Mitigating employee resistance and achieving well-being in digital transformation

Alena Valtonen and Mira Holopainen
Lappeenranta-Lahti University of Technology, Lahti, Finland

Received 28 May 2024
Revised 16 December 2024
Accepted 6 February 2025

Abstract

Purpose – Digital transformation is a complex and continuous process that presents significant challenges for companies and employees. Employee resistance, a factor often cited for the failure of digital initiatives, hinders these initiatives and contributes to stress, affecting employee well-being – a connection not yet fully explored in extant literature. Therefore, this study aimed to determine the factors that increase employee resistance to digital transformation and how it can be mitigated.

Design/methodology/approach – This study adopts a multiple case study approach to analyze qualitative data from ten industrial companies in Finland.

Findings – Factors influencing resistance at the individual, organizational, and technological levels were identified, and three key components of the resistance mitigation strategy from the case companies were identified: learning, communication and participation. The findings, supported by relevant literature, link resistance to employee well-being and propose that the identified mitigation strategy reduces resistance and supports employee well-being during digital transformation.

Practical implications – This study provides practical implications and suggests avenues for future studies to examine this unsaturated yet important research area.

Originality/value – This study is among the first to empirically examine employee resistance in digital transformation and link it to employee well-being.

Keywords Resistance, Well-being, Digital transformation, Employees

Paper type Research paper

1. Introduction

Digital technologies disrupt industries and force companies to adapt to the new digital reality (Gurbaxani and Dunckle, 2019; Kane, 2019; Vial, 2019). To remain competitive, companies invest in digital technologies and strategically leverage their resources and capabilities to fundamentally transform their operations and business models (Gong and Ribiere, 2021). This shift, described as digital transformation (DT), is a multifaceted phenomenon that reshapes structures, processes, capabilities, roles, and boundaries within companies (Holopainen *et al.*, 2022). Despite its significant performance enhancement potential (Vial, 2019), the implementation of digital technologies frequently encounters substantial difficulties and often fails (Oludapo *et al.*, 2024). Various studies reported DT failure rates ranging from 66% to 90% (Libert *et al.*, 2016; Ramesh and Delen, 2021). And this failure could result in trillions of dollars in losses globally, according to the IDC's (2022) data on global spending on technologies and services for DT.

Among the common causes of DT failure, employee resistance stands out as a significant barrier (Vial, 2019; Oludapo *et al.*, 2024). The literature highlights the central role of

Information Technology & People
Vol. 38 No. 8, 2025
pp. 42-72
Emerald Publishing Limited
e-ISSN: 1758-5813
p-ISSN: 0959-3845
DOI 10.1108/ITP-05-2024-0701

The authors thank Associate Professor Minna Saunila for her guidance and suggestions that helped improve this paper's contribution. The authors also thank the European Regional Development Fund (project People at the Center of Digital Transformation) for supporting our research within this study.

employees in DT, particularly in the introduction, adoption, and utilization of digital technology (Kane, 2019; Nadeem *et al.*, 2024). DT reshapes employee roles and skill requirements, significantly altering the nature of their work (Demerouti, 2022; Vial, 2019) and intensifying the pressures associated with organizational change. Employee resistance in DT context, which stems from rapid technological changes and difficulty in individual and organizational adaptation (Kane, 2019), can manifest in affective, cognitive, and behavioral forms (Weber *et al.*, 2022) including passive resistance, active sabotage, verbal resistance, procrastination, protest, criticism, and the non-use of systems (Lapointe and Rivard, 2005), which is in line with innovation resistance theory (IRT) posing that resistance to innovation can take active or passive forms (Ram and Sheth, 1989). Resistance to DT involves more than simply resistance to new technologies (Trenerry *et al.*, 2021). Therefore, although the integration of digital technologies forms the basis for DT, individual and organizational factors should be considered to reduce resistance and achieve strategic DT goals (Holopainen *et al.*, 2023). While much research has focused on how DT shapes business and strategy (e.g. Kraus *et al.*, 2021; Verhoef *et al.*, 2021), the human aspect is less understood (Nadeem *et al.*, 2024), particularly regarding the factors that evoke resistance to DT in employees and appropriate responses to mitigate this resistance. Emerging studies have identified employee resistance to change and challenges in adopting new technologies as two primary reasons for DT failure, highlighting the need for further research in this area (Oludapo *et al.*, 2024).

Since DT often exerts significant transformative and disruptive forces, driving substantial changes within organizations (Scholkmann, 2021), it can generate considerable stress in employees who are pressed to adapt quickly. Resistance to these change further amplifies this stress (Zhang *et al.*, 2023; Diedericks *et al.*, 2019), compounding its adverse effects on employee well-being. However, despite its significance, the relationship between employee resistance and well-being has been largely overlooked in the literature. Employee well-being is increasingly recognized as an important prerequisite for employee and organizational performance (Johnson *et al.*, 2020), and a significant factor influencing DT effectiveness (Selimović *et al.*, 2021; Trenerry *et al.*, 2021). Ignoring the effects of resistance can not only reduce employee well-being but also hinder DT and damage organizational performance and competitiveness, depending on the success of a company's digital strategy.

Thus, studying how to manage DT from an individual perspective and placing employees at the center of the process is essential for ensuring its success. Specifically, this study explores the factors that drive employee resistance to DT and how this resistance can be mitigated—an area of study that is still in its early stages of investigation, particularly regarding individual and organizational dynamics (Nadeem *et al.*, 2024; Oludapo *et al.*, 2024). While resistance is known to exacerbate stress (Zhang *et al.*, 2023; Diedericks *et al.*, 2019), which can potentially negatively affect employee well-being—another factor in DT success (Trenerry *et al.*, 2021)—this relationship remains largely unexplored and requires further investigation. Therefore, this study addressed three main questions:

(1) What kinds of factors increase employee resistance to DT and how can it be mitigated?

(2) How does resistance influence employee well-being?

(3) How can companies manage employee resistance to DT while simultaneously supporting employee well-being?

By adopting a multiple case study approach, this study analyzed qualitative data from ten industrial companies in Finland selected for their experience and advancement in DT. The study explored employee resistance to DT, strategy to mitigate it, and its impact on employee well-being.

To summarize, this research contributed to organizational change and DT literature (Hanelt *et al.*, 2021; Dąbrowska *et al.*, 2022; Minh and Thanh, 2023) by providing empirical evidence on factors driving resistance at the individual, organizational, and technological levels and

detailing effective resistance mitigation strategy, including learning, communication, and participation components. Based on this study's findings and the relevant literature, this study proposes that the components of a resistance mitigation strategy can play a mediating role between resistance factors and employee resistance, thereby reducing resistance and simultaneously supporting employee well-being during DT. This dual focus on employee resistance and well-being bridges an important gap in the literature by offering a more human-centered perspective on DT. Practically, the study provides actionable guidance for managers to navigate the complexities of DT while maintaining both employee performance and well-being, ensuring a more sustainable and effective DT process.

2. Theory

2.1 Employee resistance and resistance mitigation strategies in digital transformation

Resistance to DT can be positioned within the broader framework of innovation resistance theory (IRT), which examines individuals' reluctance to adopt new products, services, or ideas due to perceived risks, effort, or incompatibility with existing values and believes (Ram and Sheth, 1989). IRT emphasizes that resistance arises not solely from the characteristics of the innovation itself, but also from the context in which it is introduced and the user's subjective evaluation of its impact (Kleijnen *et al.*, 2009; Chawla *et al.*, 2024). Within organizations, this resistance becomes particularly complex, as employees must not only adopt but also integrate new technologies into their daily workflows, often under significant pressure to adapt quickly.

Extending IRT to organizational contexts, employee resistance represents a specialized form of innovation resistance influenced by multilevel factors. Unlike individual consumer decisions, resistance in the workplace is shaped by organizational culture, leadership, and collective dynamics, alongside personal fears of job loss, technostress, and skill obsolescence (Holopainen *et al.*, 2023; Syed *et al.*, 2023). DT, in particular, exemplifies this challenge, as it involves widespread organizational changes that require employees to learn and adapt to new tools while confronting potential disruptions to their roles (Vial, 2019).

DT encompasses organization-wide changes through the innovative use of digital technologies (Gong and Ribiere, 2021) such as automation, artificial intelligence, cloud, big data and analytics, digital twins, IoT, machine learning, and robotics (Trenerry *et al.*, 2021). These technologies augment employee tasks, change how employees collaborate and solve problems, and equip them with enhanced creativity and innovation (Weber *et al.*, 2022). However, while digital technologies typically boost employee efficiency, productivity, and innovation, they require employees to learn and adapt to new digital tools and heighten their concerns regarding technology-induced labor displacement (Brougham and Haar, 2018).

Within the DT context, employee resistance can be defined as an attitude or action that opposes the use of new or updated technology (Eyel and Mete, 2021). In DT, resistance to change is a significant barrier that can hinder digital initiatives' success, which companies should effectively address (Holopainen *et al.*, 2023). Specifically, resistance to change raises critical discussions about its influence on the methods and speed of technology implementation in organizations (Vial, 2019). Employee resistance is often considered a negative reaction to organizational change, where individuals and groups view these changes more as threats than opportunities (Eyel and Mete, 2021). Resistance manifests in three dimensions: affective (how individuals feel), cognitive (how individuals think), and behavioral (how individuals act) toward the change (Oreg, 2006). Behavioral resistance can be either covert (disinterest, distancing, or inaction) or overt (passive, active, or aggressive behaviors) (Lapointe and Rivard, 2005). Recent studies distinguish between technology adoption and resistance, noting that they are influenced by different factors (Chawla *et al.*, 2024). However, reducing resistance is crucial for users to accept technology.

Previous user resistance studies emphasized common reasons for technology resistance, such as a preference for the status quo and the discomfort associated with change (Mulki *et al.*, 2012). Several theories explain user resistance based on how users evaluate changes (e.g. Kim

and Kankanhalli, 2009; Klaus and Blanton, 2010; Laumer *et al.*, 2016). These theories suggest that employees decide to resist based on their effort versus outcome assessment (Joshi, 1991), the benefits and costs of switching (Kim and Kankanhalli, 2009), and peer comparisons (Klaus and Blanton, 2010). Additionally, resistance is influenced by technological change being perceived as threatening, of low value, incompatible, or unsatisfactory (Lapointe and Rivard, 2005; Samhan and Joshi, 2017; Laumer *et al.*, 2016). Regarding DT resistance, previous studies mentioned additional factors such as vested interests (Davison *et al.*, 2023) and a rigid and controlling organizational culture (Syed *et al.*, 2023). However, studies on DT resistance remain scarce. Given that DT involves comprehensive organizational changes beyond merely adopting new technologies, a multilevel approach to studying DT (and its aspects such as resistance) has been proposed to consider not only technological but also individual and organizational factors (Trenerry *et al.*, 2021).

Various strategies have been suggested to analyze and overcome DT resistance. Recent studies highlighted the need to shift the organizational mindset and identity to reduce digital technology resistance (Trenerry *et al.*, 2021). Jones *et al.* (2021) found that viewing digital technology as a threat increased resistance, whereas training encouraged acceptance. Holopainen *et al.* (2023) argued that new skills and mindsets among employees and management are crucial to support digital technology use, manage uncertainty, and foster collaboration, to mitigate resistance. Chawla *et al.* (2024) applied the IRT with three new constructs to understand resistance toward technology platforms, suggesting that training, education, and support can facilitate adoption. Additional effective strategies include informing, guiding, and involving employees in the change process (Peschl and Schüth, 2022) and aligning digital technology use with the existing organizational culture (Singh and Hess, 2017).

Furthermore, companies require strategic readiness for DT, which includes a willingness to change, a culture of continuous learning, and digital capabilities (Holopainen *et al.*, 2022). For companies to be successful, they should attract new digital talent and develop existing employees' digital skills (Kane, 2019). Nadeem *et al.* (2024) recommended employee training focused on openness to change, technology acceptance, and resilience to manage stress. This addresses the specific challenges that employees face during DT.

However, understanding resistance in the context of DT remains largely conceptual, and more empirical evidence is required (Vial, 2019; Eyel and Mete, 2021; Oludapo *et al.*, 2024), representing a gap that this study aims to fill, particularly in identifying resistance factors contributing to employee resistance to DT. In addition, since DT affects various organizational areas (Gurbaxani and Dunkle, 2019), it highlights the importance of understanding resistance at the individual, organizational, and technological levels.

2.2 Employee well-being during digital transformation

Organizational change is a source of stress for employees due to the associated uncertainty (Mulki *et al.*, 2012). DT, characterized by the integration of digital technology into all areas of organizational functioning, introduces an additional layer of impact on employees. DT escalates technology intensity within workplaces, which is evident from the widespread adoption of digital tools and the evolution of work environments, employee roles, and task execution (Demerouti, 2022). Beyond resistance to change, employees are challenged by DT's complexity, omnipresence, and perceived perpetual nature (Trenerry *et al.*, 2021). This can significantly alter employees' emotional and functional work responses and self-perception within the work environment, resulting in technology-related stress (technostress) and anxiety (Zhang *et al.*, 2023). Zhang (2023) suggested that technostress, driven by individuals' perceptions of technology as a stressful experience, increases their resistance to new technology. Technological resistance leads to psychological outcomes such as stress, frustration, nervousness (Diedericks *et al.*, 2019), skepticism, and emotional pain (Alohali *et al.*, 2020). Extant literature connects these outcomes to employee well-being (Pagán-Castaño *et al.*, 2020; Trenerry *et al.*, 2021).

Employee well-being can be broadly defined as a concept related to how well employees function and feel in the workplace (Keeman *et al.*, 2017). Pagán-Castaño *et al.* (2020) posited that previous studies on employee well-being typically focused on three dimensions: performance, health, and relationships. Performance encompasses how effectively employees execute their duties and how their perceptions of professional growth and learning opportunities, job security, and positive workplace experiences influence their job satisfaction (Gould-Williams, 2003). Health encompasses physical and mental health, influenced by factors such as stress, anxiety, and work exhaustion (Grant *et al.*, 2007). Relationship encompasses aspects of social well-being, such as the quality of relationships within an organization (Grant *et al.*, 2007). At the employee-employee level, this dimension focuses on the quality of employee cooperation and interaction. At the employee-supervisor/organization level, this dimension focuses on organizational/managerial support, social exchange, and corporate trust. All employee well-being dimensions are highly interconnected (Valtonen and Kimpimäki, 2023). Emerging studies on how digital technologies affect employee well-being uncovered the complex effects across various dimensions of well-being by influencing work-related factors. Work-related factors include work engagement (Peeters and Plomp, 2022), mental strain (Abeliansky *et al.*, 2024), workplace ergonomics (Bourahmoune *et al.*, 2022), and collaboration (Nourmohammadi *et al.*, 2022).

While digital technology's influence on employee well-being may be negative (Braganza *et al.*, 2021), positive (Giuggioli and Pellegrini, 2022), or mixed (Nazareno and Schiff, 2021), the relationship between resistance to technology-induced change and well-being remains unclear creating a gap in the literature. Comprehensive studies are required to explore the effects of technology-induced resistance on well-being and develop strategies to mitigate these impacts, thereby enhancing employee support during technological transitions (Qi *et al.*, 2024). Our study takes an initial step in this direction by building on empirical evidence and drawing from relevant literature to connect employee resistance to DT to employee well-being.

3. Study approach

3.1 Method

This study adopted a qualitative case study approach, which utilizes contextual data to examine a complex phenomenon and understand it more deeply (Barratt *et al.*, 2011). Specifically, this study employed multiple holistic cases to explore this phenomenon across various contexts, allowing unique patterns within cases and recurring patterns between cases to emerge, thereby providing robust results for theory development (Barratt *et al.*, 2011; Yin, 2018). While there is no consensus on the exact number of cases required for multiple case studies, ten cases are commonly regarded as a sufficient number on condition that data saturation is achieved (Eisenhardt, 1989; Marshall *et al.*, 2013; Keutel *et al.*, 2014; Yin, 2018). In this study, the number of cases was determined based on the principle of data saturation, which was reached during data collection. This ensured that the findings comprehensively captured recurring themes and patterns aligned with the study's research objectives.

3.2 Data collection

This study examines ten companies operating in Finland, comprising both small and medium-sized enterprises (SMEs) and large enterprises across diverse industries (Table 1). The inclusion of this broad representation enhances the generalizability of the findings (Polit and Beck, 2010). The companies were selected based on their advanced stages of DT and significant experience in adopting cutting-edge technologies outlined in Table 1, thus offering robust insights into resistance patterns and factors shaping successful DT across varied organizational scales. Finland serves as a suitable context for studying employee resistance to DT due to its leading position in digitalization and digital progress within Europe, as

Table 1. Selected companies' information

Company	Industry	Size	Key technologies	Participant	Technological role
A	Pulp and paper	Large	AI, big data and analytics, IoT, machine learning and vision, and VR/AR	Manager of the Process Technology department	User
B	Conveyor solutions	SME	Analytics, automation, and robotic	CEO	User
C	Construction	Large	Automation, big data and analytics, and robotic	Controller	User
D	Wood processing	Large	Analytics, automation IoT, machine vision, and optimization	Production Planner	User
E	Recycling	Large	Analytics, automation, and robotic	Operations Manager	User
F	Material handling	SME	AI, automation, big data and analytics, digital twin, IoT, robotics, and machine learning	Director of Sales and Services	Developer
G	Wood processing	Large	AI, big data and analytics, digital twin, machine learning, and robotics	Head of Engineering and R&D	Developer
H	Metal	Large	AI, analytics, automation, digital twin, and machine learning	Director of Software Engineering	Developer
I	Clothing	SME	AI, automation, and big data and analytics	CEO	Developer/ User
J	Metal	Large	Analytics and automation	The Technology and R&D Director	Developer

Source(s): Table created by authors

highlighted by the Digital Economy and Society Index (DESI) report (European Commission, 2022). It provides a unique opportunity to investigate challenges associated with employee adaptation in highly digitalized contexts. Furthermore, SMEs were selected based on established criteria of having fewer than 250 employees, an annual turnover of less than €50 million, and/or a balance sheet total <€43 million. The respondents were required to have relevant knowledge of digital technologies in various company areas. Participants from different departments and managerial positions were selected, particularly from the developer and user perspectives, to provide diverse and high-quality responses to the research questions.

Data were collected from March to May 2023 through open-ended interviews conducted online via Teams, involving one representative from each of the ten selected companies, whose roles are detailed in Table 1. Each interview, conducted by a single researcher to maintain consistency, lasted 30–60 min. The interviews were structured according to predetermined themes and questions but allowed deviations for emerging topics and in-depth questioning as needed. This approach facilitated relevant discussions and enabled simultaneous exploration of additional questions (Saunders *et al.*, 2015). All interviews were recorded and transcribed with the participants' consent to facilitate the data analysis.

3.3 Data analysis

Thematic analysis was used to identify patterns within the collected data (Braun and Clarke, 2006). The analysis process consisted of six steps: familiarizing oneself with the data, generating initial codes, searching for themes and subthemes, reviewing these themes, defining them, and generating the report. Each interview was iteratively coded using NVivo to

extract the relevant information and remove the irrelevant data. Coding was performed in NVivo using participants' direct phrases to maintain their perspectives and prevent misinterpretation (Rivas, 2012). The focus was on employees' resistance to digital technology changes, the strategies companies employed, and how digital technologies support employee well-being. After coding, a second researcher reviewed the initial codes and discussed the preliminary results to ensure validity (Yin, 2018). The unit of analysis was the entire company.

4. Results

This study's findings are categorized into two main groups: factors that contribute to employee resistance to new technologies (Figures 1–3), and factors that can potentially mitigate this resistance (Figures 4–6). These findings form the basis for proposing relationships between employee resistance, components of the resistance mitigation strategy, and employee well-being (Table 2). Additionally, based on the interview analysis, this study elucidated how technology can contribute to improving employee performance, health, and relationships in the workplace, thereby enhancing employee well-being (Appendix).

4.1 Reasons for resistance

The empirical analysis indicated that 12 factors contribute to employee resistance to new technologies in the selected companies. The identified resistance factors were systematically classified across three levels: *individual*, *organizational*, and *technological*. This classification assists in more effectively understanding and addressing resistance at different levels. Thematic maps with an overview of the findings are presented in Figures 1–3, showing two codes for each subtheme as an example. Each of these factors is briefly discussed below.

4.1.1 Individual. Lack of awareness. Some participants reported low awareness of advanced technologies among their employees. The lack of awareness stemmed from the limited use of and exposure to these technologies, leading to an inability to fully understand their functions (Company B). Consequently, employees may find it challenging to articulate their needs or questions regarding new technologies, which prevents them from effectively engaging with these technologies. Even in large, technology-focused companies, employees often lack awareness of new technologies unless they are directly involved with them (Company A).

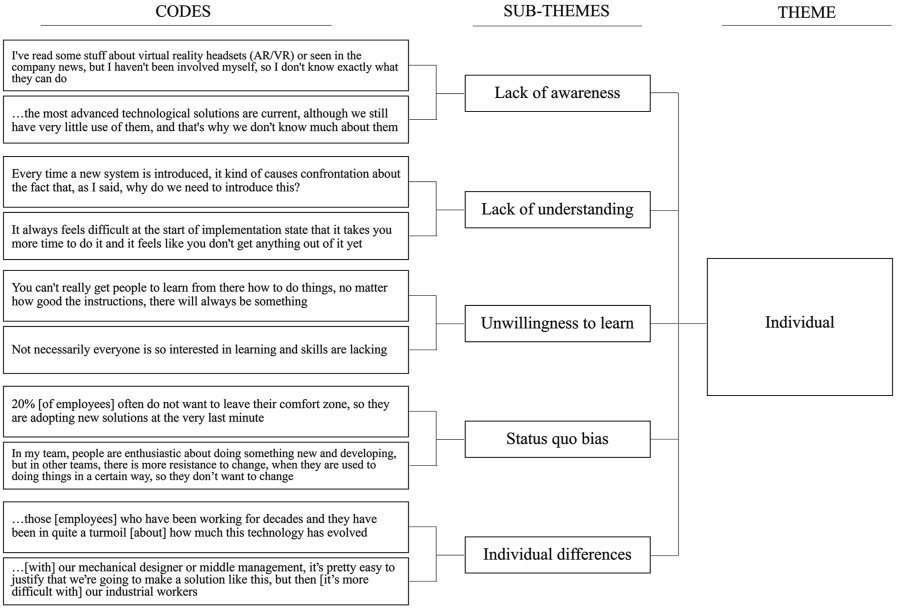
Lack of understanding. Several companies noted that a lack of understanding of the benefits of technology is a key driver of resistance. Employees' lack of understanding regarding why they need digital technology can deter them from attempting to use it (Company C). Even when employees are informed about the excellence of a new system or device, a lack of understanding of its function and benefits for their own work can reduce their willingness to engage with it (Company E). While some companies attribute it to employees' unwillingness to learn, Company A recognized that poor communication regarding new technologies on the company's side contributes to the problem.

Unwillingness to learn. Some participants acknowledged that not every employee was capable or willing to learn how to use new systems, even when good instructions were provided (Company C). This issue is particularly evident with technologies in their nascent stage; thus, their functioning is imperfect (Company D). This lack of interest in learning, combined with the initial shortcomings of newly deployed technologies, exacerbates employee resistance.

Status quo bias. Interview insights revealed a common pattern: the initial excitement regarding new technologies was often tempered by the comfort and familiarity of existing practices, leading to resistance. Company B noted that approximately 20% of its employees were reluctant to change and adapted only when necessary. This adjustment involves phases such as initial paralysis, learning new systems, and operating in a dual-system phase before

fully transitioning (Company B). Moreover, integrating technologies into daily tasks and allocating time for new work methods pose challenges (Company C).

Individual differences. Individual differences such as age, education, and tenure affect receptiveness to new technologies. Younger employees typically adapt more quickly than older employees who often have years of experience in established systems and show greater resistance (Companies D and I). Additionally, educational disparities play a role: less-educated employees, such as factory workers, engage less with new technologies, often due to limited access to digital tools (Company B). Furthermore, new hires are generally more open to novel systems than long-term employees, who are required to transition from the old systems to new systems (Company E).



Source(s): Figure created by authors

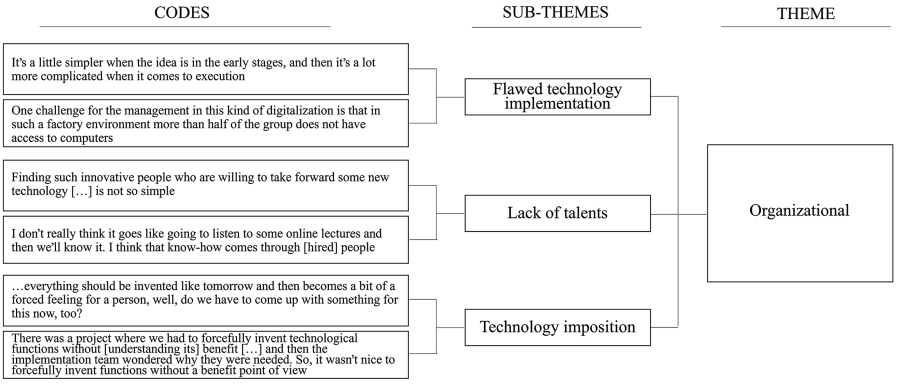
Figure 1. Thematic map of individual factors contributing to employee resistance

4.1.2 Organizational. Flawed technology implementation. A participant from Company A emphasized a significant gap between planning and actual implementation of technology projects. Although employees are initially positive about new technologies, early plans often oversimplify the implementation and fail to anticipate practical challenges. This leads to a difficult and prolonged deployment, increasing employee frustration and resistance. Additionally, access and inclusion issues during implementation, particularly in factory settings where many workers lack access to digital tools or the Internet, make digitalization projects more challenging. This exclusion limits employees' understanding of and engagement with new technologies (Company B). Moreover, Company A noted insufficient communication regarding the benefits of the new technologies.

Lack of talent. Several participants emphasized the shortage of specialized talent necessary for leading technology implementation projects. They noted that hiring new employees who already possess expertise in the latest technologies is a more effective approach for acquiring know-how than online lectures or workshops (Company B). However, finding individuals who understand new technologies and are motivated to lead technological projects is difficult.

Additionally, these individuals should be able to communicate effectively across specialized teams; however, such individuals are rare in the job market (Companies A and I). This talent deficit hinders effective technology integration and reinforces resistance owing to a lack of guidance and expertise.

Technology imposition. Some employees reportedly perceived new technologies as being imposed on them by companies. The participant from Company A indicated that when a company rapidly introduces new technologies, it can overwhelm employees. This rushed approach creates a perception of coercion because employees feel pressured not only to grasp these changes but also to innovate or provide solutions quickly.



Source(s): Figure created by authors

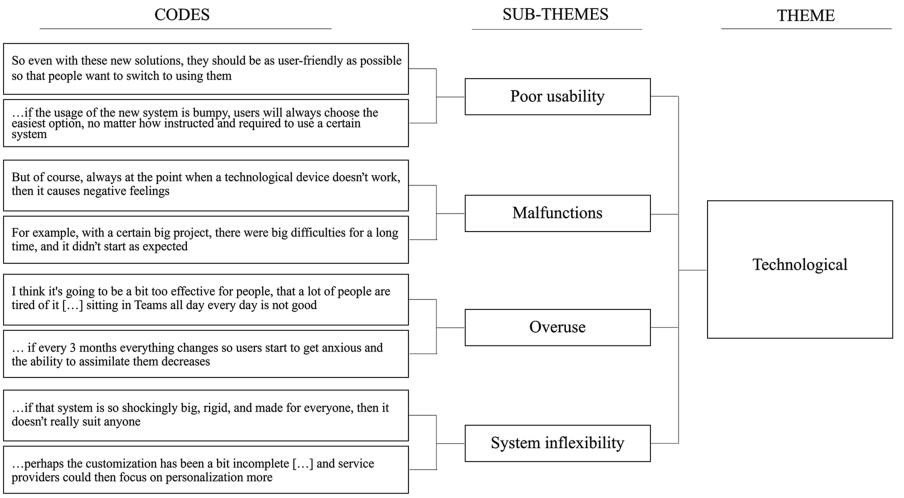
Figure 2. Thematic map of organizational factors contributing to employee resistance

4.1.3 Technological. Poor usability. Technological limitations significantly contribute to the resistance to new systems. An identified major issue was the lack of user-friendliness (Companies C, D, and I). Owing to their complexity or non-intuitive interfaces, some new systems may require significant time investment to learn how to use them (Company C). This increases users' stress and resistance to change, and, consequently, decreases their ability to adopt new systems, creating a reluctance to learn how to use a new technological solution while adhering to the old one (Company I).

Malfunctions. Technical issues and breakdowns further increase resistance because they introduce frustration and negative experiences with technology (Company H). For example, Company D reported that the laborious nature of certain technology projects, compounded by the technology being "raw" or non-functional during the implementation phase, significantly diminished employees' interest in utilizing this technology.

Overuse. Additionally, there is concern that technology can become too pervasive, as noted by the overwhelming use of platforms such as Teams, suggesting the need for balance in technology use considering human limitations and preferences (Company B). Company A emphasized the issue of "forced innovation," where the rapid pace of technological advancement and the pressure to use these technologies for continuous innovation contribute to increased stress among employees. This relentless push for novelty often leaves the benefits of such developments undefined or absent. Moreover, frequent changes in technological solutions can induce anxiety among users, resulting in a decrease in their desire and ability to adapt to new systems (Company I).

System inflexibility. Some participants reported issues with the scalability and adaptability of new technologies (e.g. Company E). This problem is particularly prominent in SMEs. Large international systems are often unsuitable for everyday use in smaller companies owing to their inflexibility and lack of customization options. If the systems are not tailored to meet employees' needs, they are likely to avoid using them (Company B). Technological limitations contribute to resistance when employees perceive the technology as flawed and ineffective.



Source(s): Figure created by authors

Figure 3. Thematic map of technological factors contributing to employee resistance

4.2 Components of resistance mitigation strategy

The empirical analysis of strategies for mitigating employees' resistance to digital technologies in the selected companies indicated 11 factors allocated across three components: *learning*, *communication*, and *participation*. Thematic maps with an overview of the findings are illustrated in Figures 4–6. Each of these factors is briefly discussed below.

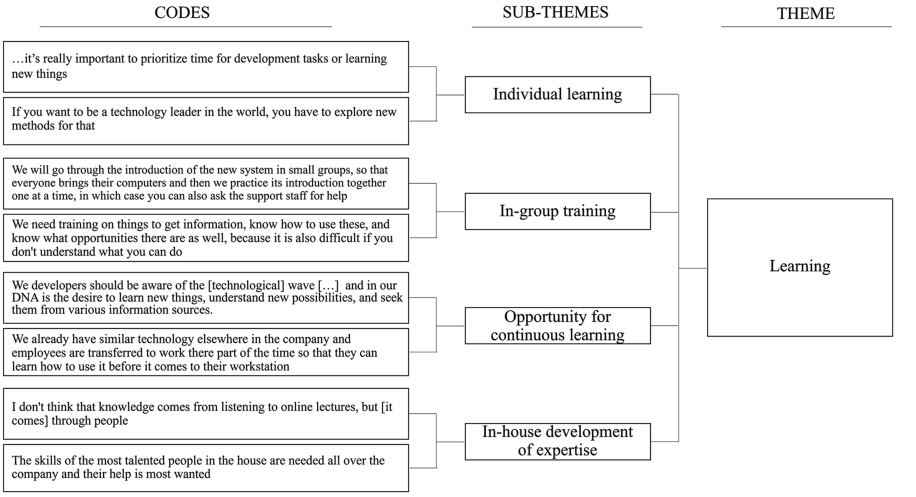
4.2.1 Learning. Individual learning. To mitigate employee resistance, companies should increase their internal awareness and understanding of new technologies. Despite some skepticism, many employees are willing and ready to learn about these advancements (Companies C, D, G, H, and J). The participants emphasized the need for employees to prioritize learning and dedicate time to new technologies, noting that without scheduled time, learning is often sidelined by daily tasks (Company C). By learning from industry leaders, partners, and competitors, employees can enhance their knowledge about new technologies and integration strategies (Company A). This familiarizes them with upcoming changes and enables them to ambitiously support the company's technological leadership (Company G).

In-group training. The participants suggested that small-group peer training could enhance employees' understanding of new technologies and improve communication. This approach, along with providing clear guidelines, is an effective way to demonstrate the benefits of new technologies (Companies B, C, and J). Such training addresses the resistance that often arises from a lack of understanding regarding what technologies can accomplish, thereby aiding resistance mitigation (Company E). Employees generally exhibit less resistance after overcoming the initial learning curve and understanding the benefits, particularly when technologies simplify the most difficult or demanding aspects of their work (Companies B, G, and J). For example, individuals engaged in physical labor value automation to ease their workload (Company J). Company B emphasizes that learning in small groups facilitates mutual knowledge exchange and creates a supportive learning environment, reinforcing understanding and acceptance among employees.

Opportunity for continuous learning. Employees with higher education levels, such as designers, middle managers, and recent graduates, tend to be more receptive to new technologies owing to their familiarity with current academic concepts, facilitating adaptation (Companies B and D). To maintain this momentum, integrating experimental development and continuous learning into organizational practices keeps employees and companies at the

forefront of technological advancement (Company H). For example, allowing employees to experiment with new technologies in controlled environments, such as temporary assignments to new workstations, effectively reduces resistance by establishing learning steps for technology adoption (Company J). Additionally, tools such as digital twins enable virtual learning, reduce reliance on specific expertise, and enhance organizational flexibility (Company G). Moreover, some employees recognize that new technologies streamline their daily tasks and enhance their job competitiveness and security, potentially increasing their motivation for continuous learning (Company E).

In-house development of expertise. High-tech companies often collaborate with partners who specialize in certain tasks, such as software development, recognizing that it is impractical to house all necessary talent internally. However, the participants agreed that true expertise and innovation stem from having skilled individuals in-house (Companies B and G). They argued that hiring skilled individuals and building a core team of experts in-house are more effective for gaining know-how and potentially onboarding other employees to technological change than relying on online lectures or workshops (Company B).



Source(s): Figure created by authors

Figure 4. Thematic map of learning as a component of the resistance mitigating strategy

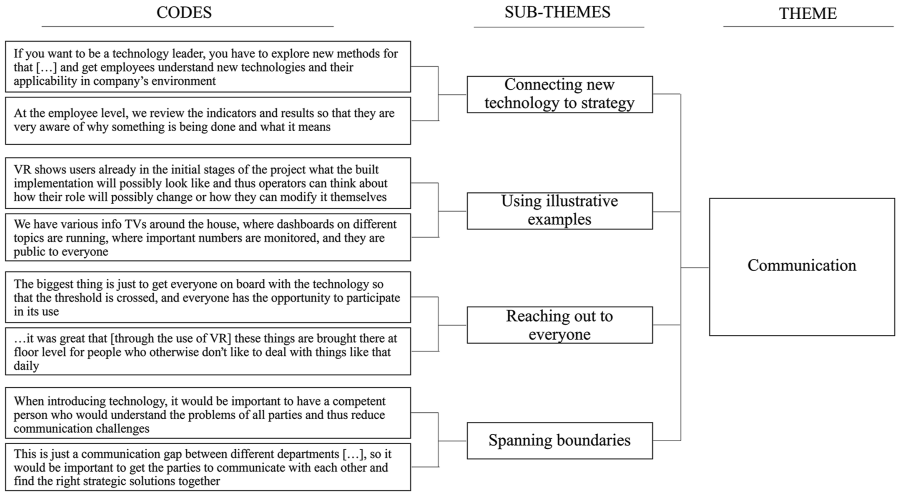
4.2.2 Communication. Connecting new technologies to strategy. Connecting the use of technology with a company's strategy can significantly reduce resistance. Company G's ambition to become a technological leader within its industry emphasized the importance of employees engaging in new technological solutions and methodologies. Similarly, Company C observed that the management's emphasis on technology-related learning tasks, by allocating more employee time to these activities, fostered an increased willingness to adopt and utilize new technologies.

Using illustrative examples. Company E aimed to adopt and Company H already employed strategy-related digital dashboards in its factory settings. These dashboards featured various measures, including safety, to encourage and support individual learning efforts and emphasize the significance of work. Company E suggested using illustrative examples of hard numbers and job-related situations to emphasize the meaningfulness and significance of employees' jobs in enhancing motivation and job satisfaction. Similarly, in-group training was utilized to demonstrate the use of new technologies, thereby illustrating their potential benefits

for employees' work (Companies B, C, and J). For example, Company F employed VR glasses to demonstrate potential solutions in the early stages of projects, aiding employees in understanding what kind of changes can be made to their work methods, and how they might change their future job roles.

Reaching out to everyone. Not all employees are equally aware of the aims and benefits of an upcoming technological change or have access to means of digital communication, such as email (e.g. factory workers). Therefore, individuals from various organizational levels should be involved in DT (Company B) to ensure that they comprehend the strategic value of their contributions (Company E).

Spanning boundaries. Some participants emphasized the need for enhanced collaboration between internal departments in digital projects to improve knowledge sharing and increase a Company's technological adaptability (Company A). This interdepartmental cooperation is crucial for the early identification of strategic solutions and the streamlining of digital project implementation (Company F). Companies E, H, and G suggested using digital technologies to reduce uncertainty and strengthen internal communication. For example, digital twins (Company G) and real-time communication channels (Companies H and I) can improve team coordination in design, production, automation, and mechanics teams.



Source(s): Figure created by authors

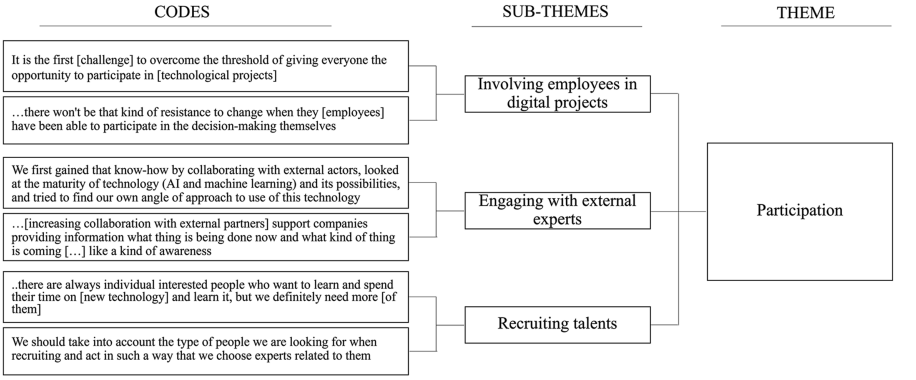
Figure 5. Thematic map of communication as a component of the resistance mitigating strategy

4.2.3 Participation. Involving employees in digital projects. Encouraging employee participation in planning and implementing digital technologies is the key to reducing resistance. This involves allowing employees to participate in decision-making processes (Company J) and fostering organization-wide active participation (Company B). The participants recommended involving experts who possess deep technology knowledge and project management skills to streamline discussions and enhance problem-solving. These experts can efficiently address specific challenges and facilitate smoother technology implementation (Company A). Additionally, conducting small-scale experiments can help identify potential challenges and simplify the adoption process. For example, Company J introduced new digital technology on a small scale, enabling employees to familiarize themselves with a new workstation before a broader rollout.

Engaging with external experts. The continuous evolution of digital technologies emphasizes the need for expertise that extends beyond the capabilities of individual

employees and organizations. To enhance their knowledge base, some companies collaborated with external experts (Company G) to aid in identifying available expertise and assess context-specific needs. Subsequently, this information may inform hiring decisions. Additionally, other companies fostered partnerships with different companies and academic institutions (Companies B and F) to facilitate the inflow of new insights and opportunities and compensate for any in-house expertise gaps.

Recruiting talents. Successful mitigation of employee resistance can be significantly enhanced by strategically recruiting the right talent, particularly in fields such as artificial intelligence and machine learning. Although companies may initially rely on external experts, the consensus is that skilled in-house personnel are crucial for successful development (Companies B and G). Recruiting individuals who are competent and adept at understanding and addressing both technological and organizational needs can facilitate the integration of new technologies and mitigate internal resistance. It is vital to hire "rock stars"—professionals with deep knowledge and the ability to apply it effectively—to keep companies at the forefront of technological advancements and reduce resistance to new technologies (Company A).



Source(s): Figure created by authors

Figure 6. Thematic map of participation as a component of the resistance mitigating strategy

5. Discussion

This study utilized a multiple case study approach to examine employee resistance and well-being in DT across ten industrial companies in Finland. The reasons behind resistance were identified and the strategies that these companies implemented or were planning to implement to mitigate such resistance were explored. In this section, this study outlines key strategic components to counteract resistance (*learning*, *communication*, and *participation*) and uses relevant literature to connect these components to employee well-being dimensions (Table 2), followed by formulating propositions for future studies. Furthermore, this study explained the relationship between employee resistance and well-being in DT, demonstrating how mitigating the former can enhance the latter through the adoption of new technologies (Figure 7).

5.1 Components of resistance mitigation strategy

5.1.1 Learning. Resistance often stems from a lack of awareness and understanding of new technologies (Alohali *et al.*, 2020). Increasing understanding regarding how these technologies function and their benefits can diminish uncertainty and the perceived threats of change (Lapointe and Rivard, 2005; Stouten *et al.*, 2018), thereby reducing resistance (Župerkienė *et al.*, 2023). Learning is an important factor for companies to reduce resistance and motivate employee participation in technological change.

Table 2. Components of the resistance mitigation strategy and its influences on employee well-being in DT

Strategy component	Mechanism	Example	Effect	Resistance factors mitigated	Influence on well-being dimensions
Learning	Individual learning	Time and opportunity for learning from partners and competitors	Increases comfort and familiarity with new technologies Increases understanding of the strategic importance of new technologies	• Lack of awareness	Performance Health
			Learning is empowering and motivating	• Unwillingness to learn • Lack of talent	Performance Health (mental)
	In-group training	Training in peer groups	Knowledge-sharing and learning from more experienced peers	• Lack of understanding	Performance
			Increases communication	• Technology imposition • Status quo bias	Relationship
	Opportunity for continuous learning	Small-scale experiments with new technology in the workplace (new workstations, VR glasses)	Practical experience is more impactful	• Status quo bias	Performance
			Small-scale interventions are not overwhelming for employees	• Unwillingness to learn • Individual differences (education)	Health
			Helps to visualize and understand potential changes in a more immersive and engaging manner	• Lack of awareness • Lack of understanding	Performance
	In-house development of expertise	Transitioning towards building a core team of skilled professionals	Skilled individuals in-house are a reliable source of expertise and know-how	• Technology implementation • Lack of talent	Performance
			Helps to facilitate smoother implementation		
			Peer learning as a side effect		

(*continued*)

Table 2. Continued

Strategy component	Mechanism	Example	Effect	Resistance factors mitigated	Influence on well-being dimensions
Communication	Connecting new technology to strategy	Communicate the company's technology-related vision	Shows employees how their contributions fit into the broader company strategy	• Technology imposition • Technology implementation	Relationship
	Using illustrative examples	Graphic demonstration of technology significance (safety metrics, dashboard communication, technology demonstrations)	Increases understanding and willingness to adopt new technologies	• Lack of understanding • Technology imposition	Performance Relationship
	Reaching out to everyone	Providing means and tailored content for communicating with employees on all levels	Generates involvement, ensures equal information access, and increases awareness among all employees concerning the changes	• Lack of awareness • Technology imposition	Relationship Health
	Spanning boundaries	Establishing clear and timely communication	Ensures alignment, streamlining technology implementation	• Technology implementation • Lack of awareness	Performance Relationship
		Increasing interdepartmental communication	Enhances knowledge-sharing concerning new technology and communication with coworkers regarding the changes	• Technology implementation • Lack of talent • Lack of awareness	Performance Relationship

(*continued*)

Table 2. Continued

Strategy component	Mechanism	Example	Effect	Resistance factors mitigated	Influence on well-being dimensions
Participation	Involving employees in digital projects	Supplying employees with a platform to express their opinions and provide suggestions regarding digital initiatives	Fosters a sense of ownership and acceptance and greater commitment to the organization	• Technology implementation • Technology imposition	Relationship
		Involving employees in the planning and implementation phases	Provides a broader understanding and buy-in for technological initiatives	• Technology implementation • Lack of understanding • Lack of talent • Status quo bias	Performance Relationship
	Engaging with external experts	Strategically collaborating with external specialists	Assists in quickly gaining insights and enhancing the understanding of available expertise Temporarily bridges the skill gap	• Technology implementation • Lack of talent	Performance
	Recruiting talents	Specifically targeting individuals with expertise in new technologies and project management skills	Fortifies the company's knowledge base	• Lack of talent	Performance

Source(s): Table created by authors

Individual learning increases comfort and readiness for new technologies, easing uncertainty and stress, and benefiting mental health. A deeper understanding of technology improves its usage and enhances employee performance and satisfaction (Limbu *et al.*, 2014). Additionally, it enhances self-efficacy and empowers and motivates further learning and applications (Nadeem *et al.*, 2024). In-group training, in which employees learn from experienced peers and share knowledge, enhances understanding and performance and strengthens communication and relationships, facilitating organizational change (Stouten *et al.*, 2018). This peer-supported learning environment promotes psychological and relational well-being (Gori and Topino, 2020) and reduces experiences of technology imposition.

Practical learning experiences, such as testing new workstations before wider implementation, allow for gradual engagement with new technologies and reduce the stress of abrupt changes (Callan, 1993). This hands-on approach enhances comprehension of forthcoming changes, making the technology more relatable and easier to adopt upon complete implementation. Such learning opportunities support reskilling and upskilling, thereby contributing to professional growth and job security. Overall, learning fosters a skilled workforce that is better equipped and more open to continuous DT. This aligns with the findings of Cirillo *et al.* (2023) who found that enhanced digital skills result in increased technology adoption among employees. Additionally, promoting learning within companies helps build a core team of in-house experts. Skilled employees implement and promote new technologies effectively and inspire and educate others, fostering knowledge acquisition and enhancing performance. This results in smoother transitions, decreased resistance, and lower stress.

Therefore, this study proposed the following:

P1. Promoting comprehensive learning mitigates employee resistance and supports well-being in DT.

5.1.2 Communication. Imperfect communication is a common motivator of resistance to new technologies, with employees often resisting it owing to insufficient information concerning the benefits and goals of implementation (Stouten *et al.*, 2018; Alohali *et al.*, 2020). If employees are disconnected from the company's strategy, they are unable to see the broader value that new technologies contribute to their work and organization. Aligning technology initiatives with a company's strategic goals and clearly communicating these initiatives can mitigate resistance (Chebbi *et al.*, 2020). Effective communication strategies include encouraging employees to learn about and experiment with new technologies and showing them how their contributions fit into the broader company strategy. Such communication elevates the importance of technology in the eyes of employees, enhances their sense of purpose, and improves their attitudes toward the company (Stouten *et al.*, 2018). Regarding communication methods, beyond traditional ones such as dashboards and presentations, creative approaches such as sauna evenings—a practice common in Finland, as suggested by Company A—may be effective, indicating that companies may leverage unconventional communication methods appropriate in their cultural and operational contexts.

Enhancing communication to make it more illustrative and compelling can significantly increase its impact (Moser and Dilling, 2007). The use of examples and demonstrations of technological benefits increases understanding and showcases the significance of new technologies. For example, displaying safety metrics associated with new technology can justify its use and reduce perceptions of forced adoption. This assists employees in experiencing less change-associated stress and feeling more positive about the change and the company. Specifically, employees recognize their company's efforts to ease their tasks and appreciate transparency regarding the reasons for technology adoption, thereby fostering a sense of shared purpose and commitment (Stouten *et al.*, 2018).

It is essential to ensure inclusive communication, particularly in settings such as factories, where access to traditional communication tools might be limited. Tailoring messages for different employee groups resonates with employees and increases their engagement (Dudo

and Besley, 2016). For example, emphasizing specific benefits that facilitate tasks that are important to different employees can enhance receptiveness to change and mitigate the perception that the company is implementing "yet another unnecessary system." Furthermore, early and transparent dialog between stakeholders and departments assists in breaking down silos and streamlining technology implementation (Chebbi *et al.*, 2020). Engaging in-house specialists ("rock stars") promotes productive communication across various technological areas and departments. Rieley (2016) found that the early engagement of well-known and professionally respected individuals facilitated smoother technology implementation and accelerated adoption because these individuals champion technology and facilitate buy-in from others. This strategy encourages interdepartmental communication and knowledge sharing and promotes alignment and supportive attitudes toward change across the organization.

Based on these considerations, this study proposed the following:

P2. Fostering clear and timely communication mitigates employee resistance and supports well-being in DT.

5.1.3 Participation. Involving employees in the DT decision-making process decreases their resistance by increasing their sense of ownership (Schraeder *et al.*, 2006). This study's findings suggest that companies should create platforms for employees to express their opinions on change and encourage broad participation. This approach fosters the acceptance of change and increases commitment to the organization. Furthermore, involving employees in the planning and implementation phases of digital projects enhances understanding, ensures buy-in, and equips them with the new skills necessary for implementing and working with digital technologies, thereby nurturing talent within the organization.

If internal expertise is lacking, bringing in external specialists can help bridge the skill gap, smooth the implementation process, and reduce stress. While there is a risk of resistance due to the "not invented here syndrome" (Ismail *et al.*, 2023), employees generally value external expertise that complements their own (Ashforth and Mael, 1989). External collaboration can deepen the understanding of technological trends and identify future hiring needs.

However, employing in-house specialists is often more effective than relying on external assistance for fostering innovation and promoting change. Recruiting individuals with digital skills is crucial for smooth digital project implementation, helps build an internal knowledge base and gradually adapts the workforce to digital change. According to Rieley (2016), such individuals can effectively champion technological change among other employees and facilitate technological implementation. New hires typically resist changes less than long-tenured employees. Engaging skilled individuals in decision-making and collaborative change reduces resistance, smooths the implementation process, and increases personal involvement and responsibility among employees, thereby enhancing the acceptance of change-related outcomes.

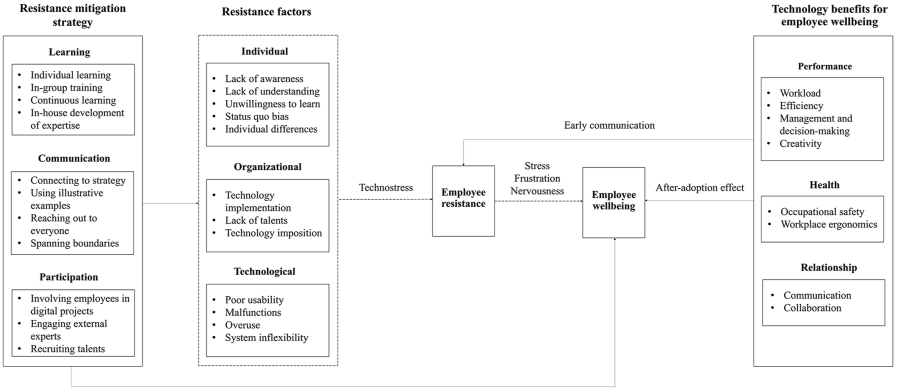
Accordingly, this study proposed the following:

P3. Enabling the participation of employees and strategic partners in DT mitigates employee resistance and supports employee well-being.

5.2 Framework for employee resistance and employee well-being

This study's findings lay the foundation for developing a theoretical framework illustrating how employee resistance and well-being interact in a DT context (Figure 7). Regarding Figure 7, the solid arrows indicate a positive impact, whereas the dashed arrows indicate a negative impact. Employee resistance affects employee well-being by increasing stress, nervousness, skepticism, and frustration, which are attitudinal and emotional manifestations of resistance behavior during the introduction of new technologies and related changes (Alohali *et al.*, 2020; Diedericks *et al.*, 2019). Resistance stems from technostress (Zhang, 2023; Bausch *et al.*, 2024), which arises at the individual, organizational, and technological levels. At

the individual level, this stems from a lack of understanding of change and an unwillingness to leave the comfort zone. At the organizational level, the causes include flawed implementation due to overly optimistic planning, talent shortages, and poor communication. At the technological level, inherent flaws and usability issues in new technologies exacerbate resistance. Given that employee well-being dimensions are interconnected (Valtonen and Kimpimäki, 2023), the stress of resisting technological changes affects not only mental but also physical health, performance, and relationships.



Source(s): Figure created by authors

Figure 7. Framework for managing employee resistance and well-being in DT

This study highlights that the components of resistance mitigation strategy—*learning*, *communication*, and *participation*—reduce employee resistance while also enhancing well-being during DT. Regarding resistance reduction, Table 2 illustrates how the components address the impact of individual- and organizational-level resistance factors, thereby decreasing overall employee resistance. Specifically, encouraging employees to engage with new technologies and offering *learning* opportunities primarily reduce individual-level resistance, whereas promoting clear *communication* and fostering *participation* mitigate mainly organizational-level resistance factors. This study's analysis indicated that the interview participants emphasized learning and communication over participation. This corresponds with the findings of Župerkienė *et al.* (2023), who found that learning and communication were more effective resistance management interventions than participation.

This study did not address mitigating technological-level factors because this issue has been extensively covered in previous literature (e.g. Chatterjee *et al.*, 2021). However, the identified technological resistance factors, such as poor usability, malfunctions, and system inflexibility, emphasized the importance of human-centric technology development; making technology more user-friendly and customizable not only mitigates associated resistance in employees (Kandler *et al.*, 2022), but also has a potential for maintaining employee well-being when employing new technologies (Werthner *et al.*, 2022; Zhang *et al.*, 2023). Simultaneously, although technology characteristics such as user-friendliness are important for technology adoption (Chatterjee *et al.*, 2021), this study's findings emphasized the role of technology usage, specifically the negative effects of overuse, which can drain employees, amplify their resistance, and decrease their well-being. This suggests the need for employee-technology coevolution through learning and training to use technology in a healthy way. This approach should be incorporated into the learning component of resistance mitigation strategy to ensure that technology use enhances effectiveness and promotes well-being at the same time (Werthner *et al.*, 2022).

Regarding employee well-being, its improvement occurs through three key mechanisms (Figure 7). First, our results suggest that the components of a mitigation strategy should address resistance factors at both an individual and an organizational level to reduce technostress and, in turn, lower resistance. This reduction in resistance alleviates stress and frustration, contributing to improved well-being. For example, respondents reported that learning about new technologies helps employees to accept change once they have overcome the initial learning curve and their understanding has improved. This finding aligns with the literature, which indicates that learning can reduce uncertainty and perceived threats associated with change (Lapointe and Rivard, 2005; Stouten *et al.*, 2018). Thus, employee well-being is promoted by diminishing technostress and the associated resistance through mitigating the resistance factors.

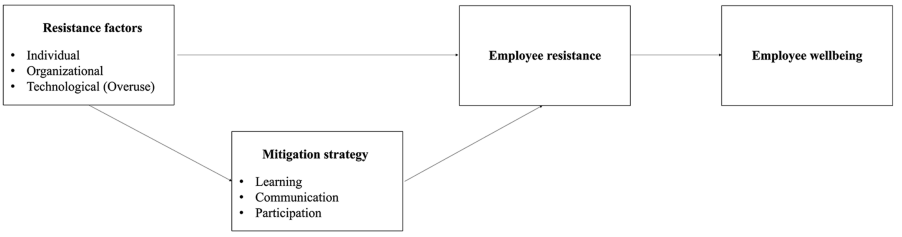
Second, the results provide further insights suggesting that the components of resistance mitigation strategy—such as commitment- and trust-building *communication*, empowering *learning* experiences that enhance performance, and *participation* that fosters the sense of ownership—have direct influence on well-being dimensions, as shown in Table 2. For example, in-group training enhances employees' understanding of new technologies, empowering them and promoting their professional growth—an aspect of the performance dimension of employee well-being. In-group training also fosters communication and knowledge-sharing, which can improve the quality of relationships within the training group (Cabrera and Cabrera, 2002), an aspect of relationships dimension.

Third, leveraging the benefits of digital technologies for well-being (outlined in Table A1) and communicating these benefits early in the implementation process may foster a positive attitude toward technological changes and reduce resistance with implications for well-being. Similarly, experiencing these benefits while working with new technologies may have a direct impact on the employee well-being dimensions.

Although the components of the resistance mitigation strategy—*learning*, *communication*, and *participation*—can be implemented independently, our analysis suggests that they are most effective when applied together, as they reinforce one another. For instance, effective communication not only reduces uncertainty about new technologies but also fosters trust and encourages participation in decision-making processes. Participation, in turn, can increase employee engagement and ownership, creating a supportive environment for learning initiatives. Learning strengthens this cycle by equipping employees with the skills and confidence to adapt to technological changes, further reducing resistance and encouraging employees to participate in digital initiatives and share their knowledge. Together, these components create a cohesive approach that addresses resistance from multiple angles and simultaneously improves employee well-being, ensuring a more robust and sustainable DT process.

5.3 The mediating role of resistance mitigation strategy in digital transformation

Building on our findings, this study proposes that the resistance mitigation strategy may act as a mediator in the relationship between resistance factors and employee resistance (Figure 8).



Source(s): Figure created by authors

Figure 8. Proposed model related to the mediator effect of mitigation strategy

Mediation occurs when a variable explains the mechanism through which one factor affects another (Baron and Kenny, 1986). Specifically, a mitigation strategy transforms the impact of resistance factors (e.g. implementation drawbacks, perceived technology imposition, or a lack of understanding) into reduced resistance by addressing underlying concerns and fostering positive engagement with DT. This mediation effect aligns with the literature on organizational change, which highlights that structured interventions can diminish perceived threats and uncertainty, thereby improving outcomes (Lapointe and Rivard, 2005; Stouten *et al.*, 2018). By alleviating resistance factors, a mitigation strategy has the potential to reduce employee resistance and enhance well-being, thereby it can play an important role in shaping both individual and organizational adaptation during DT.

6. Conclusion

DT is notoriously challenging for companies to manage, as evidenced by the high failure rate of such initiatives (Libert *et al.*, 2016; Ramesh and Delen, 2021). A significant contributing factor is employee resistance (Vial, 2019; Oludapo *et al.*, 2024). Employee well-being is another important but little researched antecedent of the success of digital initiatives and overall company performance—often disregarded during challenging technological shifts (Johnson *et al.*, 2020; Trenerry *et al.*, 2021). By focusing on individual perspectives and placing employees at the center of DT, this study examined employee resistance in the context of DT and its relationship to employee well-being. Ten multiple case studies of Finnish industrial companies were conducted to identify the causes of resistance and the strategies used to mitigate them. The results revealed that resistance stems from individual, organizational, and technological factors. This resistance not only hinders DT but also heightens stress related to the introduction of new technologies, ultimately diminishing employee well-being. However, the findings show that a mitigation strategy incorporating learning, communication, and participation can effectively reduce resistance and support employee well-being, providing valuable guidance for managing the challenges of digital transitions.

6.1 Theoretical contributions

This study contributes to the extant literature on organizational change and DT in four ways. First, it explored employee resistance during DT. It identified the origins of resistance at the individual, organizational, and technological levels, and proposed three integral components of resistance mitigation strategy: *learning*, *communication*, and *participation*. In response to Oludapo *et al.* (2024), this study offers empirical evidence of employee resistance to DT, a phenomenon that has been primarily theoretical until now.

Second, this study connected employee resistance, mitigation strategy, and well-being in the context of DT, proposing employee well-being as an outcome of a resistance mitigation strategy. Specifically, our findings highlight the potential mediating role of the components of a resistance mitigation strategy, suggesting that they transform resistance-inducing factors into opportunities for employee adaptation and growth. This integration of resistance and well-being broadens the scope of the literature, which has primarily focused on the direct effects of resistance on organizational outcomes (Naveed *et al.*, 2022), by emphasizing the dual benefits of resistance mitigation for both individuals and organizations.

Third, our findings address the call in the literature for insights into the impact of DT on employee well-being (Dąbrowska *et al.*, 2022; Nadeem *et al.*, 2024). To the best of our knowledge, this study is among the first to holistically examine this connection. Previous studies have primarily focused on specific components of employee well-being, such as mental health (Johnson *et al.*, 2020) and job satisfaction (Gori and Topino, 2020) or examined the well-being outcomes of adopting digital technologies in the workplace (Braganza *et al.*, 2021; Nazareno and Schiff, 2021; Giuggioli and Pellegrini, 2022). Additionally, while extant

literature on DT primarily focused on enhancing organizational performance and competitiveness (e.g. Mariani *et al.*, 2023), this study emphasized that individuals are central to DT, with their well-being as an important outcome.

Finally, this study developed a framework that integrated resistance, resistance mitigation strategy, and employee well-being, setting the stage for future studies. Specifically, it proposed a connection between resistance, well-being, and DT-related organizational changes. This enhances the understanding of employee behavior during DT and suggests that strategically aligning employee well-being considerations with the introduction of new technologies can increase the success rate of digital initiatives.

6.2 Managerial contributions

This study provides practical insights and guidelines for addressing employee resistance during DT. The study's findings indicate that organizations may benefit from adopting a supportive and mentoring role to help employees prepare for and adapt to digital changes. First, fostering a culture of continuous learning and creating accessible learning opportunities can help to reduce employee resistance. Providing access to resources and opportunities for skill development may also alleviate uncertainty and build employee confidence in navigating technological changes. Second, effective communication emerges as a key factor in mitigating resistance. Early, clear, and transparent communication about technological changes, complemented by examples and demonstrations of the potential benefits for various employee groups, can enhance understanding and acceptance. Explicitly linking these changes to the organization's broader strategy may also elevate their perceived importance. Extending communication across departmental boundaries and involving respected professionals as champions to support onboarding efforts could further enhance the effectiveness of change. Third, it is important to involve a broad range of participants in the DT process. Including both internal and external stakeholders, where relevant, can promote collaboration and foster a sense of shared ownership, contributing to smoother implementation and reduced resistance.

To maintain employee well-being, changes should be made to allow for sufficient adjustment time. Rapid implementation can increase resistance if employees feel that their comfort and input are being disregarded. Companies should dedicate specific working hours for employees to learn new processes, thereby alleviating the need for training during personal time or in addition to daily work. Recognizing, implementing, and promoting the well-being benefits of digital technologies is important, and technologies should be developed to address specific role requirements, such as creativity tools for designers, organizational tools for managers, and automation of physically demanding tasks for factory workers. Additionally, employees should learn how to use technologies in healthy ways. Overall, companies should aim to minimize the stress employees experience during DT by addressing the challenges associated with organizational change. Targeted support should include motivating employees to embrace learning opportunities, ensuring clear and effective communication, and fostering inclusivity by actively encouraging employee participation in the change process. This approach, while requiring additional effort from the company, helps employees to feel more prepared for digital changes, reduces stress, and fosters greater trust and commitment to the organization.

To sum up, a strategic approach to managing DT is essential for reducing resistance and enhancing employee well-being. The study's proposed framework offers a tool for organizations to effectively navigate the complexities of DT, enabling them to address resistance while simultaneously advancing digital initiatives and fostering employee well-being during potentially challenging transitions. This approach is particularly relevant for highly digitalized organizations, where digital change is both significant and continuous, as observed in the companies included in this study. The study's guidelines, informed by the context of Finnish companies with advanced digital maturity, can serve as best practices for organizations in similar environments.

6.3 Research limitations and suggestions

While the study offers valuable insights into the interplay between employee resistance and well-being in the context of DT, its limitations should be noted. First, the findings are context-specific to Finland, a highly digitalized country with advanced infrastructure (European Commission, 2022) and may not be generalizable to organizations and regions with lower levels of digital maturity. Second, the companies included in the analysis represent varied industries and company sizes, which provides a broad perspective but may mask industry- or scale-specific differences. Future research should address these limitations by testing the framework in diverse geographic, industrial, and organizational contexts.

As a theory-building study, this research focused on identifying patterns and generating qualitative insights (Yin, 2018) into the relationships between resistance factors, mitigation strategy, and employee well-being. Quantitative research is now needed to empirically test these relationships, operationalize the framework's components (similar to Figure 8), and validate its applicability through large-scale studies. For example, future studies could test whether specific components of the mitigation strategy—such as communication, learning, and participation—mediate the relationship between resistance factors and employee resistance. Additionally, examining the differential effects of these components on specific resistance factors could deepen understanding and refine the framework.

Qualitative research could also extend the framework by identifying additional resistance factors and exploring how the different components of a mitigation strategy interact with contextual influences. Specific factors such as industry type, company size, digital maturity, organizational culture, and workforce composition could be systematically analyzed to provide a more nuanced understanding of resistance dynamics. Finally, future studies could investigate how digital technologies improve employee well-being, for example, by fostering stronger organizational relationships, and enhancing subjective performance metrics—such as job satisfaction and meaningfulness—to provide actionable strategies for reducing employee resistance and maintaining well-being during technological transitions.

References

Abeliansky, A.L., Beulmann, M. and Prettner, K. (2024), "Are they coming for us? Industrial robots and the mental health of workers", *Research Policy*, Vol. 53 No. 3, 104956, doi: 10.1016/j.respol.2024.104956.

Alohali, M., Carton, F. and O'Connor, Y. (2020), "Investigating the antecedents of perceived threats and user resistance to health information technology: a case study of a public hospital", *Journal of Decision Systems*, Vol. 29 No. 1, pp. 27-52, doi: 10.1080/12460125.2020.1728988.

Ashforth, B.E. and Mael, F. (1989), "Social identity theory and the organization", *Academy of Management Review*, Vol. 14 No. 1, pp. 20-39, doi: 10.2307/258189.

Baron, R.M. and Kenny, D.A. (1986), "The moderator–mediator variable distinction in social psychological research: conceptual, strategic, and statistical considerations", *Journal of Personality and Social Psychology*, Vol. 51 No. 6, pp. 1173-1182, doi: 10.1037/0022-3514.51.6.1173.

Barratt, M., Choi, T.Y. and Li, M. (2011), "Qualitative case studies in operations management: trends, research outcomes, and future research implications", *Journal of Operations Management*, Vol. 29 No. 4, pp. 329-342, doi: 10.1016/j.jom.2010.06.002.

Bausch, D., Kraemer, T. and Mauroner, O. (2024), "Technology-induced stress and employee resistance in the context of digital transformation and identification of countermeasures", *International Journal of Innovation and Technology Management (IJITM)*, Vol. 21 No. 4, pp. 1-36, doi: 10.1142/s0219877024500299.

Bourahmoune, K., Ishac, K. and Amagasa, T. (2022), "Intelligent posture training: machine-learning-powered human sitting posture recognition based on a pressure-sensing iot cushion", *Sensors*, Vol. 22 No. 14, p. 5337, doi: 10.3390/s22145337.

Braganza, A., Chen, W., Canhoto, A. and Sap, S. (2021), "Productive employment and decent work: the impact of AI adoption on psychological contracts, job engagement and employee trust", *Journal of Business Research*, Vol. 131, pp. 485-494, doi: 10.1016/j.jbusres.2020.08.018.

Braun, V. and Clarke, V. (2006), "Using thematic analysis in psychology", *Qualitative Research in Psychology*, Vol. 3 No. 2, pp. 77-101, doi: 10.1191/1478088706qp063oa.

Brougham, D. and Haar, J. (2018), "Smart technology, artificial intelligence, robotics, and algorithms (STARA): employees' perceptions of our future workplace", *Journal of Management and Organization*, Vol. 24 No. 2, pp. 239-257, doi: 10.1017/jmo.2016.55.

Cabrera, A. and Cabrera, E.F. (2002), "Knowledge-sharing dilemmas", *Organization Studies*, Vol. 23 No. 5, pp. 687-710, doi: 10.1177/0170840602235001.

Callan, V.J. (1993), "Individual and organizational strategies for coping with organizational change", *Work and Stress*, Vol. 7 No. 1, pp. 63-75, doi: 10.1080/02678379308257050.

Chatterjee, S., Chaudhuri, R., Vrontis, D., Thrassou, A. and Ghosh, S.K. (2021), "Adoption of artificial intelligence-integrated CRM systems in agile organizations in India", *Technological Forecasting and Social Change*, Vol. 168, 120783, doi: 10.1016/j.techfore.2021.120783.

Chawla, U., Verma, B. and Mittal, A. (2024), "Resistance to O2O technology platform adoption among small retailers: the influence of visibility and discoverability", *Technology in Society*, Vol. 76, 102482, doi: 10.1016/j.techsoc.2024.102482.

Chebbi, H., Yahiaoui, D., Sellami, M., Papasolomou, I. and Melanthiou, Y. (2020), "Focusing on internal stakeholders to enable the implementation of organizational change towards corporate entrepreneurship: a case study from France", *Journal of Business Research*, Vol. 119, pp. 209-217, doi: 10.1016/j.jbusres.2019.06.003.

Cirillo, V., Fanti, L., Mina, A. and Ricci, A. (2023), "The adoption of digital technologies: investment, skills, work organization", *Structural Change and Economic Dynamics*, Vol. 66, pp. 89-105, doi: 10.1016/j.strueco.2023.04.011.

Dąbrowska, J., Almpanopoulou, A., Brem, A., Chesbrough, H., Cucino, V., Di Minin, A., Giones, F., Hakala, H., Marullo, C., Mention, A., Mortara, L., Nørskov, S., Nylund, P.A., Oddo, C.M., Radziwon, A. and Ritala, P. (2022), "Digital transformation, for better or worse: a critical multi-level research agenda", *R&D Management*, Vol. 52 No. 5, pp. 930-954, doi: 10.1111/radm.12531.

Davison, R.M., Wong, L.H. and Peng, J. (2023), "The art of digital transformation as crafted by a chief digital officer", *International Journal of Information Management*, Vol. 69, 102617, doi: 10.1016/j.ijinfomgt.2022.102617.

Demerouti, E. (2022), "Turn digitalization and automation to a job resource", *Applied Psychology*, Vol. 71 No. 4, pp. 1205-1209, doi: 10.1111/apps.12270.

Diedericks, J.C., Cilliers, F. and Bezuidenhout, A. (2019), "Resistance to change, work engagement and psychological capital of academics in an open distance learning work environment", *SA Journal of Human Resource Management*, Vol. 17 No. 1, pp. 1-14, doi: 10.4102/sajhrm.v17i0.1142.

Dudo, A. and Besley, J.C. (2016), "Scientists' prioritization of communication objectives for public engagement", *PLoS One*, Vol. 11 No. 2, 148867, doi: 10.1371/journal.pone.0148867.

Eisenhardt, K.M. (1989), "Building theories from case study research", *Academy of Management Review*, Vol. 14 No. 4, pp. 532-550, doi: 10.2307/258557.

European Commission (2022), "Digital economy and society index (DESI) 2022", Finland, available at: https://digital-strategy.ec.europa.eu/en/policies/desi-finland (accessed 12 February 2024).

Eyel, C.Ş. and Mete, İ. (2021), "Investigating user resistance of employees working at technology companies in Istanbul towards digital transformation", *International Journal of Information Science and Management (IJISM)*, Vol. 19 No. 2, pp. 93-106.

Giuggioli, G. and Pellegrini, M.M. (2022), "Artificial intelligence as an enabler for entrepreneurs: a systematic literature review and an agenda for future research", *International Journal of Entrepreneurial Behavior and Research*, Vol. 29 No. 4, pp. 816-837, doi: 10.1108/ijebr-05-2021-0426.

Gong, C. and Ribiere, V. (2021), "Developing a unified definition of digital transformation", *Technovation*, Vol. 102, 102217, doi: 10.1016/j.technovation.2020.102217.

Gori, A. and Topino, E. (2020), "Predisposition to change is linked to job satisfaction: assessing the mediation roles of workplace relation civility and insight", *International Journal of Environmental Research and Public Health*, Vol. 17 No. 6, pp. 21-41, doi: 10.3390/ijerph17062141.

Gould-Williams, J. (2003), "The importance of HR practices and workplace trust in achieving superior performance: a study of public-sector organizations", *International Journal of Human Resource Management*, Vol. 14 No. 1, pp. 28-54, doi: 10.1080/09585190210158501.

Grant, A.M., Christianson, M.K. and Price, R.H. (2007), "Happiness, health, or relationships? Managerial practices and employee well-being tradeoffs", *Academy of Management Perspectives*, Vol. 21 No. 3, pp. 51-63, doi: 10.5465/amp.2007.26421238.

Gurbaxani, V. and Dunkle, D. (2019), "Gearing up for successful digital transformation", *MIS Quarterly Executive*, Vol. 18 No. 3, pp. 1-21, doi: 10.17705/2msqe.00017.

Hanelt, A., Bohnsack, R., Marz, D. and Antunes Marante, C. (2021), "A systematic review of the literature on digital transformation: insights and implications for strategy and organizational change", *Journal of Management Studies*, Vol. 58 No. 5, pp. 1159-1197, doi: 10.1111/joms.12639.

Holopainen, M., Ukko, J. and Saunila, M. (2022), "Managing the strategic readiness of industrial companies for digital operations", *Digital Business*, Vol. 2 No. 2, 100039, doi: 10.1016/j.digbus.2022.100039.

Holopainen, M., Saunila, M. and Ukko, J. (2023), "Value creation paths of organizations undergoing digital transformation", *Knowledge and Process Management*, Vol. 30 No. 2, pp. 125-136, doi: 10.1002/kpm.1745.

IDC (2022), "Worldwide digital transformation investments forecast to reach $1.8 Trillion in 2022", available at: https://www.idc.com/getdoc.jsp?containerId=prUS49114722 (accessed 17 December 2023).

Ismail, M., Bello-Pintado, A., García-Marco, T. and Lazzarotti, V. (2023), "Enhancing open innovation: managing not invented here syndrome in collaborative projects", *Technovation*, Vol. 128, 102879, doi: 10.1016/j.technovation.2023.102879.

Johnson, A., Dey, S., Nguyen, H., Groth, M., Joyce, S., Tan, L., Glozier, N. and Harvey, S.B. (2020), "A review and agenda for examining how technology-driven changes at work will impact workplace mental health and employee well-being", *Australian Journal of Management*, Vol. 45 No. 3, pp. 402-424, doi: 10.1177/0312896220922292.

Jones, M.D., Hutcheson, S. and Camba, J.D. (2021), "Past, present, and future barriers to digital transformation in manufacturing: a review", *Journal of Manufacturing Systems*, Vol. 60, pp. 936-948, doi: 10.1016/j.jmsy.2021.03.006.

Joshi, K. (1991), "A model of users' perspective on change: the case of information systems technology implementation", *MIS Quarterly*, Vol. 15 No. 2, pp. 229-242, doi: 10.2307/249384.

Kandler, M., Dierolf, L., Bender, M., Schäfer, L., May, M.C. and Lanza, G. (2022), "Shopfloor management acceptance in global manufacturing", *Procedia CIRP*, Vol. 115, pp. 190-195, doi: 10.1016/j.procir.2022.10.072.

Kane, G. (2019), "The technology fallacy: people are the real key to digital transformation", *Research-Technology Management*, Vol. 62 No. 6, pp. 44-49, doi: 10.1080/08956308.2019.1661079.

Keeman, A., Näswall, K., Malinen, S. and Kuntz, J. (2017), "Employee wellbeing: evaluating a wellbeing intervention in two settings", *Frontiers in Psychology*, Vol. 8, p. 505, doi: 10.3389/fpsyg.2017.00505.

Keutel, M., Michalik, B. and Richter, J. (2014), "Towards mindful case study research in IS: a critical analysis of the past ten years", *European Journal of Information Systems*, Vol. 23 No. 3, pp. 256-272, doi: 10.1057/ejis.2013.26.

Kim, H.W. and Kankanhalli, A. (2009), "Investigating user resistance to information systems implementation: a status quo bias perspective", *MIS Quarterly*, Vol. 33 No. 3, pp. 567-582, doi: 10.2307/20650309.

Klaus, T. and Blanton, J.E. (2010), "User resistance determinants and the psychological contract in enterprise system implementations", *European Journal of Information Systems*, Vol. 19 No. 6, pp. 625-636, doi: 10.1057/ejis.2010.39.

Kleijnen, M., Lee, N. and Wetzels, M. (2009), "An exploration of consumer resistance to innovation and its antecedents", *Journal of Economic Psychology*, Vol. 30 No. 3, pp. 344-357, doi: 10.1016/j.joep.2009.02.004.

Kraus, S., Jones, P., Kailer, N., Weinmann, A., Chaparro-Banegas, N. and Roig-Tierno, N. (2021), "Digital transformation: an overview of the current state of the art of research", *Sage Open*, Vol. 11 No. 3, 21582440211047576.

Lapointe, L. and Rivard, S. (2005), "A multilevel model of resistance to information technology implementation", *MIS Quarterly*, Vol. 29 No. 3, pp. 461-491, doi: 10.2307/25148692.

Laumer, S., Maier, C., Eckhardt, A. and Weitzel, T. (2016), "Work routines as an object of resistance during information systems implementations: theoretical foundation and empirical evidence", *European Journal of Information Systems*, Vol. 25 No. 4, pp. 317-343, doi: 10.1057/ejis.2016.1.

Libert, B., Beck, M. and Wind, Y. (2016), "Questions to ask before your next digital transformation", *Harvard Business Review*, Vol. 60 No. 12, pp. 11-13.

Limbu, Y.B., Jayachandran, C. and Babin, B.J. (2014), "Does information and communication technology improve job satisfaction? The moderating role of sales technology orientation", *Industrial Marketing Management*, Vol. 43 No. 7, pp. 1236-1245, doi: 10.1016/j.indmarman.2014.06.013.

Mariani, M.M., Machado, I., Magrelli, V. and Dwivedi, Y.K. (2023), "Artificial intelligence in innovation research: a systematic review, conceptual framework, and future research directions", *Technovation*, Vol. 122, 102623, doi: 10.1016/j.technovation.2022.102623.

Marshall, B., Cardon, P., Poddar, A. and Fontenot, R. (2013), "Does sample size matter in qualitative research? A review of qualitative interviews in IS research", *Journal of computer information systems*, Vol. 54 No. 1, pp. 11-22, doi: 10.1080/08874417.2013.11645667.

Minh, H.P. and Thanh, H.P.T. (2023), "A framework for managing organizational change in the context of digital transformation", *International Conference on Emerging Challenges: Strategic Adaptation in The World of Uncertainties (ICECH 2022)*, Atlantis Press, pp. 402-422.

Moser, S.C. and Dilling, L. (2007), *Creating a Climate for Change: Communicating Climate Change and Facilitating Social Change*, Cambridge University Press, Cambridge.

Mulki, J.P., Jaramillo, F., Malhotra, S. and Locander, W.B. (2012), "Reluctant employees and felt stress: the moderating impact of manager decisiveness", *Journal of Business Research*, Vol. 65 No. 1, pp. 77-83, doi: 10.1016/j.jbusres.2011.01.019.

Nadeem, K., Wong, S.I., Za, S. and Venditti, M. (2024), "Digital transformation and industry 4.0 employees: empirical evidence from top digital nations", *Technology in Society*, Vol. 76, 102434, doi: 10.1016/j.techsoc.2023.102434.

Naveed, R.T., Alhaidan, H., Al Halbusi, H. and Al-Swidi, A.K. (2022), "Do organizations really evolve? The critical link between organizational culture and organizational innovation toward organizational effectiveness: pivotal role of organizational resistance", *Journal of Innovation and Knowledge*, Vol. 7 No. 2, 100178, doi: 10.1016/j.jik.2022.100178.

Nazareno, L. and Schiff, D.S. (2021), "The impact of automation and artificial intelligence on worker well-being", *Technology in Society*, Vol. 67, 101679, doi: 10.1016/j.techsoc.2021.101679.

Nourmohammadi, A., Fathi, M. and Ng, A.H. (2022), "Balancing and scheduling assembly lines with human-robot collaboration tasks", *Computers and Operations Research*, Vol. 140, 105674, doi: 10.1016/j.cor.2021.105674.

Oludapo, S., Carroll, N. and Helfert, M. (2024), "Why do so many digital transformations fail? A bibliometric analysis and future research agenda", *Journal of Business Research*, Vol. 174, 114528, doi: 10.1016/j.jbusres.2024.114528.

Oreg, S. (2006), "Personality, context, and resistance to organizational change", *European Journal of Work and Organizational Psychology*, Vol. 15 No. 1, pp. 73-101, doi: 10.1080/13594320500451247.

Pagán-Castaño, E., Maseda-Moreno, A. and Santos-Rojo, C. (2020), "Wellbeing in work environments", *Journal of Business Research*, Vol. 115, pp. 469-474, doi: 10.1016/j.jbusres.2019.12.007.

Peeters, M.C. and Plomp, J. (2022), "For better or for worse: the impact of workplace automation on work characteristics and employee well-being", in Petrillo, A., De Felice, F., Achim, M.V. and Mirza, N. (Eds), *Digital Transformation – Towards New Frontiers and Business Opportunities*, IntechOpen.

Peschl, A. and Schüth, N.J. (2022), "Facing digital transformation with resilience–operational measures to strengthen the openness towards change", *Procedia Computer Science*, Vol. 200, pp. 1237-1243, doi: 10.1016/j.procs.2022.01.324.

Polit, D.F. and Beck, C.T. (2010), "Generalization in quantitative and qualitative research: myths and strategies", *International Journal of Nursing Studies*, Vol. 47 No. 11, pp. 1451-1458, doi: 10.1016/j.ijnurstu.2010.06.004.

Qi, Y., Sajadi, S.M., Baghaei, S., Rezaei, R. and Li, W. (2024), "Digital technologies in sports: opportunities, challenges, and strategies for safeguarding athlete wellbeing and competitive integrity in the digital era", *Technology in Society*, Vol. 77, 102496, doi: 10.1016/j.techsoc.2024.102496.

Ram, S. and Sheth, J.N. (1989), "Consumer resistance to innovations: the marketing problem and its solutions", *Journal of Consumer Marketing*, Vol. 6 No. 2, pp. 5-14, doi: 10.1108/eum0000000002542.

Ramesh, N. and Delen, D. (2021), "Digital transformation: how to beat the 90% failure rate?", *IEEE Engineering Management Review*, Vol. 49 No. 3, pp. 22-25, doi: 10.1109/emr.2021.3070139.

Rieley, J.B. (2016), "What to do when employees are gaming the system: overcoming resistance to change", *Global Business and Organizational Excellence*, Vol. 35 No. 2, pp. 31-37, doi: 10.1002/joe.21653.

Rivas, C. (2012), "Coding and analysing qualitative data", *Researching society and culture*, Vol. 3 No. 2012, pp. 367-392.

Samhan, B. and Joshi, K.D. (2017), "Understanding electronic health records resistance: a revealed causal mapping approach", *International Journal of Electronic Healthcare*, Vol. 9 Nos 2-3, pp. 100-128, doi: 10.1504/ijeh.2017.083163.

Saunders, M., Lewis, P. and Thornhill, A. (2015), *Research Methods for Business Students*, 7th ed., Pearson Education, Harlow.

Scholkmann, A.B. (2021), "Resistance to (digital) change: individual, systemic and learning-related perspectives", in *Digital Transformation of Learning Organizations*, pp. 219-236.

Schraeder, M., Swamidass, P.M. and Morrison, R. (2006), "Employee involvement, attitudes and reactions to technology changes", *Journal of Leadership and Organizational Studies*, Vol. 12 No. 3, pp. 85-100, doi: 10.1177/107179190601200306.

Selimović, J., Pilav-Velić, A. and Krndžija, L. (2021), "Digital workplace transformation in the financial service sector: investigating the relationship between employees' expectations and intentions", *Technology in Society*, Vol. 66, 101640, doi: 10.1016/j.techsoc.2021.101640.

Singh, A. and Hess, T. (2017), "How chief digital officers promote the digital transformation of their companies", *MIS Quarterly Executive*, Vol. 16 No. 1, pp. 1-17.

Stouten, J., Rousseau, D.M. and De Cremer, D. (2018), "Successful organizational change: integrating the management practice and scholarly literature", *The Academy of Management Annals*, Vol. 12 No. 2, pp. 752-788, doi: 10.5465/annals.2016.0095.

Syed, R., Bandara, W. and Eden, R. (2023), "Public sector digital transformation barriers: a developing country experience", *Information Polity*, Vol. 28 No. 1, pp. 5-27, doi: 10.3233/ip-220017.

Trenerry, B., Chng, S., Wang, Y., Suhaila, Z.S., Lim, S.S., Lu, H.Y. and Oh, P.H. (2021), "Preparing workplaces for digital transformation: an integrative review and framework of multi-level factors", *Frontiers in Psychology*, Vol. 12, 620766, doi: 10.3389/fpsyg.2021.620766.

Valtonen, A. and Kimpimäki, J.P. (2023), "Automation and wellbeing: topic modelling literature review", *Academy of Management Proceedings*, Academy of Management, Briarcliff Manor, NY, Vol. 2023 No. 1, 12157.

Verhoef, P.C., Broekhuizen, T., Bart, Y., Bhattacharya, A., Dong, J.Q., Fabian, N. and Haenlein, M. (2021), "Digital transformation: a multidisciplinary reflection and research agenda", *Journal of Business Research*, Vol. 122, pp. 889-901.

Vial, G. (2019), "Understanding digital transformation: a review and a research agenda", *The Journal of Strategic Information Systems*, Vol. 28 No. 2, pp. 118-144, doi: 10.1016/j.jsis.2019.01.003.

Weber, E., Büttgen, M. and Bartsch, S. (2022), "How to take employees on the digital transformation journey: an experimental study on complementary leadership behaviors in managing organizational change", *Journal of Business Research*, Vol. 143, pp. 225-238, doi: 10.1016/j.jbusres.2022.01.036.

Werthner, H., Prem, E., Lee, E.A. and Ghezzi, C. (2022), *Perspectives on Digital Humanism*, Springer Nature Switzerland AG, Cham.

Yin, R.K. (2018), *Case Study Research and Applications: Design and Methods*, 6th ed., SAGE, Thousand Oaks, CA.

Zhang, H. (2023), "Technostress, academic self-efficacy, and resistance to innovation: buffering roles of knowledge sharing culture and constructive deviant behavior", *Psychology Research and Behavior Management*, Vol. 16, pp. 3867-3881, doi: 10.2147/prbm.s424396.

Zhang, C., Wang, Z., Zhou, G., Chang, F., Ma, D., Jing, Y., Cheng, W., Ding, K. and Zhao, D. (2023), "Towards new-generation human-centric smart manufacturing in Industry 5.0: a systematic review", *Advanced Engineering Informatics*, Vol. 57, 102121, doi: 10.1016/j.aei.2023.102121.

Župerkienė, E., Šimanskienė, L., Fiore, M. and Paulikas, J. (2023), "Management of employee resistance caused by technological change for organisational sustainability", in Riad Shams, S.M., Vrontis, D. and Weber, Y. (Eds.), *Technology, Business and Sustainable Development*, Routledge, pp. 67-84.

(The Appendix follows overleaf)

Table A1. Benefits of digital technologies for employee well-being

Employee well-being dimension	Benefit	Example quotes	Explanation
Performance	Workload	• [Introduction of new technologies] does make work easier • Product management communication system can make detailed instruction on what needs to be done and it reduces the workload	Using technology to manage or reduce workload directly enhances employee performance by streamlining organizational processes and facilitating their tasks. For example, automation eases production line duties for employees at Company D and helps with product shelving at Company I. Meanwhile, production management systems at Company E provide clear, detailed task instructions, simplifying the workload and making tasks easier for employees
	Efficiency	• [Automatizing data transfer and its utilization] speeds up and streamlines the overall time that is spent to the design of the product [. . .] total time is reduced when the number of manual work steps decreases • [Automating work routines] makes work faster and more efficient	Interviewees confirm that new technologies significantly enhance employee efficiency. Digital tools streamline time-intensive activities like product design and testing, cutting down effort from weeks to hours (Companies G, H, I). This improvement extends across the production chain, from quoting to delivery, reducing manual labor and speeding up both product development and delivery (Companies H, I). Furthermore, automation and digital work environments accelerate tasks and eliminate routine menial work, freeing up time for more cognitive tasks such as customer service, which boosts overall employee efficiency and performance
	Management and decision-making	• [Using new technologies] decreases administrative work to a minimum [. . .] you get efficient workforce planning • [With the introduction of production management system] the level of uncertainty has decreased, and the amount of knowledge has increased	Some interviewees observe that the integration of technologies in the workplace has reduced their administrative tasks, leading to more efficient workforce planning (Company I). These technologies structure information and provide insights clearly, improving employees' understanding of their tasks and company operations (Company E). This method not only enhances employees' knowledge and reduces uncertainty but also aids in decision-making (Company E). Employees are able to make informed decisions using accurate, timely data, which improves work phase efficiency and product design. Moreover, the decrease in manual information processing and planning not only elevates productivity but also enhances resource utilization, such as optimizing material use in manufacturing (Company H)
	Creativity	• When it comes to these creative tools like AI, you can ask AI for help in creating marketing ideas or use photoshop to change the background of the picture for a catalog • Robots can answer questions or create a program code for you so some people are quite creatively thinking how these could change their own work [. . .] so they also have such an effect that feeds creativity	Interviewees from Companies F, G, and I observe that new technologies, particularly AI, liberate employee time for creative pursuits. For instance, by automating routine tasks such as image editing, AI shifts employee focus towards more creative activities like marketing strategy development. These technologies also enhance employees' capabilities in creative problem-solving and ideation. AI applications are widely used for unrestricted creative efforts in design and marketing, while tools like automation and 3D modeling expand creative possibilities in more regulated environments such as construction planning. These tools aid in early issue identification and feasibility analyses, thereby broadening project development options (Company H). Interviewees note that engaging in "more sensible jobs" and value-adding tasks empowers employees, fostering creativity in their work (Company F). Technology also supports the visualization and implementation of employees' ideas (Company H). However, some interviewees from Companies D and E question the impact of new technologies on creativity, while others from Company B suggest that creativity thrives more through group discussions and idea sharing, independent of digital tools

(*continued*)

Table A1. Continued

Employee well-being dimension	Benefit	Example quotes	Explanation
Health	Occupational safety	• We try to reduce human intervention so instead it is done automatically. It also reduces the risk of occupational accidents • The digital model is used when designing those safety issues, e.g. where to place fences or control switches because it's easier to place them virtually first and see where they fit and where they can go	All interviewees collectively highlight the significant role of technology in advancing occupational safety by reducing exposure to hazards, preventing accidents, and enabling proactive safety planning. For example, wireless sensors can monitor faults and automatically alert maintenance. This process, along with other automated interventions, helps reduce occupational accidents by limiting human exposure to hazardous areas (Companies A, D). The similar goal has been achieved by providing employees with opportunities for remote work, which was particularly effective during coronavirus pandemic (Company I). Digital reporting of hazards and near-misses is also reported to decrease accident frequency (Company E). Also, companies report using simulation and VR to design accident-free employee training systems and occupational safety planning (Companies B, J). Similar tools help further improve occupational safety by enabling employees to familiarize themselves with work environment in advance using digital models of factories or construction sites (Company B)
	Workplace ergonomics	• The degree of automation has gone so far [. . .] where a few years ago we used wrench now we use touch screen • In the future you will be able to strive for safer and more ergonomic work environment that allows people to participate earlier in the design work	In the discussion of workplace ergonomics, Company J mentions a transition from manual to automated processes, illustrating an evolution from physical tools to digital interfaces, such as touch screens, which streamline operations and reduce the physical strain on employees. This shift not only increases efficiency but also minimizes the risk of work-related injuries. Company F emphasizes the forward-looking perspective on workplace safety and ergonomics. They suggest that future workplaces will prioritize ergonomically designed environments that are tailored to the needs of employees, thereby fostering earlier and more inclusive participation
Relationship	Communication	• We use Slack so we can inform all stores and all staff in real time and maintain good [level of] communication in all stores • We have coders around the world, and we need to manage them remotely so the use of instant communication tools like those on the phone is beneficial	Company I highlights the benefits of using technology for remote management and flexible meeting attendance, like joining sales meetings via video call from home. The company has also adopted real-time communication platforms like Slack, which facilitate instant sharing of information across departments, streamlining conversations and improving efficiency over traditional emails or scattered messaging groups. This approach has fostered a more collaborative and efficient work environment. Company B reflects on the transformative impact of remote and video communications in conducting business. They note that practices once deemed impossible, like closing million-dollar deals over Teams, have become efficient and commonplace. The ability to review contracts together on-screen during a video call has streamlined negotiations, highlighting the significant efficiency gains and convenience brought by digital communication tools
	Collaboration	• When we use digital twin technology for [project] overview, cooperation gets stronger in the development group [. . .] because it allows for everyone seeing automation and mechanics • Digital twin [technology] made communication easier both in-house and with end user, i.e. customer's customer [. . .] because information is transferred digitally [. . .] and real-time data [is used]	The adoption of technologies, such as digital twins, has been recognized by Company G and H as a catalyst for enhancing collaboration across various organizational actors. These technological initiatives necessitate more in-depth communication between diverse stakeholders and experts, spanning organizational boundaries. Digital twins can also be used to provide a comprehensive overview of ongoing projects, enabling real-time monitoring of actions, and facilitating direct communication about potential adjustments or issues, thereby reducing the need for traditional communication methods like emails. This integration not only bolsters collaboration but also mitigates uncertainty (Company H). Furthermore, the enhancement in collaboration fosters stronger internal and external partnerships, leading to synergistic gains in technological proficiency and expertise, as observed by Company B and D

Source(s): Table created by authors

About the authors

Alena Valtonen is Doctoral Student in the School of Engineering Science at LUT University, Finland. She has a background in innovation management. Her research focuses on performance measurement and management, as well as on employee well-being in automated/digital workplaces. She has published in the *Creativity and Innovation Management* journal and in the proceedings of the *Academy of Management* conference. Alena Valtonen is the corresponding author and can be contacted at: alena.valtonen@lut.fi

Mira Holopainen is Postdoctoral Researcher at LUT University, School of Engineering Sciences at LUT University, Finland. Her research is related to performance management as well as digital transformation of industrial companies. She has previously published in the journals of *Technology Analysis and Strategic Management*, *Information Technology and People*, *Digital Business*, *Knowledge and Process Management*, *Measuring Business Excellence* and *Production and Manufacturing Research*.