, the remaining documents were added and coded and merged as well. In the next step, the data was exported to Excel, where the second-order categories were grouped, resulting in the third-order dimensions. In total, the analysis of 20 transcripts resulted in 696 quotations, 206 first-order codes, 23 second-order codes, and five third order codes (see coding template in Appendix II). Since the coding process resulted in many codes and categories, the second step of the analysis focused on the factors most related to answering the research question. Figure 2 gives an overview of these factors.

Figure 2
Data structure



4. Results

The research question of this paper was “*Which factors shape the participation of shop floor workers in a digital ESS?*” Therefore, the analysis will mainly focus on those factors that are particularly relevant in the context of a digital ESS.

4.1 The Employee suggestion system (ESS) at the case company

At the case company, all employees are allowed, but not obliged, to participate in a digital ESS. Employees can either submit ideas for improvements individually or as a group. The submission of ideas (in written form) and evaluation of ideas take place in a dedicated ESS software, which is accessible from any computer at the company. Basically, a distinction is made between two types of ideas. There are “small” ideas with a value that cannot be expressed in monetary terms. These ideas often fall into the category of continuous improvement processes (CIPs). For example, a small idea could be to move a fire extinguisher in a factory to a more suitable location. In this case, the idea may increase safety, but the value is relatively abstract and cannot be calculated. Ideas, for which the value is not calculated represent the majority of all suggested ideas. On the other hand, there are “bigger” ideas with a value that can be calculated; for instance, if the idea leads to cost savings. An example of such an idea could be a process improvement that reduces the amount of a specific ingredient by 10 percent each year. In this example, it is possible to calculate the generated cost savings and precisely determine the idea's value. The evaluation process differs between those two kinds of ideas. Bigger ideas require a more extensive evaluation than smaller ideas. After an employee has submitted an idea, it is evaluated in a so-called quality check, where a supervisor of the employee checks if the idea is worthwhile to pursue. If the supervisor agrees, the employee or other involved parties can implement the idea. However, depending on the expected value or generated savings, the idea might undergo a longer evaluation process involving an additional expert review and a discussion in an idea management commission. Therefore, the evaluation process can vary vastly. After the successful implementation, the employee receives a monetary reward which is a proportion of the value or savings the idea generated for the company.

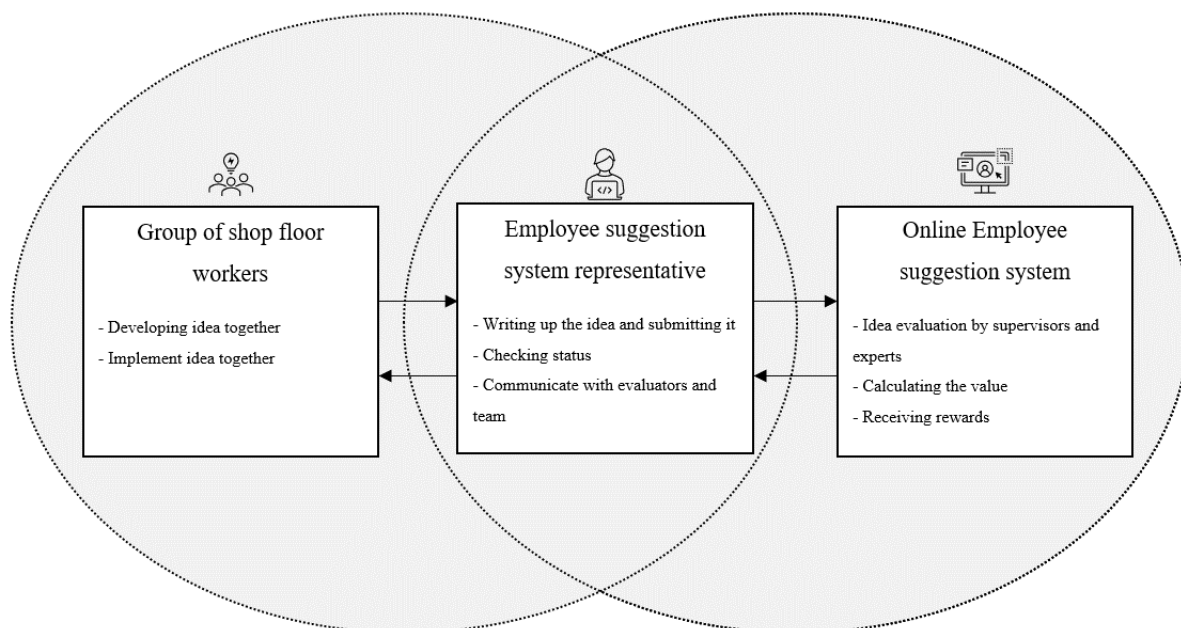
4.2 Idea development within teams

Most ideas are developed and written within a team as part of so-called “group work” activities. The company also desires this approach since it has turned out that group ideas lead to better results. This exemplary quote illustrated the advantages of the teamwork approach: “*But at the end of the day, that's what we've always experienced in the group. If you talk to one or two other people beforehand, you might get two or three steps further that you wouldn't have taken on your own.*” - SF_2_002. The typical idea development process looks as follows: an employee discovers a problem and takes that problem into the weekly group meeting. In this meeting, the employee can present the problem and maybe already their thoughts about a potential solution. Then, the whole group – or a portion of the group – work together to improve the idea and further develop it. This might also take place in consultation with the group supervisor. Afterwards, one dedicated person in the team is usually

responsible for submitting the idea to ESS software. This role is referred to as *ESS representative* within a team in the following. Although it is a somewhat unofficial role, it does exist within most teams. Submitting the idea to the digital ESS means filling out an online form in the ESS software, describing the idea, including describing the current situation and the improvements that the idea creates. It might also include calculating the potential value or cost savings generated by the idea. Usually, that person is also responsible for checking the status of the evaluation process of the idea in the digital ESS regularly. If there are any status changes (e.g., comments, open questions, need for further explanations), the employee informs the other group members about this in the next group meeting. Hence, the employee is a bridge between the online and offline world (see Figure 3). Usually, it is then the task of the group to implement the idea. For instance, this can mean changing an existing process in daily operations. Depending on the nature or complexity of the idea, it may also require the advice of external consulting partners. After the successful implementation, the group members share the monetary reward. Finally, it must be noted that this description of a typical process might differ from team to team. Furthermore, it is also possible to suggest ideas individually without other group members.

Figure 3

Typical idea development process in a group



4.3 ESS representatives connecting teams and digital ESS

As the general description above has shown, two essential elements for the idea development on the shopfloor are teamwork and the role of the ESS representative, who is responsible for the tasks that involve the use of the ESS software. Within most teams, such an ESS representative is not an official role but one that has evolved over time. Therefore, being an ESS representative is not part of an official job description of an employee: *“They are not specially trained, they are simply those who have made more of an effort than others and have taken on the subject”* - GC_4_001. Mostly, an ESS representative gets some dedicated time for doing the ESS-related tasks. For instance, colleagues may take over some

of the employee's regular tasks, so that they have time to work on ESS-related issues. The ESS representative is often also responsible for doing other computer-related tasks within the group and, hence, already has some knowledge of using the company's IT systems. A typical self-description of an ESS representative could sound like this: *"Well, I would say that in our group, I'm a bit in charge of that [ESS]. If I can put it this way. If colleagues who are perhaps not so familiar with the computer have ideas, then I sit down with them and make a note of it and then write this idea into the system for the colleagues, so to speak."* - SF_4_001. Typically, the ESS representatives are not only responsible for submitting an idea initially but also do all the subsequent tasks related to the ESS software, like checking status updates for the idea and informing other group members about it: *"We have a group discussion once a week. And he [ESS representative] always makes these lists and always says how far they are. Then he says, for example: Here, we still have to implement something. The other one is already done, only the money is missing. He goes through every idea with the team."* – GC_1_001. Hence, the ESS representative can be seen as a link between the digital world of the ESS software and the offline world of the team meetings. Thus, the ESS representative enables participation in the digital ESS even for employees who do not use computers at all. However, it should be noted that employees are not required to use the help of an ESS representative. They can also suggest ideas digitally on their own if they prefer not to share their ideas with colleagues.

4.4 Teamwork as the main facilitator of idea development

The company has introduced the teamwork approach, which encourages employees to be self-organized and work together on problems. It is used in particular in the ESS. Within a team, employees are encouraged to work on ideas for improvement jointly in weekly team meetings. In this context, innovation workshops can also take place to develop solutions to existing problems systematically (WC_003; SF_4_002). The teamwork approach also has the advantage that employees can help each other in the idea development and implementation process: *"I would say that group work is always beneficial because the team is strong. And there are always people who are not so good at paperwork. But there are also people who can really put everything down on paper very well and write down the technical content accordingly."* - WC_003.

Another benefit of the teamwork approach is that it is helpful for the division of work among a group of people. For instance, one person can be responsible for all the computer-related tasks, and another person might be responsible for getting the necessary information for the implementation. Due to the team meeting approach, most idea development takes place in an offline, face-to-face setting within a team meeting. *"Group work has the idea that my employees should organize themselves mostly on their own and that I should only be there to look after them. That means they divide themselves up into functions and the corresponding work - based on their strengths. Of course, this also provides the so-called leave of absence where one employee can work out such an idea in detail, because the others continue to work while a colleague takes care of the idea and submits into the system"* - GC_4_001. In practice, this means that only one employee (i.e., ESS representative) needs access to a computer to

submit the idea to the ESS software. Hence, the other group members do not need computer access to participate in the idea development process.

4.5 Connection between teamwork and ESS representative

The role of the ESS representative in a group is closely related to the teamwork approach. First, the task of the ESS representative can be seen as a division of work approach because one employee is specialized in doing all the computer-related tasks in the ideation process, while other employees can focus on other issues. The specialized employee is often also responsible for other PC-related tasks within their group. Second, the limited digital access of shop floor workers plays a role because not everyone may be able to access a computer at any time. Third, many employees perceive the ESS software as rather complex and not user-friendly. Typically, employees complain about a too-long form with many questions, including calculations, that needs to be filled out: *“There are too many tabs for me to deal with. And what is difficult is this cost-benefit calculation, so I always have to think about where do I enter what”* - GC_3_001. That is why many employees avoid using the software and instead ask experienced co-workers if they can submit their ideas online: *“It is related to the digital affinity of the person himself and also that not everyone has access to a computer at all times. And the fact that the process of entering data into this software is not self-explanatory has led to the fact that the employees on site have individual people who are more concerned with the topic of submitting data, but who then also enter data for the entire group. In practice, this means that a great deal happens at the group level. This means that ideas that individual employees have are often discussed with the group and then submitted as a group idea.”* - IDM_001. Since ESS representatives are group members, their tasks are closely related to the group work approach.

4.6 Face-to-face communication as the major form of communication

The importance of functioning communication has been stressed by many employees as well as supervisors. Many participants prefer face-to-face communication over digital communication, for instance, via mail. On the shop floor, face-to-face communication plays a vital role since digital tools are not always available easily. Face-to-face communication is also closely related to the group work approach. Weekly team meetings take place on-site and not in an online format. Many interview participants argued that they prefer to explain their ideas face-to-face to their supervisors instead of communicating only via the digital ESS. The following exemplary quote illustrates this: *“But I usually ask the colleague who wrote the idea to join me in my office, so that when he writes something, I understand what he wants. And sometimes it's also a barrier to understand: what does he actually want from me now, if I just read the text?”* - GC_4_001. Hence, instead of communicating digitally, many employees prefer face-to-face communication and use the ESS software not as a working tool but rather as a tool to protocol what has been agreed in a personal conversation. The main reason why face-to-face communication is preferred is because many activities still take place in offline settings on the shop floor. For instance, mobile phone or tablet use are restricted due to safety reasons. Moreover, of course, the access and availability of computers are limited. Furthermore, some employees argue that explaining

an idea in written form is more challenging than explaining an idea verbally. For instance, it seems that many employees and supervisors prefer to discuss ideas directly on the spot instead of writing about them, as illustrated in the following exemplary quote: *“But that only works if I stand with the man on the spot, show him what I want, tell him my idea and then he has to think about it technically. But that does not go via written correspondence, no one can tell me that. So I can't write so precisely to explain a project or an idea in such a way that he actually understands what I want from him.”* - SF_2_002. Generally, face-to-face communication still plays a vital role on the shop floor. And it seems to be especially useful when discussing (complex) ideas.

4.7 Supervisors supporting employees in using the ESS

Many participants mentioned that the role of the supervisor in a team is crucial as they might act as a gatekeeper for the ESS. Whereas some supervisors have a positive attitude towards the ESS, others might not be in favour of the scheme. This, in turn, has consequences on whether supervisors encourage their employees to participate in the ESS: *“I know that especially [supervisor], with his people, he expects these ideas from his employees, and he also supports them massively. And when someone is so active supporting them, you can clearly see that things are moving in the right direction. And if someone says, okay, I don't really care if ideas are coming, then you also notice clearly that it blocks the idea generation a bit.”*- IDM_002. One main task of the supervisor is to give employees feedback on their ideas. In the ESS software, supervisors receive the written idea proposals of their employees and have to evaluate those ideas in an initial quality check. Some employees also discuss their ideas with their supervisors in a personal conversation before submitting them to the ESS software. And only in case, the supervisor agrees to the idea, they submit it electronically.

Furthermore, supervisors support employees in the whole idea creation process. For instance, most supervisors said that they would support their employees when they face problems using the ESS software or when they need assistance in the implementation phase of their ideas. This attitude is illustrated in the following exemplary quote: *“They can come to my office at any time and we'll do it together. Or I do it here on the spot, we have a PC here on the spot. So, the people who want to write, come to me and say: I have this idea. Write it down. And he sits next to me and I write exactly what he tells me. Of course, I support him in calculating and because I am perhaps better at dealing with numbers and because I know what else he needs to calculate the benefits, and so on. Of course we support him in that”* – GC_3_001.

Many employees see their supervisors – together with their co-workers – as an important source of support. Supervisors can actively foster participation in the digital ESS by making discussions about ideas a fixed point on the agenda in weekly team meetings. They might also demand a certain number of ideas per year from their employees as part of their personal annual goals so that reaching a certain number of ideas can lead to a bonus payment. The supervisors' level of support also depends on their priority on the ESS and their personal (time) resources available for the topic. Some supervisors argue as follows: *“I have too much to do to prioritise now. What is more important now? The continuous*

improvement or my daily work? And probably the same will be the goes for others here at the facility.”

- SF_4_001. Some employees have the feeling that their supervisor's priority on the ESS is too low, which results in too slow evaluations and feedback about ideas, as illustrated in the following quote: *“The point is that things are going very slowly. Ideas are written, then they go to the supervisor, but they aren't processed. There are ideas that were written before 2019, and a lot of money could have been saved if they had been processed timely”* - SF_4_003_a. Such an experience can have negative consequences on the employee's motivation to participate in the ESS.

Consequently, the role of supervisors is essential in the whole process because they have much influence on how the ESS is used in a team. They can either support or inhibit participation in the ESS with their behaviour.

4.8 Role of idea manager & HR department

The HR department is officially responsible for the ESS program at the company. One manager is responsible for the idea management, hereafter called idea manager. He is responsible for organizing all processes related to the ESS. For instance, he is in charge of supporting employees or supervisors in process-related questions. He may also advise employees regarding the use of the ESS software. Another subject area concerns professional training for employees about the ESS process in general and the ESS software in particular. Although many employees know that the idea manager is a potential contact person, there seems to be only little contact between employees and the HR department: *“That's just within our team. I know if I asked him, I'm sure he would be helpful, but we do it within the team.”* - SF_4_001. Many employees seem to prefer to get help within their own team first.

4.9 Training as an enabler of the ESS

The role of training is twofold. On the one hand, it can refer to the way ideas are developed and discussed. On the other hand, it refers to the way employees receive training on how to use the ESS software. For instance, there are innovation workshops building on the Kaizen philosophy where employees systematically learn how to generate ideas - and especially how to develop solutions to existing problems. Of course, this kind of training is generally relevant for any ESS, as it can be seen as the basis for innovations. However, it is not of specific importance for a digital ESS. The second kind of training, referring to the ESS software, is very relevant for shop floor workers with limited digital access. Many employees mentioned that training on how to use the ESS software is essential. Some employees indicated that they received basic software training by the HR department when the current ESS software was introduced. For that purpose, the idea management manager, responsible for the management of the ESS at the company, introduced the software by actively going into the factories and explaining the software to employees. However, many say they learned most of their skills in a learning-by-doing approach: *“The approach was learning by doing. There were colleagues from the HR department who explained the system once when it was new. And if you needed help, they were happy to support you. But it's still complicated because of all the functions. And for those who don't work with it that much, it becomes very complicated to use the software”* - GC_4_001. Some employees also

indicated that they did not receive training in the past, although there seems to have been training offerings for interested employees. So, the training opportunities seems not to have reached all employees.

As the ESS software at the company is perceived as complicated and not intuitive by many employees, proper training seems to be essential for the successful use of the software. Some employees expressed that they would like to receive some extra training, for instance, face-to-face training or by easily understandable materials, such as video tutorials. Although training material would be available on request by the HR department, some employees seem not to know that such material is available. However, generally employees argue that proper training is important, as stated in the following exemplary quote: *“So it would actually be nice in the future if you could get a training course or something like that. On topics related to idea management, when you submit ideas, so that you don't always have to run to the group coach and ask: show me this, show me that. But instead a training course right from the start.”* - SF_3_001. Some employees also indicated that it is enough if only the key users of the system (ESS representatives) get some in-depth training - as many employees do not use the software actively themselves.

Besides dedicated training programs, co-worker support and supervisor support play an essential role here. Many employees also learn to use the software because more experienced co-workers or supervisors show them how to submit ideas in the software. The following example illustrates this: *“They can come to my office at any time and we'll do it together. Or I do it here on the spot, we have a PC here on the spot. So, the people who want to write, come to me and say: I have this idea. Write it down. And he sits next to me and I write exactly what he tells me. Of course, I support him in calculating and because I am perhaps better at dealing with numbers and because I know what else he needs to calculate the benefits, and so on. Of course we support him in that.”* - GC_3_001.

In conclusion, it can be said that training opportunities are important. They are influenced by the teamwork approach (because it can be sufficient when a few team members receive specific software training). Furthermore, the team supervisor might train employees.

4.10 Motivation by rewards and easier improvements

The analysis revealed that two main mechanisms motivate shop floor employees to participate in the digital ESS. First, there is the monetary reward that employees receive as a proportion of the value or cost savings that their ideas generated for the company. Employees might also have a certain number of ideas as their personal annual goals. Reaching this goal can also motivate since it also leads to a monetary reward. *“So the first one would be a little bit, the motivation, it's goals that you get from the supervisor or that you set as a group, that you just want to actively do something. And the second motivation is that you get a bonus.”* - IDM_001. The second mechanism is that employees aim to make their work easier with their ideas. An example can be a process improvement in a work process that makes hard physical work easier. This kind of motivation seem to be particularly crucial in the shop floor context where physical work plays an important role. *“I believe, I mainly write the ideas for*

improvements so that it makes my work easier” - SF_1_001. Often both mechanisms also go hand in hand: “Well, of course, that you can make your work easier, definitely. And if you earn something on top of that, that's of course also a motivation” - SF_4_001.

However, the motivational effect of the monetary rewards seems to be limited in the case of smaller ideas that also result in smaller bonus payments. *“But now if you get 4 € or 10 €, you don't even notice it on the payroll” - SF_4_003_a. Many employees argue that they would prefer accumulating points instead of receiving small amounts of cash for each idea. In such a system, points can be collected and used to buy goods in an accompanying reward online shop connected to the ESS software. “I can even remember that someone once took home such a reward store catalog or showed it to his wife - and then she said: Wow, I would really like to have a new TV, as an example. Now make an effort and come up with a few good suggestions. So then there's a bit of a push from the channel as well.” - IDM_002.* This gamification approach of receiving goods instead of money seems to motivate more than receiving small amounts of money. In general, however, it seems to be a mix of monetary and non-monetary rewards to motivate employees to participate.

4.11 The digital nature of the ESS

In the following section topics related to the digital nature of the ESS are discussed.

4.11.1 Digital access as necessary condition to participate

This section deals with the question of digital access. Thereby digital access refers to a situation where an employee has access to a computer (or another digital device) that allows access to the digital ESS software used in the company. For office workers who may have their computers or laptops, full digital access is given nearly all the time. However, on the shop floor, where the production process takes place, employees usually do not have their computers. This is, for instance, due to safety reasons not possible because computers might not be allowed in any sections of a factory. However, shop floor workers are able to access computers, too. For instance, they do have access to shared computers located somewhere in a factory. For example, this can be in a separate room or office, but it might also be a computer close to the production facility. A shared computer might not be available at all times, for instance, when a person already occupies it. Employees might also get access to the computers of their supervisors, often located in an office within the factory. This kind of access is referred to as limited digital access in this study. It means shop floor workers have access to computers or other digital devices - but this access is limited. For instance, the access can be limited in terms of availability or quality: another user might occupy a computer for a specific time. Also, a computer many users share jointly might not be in the best condition. Certainly, the access is limited compared to office workers who often have their own computer or laptop and often even an own office. Whereas office workers mostly use their computers all day long, this rarely happens on the shop floor. With their user credentials or smartcard, shop floor workers can log in at any computer and access all IT software, including the ESS software, which is used to manage the whole idea creation process.

4.11.2 Digital access and the ESS software

Access to the ESS software is necessary to submit ideas to the ESS officially. The submission of an idea includes a written explanation of the idea and filling out a specific form with detailed descriptions of the current situation and the desired situation, and a calculation of the potential value or cost savings that the idea is expected to generate. After the submission, the idea is automatically passed on to the employee's supervisor for an initial evaluation. Depending on the type and complexity of the idea, there might be further steps in the evaluation process, which can include expert reviews or advanced cost-benefit analyses. During the evaluation and implementation process, an evaluator might also ask for further explanations from the ideator. In this case, the employee receives an e-mail notification that they need to provide some further written explanation. The employee can also check the current status of the idea in the ESS software. Hence, it might be necessary to use the ESS software more than once in the idea development and implementation process.

Most participants said that they could get access to a computer if needed. *“In the production, we actually have shared computers where anyone can log on if they want to”* - WC_002. A computer might be located in an extra room within a factory. Employees might also be allowed to use the computer of their supervisors. Each employee has specific user credentials and an e-mail account with which they can login to any public computer, for instance, to access e-mails. Also, the digital ESS software is available on every computer. However, the actual use of such computers among shop floor employees varies widely. Some say that they use a computer daily, for instance, to check their e-mails. Others say they use it on a very irregular basis or never. Due to the group work and division of work approach, an employee might not use a computer at all, if other group members do the PC-related tasks (see section 4.4). Also, a few participants said that especially older employees would not like using computers regularly. However, this seems to be the case only rarely.

Some employees argued that the working environment is not ideal, primarily when the computer is located in a noisy area. Another issue is that a shared computer might not always be available, which makes the process of interacting with the digital ESS less comfortable. *“There are computers down here, they're pooled. I go up to the second floor. And you can imagine if there's 30 people or so sharing a computer, that the computer might not necessarily work that well all the time - to say it rather nicely.”* - SF_2_001. However, some also argue that the quality of the PC environment is not so important because the main tasks of the idea creation process take place in other environments, for instance, during group meetings *“But for the actual submission of ideas itself, I don't think that is a great disadvantage, because there is always the possibility, even in these prior processes, to sit down somewhere and first discuss and work things out elsewhere, which often happens in the break room, but there are also sufficient meeting rooms available. But of course that's different from having my own office and above all - and this is the most important point - having my own computer. In that respect, it is some kind of barrier that is there.”* – IDM_001.

Generally, it can be said that employees have computer access. However, it is limited in the

sense that it might not be available at all times and that the work environment might not be comparable to an office environment.

4.11.3 Digital skills as an enabler for effectively using the ESS software

Besides the access to a computer, the question matters if an employee is able to use the digital access effectively. Some basic digital skills can be seen as a requirement for using computers – and hence also for the ESS software. The analysis revealed a diverse picture. Some employees feel sufficiently skilled and competent to use the ESS software, while others have little computer affinity and are not actively using the ESS software. The level of digital skills can be seen as an individual factor of each employee that can vary widely among employees: *“I’ll say, everyone has a different know-how. For one it is maybe much more difficult than for me. You can look at the question both ways. Personally, my feeling is that for anyone who has basic knowledge on PC issues, they can definitely handle it. If you have no PC skills, of course, it is more difficult. You should have some basic knowledge”* - SF_4_001.

In this context, also training plays a role, since some employees said that they received a dedicated ESS software training while other have not received such a training (GC_4_001; SF_3_001). However, besides a specific training on the ESS software there seems to be a difference between employees who generally feel comfortable using the computer systems at the company and those who generally feel not skilled enough and avoid the use of the ESS software. Some participants also indicated that especially older employees would face problems using the software compared to younger employees.

However, many participants indicated that it is actually not a requirement to be able to use the digital ESS software in order to participate in the ESS process. This is because most processes, from idea generation till idea implementation, still take place in an offline setting, mostly in groups. (WC_002). Especially the role of the ESS representatives who submit ideas for others and are responsible for all computer-related tasks, is crucial here. Most employees indicated that if they were not able to submit ideas themselves, they could count on co-worker or supervisor support. *“We have for the guys who have this resistance to the system or who are really not PC-savvy or can't get along with the system. To those, I think we've communicated enough that the option is there: I'll write for you, for example. Or we practice until someone is of the opinion: I can do this. I have a couple of people who are really a little more creative that I've still been submitting ideas for 10 years”* - GC_3_001.

In conclusion, digital skills are closely interrelated with digital access because, without the necessary skills, access alone is not enough. Furthermore, the level of digital skills can be influenced by training opportunities.

4.11.4 Digital avoidance and workarounds

Some participants say that a minority of employees actively avoid all computer-related tasks if they are not absolutely necessary. In particular this would be the case for older employees. However, even in such cases, most participants say that they would get help from colleagues or supervisors in submitting their ideas into the ESS. *“So if it's a colleague who, if I may put it boldly, is a PC refuser,*

like: I don't need this nonsense. I don't have a computer at home either, I don't write any e-mails or anything like that, I don't feel like dealing with it. We also have some of the older ones, and they go to someone else and say, 'Look, I have an idea, we can do it this way, can you submit it?'" - SF_4_002. In such cases, the colleague who is helping to submit the idea into the digital ESS might receive a proportion of the reward of the idea in exchange for the help.

For employees who avoid digital tools, there are also "offline workarounds" available. For instance, employees might even work with a paper-based approach, where employees write down their ideas on paper. Then they hand the paper over to a colleague, who submits the idea from paper into the ESS software: *"Yes, not such a simple piece of paper, but they have these printed sheets. And then they write it down: Current situation, target situation, whether savings are possible or not. Yes, and when that is finished, it is passed on directly to the employee, who then enters it into the system"* - SF_4_002.

To conclude, we found that although the digital access and skills of shop floor workers might be limited compared to office workers, this does not necessarily negatively affect the participation of shop floor workers in the digital ESS. Even if digital tools are not used or avoided, participation in the digital ESS on the shop floor is possible. Generally, it should be noted that digital avoidance strategies seem to be relevant for only a minority of employees. Therefore, it was not possible to examine whether digital avoidance strategies are more or less successful than the standard procedure.

4.11.5 Software-related factors influencing the participation in the ESS

Besides the access to the digital ESS, the ESS software itself matters as well. Many participants describe the ESS software as too complex and not user-friendly. They argue that it is not generally a problem that an online tool is used to manage the ESS but that the particular software in place is too complicated. *"Having access to a PC is one thing. But then it's also, how shall I say it, not so user-friendly that I simply run through it from A to B and say: so, now I've finished it. In my view, that's already too complex"* - IDM_002. Some employees complain about too many questions in the suggestion form or feel that the software is not intuitively understandable and unorganized. Furthermore, employees complain about a lack of transparency about the status of an idea in the system. A too complex and not understandable software might discourage employees from participating: *"If you are already frustrated with the submission, because it somehow does not work or does not go further, then you already have no interest in the overall system anymore"* - IDM_002. On the other hand, some interview participants argued that the software is easy to use in their opinion. Whether employees find the software easy to use also seems to depend on their level of IT skills and if they have received proper training (see sections about training and digital skills). In addition, the system seems to be easier to use for employees who already have used it several times. Hence, practical experience seems to play a role, too.

Some participants also complained about too complicated cost-benefit analyses that they would need to calculate during the idea submission process, which sometimes discourages employees from submitting big ideas with a measurable value. Instead, many employees focus on smaller with an indirect

value where no calculation is necessary. *“So it's not really user-friendly. And there are many questions that arise when I submit an idea and I am asked to value the benefits. Yes, how do I do that exactly? What is actually a benefit for the company? What is the basis for calculating it?”* – IDM_001. Another point that employees are complaining about is that it is not always easy to check the current status of an idea in the ESS software. *“And then also in the later process, when you have submitted the idea, to understand it. Now it is in the hands of a supervisor, they are doing a quality check, now it is in the hands of the reviewer.”* – IDM_001.

One feature of the ESS software is e-mail notifications for open tasks or status changes of an idea. For instance, supervisors receive e-mail notifications about open tasks in the ESS software. However, the e-mails seem not to reach everyone *“System-wise, it is made in such a way that everyone who has a task is also notified about it by e-mail accordingly. In reality, however, it is different. Many ignore the e-mail or perhaps don't even notice it and don't even know that they currently have an open task”* – IDM_001. If, for instance, an expert forgets to do an evaluation, this can delay the whole idea creation process. Therefore, some interview participants argue that the human factor behind the system is more critical for the success of the idea development process than the ESS tool itself.

4.12 External, process-related and organizational factors

The analysis revealed a couple of factors that can influence the participation of shop floor workers in the digital ESS indirectly. For instance, the Covid-19 pandemic as an external factor negatively influenced the role of teamwork. And by negatively influencing the teamwork approach, the pandemic also influenced the participation in the digital ESS.

4.12.1 The negative effect of the Covid-19 pandemic

The Covid-19 pandemic had a substantial impact on the idea development process at the company. The pandemic negatively affected other ideas development factors, such as face-to-face communication and teamwork. Usually, a large part of the idea development process occurs in weekly meetings, where ideas are discussed. However, due to strict social-distancing rules, group meetings could not take place as usual, as expressed in the following exemplary quote: *“As I said, people used to talk to each other a lot more in the group. On Wednesdays, you had a group meeting where you sat together and talked if you had an idea or had something to say. But that's all gone now. We hope it will come back soon.”* - SF_4_001. This resulted in less exchange and discussions about ideas. Also, the missing mutual exchange from the cancelled team meetings could not simply be compensated by virtual meetings as shop floor workers could not work in the home office but had to work on site. In a similar way, the pandemic also affected the possibility of conducting face-to-face training with larger groups of people. Moreover, there was a stronger focus on keeping operations running instead of developing new ideas. These factors, in combination, led to fewer generated ideas. *“I also believe that the situation means that, let's say, group discussions or larger meetings are no longer held. Everything has slipped back a bit with the ideas. People are no longer active together in the group as they were before Corona. You notice that you no longer have the exchange of information that you had before Corona. That's why*

the number of ideas in our group has also dropped a bit. We were, we had years where we definitely wrote a lot more and also sometimes got quite good rankings.” – SF003. Indeed, the document analysis revealed a decline in the number of ideas in 2020 (begin of the pandemic) compared to 2019.

4.12.2 Process-related factors

There are also process-related dependencies on others that can lead to affect the process. For instance, employees might need to wait very long for an expert review which can delay the process. *“I’ll say it, if you would get faster results, it would be even more motivating that if you write a lot, if you have a lot of ideas, and that you still don’t have a result after three months, so to speak, or that you can’t implement that - for reasons because it’s still stuck somewhere or someone else doesn’t continue working on it.”* - SF_4_001. There might also be dependencies on external involved parties, for instance, in case of technical questions that concern the implementation of ideas. *“I would say that some of these processes are technical things where I have to start a process and they can take up to 1 or 2 years. So I’ll put it this way: the simple things, sure, I’m with you. You might get that faster here and there. But certain things, especially when it comes to technical things. That’s a different world, especially when it comes to real investments.”* – GC_2_001. These process-related factors slow down processes which, in turn, can negatively affect the motivation to participate when employees feel that things are too complicated and take a too long time.

4.12.3 Organizational factors and resources

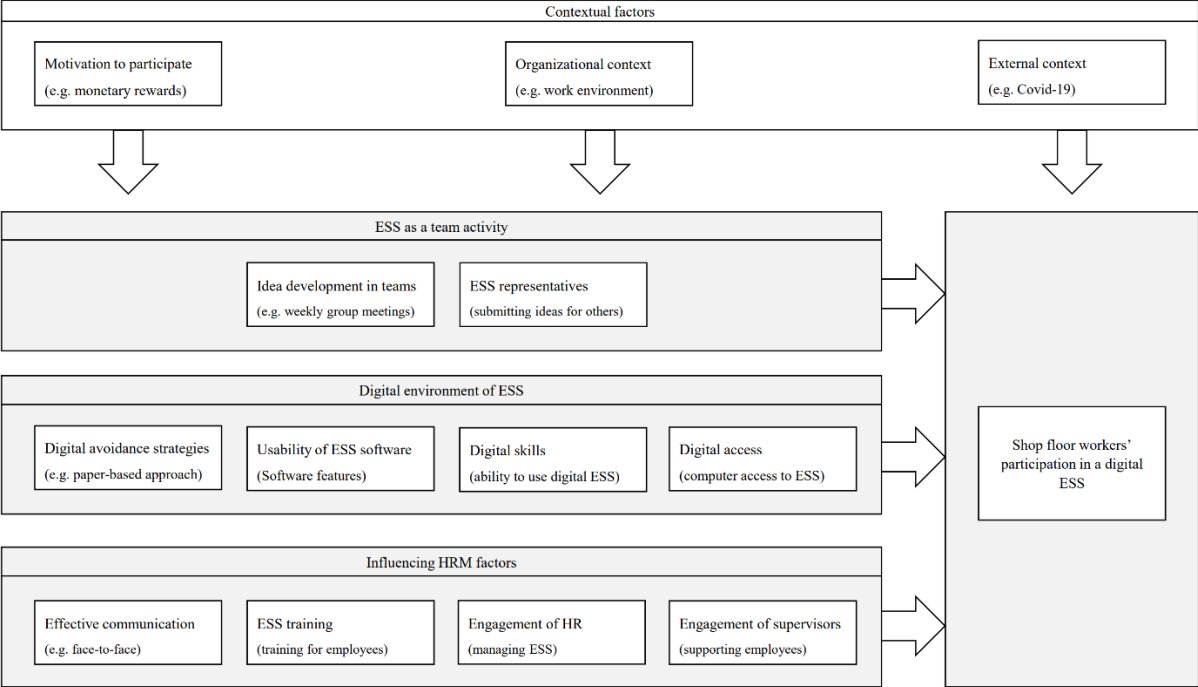
Another factor is that employees get the necessary time and resources to be able to participate in the ESS successfully. Most employees seem to get enough time to work on their ideas – especially during team meetings. Since ESS representative often do the computer-related tasks, they get some dedicated time for that. Also, when it comes to implementing ideas, there seems to be enough time and resources available. For instance, supervisors might actively support employees in implementing more complicated ideas: *“If they wrote an idea, then they have to make sure that this CIP is implemented. And I provide advice, I tell them where they have to go, who they have to talk to, or I make appointments, because I know the people better than they, so that they can make progress.”* - GC_1_001. However, it is mainly the responsibility of the employees to implement their own ideas. Only few participants argued that they do not find the time to work on ideas. In this context, it can also be relevant that employees feel that their participation in the digital ESS is appreciated and supported by the company in general.

4.13 Towards a conceptual model of factors shaping shop floor workers' participation in a digital ESS

The analysis revealed that many factors shape the participation of shop floor workers in a digital ESS. Especially the role of teamwork and ESS representatives are essential on the shop floor as idea development can be seen as a team activity. When it comes to the digital environment, the analysis has shown that besides digital access also digital skills matter. However, participation in a digital ESS is possible even with limited digital access, for instance, via offline workarounds and support by co-workers and supervisors. Also, HR activities such as support and feedback by supervisors and training

matter. Furthermore, contextual factors, like the working environment, shape participation in a digital ESS. Figure 4 gives an overview of the results.

Figure 4
Overview of results



5. Discussion

This study explored the participation of shop floor workers in a digital ESS in the context of limited digital access. We found that digital access is a necessary but not sufficient condition for participating in a digital ESS. Digital skills, training, and support are essential, too. Furthermore, the findings suggest that it is not individual digital access of each employee that matters but joint digital access in a group. Teamwork plays a decisive role: most ideas are developed within a team. Within a group, so-called ESS representatives lead the ESS activities, including all sorts of digital touchpoints with the ESS software. To a certain extent, ESS representatives can be seen as key users of the ESS. Often, they have notably distinguished themselves from others over time, for example, by suggesting many ideas and being very innovative. They have become experts in all aspects of the ESS process and software. Hence, they are not only supporting other employees in the ESS process but suggest many ideas themselves. As such, they might also be seen as lead users (Franke et al., 2006). Research has shown that lead users are important in innovation processes and that ideas from lead users are more likely to be implemented than ideas from non-lead users (Schweisfurth & Dharmawan, 2019). Since this study has found that most ideas result from teamwork processes, ESS representatives (in their role as lead users) might positively influence the idea development and implementation process with not only their own ideas but for team ideas as well. Therefore, their role might go way beyond supporting employees in submitting their ideas.

Whether more digital access and digital skills of all employees would lead to higher levels of participation in the ESS cannot be answered in this study. Some employees predicted that more accessible ways of submitting ideas (for instance, a non-digital submission on paper) would lead to more suggested ideas. However, it cannot be said with certainty if this would be the case in reality. Also, it remains unclear if an easier way of submitting ideas might affect the quality of the ideas.

5.1 Theoretical implications

This study combined literature on ESS with the literature on the digital divide in the context of shop floor workers. Hence, this study contributes to two literature streams: the literature stream on ESS and the literature on the digital divide. In the following, the contributions to both literature streams will be discussed.

This study makes eight major contributions to the ESS literature. First, idea development within a team has been found to be very useful in a shop floor setting. In previous studies, team idea development has also been identified as effective (Gerlach & Brem, 2017; Flynn et al., 2003). When team members collaborate, they can develop and implement better ideas quantitatively and qualitatively (Fairbank et al., 2003; Rapp & Eklund, 2007). This study contributes to these findings by showing that team collaboration cannot only be effective for the idea development itself but also when it comes to making use of and accessing a digital ESS. Axtell et al. (2000) found that the submission of ideas was strongly related to personal and job characteristics. In contrast, the actual implementation of ideas was highly related to group and organizational factors. This study cannot completely confirm these findings.

In fact, the results suggests that at the case study company, both the idea submission and the implementation are strongly related to group and organizational factors. Especially, group work seems to encourage employees to discuss and develop ideas which are then implemented together. However, the effect of the group might be so strong because it is also actively encouraged by the company to develop ideas in groups. Furthermore, the focus of this research was not on studying the personal characteristics of individual employees.

Second, this research found that a dedicated process expert (or ESS representative) within a team can be of great value. In the studied context of limited digital access, ESS representatives are skilled in the ESS so that they can support other team members. For instance, an ESS representative can submit ideas to the digital ESS for others or the whole team, thus bridging the digital ESS and the offline world of a team. In this study, ESS representatives were regular shop floor workers within a team that gained specialized skills in ESS-related topics. Interestingly, we also found that ESS representatives emerge in a bottom-up fashion within a team. Hence, their support can be seen as a kind of co-worker support, which was also found to be a crucial success factor for ESS in other studies (Arif et al., 2010; Fairbank et al., 2003).

Third, our study found that supervisors are important for an ESS, as they can significantly influence the idea development process, for instance, by supporting employees in the form of feedback or by giving them enough resources for working in groups. This finding is in line with many studies on ESS that found the role of supervisor support to be crucial in any ESS (Arif et al., 2010; Frese et al., 1999; Lasrado et al., 2016). For instance, Marx (1995) found that employees need guidance from supervisors or other experts in formalizing an idea so that it can be submitted to an ESS. This study can confirm this finding. Indeed, especially in a shop floor context where employees often have little experience in writing formal proposals, there is a need for guidance. Therefore, next to co-workers also supervisors are often the contact persons if employees need help.

Fourth, this study found that face-to-face communication seems to remain very important on the shop floor, especially for shop floor employees who have limited access to digital communication channels. Previous studies have highlighted the importance of effective communication in the context of an ESS (Binnewies et al., 2007; Lasrado et al., 2016; Shalley et al., 2004). However, this study adds to the existing findings that the communication channels matter on the shop floor. Especially, face-to-face communication about ideas seems to be effective. So, although the digital ESS is used to submit, evaluate and manage ideas, face-to-face communication remains essential. However, this is not to say that an offline approach to handling ideas is more effective generally. Instead, it seems that the advantages of an online system (e.g., managing many ideas) and traditional but practical communication approaches complement each other.

Sixth, this study also found that the features of the ESS software can influence the usage of employees. The ESS software should be easy to use and not be seen as a barrier to participation. For instance, this is in line with Arif et al. (2010), who found that an ESS software should be easy to submit

ideas and that the digital ESS should have certain usability features. Especially in a shop floor context where employees have limited access to computers, the submission process must be easily accessible for shop floor employees.

Seventh, we found that training – which is closely related to the ESS software – is crucial for an ESS on the shop floor. Employees need to be enabled to generate and implement ideas and they need to be skilled in working with ESS software. This finding confirms other studies showing that training can foster idea development by employees (Birdi, 2005; Charles & Chucks, 2012; Gerlach & Brem, 2017). However, this study adds to the existing literature that training is necessary for giving employees skills to develop and implement ideas, and dedicated software training might be helpful if a digital ESS system is used to manage ideas.

Eighth, this study has shown that employees' organizational and working environments need to be considered as well. For instance, employees need to get the necessary resources in terms of time or financial and technical resources to work on their ideas. This finding supports the study by Lasrado et al. (2016), who found that employees need sufficient resources to implement ideas. Also, the specific work environment on the shop floor must be considered. For instance, there should be a physical location where employees can meet to discuss ideas. Also, the location of a computer can be important because a noisy environment can negatively influence the submission of ideas.

In conclusion, this study adds eight important insights to the existing body of knowledge about ESS by explicitly focussing on ESS in the context of shop floor employees. By doing so, this study could confirm some general success factors of previous studies. Furthermore, this study shows that some factors are especially important for shop floor workers with limited digital access.

Moreover, this study also contributes to the digital divide literature (Grošelj et al., 2021; Scheerder et al., 2017; van Deursen, 2020), especially by adding knowledge to the literature on the so-called corporate digital divide (Shakina et al., 2021). There are three major contributions that this study makes to the literature on the digital divide.

First, this study has found that digital access and digital skills are important factors that are essential requirements for using a digital ESS. It has become clear that digital access, i.e., access to a computer with the ESS software, is a necessary but not sufficient condition. In order to be able actually to participate in the ESS, employees need the necessary digital skills to use the software. The finding is in line with Shakina et al. (2021), who found that the use of digital systems should go hand in hand with the development of digital skills. It also supports the general notion of the digital divide literature that ICT access (first-level digital divide) is not sufficient but that digital skills (second-level digital divide) are also essential (Scheerder et al., 2017; van Deursen, 2020).

Second, an important finding of this study is that although digital access and digital skills are necessary for participation in a digital ESS, it is not necessarily the case that all employees need to have digital access and skills. In fact, it can be sufficient if at least one or more group members have the required digital access and skills. This is because of the strong influence of collaboration within a group

that was present in the studied case. Also, with supervisor support, an employee's lack of digital skills can be compensated.

Third, the results have shown that employees' successful participation in a digital ESS is even possible if they do not have digital access themselves. Co-workers or supervisors might take over all computer-related tasks for an employee. Hence, this study could not support the argument that limited digital access or a lack of digital skills necessarily lead to less beneficial outcomes on an individual level (Scheerder et al., 2017). At least, this is not the case as long as an employee knows how to get help from colleagues or supervisors.

In conclusion, it can be said that this study contributes to both the literature on ESS and the literature on the digital divide by connecting ESS with the topic of digital access and digital skills.

5.2 Practical implications and recommendations

The results of this study can be of value for practitioners who aim to implement a new or improve an existing digital ESS in a shop-floor context where employees have limited digital access. Several lessons from this study can be drawn for practical purposes.

First, the role of supervisors is essential in the process of empowering employees to participate in an ESS. Supervisors can foster or inhibit idea development among their employees. They should have a positive attitude towards the ESS themselves and be willing to devote a certain amount of their time to support employees in the idea development and implementation process. Supervisors must also be willing to give their employees the necessary time and resources to participate effectively in an ESS. Therefore, we recommend that companies make supervisors aware of the influence that they can exercise on their employees and that they should support their employees in using the ESS. Also, it is not enough to just provide digital access to the ESS software. Employees also need to have the necessary digital skills. Training opportunities are therefore essential. Employees should learn how to develop, write, and submit an idea to a digital ESS. Only when employees are equipped with all the necessary tools and skills, they will be fully motivated to participate. We recommend companies to provide training opportunities for their employees so that they can learn how to use the ESS best. For the case company, we recommend offering in-depth training, particularly for ESS representatives (or employees who want to become one).

This study has shown that working in groups can enable idea development and implementation on the shop floor. When a group of people can jointly develop and improve ideas, a culture of innovation can emerge. In this context, co-worker support and a division of work among team members can also be fruitful. For instance, dedicated ESS representatives within a team can support the idea creation process. They can act as a bridge between the offline world and the online ESS world on the shop floor. The results have also shown that not every employee necessarily needs digital access to a computer, but it can be sufficient if a few group members have access. Therefore, we recommend companies to support employees who want to become ESS experts, for instance, by offering training and by giving them enough time to spend on ESS issues. For companies where process experts do not emerge in a bottom-

up fashion, it might be an option to actively encourage employees to become experts in an ESS system.

Finally, managers should keep in mind the work environment of shop floor workers. We recommend analysing the unique work environment of employees carefully and making it as easy as possible for them to participate in a digital ESS. For instance, if there is limited digital access on the shop floor, it might make sense to implement some offline alternatives, such as paper-based idea submissions or face-to-face communication channels. Such optional alternatives to a digital system might be a pragmatic and effective way to foster the participation of shop floor employees in an ESS.

5.3 Limitations and future research

Of course, this study comes with limitations. For instance, the chosen sampling method might have led to not optimal sampling as most shop floor workers that participated in the interviews were quite engaged in the ESS. Those who denied participating in the interviews often justified this by arguing that they did not participate in the ESS. However, it would have been interesting to involve more shop floor workers who are not participating. This way, we could have found out more about the reasons discouraging them from participation. Furthermore, only male employees participated in the interviews, probably because most shop floor workers in the case company are males. Future research might profit from choosing another sampling method that purposely included participants with different levels of participation.

Moreover, the results of this research were influenced by the Covid-19 pandemic, which negatively influenced idea development. The pandemic mainly affected the role of teamwork which was found to be critical in the case company. It also affected the data collection as some interviews with non-shop floor participants took place online, which is sub-optimal. Nevertheless, the interviews with the shop floor employees could take place in person.

This study was conducted in the context of shop floor workers with limited digital access in the chemical industry. Therefore, the generalizability of the findings to other contexts is limited. Future research might also look at shop floor workers in other industries or other company sizes to broaden the understanding of the shop floor context. It could also be interesting to compare varying ESS practices of different units within a company. Whereas this study mainly focused on digital access, future research might also consider the effect of different levels of education, including digital skills, which seem to play an important role, too. Furthermore, it seems promising to look at specific software features of the digital ESS in more detail. In this context, it might be promising to connect aspects of the crowdsourcing literature with the literature on ESS.

6. Conclusion

This study investigated the factors that shape the participation of shop floor employees in a digital ESS. Thereby it combined the literature on ESS with the digital divide literature. The research question of this study was, “*Which factors shape the participation of shop floor workers in a digital ESS?*”. We found that a variety of factors influence the participation of shop floor workers in a digital ESS. Digital access is a necessary but not sufficient prerequisite for participation. To use the digital ESS software effectively, employees need digital skills, too. Training and support by supervisors and co-workers play an essential role in gaining such digital skills. However, since most ideas are developed within a team, not every group member necessarily needs digital access if at least one group member has digital access. We found that within a group, dedicated employees, so-called ESS representatives, are often responsible for tasks related to the digital ESS. The findings also suggest that several other factors shape shop floor workers' participation in a digital ESS. For instance, face-to-face communication remains an important factor even in a digital ESS framework. Furthermore, teamwork was found to be a vital driver of idea generation. Finally, also environmental and organizational context, such as the working environment or the Covid-19 pandemic influence the participation in a digital ESS.

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Appendix

Appendix I: Semi-structured interview guidelines

Since the interview partners involved shop floor workers and non-shop floor workers two different interview guidelines were used: one for shop floor workers and another one for all other interview partners, such as supervisors, idea managers, or other interview partners. Before the interviews took place, all participants were informed about the context and goal of the research as well as about the voluntariness of their participation in the research. Furthermore, they were asked if they agree to be recorded and verbatim transcribed. Also, confidentiality and anonymity were guaranteed to the interview partners. Once the interviews took place, the interview partners got the chance to read the written transcripts and to verify them.

Interview guideline (I) for shop floor workers

Table 2
Interview Guideline I

Main concept	Sub dimension	Interview question
Introduction / Opening	General remarks (before the interview starts)	General remarks (anonymity, recording, transcripts, vulnerability of participation)
	Introduction of the research	Introduction of the researcher; explanation of the research (question)
	Introduction of interview partner	Could you introduce yourself and explain job role at ChemComp?
General views about innovation at the company & the ESS	General role of innovation at ChemComp	What is your opinion about the role of innovation at ChemComp? Probe: Which innovation initiatives do you know?
	General opinion about the employee suggestion system at ChemComp	What do you know about the employee suggestion system at ChemComp? What is your opinion about it? Probe: What is your experience with the system? Probe: To what extent are you engaged in the system?

	Experience with the system	Can you describe a typical process from submitting an idea until evaluation and implementation from your personal perspective/ experience from an idea that you suggested? Probe: can you say something about your general involvement in innovation, apart from the suggestion system (esp. in case you do not participate)?
Motivation to participate	Motivation	Can you describe what motivates you to participate in the employee suggestion system? Probe: If you do not participate, what hinders you from doing so?
Organizational support & HRM	General support	Do you receive support in using the idea management system? Probe: If yes, what kind of support? Probe: If no, what kind of support would you like?
	Company /HRM support	Can you explain what the company does (in your opinion) to support and/ or stimulate employees in successfully using the system? Probe: Training, support, information about the system
	Company /HRM policies	Can you explain what the company does (in your opinion) to motivate you in using the system? Probe: Benefits, rewards

	Process /design of the system	Do you think the system is designed in a good way? Probe: evaluation process, feedback, rewards?
	Support	From which person(s) in particular do you receive support? Probe: If not, from whom would you like support?
Barriers & limitations	Barriers for participating	What factors restrict your experience or even prevent you from participating?
Digital issues	General thoughts about the digital system	Can you explain what role the digital nature of the systems plays for you?
	Digital access	Can you explain something about the role of digital access (e.g., access to a computer) in the process? Probe: can you describe how you submit an idea digitally?
	Digital abilities	Can you explain something about the role of digital abilities (skills) in the process? Probe: Can you explain how difficult/easy it is to use a digital system?
Closing the interview		Do you have any suggestions for the system that we have not talked about so far? Do you want to add anything?
		Thank you for your participation.

Interview guideline (I) for other participants (e.g., supervisors, managers, committee members)

Table 3
Interview Guideline II

Main concept	Sub dimension	Interview question
Introduction / Opening	General remarks (before the interview starts)	General remarks (anonymity, recording, transcripts, vulnerability of participation)
	Introduction of the research	Introduction of the researcher; explanation of the research (question)
	Introduction of interview partner	Could you introduce yourself and explain job role at ChemComp?
General views about the employee suggestion system	General opinion about the employee suggestion system at ChemComp	Are you familiar with the employee suggestion system at ChemComp? What is your experience with the system?
	Experience with the system	Can you describe the way in which you are involved in the system?
Motivation to participate	Motivation	From your role and experience, what do you think it is that motivates shop floor employees to participate? If they do not participate, what hinders them from doing so?
Barriers & limitations	Barriers for participating	What factors restrict employees or even prevent them from participating?
Organizational support & HRM	HRM policies	Which initiatives/actions does the organization take to stimulate shop-floor employees to participate?
	Barriers	Which policies or practices hinder the participation of shop-floor workers?

	Support	Probe: Can you explain what the company does (in your opinion) to support employees in successfully using the system? Probe: Training, support, information about the system
	Benefits and rewards	Probe: Can you explain what the company does (in your opinion) to motivate employees in successfully using the system? Probe: Benefits, rewards
Digital issues	General thoughts about the digital system	Can you explain what role the digital nature of the systems plays for shop floor workers? Probe: How do employees without an own computer hand in ideas?
	Digital access	Can you explain something about the role of digital access (e.g., access to a computer) in the process? Probe: Can you explain how difficult/ easy it is to use a digital system
	Digital abilities	Can you explain something about the role of digital abilities (skills) in the process? Probe: Do employees have the necessary digital skills to use the system?
Closing the interview		Do you have any suggestions for the system that we have not talked about so far? Do you want to add anything?
		Thank you for participating.

Appendix II Coding template

Table 4
Coding Template

Third order codes	Second order codes	First order code
Role of digital environment	Digital access	Access for private devices appreciated
		Access for private devices not appreciated
		Access to jointly shared computers
		Computer access available
		Feeling that limited digital access is a problem
		Feeling that limited digital access is no problem
		No own computer
		Limited computer access given
	Digital skills	Employees have necessary digital skills
		Everyday computer use
		Feeling that ESS is too complicated for employees without IT affinity
		Lack of digital affinity
		Limited digital abilities
		Little computer use in general
		Little knowledge about ESS software
	Digital avoidance strategies	Computer avoidance
		Feeling that offline collection of ideas is easier
		Feeling that PC use is an extra effort
		Hand written board for small ideas
		Offline work-arounds
		Submitting hand-written ideas on paper
		Supervisor submits ideas for employees
	Writing ideas on paper	
	ESS software experience	ESS software is more effective than hand written ideas
		Feeling that complicated software is demotivating
		Feeling that the ESS software is easy to use

		Feeling that the software is complicated when not used regularly
		ESS software as tool as documentation only
		Not all employees are familiar with the ESS software
		Other software and process for small improvements
		Positive experience with ESS software
	Limitations of ESS software	Difficult to find ESS software among other applications
		ESS software lacks features
		ESS software not user-friendly
		Feeling that software is too complicated
	Desired features of ESS software	Not easy to check status of ideas digitally
		Bonus shop for non-cash rewards appreciated
		Introduction of a new ESS software appreciated
		Reduced complexity in the evaluation process
		Software access on multiple devices
Wish for easier software		
Wish for more transparency		
Group dynamic of ESS	Role of group work	Wish to see ideas of others
		Discussing ideas as part of group meetings
		Division of work in team
		Feeling that sharing rewards is unfair
		Getting inspiration from ideas of others
		Group discussions as initial quality check of ideas
		Group work as facilitator of idea generation
		Groups organize themselves
		Joint idea development in group
		Mistrust within the team
		Mutual support within a team
		Sharing rewards in a team
		Workshops for idea generation
	Between group cooperation	Cooperation between teams
Idea development remain inside a team		
Little cooperation between teams		
Wish for cooperation between teams		
		Employees with PC expertise submit ideas

	Role of ESS experts	<p>Employees submit ideas for others and receive part of the rewards</p> <p>ESS representative as a bridge between team and digital system</p> <p>ESS representative informs group members about status of ideas</p> <p>ESS representative is process expert in a group</p> <p>ESS representative submits group-ideas into the ESS software</p> <p>ESS representative submits ideas for others into the ESS software</p> <p>No ESS representative in a group</p> <p>Wish to have one full-time ESS expert in each factory</p>
Phases of ESS	Idea generation	Decline in number of ideas
		Ideas by individuals are rare
		Very few suggested ideas
		Many suggested ideas
		Medium amount of suggested ideas
		Most ideas are small ones
		No individual ideas
		Problems as a basis for idea development
		Supervisor involvement in idea development
	Idea evaluation	(Technical) experts evaluate ideas
		Evaluation of ideas by supervisors
		Expert commission evaluates bigger ideas
		Multi-level evaluation process
		Feeling that feedback is not helpful
		Feeling that evaluation process is slow
Idea implementation	Feeling to be dependent on others in the implementation process	
	Rewards only after implementation of ideas	
	Slow idea implementation	
	Supervisor encourages employee to implement ideas on their own	
Role of Stakeholders	Individual employee experience	Dissatisfaction about rejected ideas
		Employees can implement ideas on their own
		Employees know how to get help
		Employees submit individual ideas
		Fears about negative consequences of ideas
		Feeling of being able to use the ESS
		Feeling of getting no appreciation

		Feeling of not being able to use ESS
		Feeling that some employees are not motivated to participate
		Idea development as part of personal annual goals
		Idea development not part of annual goals
		Negative sentiment towards the ESS
		Neutral sentiment towards the ESS
		Positive sentiment towards the ESS
		No other innovation initiatives known
	Role of HRM	Employees have little contact with HRM department
	Role of HRM	Employees have no contact to HRM
	Role of HRM	HRM department as link between involved parties
	Role of HRM	HRM department as manager of ESS
	Role of HRM	Idea manager as contact person for problems
	Role of HRM	Idea manager checks ideas
	Role of HRM	Idea manager organizes initiatives to promote idea development
	Role of HRM	Idea manager responsible for the ESS
	Role of HRM	Idea manager supports employees
	Role of HRM	Idea manager supports supervisors
	Role of management	Feeling that companies wants to see cost savings
	Role of management	Feeling that company and workers interests are aligned
	Role of management	Feeling that company management supports idea development
	Role of management	Feeling that the company appreciates ESS
	Role of management	Group ideas are desired by the company
	Role of management	Feeling that importance of idea development has declined
	Role of management	Lack of appreciation by company
	Role of management	Management support for ESS
	Role of supervisors	Employees and supervisors work together on implementation
	Role of supervisors	High supervisor priority on ESS
	Role of supervisors	Low supervisor priority on ESS
	Role of supervisors	Supervisor support
	Role of supervisors	No supervisor support
	Role of supervisors	Positive attitude of supervisors on ESS
	Role of supervisors	Success depends on supervisor's attitude towards ESS
	Role of supervisors	Supervisor demands active participation by employees

		Supervisor encourages employee to suggest ideas
		Supervisor has duty to support employees
		Supervisor receives notifications for open tasks
		Feeling that supervisors evaluate ideas too slow
		Lack of appreciation from supervisor
		Supervisor has not enough time for ESS
Factors influencing employee participation in a digital ESS	Training	Employees received training
		Existence of training material for employees to use the system
		Face-to-face training
		Lack of training opportunities
		Learning by doing
		Supervisor teaches employees to use computer software
		Need for easy training material
		Need for supervisor training
		Need for training on ESS
		No need for training
		No training material known
		Not enough training on ESS
		Self-learning training material appreciated
		Video training material appreciated
		Software training for key users necessary
	Training opportunity only on request available	
	Support	Consulting experts for advice
		Co-worker support
		Employees receive help if they ask
		Feeling that there is not enough support
		Help for calculations needed
		Help necessary to get idea submitted
		Idea manager supports employees
		No clear contact person for questions
		No clear guidelines on how to use ESS software
No need for help		
Success depends on supervisor support		
Workers council support		

	Communication	communication outside the system
		communication problems
		communication via the ESS software
		e-mail communication
		face-to-face communication
		mix of digital and analog communication
		supervisors inform employees about news
		communication via app
	Motivation	Bonus shop for non-cash rewards: neutral
		Bonus shop for non-cash rewards: not motivating
		Drop in motivation due to long waiting times
		Feeling that appreciation matters
		Feeling that motivation has declined
		Feelings of appreciation for submitted ideas
		Ideas included in annual targets: motivating
		Long waiting times for rewards
		Making tasks easier: motivating
		Monetary reward: motivating
		Monetary reward: not motivating
		No incentives for some involved parties
		Non-monetary appreciation: motivating
		Participation in lottery to win cash reward
	Team events as rewards	
	Process-related issues	Differentiation between small and big ideas
		Difficult calculations necessary
		Employees are dependent on others for implementation
		Feeling that processes are too complicated
Intransparent feedback		
Intransparent processes		
Slow processes		
Small ideas less bureaucratic		
Transparent processes		
Waiting for approvals takes too long		
	Dedicated time for idea development necessary	

	Working environment	Employees get time to work on ideas
		Enough time to generate ideas
		Limited time available to submit ideas
		Mix of different ideation programs
		Noisy work environment
		Not enough time to work in ESS software
	Work with external parties complicated	
	Role of Covid-19	Fewer ideas due to covid-19
		Fewer workshops due to covid-19
		Less face-to-face interaction due to covid
Less interactions within and between groups due to covid		

Appendix III Overview of factors

Table 5
Overview of factors

Area	Factor	Quote	Mechanism
Role of supervisor	Supervisor priority on ESS	<p>+ <i>"It must also be strongly desired by the superior. Again and again. From my point of view, it's not a matter of course. If you don't constantly put energy into it, then the process falls asleep." - IDM_002</i></p> <p>+ <i>"That is a culture that is lived differently and how you also go after an employee like that. That is related to everything. That's how you are as a supervisor and also if you stand behind it yourself. Yes, it's all related to that." - GC_4_001:</i></p> <p>- <i>"I have too much to do to prioritise now. What is more important now? The continuous improvement or my daily work? And probably the same will be the goes for others here at the facility. What I said earlier, when I have passed the idea forward, either it runs into such a dead end or the priorities of the next instances are higher or different, too." - GC 4 001</i></p>	<p>High priority: leads to support by supervisor</p> <p>Low priority: leads to less support by supervisor</p>
	Supervisor support	<p>+ <i>"They can come to my office at any time and we'll do it together. Or I do it here on the spot, we have a PC here on the spot. So, the people who want to write, come to me and say: I have this idea. Write it down. And he sits next to me and I write exactly what he tells me. Of course, I support him in calculating and because I am perhaps better at dealing with numbers and because I know what else he needs to calculate the benefits, and so on. Of course we support him in that. - GC_3_001</i></p> <p>+ <i>"Yes, and therefore it is very much dependent on the supervisor, if he participates, if he is there himself, if he also gives his input, if he is present, then it is something different than if he considers it a necessary evil." - IDM_002</i></p> <p>+ <i>"But I usually ask the colleague who wrote the idea to join me in my office, so that when he writes something, I understand what he wants. And sometimes it's also a barrier to understand: what does he actually want from me now, if I just read the text?" - GC_4_001</i></p> <p>+ <i>"It varies. It really varies from person to person. One has no desire at all to somehow take care of it. He expects the supervisor to do it and says: here, I have the idea, take care of it. And the next one tries to work it out and says: I don't get along with the system, I just want to write the idea, but I don't get along with the system. But that's actually the least of the problems, because everyone in my team knows that if you have a problem, you have to get in touch with me. Either I do it directly, if time permits, or I say: Watch out, come then and then again. Then we do it together." - GC_2_001</i></p>	<p>Creates help for employees</p>
Influencing factors	Team work	<p>+ <i>"There are ideas, if someone has worked them out all by himself, that he also writes them alone. But mostly it's like what I said at the beginning, that one person writes and the others add stuff. So there's always a situation that, let's say, it's like a wheel turning." - GC_4_001</i></p> <p>+ <i>"Group work has the idea that my employees should organize themselves mostly and that I should only be there to look after them. That means they divide themselves up into functions and the corresponding work - based on their strengths. Of course, this also provides the so-called leave of absence where one employee can work out such an idea, because the others continue to work while a colleague takes care of the idea and submits it online." - GC 4 001:</i></p>	<p>Helps to develop ideas together and get help and feedback</p>
	ESS representative	<p>+ <i>"I have too much to do to prioritise now. What is more important now? The continuous improvement or my daily work? And probably the same will be the goes for others here at the facility. What I said earlier, when I have passed the idea forward, either it runs into such a dead end or the priorities of the next instances are higher or different, too." - GC 4 001</i></p>	<p>Helps to do computer-related tasks & ensures</p>

	<p><i>"We then sit down together. He tells me the idea. I make notes, I sort of memorise it and type it into the software system." - SF_4_001</i></p> <p>+</p> <p><i>"Well, I would say that in our group, I'm a bit in charge of that. If I can put it this way. If colleagues who are perhaps not so familiar with the computer have ideas, then I sit down with them and make a note of it and then write this idea into the system for the colleagues, so to speak." - SF_4_001</i></p> <p>+</p> <p><i>"The problem is always that many people have nothing to do with computers. They want to do their work, and that's it. And many don't even know how a computer works. [...] The problem is, if everyone writes up an idea, you always have to give everyone this half hour. So they said: Come on, [name], you do it. We'll give you the time. The time you need do it, we do your regular work for you." GC_1_001</i></p> <p>+</p> <p><i>"No, I have another group of people who don't have PCs at all, they come to me and write down ideas together with me here. They write more than the people here who have a PC on site." - GC_3_001</i></p>	<p>participation without the need for digital access for each team member</p>
<p>Co-worker support</p>	<p>+</p> <p><i>"So I would rather say that it has no particular relevance that you submit the ideas via the PC. You actually always get support. I've been here in the department for two and a half years now. Before that, I don't know, I was at [Factory X] for nine years or so, and we also had people who didn't get along with PCs at all. And when they wanted something, you sat down with them. And you'd go and say, "Hey, you know how to do this, sit down and do it together with him." - SF_3_002</i></p> <p>+</p> <p><i>"Mostly it is then explained directly on the spot. That is, he is in the process of doing it. Then he says: Here's where it gets tricky, and then he either gets help from the left or from the right. I'm talking about his colleagues or his supervisor." - GC_4_001</i></p> <p>+</p> <p><i>"And the point that you raise is a very important one, that quite a lot actually happens by knowing someone who is familiar with it and that you help each other and that they help each other. That is a central point." - IDM_001.</i></p>	<p>Helps to improve ability of employees to use the system and to improve ideas</p>
<p>Face-to-face communication</p>	<p>+</p> <p><i>"I think consultation with the others is absolutely important to me, because otherwise it makes no sense. And that's why we often have an appointment with the expert, because writing is always such a thing, but he doesn't understand it anyway. That's why we usually have an appointment every three or four months and talk through the ideas and show them to him. For example: a pipe has to be built downstairs and we need something there. Then we go down and show him that. Because sending it to him like that and explaining it to him in writing doesn't make sense." - GC_1_001</i></p> <p>+</p> <p><i>"But that only works if I stand with the man on the spot, show him what I want, tell him my idea and then he has to think about it technically. But that does not go via written correspondence, no one can tell me that. So I can't write so precisely to explain a project or an idea in such a way that he actually understands what I want from him." - SF_2_002</i></p> <p>+</p> <p><i>"Not everyone has PC access, you have to know that. Yes, that means you have to somehow choose a different format so that the people who don't have PC access are also addressed. I don't know, you can go to the door and hand out something, for instance, flyers. Or maybe some kind of items, e.g. mugs, where people remember that there are ideas." - GC_3_001</i></p> <p><i>"For me it doesn't make sense if he submits an idea and I say: no, that's bullshit and I reject it. Then he's already sat down at the computer half an hour for nothing at all. That's why we talk about it beforehand and I say: Yes, write it, it makes sense. Or: leave it, it won't go through the evaluation anyway. Because that's always time that we waste." - GC_1_001.</i></p>	<p>Helps to express ideas and enables easy and understandable communication about ideas</p>

	Training	<p>+ <i>"So it would actually be nice in the future if you could get a training course or something like that. On topics related to idea management, when you submit ideas, so that you don't always have to run to the group coach and ask: show me this, show me that. But instead a training course right from the start." - SF_3_001</i></p> <p>- <i>"The people who do it in the factories, it should be explained to them, because that's the big problem here: If there is an new feature on the market, then it is simply integrated into the system and there is no one to explain it in a proper way. So we should explain to the people, how it works." - WC_003</i></p> <p>+/- <i>"The approach was learning by doing. There were colleagues from the HR department who explained the system once when it was new. And if you needed help, they were happy to support you. But it's still complicated because of all the functions. And for those who don't work with it that much, it becomes very complicated to use the software" - GC_4_001</i></p> <p>+ <i>"And then you can also consider - from my point of view - training one or two multipliers. These people could be group coaches who are then also well experienced with the system, and then they can train their employees again. So there should actually be something like that." - IDM_002</i></p> <p>+ <i>"Exactly, so in the past, we actively offered a training. However, since we had reached a saturation point at some day where there was no longer any demand, we no longer actively offer these training courses and have so many people who are well versed in this that they tend to support each other within the team in this respect." - IDM_001</i></p>	<p>Training: being able to participate and use the system</p> <p>No training: can lead to inability to participate</p>
	Support from HR department	<p>+ <i>"Those who want to know [the status of their ideas] have to call the [idea manager]. He can then look for them. Some people come to me and ask: What's the current status? And then I take a look. That's no problem." - WC_001</i></p> <p>+/- <i>"No, we don't do much with him. There is no contact" - SF_3_001.</i></p> <p>+/- <i>"That's just within our team. I know if I asked him [idea manager], I'm sure he would be supportive, but we do it within the team." - SF_4_001</i></p>	<p>Only little contact with HR department</p>
ESS software	User-friendly software	<p>+ <i>"A certain level of knowledge you should probably have, but otherwise it is quasi, there are six steps, in order to submit a suggestion here, which you have to complete. And everything is explained to you even or is indicated. From that point of view, it's actually not that hard, I'd say." - SF_4_001</i></p> <p>+/- <i>"How difficult? I'll say, everyone has a different know-how. For one it is maybe much more difficult than for me. You can look at the question both ways. Personally, my feeling is that for anyone who has basic knowledge on PC issues, they can definitely handle it. If you have no PC skills, of course, it is more difficult. You should have some basic knowledge" - SF_4_001</i></p> <p>- <i>"Well, finding the ESS software is still easy. But then it already starts with the submission. Then there are all the different steps that you have to go through. So I think that for some people who don't have much of an IT affinity, there's a high barrier. From my point of view, this is a very complex process for many people." - IDM_002.</i></p> <p>- <i>"If you are already frustrated with the submission, because it somehow does not work or does not go further, then you already have no interest in the overall system anymore." - IDM_002</i></p>	<p>User-friendly software: supports ability and willingness to participate</p> <p>Not user friendly- software leads to inability and unwillingness to participate</p>
	E-mail notifications	<p>+ </p>	<p>E-mail notifications are often ignored</p>

		<p>“Yes, but I’ll say now, I as a supervisor have now been contacted 15 times with a reminder mail from the system. The 16th mail no longer goes only to me, but also to my supervisor. And if he then gets 15 mails because I’m too lazy, then I’m already 30 weeks further along. Then his superior has to be in the chain. That creates pressure to do the same. I don’t know now if that’s included today. I don’t know, but that would put a whole different pressure on it to process something like that even faster.” - GC_4_001</p> <p>-</p> <p>“System-wise, it is made in such a way that everyone who has a task is also notified about it by e-mail accordingly. In reality, however, it is different. Many ignore the e-mail or perhaps don’t even notice it and don’t even know that they currently have an open task” – IDM_001.</p>	
	Mobile access	<p>-</p> <p>“From the mobile phone I think, from the smartphone it’s too small. I think it’s not easy to enter everything there. It’s not like just writing a WhatsApp or a Facebook post or doing something. I think that will be difficult.” - IDM_002</p> <p>-</p> <p>“No, we do it on the PC. Because you wouldn’t be allowed to take cell phones into production anyway.” - GC_1_001</p>	Is not appreciated by most shop floor workers
	Seeing ideas of others	<p>+</p> <p>“This may be too much, but if you just do a quarterly listing like this, where do we stand? What is there? We now have an app, where you can make such things known, which many people also read. And if someone then thinks they need to know a bit more about this idea, then they can certainly get the people who submitted it via [idea manager] and then they can discuss it.” - IDM_002</p>	Gives inspiration for own ideas
	Gamification elements	<p>+</p> <p>“I think it was much better in the past. It was so that the money that you received was converted into points, so to speak. There we had the premium store, where you could collect points [to buy goods]. It was really great. If you write many small ideas, and earn 30 euros here and 20 euros there, then after a few months you have a larger sum. Then it’s attractive to get it paid out, I’d say.” - SF_4_001</p>	Gamification can motivate employees to participate
Process related aspects	Long waiting times	<p>-</p> <p>“I have an idea which is two years old. And that’s a small thing. It’s stuck somewhere and it’s just not being processed any further. You can ask ten times and write emails and still nothing happens. What can you do? So you stop writing down ideas. That doesn’t make any sense, it won’t be processed anyway.” - SF_2_002</p> <p>-</p> <p>“Yes, we have ideas that run for three years. So I think then you can actually just forget about it.” - SF_1_001</p> <p>-</p> <p>“The speed of processing, it’s definitely not the fault of the system. It’s because of the people who are evaluating it.” - GC_2_001</p>	Long waiting times are demotivating
	Dependencies on others	<p>-</p> <p>“I would say that some of these processes are technical things where I have to start a process and they can take up to 1 or 2 years. So I’ll put it this way: the simple things, sure, I’m with you. You might get that faster here and there. But certain things, especially when it comes to technical things. That’s a different world, especially when it comes to real investments.” – GC_2_001.</p>	Dependencies on others can slow down the implementation process
Work environment	Noisy environment	<p>-</p> <p>“Yes, the quietness is such a small problem here. That’s true, because we have a basic noise level here in the room.” - SF_3_003</p> <p>-</p> <p>“But not everyone has this access, and it’s difficult for us because there are PCs in the production area, and if it’s noisy, you can’t understand much. We had a training session yesterday and I didn’t understand a thing.” – SF_3_001</p>	Noisy working environment is not ideal for submitting ideas
	Time	<p>-</p> <p>“But I’ll put it this way, in production, I would say that I personally never had much time to do anything on the PC. I was happy when I could sometimes read my emails. Sometimes I had days, several days or weeks, before I could read my emails, because I didn’t find time to</p>	Employees need to get enough time to work on ideas

		<p><i>sit down at a computer and log on. So for me personally it was a time problem.” - SF_3_003</i></p> <p>+</p> <p><i>“You take some time when you feel like it. As I said, in my position I am also partially called off to do such tasks. That’s the same thing here.” - SF_4_001</i></p> <p>+/-</p> <p><i>SF_4_003_a: Depending on how I have the time for it and depending on how the computer is available then. Sometimes in the early shift both computers are occupied. Then I don’t have the time for it and I also have to deal with the apprentices and depending on that.</i></p>	
External environment	Covid-19	<p>-</p> <p><i>“Exactly, we try to separate the employees as much as possible. That’s why there is less exchange. And that’s why my personal opinion is, everyone is still far too focused on such a small circle when it comes to ideas. The input of mutuality is missing. The break room, where everyone sits together, doesn’t happen at all at the moment” - GC_4_001</i></p> <p>-</p> <p><i>“I also believe that the situation means that, let’s say, group discussions or larger meetings are no longer held. Everything has slipped back a bit with the ideas. People are no longer active together in the group as they were before Corona. You notice that you no longer have the exchange of information that you had before Corona. That’s why the number of ideas in our group has also dropped a bit.” - SF_4_001</i></p> <p>-</p> <p><i>“It’s downsized then and on another level because the break room is too small. Right now, I can only have three people in a break room. That’s where my group meets and they exchange ideas there. But of course it’s not this big dynamic. It’s just a small dynamic.” - GC_3_001</i></p>	Covid-19 negatively affected discussions and group work on ESS topics