THE ROLE OF WORKPLACE DIGITALIZATION ON EMPLOYEES' BURNOUT, WORK ENGAGEMENT, AND JOB MEANINGFULNESS IN FINLAND

Lappeenranta–Lahti University of Technology LUT

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Abstract

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The current study explored the role of workplace digitalisation on employee burnout, work engagement, and job meaningfulness in Finland. The participants included in the study consisted of 1261 males and females with an age range of 18-64 years working in different organisations in Finland. The data included in the study were taken from the Finnish Working Life Barometer (2023). The variables included were: the use of digital tools, the burnout scale, work engagement, and work meaningfulness. Bivariate statistics revealed that the overall use of digital tools had a non-significant relationship with burnout and job meaningfulness. For work engagement, a statistically significant positive correlation between total use of digital tools and work engagement was found. Group comparisons revealed that employees who use social media and those who do not use social media have non-significant mean differences in burnout. Similarly, employees who collaborate virtually and those who do not collaborate virtually have non-significant differences in burnout and job meaningfulness. Furthermore, there is a statistically significant mean difference between social media users with work engagement and job meaningfulness. There is also a significant difference between virtual collaboration and work engagement. Structural equation modelling confirmed that the use of digital tools does not significantly predict burnout, work engagement or job meaningfulness. Demographic variables, including the employment status (part-time/full-time), positively predicted burnout and negatively influenced work engagement and job meaningfulness. Gender had a significant effect on work engagement and job meaningfulness. Structural equation modelling (SEM) also revealed that older people considered their job more meaningful compared to younger people. Overall, it shows that digitalisation itself does not directly affect employees' wellbeing but the context it is used in plays a significant role. These insights contribute to helping organisations and HR professionals design their workplaces to support the well-being of employees and the use of digital tools in a way that helps to increase clarity, independence, and efficiency and not lead to exhausting cognitive processes.

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SYMBOLS AND ABBREVIATIONS

JD-R	Job Demand Resource Theory
α	Chronbach's Alpha
SD	Standard Deviation
p	Significance value
r	correlation coefficient
Φ	phi representing covariance
β	Beta

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Chapter 1

1.1 Introduction

One of the fundamental changes brought about by the COVID-19 pandemic that transformed industrial work organization was the accelerated digitalization of the workplace. Organisations sought to use remote models for work and adopt digital communication platforms to ensure that their operations and workflows would continue (Kniffin et al., 2021). The classical workplace has been transformed, and the way people conduct their work activities is evolving, which enables remote as well as virtual working. This shift not only affects the interaction of employees with one another but also the way employees handle their work and manage the boundaries between work and home (Wang et al., 2021).

As a result of remote working, the use of online technologies such as email, Microsoft Teams, Zoom, mobile devices, and other software has already become routine for employees. Although these tools provide flexibility in the work environment, but they also increases concerns regarding the way digital tools reshape work practices (Leonardi, 2020), especially with respect to burnout (Consiglio et al., 2023), perceived job meaningfulness (Aleksic et al., 2024), and continuous work involvement (Mazmanian et al., 2013). Based on this background, the purpose of this study is to explore the relationship between the use of digital tools and key indicators of employee well-being including burnout, work engagement, and job meaningfulness in Finland using data from the Finnish Working Life Barometer 2023.

Finland is among those countries that are at the forefront of technological innovation and work-life development (World Intellectual Property Organisation, 2025). According to the Finland 2024 Digital Decade Country Report (European Commission, 2024), 82% of Finns have a basic level of digital literacy, which is significantly higher than the EU average, which is 57.7%. Furthermore, 79.5% enterprises use artificial intelligence or data analytics, which is also high in comparison with the EU average of 54.6%. Because of its high degree of digitization, it is vital to research how digital technologies affect workers well-being in Finland.

Digitalisation can also bring digital fatigue, techno stress, and work/life balance issues despite the fact that it enables employees to work more freely, and enhances their productivity in the workplace (Tarafdar et al., 2015). For instance, a recent study found that employees feel overwhelmed by technology at work due to excessive messages, emails and online meetings, which causes emotional exhaustion, cognitive overload and difficulty in focusing (Marsh et al., 2024). These mixed findings emphasise the need to comprehend how workplace digitisation affects employee experiences in highly digitalised nations like Finland.

The proposed study aims to assess this mixed-effect of digitalisation on employees' well-being. On the positive side, it gives autonomy and engagement to employees. For instance, Huu (2023) carried out a systematic review to explore employee digital competency and the relationship between digital autonomy and innovative work behaviour. The findings suggested that the more employees have digital autonomy, the more they tend to work innovatively, which results in high job performance and empowerment. Digital autonomy development therefore targets organisations by making digital tools, training, and a supportive work environment available to organisations.

Conversely, digitalisation can be a leading factor of stress among employees. A study by Zhan & Xie (2025) found that digital tools can be viewed either as challenges (which assist engagement) or threats (which intensify stress), depending on the digital literacy of employees and perceived support. The study focused on Chinese workers working in the public sector, and it reveals that when digitalisation is viewed as a challenge, work engagement is improved, whereas when it is viewed as a threat, it is diminished.

Quantitative studies on these topics are few and have not focused on the outcomes of the three variables of burnout, work engagement and job meaningfulness collectively in a single framework (Beer & Mulder, 2020; Chadee et al., 2021). Most studies have focused on one or two outcomes, which makes it difficult to understand how digital tools affect the overall work experience of individuals. Moreover, a scarce amount of research has been done previously that includes large-scale representative national data, particularly in highly digitalised societies like Finland. While major European initiatives, including the European Social Survey and national programmes on sustainable working life, highlight the importance of employee well-being, the psychosocial benefits and risks of digital tool

usage have still not been fully explored. Most importantly, an important aspect of employees' well-being and motivation is job meaningfulness, which has not been explored directly alongside workplace digitalisation. A few studies have explored job meaningfulness indirectly with workplace digitalisation (Xu et al., 2023; Gosh & Sadeghian, 2024). The purpose of this study is to fully fill these gaps and explore the direct impact of workplace digitalisation on job meaningfulness along with the other two outcome variables, burnout and work engagement, and using nationally representative Finnish data.

The study is grounded in two complementary theoretical frameworks. First, Job Demand Resource (JD-R) theory (Demerouti et al., 2001; Bakker & Demerouti, 2017), explains the way digitalisation can create job pressures, such as information overload and increased workloads, while job resources are the efficient use of digital tools that increase engagement, autonomy, or flexibility. Second, techno-stress theory (Tarafdar et al., 2015) helps to examine the stress caused by digital technologies. This theory helps to understand the way employees view digital tools either as a threat or a challenge. Both of these theories collectively provide a foundation for analysing the impact of digitalisation. The purpose of this study is to integrate these theories to examine the dual effect of digitalization as an enabler and stressor.

The current research centers on the Nordic region, particularly Finnish society, in which the psychosocial impact of the digitalisation process is not yet recognized despite its advancement. The study will help in understanding how digitalisation is changing modern work experiences by investigating the relationship between the use of digital tools and all three outcome variables. It also considers variations across demographic variables such as age, gender, and remote work status, which provides insights that are relevant for both academic research and real-life work place policy.

The following research questions will be addressed in the current thesis.

- How the frequency of the use of digital tools is related with employee burnout?
- What is the relationship between use of digital tools and work-engagement?
- Does digital tool usage influence perceived job meaningfulness?

- Is there a significant difference between burnout, work engagement and job meaningfulness with use of digital tools?

1.2 Structure of the Thesis

This thesis is divided into five parts to explore the role of workplace digitalisation on employee burnout, work engagement and job meaningfulness in Finland. Chapter 1 includes the introduction of the thesis and explains the structure. Chapter 2 consists of the theoretical background, including a review of the existing literature on digitalisation, employee well-being, engagement, and job meaningfulness, which sets the conceptual framework of the research. It also includes the research hypothesis. Chapter 3 describes the methodology and analysis, which includes the research design, method of data collection, the sample size, and the statistical approach used to investigate the relationship between workplace digitalisation and components of employee wellbeing. Chapter 4 comprises the findings of the analysis and trends in the data. Lastly, Chapter 5 provides a discussion, which interprets the results within the framework of the research hypotheses, and describes the implications regarding theory and practice. Chapter 5 also provides the conclusions, limitations, and further implications of the study along with future research directions.

Chapter 2

2.1 Theoretical Background

In the current period of digitalisation, the digital transformation within the workplace is becoming a trend and organisations are supposed to transform their contemporary workplaces into digital workplaces (Singh & Hess, 2020). The same can be observed in the traditional industries, in which digitalisation is viewed as an ongoing, automation-driven practice. Various manufacturing initiatives—including Industry 4.0 technologies, industrial robotics, and cyber-physical systems—are being implemented, which are influenced by factors such as the national context, union involvement, and firm size. A recent study revealed that large Norwegian enterprises showed high-end automation, whereas in the United Kingdom, small- and medium-sized enterprises were experiencing more gradual changes (Lloyd & Payne, 2023).

For this study digital tools can be defined as software programs, applications, platforms, or any online or offline resources that can be used with mobile devices and become increasingly embedded in daily work routines (Oikonomou & Patsala, 2021), Moreover these tools also facilitates educational and professional activites (Selwyn, 2016). Research on the effects of digital tools on employees is growing. Particularly in the past five years, scholarly attention has grown around how digitalisation influences employee outcomes, behaviours, and overall psychological well-being. Research on the impact of the digital transformation on employee well-being has found that the impact depends on the type of job and life stage of the employees. Additionally, employees who are working in highly digitalised industries such as consultation have been found to be less affected compared to employees such as craftsmen who work in less digitalised industries. Moreover, some middle aged employees with children may face challenges with health, and autonomy, and may lack certain competencies compared to younger employees (Helms et al., 2024).

The dual nature of digitalisation’s impact has been reported. On the one hand, research suggest that increase digital usage is linked with autonomy and flexibility at work which can lead towards job satisfaction (Lechevalier & Mofakhami, 2025). On the contrary,

employees who believed that automation threatened their jobs experienced job insecurity and high turnover (Brougham & Haar, 2020).

Digitalization in workplace has affected well-being of employees in various ways. It improves work efficiency and provides flexible working conditions, but it also brings psychological strain. For instance, digitalisation gives opportunities for employees to work flexibly and become more productive at work. Nevertheless, it also brings the risk of digital fatigue, techno stress, and blurred work-life boundaries (Tarafdar et al., 2015). Moreover, a study conducted by Marsh et al. (2024) explored the digital workplace and the demands associated with it. Results of the study revealed that information overload and fear of missing out lead to greater exhaustion and stress among employees. It was also highlighted that the fear of missing out (FOMO) is a specific risk factor for the mental health of employees, indicating a significant need and demand for support in managing the demands of digital work.

The transition towards digitalization has reduced physical work demand, which may have positive effects on employee well-being. research done by Batra & Halder (2024) suggests that broadly digitalisation has a positive effect on physical well-being, but it is negatively associated with psychological well-being, as it leads to techno stress, as observed in young construction professionals. However, a study by Sun et al., (2022) examined how digitalisation of the workplace affects the mental health of employees and demonstrated that well-being at work mediates the interdependence of these two factors i.e. Digitalization of Workplace (IT infrastructure, IT business pervasiveness, IT attitude) and Employees mental health. They established that a robust IT infrastructure, IT business pervasiveness and an active IT attitude had a positive impact on mental health by boosting the sense of well-being in employees. This analysis indicates that digital tools can be used to enhance the mental health outcomes, provided that the tools are structured to promote the well-being of employees.

A scoping review was conducted by Supriyadi et al. (2025) on the impact of digital fatigue on employees' well-being. Their research highlighted that continuous use of digital tools leads to mental exhaustion, decreased job performance, and increased stress. Hybrid communication strategies, digital wellness programs, and updated organisational policies

were suggested to support employee well-being. In addition, Mohammadnejad et al. (2023) carried out a scoping review in which they investigated the impact of technology use on the workload of registered nurses. It was found that technology can be instrumental in helping nurses in rural settings, although not all types of technology are equally effective. Certain evidence shows that technologies had a positive influence on the workload of the nurses, however this was not universal. The technological solutions should be viewed in the contextual sense and care should be kept in mind when choosing which ones to use in nursing work. For instance, a narrative review conducted on clinicians also reveals that electronic health records present a lot of information in confusing ways, which, instead of reducing time, makes the task harder, which leads to an increased cognitive workload and stress (Asgari et al., 2024).

Although technology improves task efficiency, it also increases the cognitive demands on workers. Beer and Mulder (2020) found that when people use automated systems for their work, it is more mentally demanding and complex than manual tasks. They conclude that it is essential for employees to understand the usage of digital tools to manage their work tasks effectively. They suggest that training programs should equip participants with knowledge about technology, self- and time management skills, openness towards change and technology, and the ability to adapt to diverse work contexts. Additionally, research conducted on Chinese public sector employees reveals that although digitalisation empowers employees to design their work, it also increases workplace anxiety. Employees with a promotional orientation are more likely to progress, whereas those who avoid digitalisation face anxiety and withdrawal (Huang & Li, 2025). This study illustrates that an individual's perception of digitalisation determines whether digitalisation is empowering or overwhelming.

Considering these complex findings, the present study is based on Job Demands–Resources (JD-R) Theory (Demerouti et al., 2001; Bakker & Demerouti, 2017) and Techno stress Theory (Tarafdar et al., 2015), which focuses on the way technology creates stressors such as technology overload, insecurity, invasion, uncertainty, and complexity. Altogether, these theories provide a framework for understanding the impact of digital tools on employee well-being. According to JD-R Theory (Bakker & Demerouti, 2017), every job is categorized by demands and resources, and the balance between them will determine

employee outcomes such as burnout, engagement, and job meaningfulness. In the context of workplace digitalisation, digital tools can become both job demands and job resources. On the one hand, they create demands in the form of information overload, constant connectivity, cognitive complexity, and blurred work-life boundaries. When these demands exceed the coping level of employees, employees feel emotional exhaustion, reduce engagement, and consider their job less meaningful. Conversely, digital tools can serve as resources by providing flexibility, autonomy, skill development opportunities, and enhancing collaboration, which forms a sense of meaningfulness.

Complementing this, the present study seeks to determine the frequency of use of digital tools associated with employee burnout, the relationship between digital tool usage and work-engagement, and the influence of digital tool usage on perceived job meaningfulness.

2.2 Digitalisation and Burnout

In recent years, rapid digitalisation has reshaped the nature of work, which has increased the scholarly interest to explore its effects on the psychological well-being of employees, particularly burnout. Burnout is described as a psychological syndrome that develops in response to ongoing stressors at work. It is defined by emotional exhaustion, depersonalization, and reduced personal accomplishment (Maslach & Leiter, 2000). Considering the importance of burnout in the workplace, it is crucial to understand the relationship of burnout to modern workplace dynamics.

Digitalisation enhances the flexibility and efficiency in the workplace, but it also leads to emotional and cognitive strain. Meyer and Tisch (2024), in a representative survey, reported similar findings, which indicates that the more frequently employees experience techno-induced interruptions (as an indicator for techno-unreliability), the stronger they experience their burnout symptoms. Similarly, research based on the Job Demand Resource Model illustrates that digital demands, including constant connectivity and system complexity, which exceeds employee capacity may lead to overload and burnout, especially in younger employees (Zhang et al., 2025).

Training and organisational support such as managerial guidance and training was found to buffer these effects (Zhang et al., 2025). Borle et al. (2021), in a systematic review

examined the techno stress association with mental health and work outcomes. The findings of the study demonstrated that technostress had a positive relationship with exhaustion and burnout symptoms. Similarly, Pinto et al. (2024) conducted a systematic review on the relationship between new technologies and burnout. The majority of the studies (66%) included in their review were carried out in the last four years. The results of the study demonstrate that lack of information, insufficient training for workers, and insecurity in using advanced technologies contributed to an increase in burnout syndrome among employees.

Digital burnout has also been observed in healthcare settings. Research conducted on Finnish physicians revealed that frequent teleconsultations and digital work significantly increased stress, especially for less experienced physicians (Virtanen et al., 2023). Similarly, Bahr et al. (2023) found that physicians who use digital technology after office hours experienced increased levels of burnout. Another study of healthcare workers by Tawfik et al. (2021) found that one of the factors associated with emotional exhaustion is experienced frustration with technology. They suggest that reducing frustration with healthcare technology could be an efficient approach to minimize burnout levels among healthcare workers. In contrast, some healthcare professions benefit from digital tools; for instance, dentists who are using digital technology reported reduced burnout due to improved diagnostic capabilities and workflow efficiency (Dawa et al., 2025). These mixed findings suggest that the way we utilize digital tools in work settings determines whether they reduce or increase burnout.

Remote and telework environments appear especially vulnerable to digital burnout. Fernandez et al. (2023) observed that technostress among teleworkers contributes to an increased level of anxiety and low job satisfaction. Similar evidence was also found in a multi-country survey (Consiglio et al., 2023) that demonstrated technostress leads to burnout, while domain specific self-efficacy buffered this relationship. Employees with higher self-efficacy suffer less from burnout because they have the confidence in their abilities which weaken the impact of technostress. These results demonstrate that digital tools have a context-specific effect, which differs depending on the occupation, work structure, and level of experience.

In general, the integration of digital tools into daily work is intended to enhance productivity and connectivity. It also creates greater job demands, information overload, and frequent digital interruptions. These are well-established predictors of techno stress, which is contributing to burnout (Tarafdar et al., 2015; Wang et al., 2021). These results are consistent with the JD-R Theory, which states that burnout arises when the job demands exceed the available resources. In digital work environments, this means to be constantly available, information overload, and a lack of recovery time. Without adequate organisational support, employees' psychological resources are depleted, leading to burnout (Bakker et al., 2004; Zhang et al., 2025).

To sum up, digital tools provide clear advantages, but they also increase risks to employee mental health if not properly managed. Research shows a positive association between the use of digital tools and burnout, particularly when the use is excessive, unsupported, or after regular work hours. On the basis of above literature, it is hypothesised that:

The use of digital tools is positively associated with employee burnout ***(Hypothesis 1).***

2.3 Digitalisation and Work Engagement

Employee work engagement is a key driver of organisational success. Work engagement is defined as "a positive, fulfilling, work-related state of mind that is characterised by vigor, dedication, and absorption" (Schaufeli et al., 2002). In recent years, the role of digitalisation in shaping work engagement has received increased attention, as organisations are adopting digital tools to improve efficiency, collaboration, and communication. However, its impact largely depends on the context, employee perceptions, and implementation, and is not uniform.

Research shows that the way employees perceive digitalisation plays a vital role in determining its impact on engagement. Research on Chinese public sector organisations revealed that employees who viewed digitalisation as an opportunity to grow experienced greater engagement, whereas those who perceived it as a threat showed lower engagement. This relationship was moderated by digital literacy, emphasising the importance of individual capabilities in managing digital transitions (Zhan & Xie, 2025). Similarly, the impact of digital tools on work engagement is increased when supported by a positive

organisational environment. For instance, a study on digital innovation in human resource management found a weak relationship between digitalisation and engagement which suggests that other factors like organizational support and managerial factors might influence the way digital tools impact engagement (Stachova et al., 2024). Expanding on these findings, Hooi and Chan (2023) in their research suggest that workplace digitalization is positively related to work engagement and innovative culture also has a positive effect on employee's engagement. Their study highlights that innovative culture is a critical enabler of engagement in the digital workplace.

Even during periods of workplace disruption, digital tools can help to sustain engagement. For instance, Makiniemi (2022) carried out the first qualitative study on techno work engagement among educators in Finland. The results of the study revealed that participants reported that they experience techno work-engagement when working collaboratively and in a positive work environment. Educational technologies also facilitated work, which increase engagement through progress and novelty. Another study by Nuutinen & Bordi (2025) on Finnish school teachers during the COVID-19 pandemic found that techno strain was negatively related to work engagement and positively associated with burnout. However, school support buffered the negative impact of techno strain on emotional exhaustion, thereby increasing work engagement. These studies highlight that institutional support is essential in maintaining engagement even during times of disruption.

Digital tools can improve flexibility, creativity, and communication within teams, their effects are not entirely positive. Stofberg et al. (2021) argued that the success of digital technologies in enhancing engagement depends on how digital tools are implemented and perceived by employees as an enabler or disabler. Salanova et al. (2005) found that work engagement and organisational resources, when combined with a positive service climate, enhance employee performance and customer loyalty. However, Ragu-Nathan et al. (2008) introduced the concept of technostress, found that ineffective technology adoption reduces job satisfaction and organisational commitment. Whereas organisational support reduced these effects and increased job satisfaction and employee commitment.

Leadership style, particularly in digital contexts, is another key determinant of engagement. A recent study by Boccoli et al. (2024) found that during the COVID-19 pandemic transformational leadership enhanced employee work engagement in remote

work settings. The effectiveness of such leadership was moderated by the leaders' digital fluency, suggesting that strong digital communication skills are important for maintaining engagement in virtual work environments. In addition to leadership, digital communication platforms such as social media have also been linked to higher work engagement. A Finnish study conducted by Oksa et al. (2021) found that professional social media use was positively associated to work engagement, task resources, and social support, both before and during the COVID-19 pandemic. However, the challenges related to digitalisation remains prominent, particularly in healthcare settings. Research conducted in Germany on physicians working in urology department found that techno stress was positively associated with burnout and negatively linked to work engagement and job satisfaction among urologists (Bail et al., 2023). This highlights that effect of digitalisation on engagement is contextual and depends on sector, profession, and the degree of technological support.

In conclusion, digital tools have the potential to enhance work engagement by facilitating better communication, collaboration, and flexibility. However, the outcome is dependent on contextual factors such as organisational support, leadership style, digital fluency, and individual perceptions. When digital tools are integrated properly and supported by a positive work environment and leadership framework, they can enhance employee engagement. On the other side, poor integration or lack of support may lead to disengagement and techno stress. Based on these insights, it was hypothesized that:

The use of digital tools is positively associated with employee work engagement ***(Hypothesis 2)***.

2.4 Digitalisation and Job Meaningfulness

Work meaningfulness is defined as the degree to which individuals perceive their work to be significant and have positive personal meaning (Rosso et al., 2010). In the context of increasing digitalisation, job meaningfulness is a key psychological mechanism in maintaining motivation and engagement in the workplace.

Recent research has increasingly focused on the role of job meaningfulness as a critical psychological factor influencing employee behaviour and adaptability in the workplace. A study by Hamid (2022) explored the technology readiness of employees related to adaptive

performance. Findings suggest that employees are more likely to respond positively to digital changes when they perceive their work as meaningful**.** Moreover, job perceptions and individual traits affect the ability of workers to adopt the digital transformation, as employees with a proactive personality were better able to translate technology readiness. The findings highlight the importance of meaningful work, which help employees to adapt effectively in the growing digital job structure.

Numerous studies have proved a complex relationship between digital tool usage and job meaningfulness. Research has explored how technology characteristics facilitate the meaningfulness of work via job crafting. Results suggest that characteristics of technology, such as technology customisation and reconfigurability, assist employees to craft their jobs, which in turn contributes to their sense of work meaningfulness (Xu et al., 2023). This suggests that job crafting (a process whereby employees actively shape the boundaries of their jobs) can be supported by digital tools, which can lead to increased job meaningfulness. Another research was done to explore the impact of the increased use of collaborative and communication digital tools during the COVID-19 pandemic on teleworkers' well-being and productivity (Martin et al., 2022). The findings of the study revealed that daily or weekly use of digital tools enhance job productivity, but it may decrease job satisfaction. On the contrary, employees who were using digital tools daily before the pandemic were able to manage remote work effectively, but still experience stress.

Based on these insights, recent research has highlighted both positive and negative relationship between digitalisation and job meaningfulness. For instance, Wulff & Finnestrand (2024) emphasise that explainability in artificial intelligence (AI) systems maintains meaningful work by preserving employee agency and fostering an understanding of decision-making processes. When AI decisions are opaque, workers feel less sense of control and a lower sense of contribution, which undermines meaningful work. From a different perspective, Aleksic et al., (2024) illustrate that techno stress, especially techno-invasion- blurring work- life boundaries due to constant digital connectivity (Tarafdar et al., 2007) reduces the perceived meaningfulness of work by enhancing frustration and psychological strain. The study also shows that corporate-social-responsibility practices

can buffer this relationship, which suggests even in highly digital contexts social impact initiatives and organisational values help employees maintain meaning.

According to the research conducted by Kinowska and Sienkiewicz (2023), in the context of algorithmic management, where digital mechanisms control the allocation of tasks, their monitoring, and assessment, the perception of autonomy and fairness can be negatively felt by employees, thereby reducing their well-being at work. Since autonomy is one of the fundamental aspects of job meaning, the loss of control due to algorithmic supervision can also strip workers of meaning and purpose in the workplace, unravelling the meaning of work and disempowering staff. These results highlight the fact that the effect of digitalisation on meaningfulness depends on the state of the technological infrastructure, as well as the degree to which control is maintained within the digital systems. Similarly, Sadeghian et al., (2024) found that the meaningfulness of interaction between employees and AI systems that enable human accountability and interaction (interactive models) was higher than in the context where AI operated in a supervisory role or autonomously. The research also stresses that meaningfulness in the digitally transformed work environment is enhanced when technology serves not as a replacement, but a supplement to human talents, which strengthens the feeling of contribution and responsibility among employees.

The way digital tools are integrated in the workplace and how employees interact with them contribute to the job's meaningfulness. A qualitative study by Coetzee et al. (2023) explored the views of African undergraduate students to understand the way individuals' personal beliefs and cultural perspectives shape their views of meaningful work in the digital age. The findings revealed that when students have a sense of autonomy, support of others, self-communion, and others communion, then virtual workplaces can bring job meaningfulness. The study emphasised that the way workers interact with digital technologies in a human-oriented, value-creating process impacts meaningful work. Furthermore, Ghosh and Sadeghian (2024) investigated how artificial intelligence impacts workers' perceptions of job decency and meaningfulness. The study found that employees considered human to remain central, even with advanced AI, and AI tools can be used to augment rather than replace human skills. Participants of the study also believed that introducing AI may increase job satisfaction.

Digital work connectivity can lead to less self-control, and this depletion arises from the continuous effort to manage digital communications and work-related tasks, which in turn leads to disengagement from the work, thereby resulting in withdrawal and absenteeism, reduced effort, and a decline in performance (Chadee et al., 2021). Similarly, another study was conducted to explore the consequences of techno stress for end users in an organisation, which reveals that techno stress negatively affects job satisfaction, which leads to a decline in organisational commitment (Ragu-Nathan et al., 2008). Based on these findings, it was hypothesised that:

The collaborative use of digital tools is positively associated with job meaningfulness **(*Hypothesis 3*).**

Chapter 3

3.1 Methodology

The current study adopted a cross-sectional research design to explore the relationship between the use of digital tools, burnout, work engagement, and job meaningfulness in Finland. A cross-sectional study examines multiple variables at a single point in time, making it well-suited to study distinct characteristics within a population (Wang & Cheng, 2020). This design relates to the study objectives to understand workplace digitalisation and its relation to psychological and motivational outcomes in Finnish employees.

The data used in this study were obtained from the Finnish Working Life Barometer (2023)[1] (FSD3914), which has been archived and made accessible by the Finnish Social Science Data Archive. This dataset is publicly available and was collected by the Finnish Ministry of Economic Affairs and Employment. It provides annual survey data on employee well-being, working life trends, and labour market conditions in Finland. The sample of the current study consists of 1261 Finnish working employees with an age range of 18-64 years and working at least 10 hours per week.

3.1.1 Variables and Measures

The study included one independent variable and three dependent variables. The use of digital tools was an independent variable and burnout, work engagement and job meaningfulness are dependent variables. Control variables included: age (categorical variable) divided into five categories, gender (categorical variable) divided into two categories, and remote work with two categories.

The key variables were measured using the following items.

Under the use of digital tools the following four items were used from the dataset:

●K65_1: How large a part of your working time do you use digital applications or information technology devices in general? (6 - point scale)

[1] See the data and documentation here: https://services.fsd.tuni.fi/catalogue/FSD3914?study_language=en&lang=en

●K65_2: How often do you use tools based on artificial intelligence for your work, such as chatbots, virtual assistants, speech recognition, machine vision, machine translation or other applications based on machine learning? (5- point scale)
●K48: Do you use electronic workspaces or instant messaging tools in your work to discuss, share information and cooperate virtually? Categorical variables (Yes/No)and
●K47: Do you use social media in your work? Categorical variables (Yes/No).

These items collectively represent digital usage including AI usage, virtual collaboration and social media usage.

The second variable was burnout, BAT-4 (Schaufeli et al., 2020) (5 options each > and their internal consistency was measured with a Cronbach's alpha test). It included the following items:

●K56a: How often do you feel mentally exhausted in your work?
●K56b: How often do you feel that you are not interested in or enthusiastic about your work?
●K56c: How often do you feel, when working that you cannot concentrate well?
●K56d: How often do you feel that you cannot control your feelings in your work?

The third variable was work engagement using the UWES-3 scale (Schaufeli et al., 2017) (5 options each > sum variable and internal consistency was measured with the alpha test). It includes the following three items:

●K57a: How often do you feel full of energy when you work?
●K57b: How often are you enthusiastic about your work?
● K57c: How often are you completely immersed in your work?

The fourth variable was job meaningfulness (K69) which is a single item measure and described as:

●K69: How meaningful do you feel your work is? 4 options.

3.1.2 Scale Reliability Assessment and Multicollinearity Check

The scores for all three variables were calculated by summing the values of their respective items. To check the internal consistency of each score, the Cronbach's alpha was

calculated. The results indicated that the Cronbach's alpha for digital usage was $\alpha = 0.39$, which indicates low reliability, reflecting that the items present in digital tools measure different dimensions. However, for burnout, the alpha reliability was $\alpha = 0.69$, which indicates acceptable reliability, and for work engagement, the Cronbach's alpha was $\alpha = 0.70$, which indicates that the scale is reliable. Multicollinearity was assessed between the items of burnout and work engagement using a correlation matrix. The correlation between the items was well below 0.80, which shows that no multicollinearity exists between the items.

3.2 Structural Equation Modelling

Structural equation modelling was used to examine the relationship between multiple independent and dependent variables while accounting for measurement error in latent constructs. This is applicable to the present study since the most important constructs, including burnout, the level of work engagement, and the use of digital tools are not observed directly but are measured with the help of several survey items by using the lavaan (Rosseel, 2012) open source R package.

The purpose of the application of SEM in the current study is to examine the complex relationship between multiple variables and to determine the direct and indirect effects of digital usage, burnout, and work engagement. SEM offers a stronger and more precise approximation of these relationships than conventional regression models.

All multi-item constructs were modelled as latent variables, while job meaningfulness, measured with a single item, was treated as an observed variable. The marker method was used to set the scale for each latent construct, in which one indicator factor loading per latent variable was fixed to 1. This allows the remaining loading to be freely estimated.

3.3 Data Analysis

All the statistical analyses were conducted in R version 4.5. The data was imported and analysed using basic R functions. Analyses were carried out in three stages including a univariate analysis, bivariate analysis and multivariate analysis. In the univariate analysis the frequency, mean, median, mode and standard deviation were calculated.

In the second step, a bivariate analysis was conducted to explore the relationship between two variables at a single point. This included cross-tabulations for categorical variables, Pearson-correlation for continuous variables and mean comparisons across different groups.

In the third step, a multivariate analysis was conducted to evaluate the predictive power of digital tool use on burnout, work engagement and job meaningfulness via a series of multiple linear regression models with respect to age, gender and remote work.

3.4 Ethical Considerations

This study used secondary data from a publicly available archive. There was no human involvement in the collection of data. The data set was already ethically approved and anonymised by the data providers. It was cited appropriately as per FSD's policy.

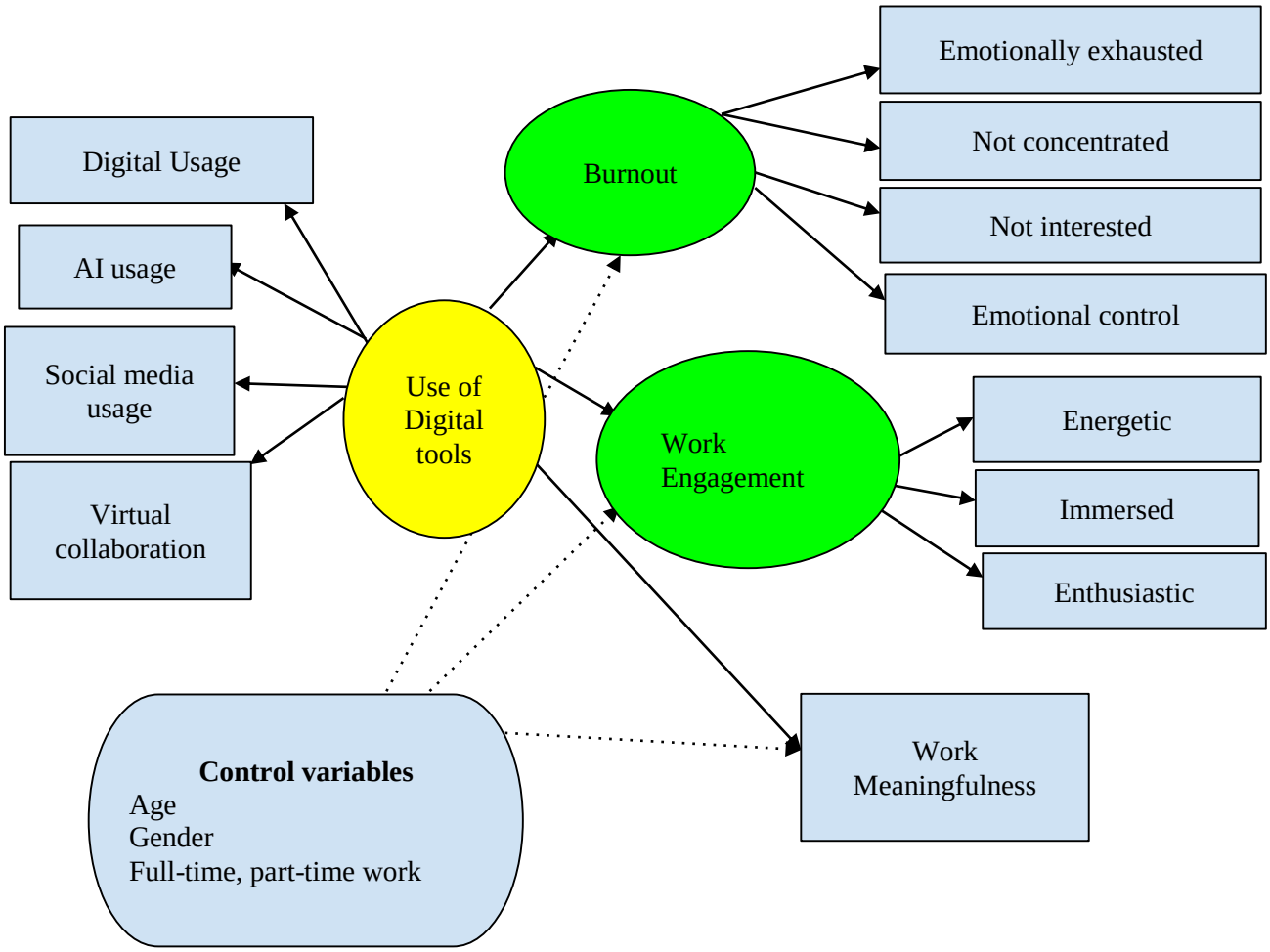

Fig.1: The relationship between the explanatory and outcome variables.

Chapter 4

4.1 Results

This chapter presents the findings of the current research. The results are analysed based on our research question by using R Studio (version 4.5).

4.1.1 Descriptive Statistics

To summarise and describe the data in a meaningful way, descriptive statistics were used. Table 1 below shows the percentage, mean, and standard deviation of the demographic and study variables.

Table 1: The table shows the frequency, percentage, mean, and standard deviation of the participants along with the Cronbach's alpha for the reliability of the main variables.

Variables	**N**	**%**	**Mean**	**SD**	**Min**	**Max**	**Alpha**
Gender							
Male	642,00	51,00					
Female	619,00	49,00					
Age							
18-24	42,00	3,30					
25-34	258,00	20,00					
35-44	375,00	30,00					
45-54	292,00	23,00					
55+	294,00	23,00					
Remote work							
Full time work	113,00	90,00					
Part time work	125,00	9,90					
Total Use of Digital tools			2,06	0,87	0,00	4,00	0,39
Digital Usage			5,28	1,09	1,00	6,00	
AI Usage			1,88	1,16	1,00	5,00	
Virtual Collaboration			0,85	0,36	0,00	1,00	
Social media usage			0,24	0,43	0,00	1,00	
Total Burnout			2,33	0,53	1,00	4,25	0,69
Mentally Exhausted			2,59	0,80	1,00	5,00	
Not Interested			2,48	0,82	1,00	5,00	
Not Concentrated			2,62	0,79	1,00	5,00	
Emotional Control			1,61	0,48	1,00	5,00	
Total Work Engagement			4,33	0,55	1,60	4,67	0,70
Energetic			3,39	0,69	1,00	5,00	
Enthusiastic			3,51	0,63	1,00	5,00	

Immersed	3,38	0,73	1,00	5,00
Job meaningfulness	3,23	0,65	1,00	4,00

Table 1 shows that the gender distribution in the sample was almost equal. With respect to age, the largest number of respondents fell within 35-44 years of age (30%), and the smallest number of respondents were within 18-24 years (3.3%). The age group 45-54 and above 55 years of age were almost equal (i.e., 23%). However, the age group of 25-34 constituted 20% of the sample. These results show that the participants included in this sample were mostly mid-career or late-career employees. It can also be seen that most of the participants were working full-time (90%) and only 9.9% were working part-time.

Overall, the participants' use of digital tools was moderate (M=2.06, SD=0.50), but the internal consistency of this measure was low (α=.39), which implies that the scale reliability might be limited. The employees' use of digital technologies during working time was reported at relatively high levels (M=5.28, SD=1.09), while the use of tools based on artificial intelligence was moderate to low (M=1.88, SD=1.66). Virtual collaboration and social media usage were standardised between 0 and 1 to construct the score. Cooperating virtually and discussing information (M=0.85, SD =1.16), and use of social media (M=0.24, SD=0.43) at work were also reported to be low.

The level of burnout within the respondents was moderate (M = 2.33, SD = 0.53), and the reliability was acceptable (α = .69). Subscale scores indicated that the respondents were moderately mentally exhausted (M = 2.59, SD = 0.80), uninterested (M = 2.48, SD = 0.82), and they had problems with concentration (M = 2.62, SD = 0.79). The level of emotional control was a little more robust although the mean score (M = 1.61, SD = 0.48) for emotional control was less significant.

Total work engagement was high (M = 4.33, SD = 0.55) for the employees and was reported with good reliability (alpha = .70). Subscale scores indicated that enthusiasm (M = 3.51, SD = 0.63), energy (M = 3.39, SD = 0.69), and immersion (M = 3.38, SD = 0.73) were also high among the employees. Correspondingly, the participants considering their work to be meaningful was also high (M = 3.23, SD = 0.65), which might be a factor for their engagement with their work.

Overall, the findings indicate that the participants included in the sample were mostly mid-career workers with an equal level of gender representation. It also showed the intensive use of digital technologies and high-level work engagement among participants. Despite moderate burnout levels among the participants, they still considered their work to be meaningful, which might be a factor contributing to their motivation.

Research Questions:

- How is the frequency of use of digital tools associated with employee burn out?
- What is the relationship between the use of digital tools and employee engagement?
- What is the contribution of digital tools to perceived job meaningfulness?

4.2 Bivariate Statistics

To examine the relationship and mean difference between use of digital tools, burnout, work engagement and job meaningfulness among employees in Finland a correlation and t-test were conducted.

4.2.1 Correlation

To determine the relationship between the overall use of digital tools with total burnout, total work engagement and job meaningfulness, a Pearson product correlation was carried out. The Pearson's product-moment correlation test results indicated that there was a statistically non-significant relationship between use of digital tools and total burnout (p-value = 0.079) and the correlation coefficient (r = 0.049) suggests that the observed relationship was weak and very small. The 95% confidence interval for the correlation ranged from -0.005 to 0.104.

For work engagement, the Pearson's product correlation indicated a statistically significant positive correlation between the use of digital tools and total work engagement (p-value = 0.000). The correlation coefficient (r = 0. 130) suggested that higher levels of the use of digital tools was associated with higher work engagement, but the strength of the relationship was weak. The 95% confidence interval for the correlation ranged from 0.0761 to -0.184, reinforcing the strength and direction of this relationship.

Conversely, for job meaningfulness, the Pearson's product correlation indicates that there was a statistically non-significant relationship between the total use of digital tools and job

meaningfulness (p-value = 0.257). The correlation coefficient (r= 0.031) also shows that there was almost no relationship between the total use of digital tools and job meaningfulness. The 95% confidence interval for the correlation ranged from -0.023 to 0.086.

To determine the relationship between the subscales for the use of digital tools with burnout a Pearson product correlation was calculated. The relationship coefficient between the variables of digital usage and burnout in the bivariate correlation model was positive and statistically significant (r = 0.072, p = 0.010), meaning that increased digital usage was weakly correlated with increased levels of burnout. The relationship between digital usage and burnout was positively significant, but of a small magnitude. The 95% confidence interval ranged from 0.017 to 0.127, which suggests that employees who use digital tools tend to have slightly higher burnout level, but it is not a significant contributor to the variation in the burnout scores. On the other hand, the relationship between AI usage and burnout was very small and positive (r = 0.020), but statistically it was non-significant (p =0.474), which suggests that use of AI tools during work was not related to burnout levels among employees.

The relationship between digital usage and work engagement was statistically non-significant (r = 0.22, p = 0.82). The 95% confidence interval ranged from -0.04 to 0.06, shows no reliable evidence of an association. These findings reveal that the use of digital tools is not related to the work engagement of employees. However, the relationship between AI usage and work engagement, showed a significant positive correlation (r= 0.069, p = 0.015) between AI usage and work engagement, but magnitude was small. The results suggest that employees who use more AI tools in their work tend to have slightly higher work engagement despite the weakness of the relationship.

To determine the relationship between digital usage and work meaningfulness, a Pearson's product correlation was conducted. The results showed a statistically significant negative correlation (r = –0.080, p = .004) between digital usage and work meaningfulness, but the strength of the relationship was relatively weak. These findings indicate that employees who use digital tools frequently during work find their work is not very meaningful for them, but the statistical effect was minimal. On the other hand, the relationship between AI usage and work meaningfulness revealed a small positive correlation between AI usage

and perceived work meaningfulness, which was not statistically significant ((r = 0.034, p = 0.234), which suggests that AI usage and perceived work meaningfulness are not related to each other.

T-test

To determine the mean difference between categorical variables of use of digital tools subscale a t- test was conducted. The mean difference between burnout levels and work engagement was analysed based on social media usage and virtual collaboration.

Comparison between Burnout, Work engagement and Job Meaningfulness with Social Media Users

Is there a significant difference between burnout levels and social media users?

To determine the mean difference between burnout levels based on social media usage a Welch two sample t-test was conducted. The results showed a non-significant difference (t= 0.367, p = 0.713) in burnout scores between employees who used social media with mean of 2.33 and those who do not use social media with a mean of 0.24. The 95% confidence interval ranged between -0.052 and 0.076. These findings suggest that employees who used social media during work had experienced substantially higher levels of burnout compared to those employees who do not use social media at work, but the difference is not significant.

Is there a significant difference between work engagement and social media users?

A Welch two sample t- test was conducted to analyse the mean difference between work engagement and social media users. The findings reveal that there was a statistically significant difference between social media users and work engagement t (582.58) = -5.716, p =.001. In particular, employees who used social media had a higher mean engagement score (M =3.57) than those who do not use social media (M = 3.38). These findings suggest that social media usage is positively associated with higher engagement levels, which supports the arguments that employees who do not use social media tend to exhibit low work engagement, while those who use social media show greater engagement.

Is there a significant difference between job meaningfulness and social media users?

The Welch two sample t-test results indicate a statistically significant difference in job meaningfulness between social media users and non-social media users (p-value = 0.0005). The test statistic (t = -3.454) and degrees of freedom (562.45) suggest that the mean job meaningfulness was not equal between the two groups. Specifically, the mean for social media users was higher (M=3.33) compared to employees who do not use social media (M=3.19). The 95% confidence interval for the difference in the mean ranged from -0.217 to - 0.059, further indicating that employees who used social media in their work tended to experience significantly higher work meaningfulness.

Comparison between Burnout, Work engagement and Job Meaningfulness with Virtual Collaboration

Is there a significant difference between burnout and virtual collaboration?

The Welch two sample t-test results show a statistically non-significant difference between burnout levels and virtual collaboration (p-value = 0.127). The test statistic (t = -1.528) and degrees of freedom (269.09) suggest that there is no reliable difference between these two variables. Although the mean burnout score is slightly higher for employees who engage in virtual collaboration (M =2.33) compared to those who do not collaborate virtually (M= 2.27). The 95% confidence interval for the difference in means ranged from -0.144 to 0.018. These findings suggest that virtual collaboration alone may not be a predictor of burnout.

Is there a significant difference between work engagement and virtual collaboration?

The Welch two sample t-test results indicate a statistically significant difference in work engagement between employees who collaborated virtually and those who did not collaborate virtually (p-value = 0.004). The test statistic (t = -2.84) and degrees of freedom (268.23) suggest that the mean work engagement was not equal between the two groups. Specifically, employees who collaborated virtually during work have slightly higher work engagement (M =3.44) compared to those who did not collaborate virtually at work (M= 3.32). The 95% confidence interval for the difference in means ranged from -0.204 to -

0.037, further indicating that employees who collaborated virtually at work felt more engagement with work than those who did not.

Is there a significant difference between job meaningfulness and virtual collaboration?

A Welch two sample t-test was used to analyse the differences in the perception of meaningful work between people who did not engage in virtual collaboration (group 0) and those who did (group 1). There was no statistically significant difference between the two groups in the scores for meaningful work, t (267.69) = -0.76, p = .447. The average score was a little bit lower among non-collaborators (M = 3.20) than collaborators (M = 3.23), but the 95% confidence interval of the mean difference was -0.138 to 0.061, which contains zero, which means that the observed difference may be simply a matter of chance. These results suggest that engagement in virtual collaboration was not significantly related to the sense of meaningful work in this sample. The difference present between groups is so minor that it does not support a significant effect.

4.3 Multivariate Statistics

4.3.1 Structural Equation Modelling

Structural equation modelling (SEM) was used to examine the relationship between the use of digital tools, burnout, work engagement and job meaningfulness. These models allow us to assess the relationships between the multiple independent and dependent variables by incorporating latent constructs as well.

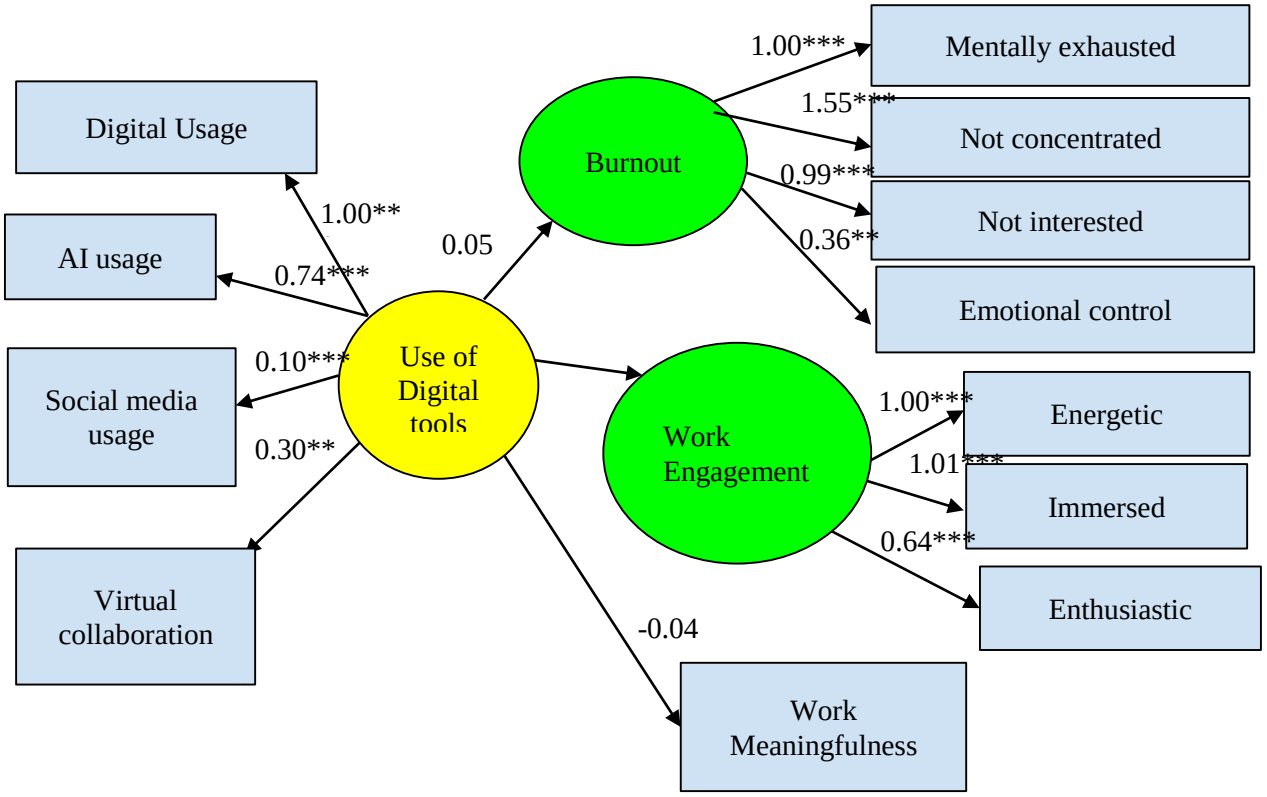

Fig.2: Structural Equation Modeling showing the effect of digital tools on burnout, work engagement and job meaningfulness.

Note: Significance levels are represented as follows '***' $p < .001$, '**' $p < 0.01$.

A structural equation analysis was conducted by using maximum likelihood (ML) with the NLMINB optimisation method, based on 1,261 observations and 47 parameters. The chi square results were significant ($p < .001$), but the model demonstrated mixed fit indices: the RMSEA (0.061) and SRMR (0.048) indicated an acceptable fit. Other statistics were slightly lower than the "good" fit values (CFI = 0.847, TLI = 0.794).

All factor loading for the latent constructs were significant ($p < .001$). The construct "use of digital tools" was composed of digital usage ($\beta = 1.00$, reference from the marker method), AI usage ($\beta = 0.75$), virtual collaboration ($\beta = 0.31$), and social media usage ($\beta = 0.11$) and these were all significant indicators ($p < .001$). For the construct "burnout", mentally exhausted ($\beta = 1.00$), not interested ($\beta = 1.55$), not concentrated ($\beta = 0.99$) and emotional control ($\beta = 0.36$) were significant indicators. The construct "work engagement" was strongly associated with energetic ($\beta = 1.00$), enthusiastic ($\beta = 1.01$) and immersed ($\beta = 0.64$) indicators. The covariance results indicated that work engagement ($\Phi = -0.16$, $p < .001$) and job meaningfulness ($\Phi = -0.11$, $p < .001$) were negatively related to burnout, but job meaningfulness had a positive relationship with work engagement ($\Phi = 0.16$, $p < .001$).

The structural pathway regarding the use of digital tools did not significantly predict burnout ($\beta = 0.052$, $p = 0.09$), nor work engagement ($\beta = 0.057$, $p = 0.11$) or job meaningfulness ($\beta = -0.43$, $p = 0.28$). This means that the use of digital tools did not have a direct effect on the outcome variables. Among the control variables, the employment status (part-time/full-time) positively predicted burnout ($\beta = 0.21$, $p = 0 < .001$) and negatively influenced work engagement ($\beta = -0.224$, $p = 0 < .001$), while it also had a negative effect on job meaningfulness ($\beta = -0.16$, $p = .008$). Gender had a significant effect on work engagement ($\beta = -0.103$, $p = 0 < .01$) and job meaningfulness ($\beta = -0.13$, $p = 0 < .001$). SEM also indicated that older people ($\beta = -0.45$, $p = 0 < .001$) considered their job more meaningful compared to younger ones ($\beta = -0.36$, $p = .001$).

Table 2. Summary of the main findings

Hypothesis	**Rejected/Accepted**	**Explanation**
Use of Digital Tools is positively related to Burnout	Rejected	Non- significant relationship
Use of Digital Tools is positively related to Work engagement	Accepted	Significant positive relationship
Use of Digital tools is positively related to Job Meaningfulness	Rejected	Non- significant relationship

Chapter 5

5. Discussion & Conclusion

This study underscores the critical role of use of digital tools on employee burnout, work engagement and job meaningfulness in Finland. A descriptive analysis shows that most of the employees who took part in the study were either at a middle 30% or late career stage 23% with almost equal gender representation. These findings reflect that Finnish recruiters prefer more experienced workers compared to those who are at an early career stage. Similarly full-time workers 90% were more dominant compared to those who were working part time 9.9% reflecting that the findings of the current study are more suitable for employees with stable work contexts.

Overall the Cronbach's alpha for the reliability of digital tools was low (0.39), however, the reliability of other two constructs for burnout (0.69) and work engagement (0.70) were acceptable. The low reliability of the Cronbach's alpha scores concerning digital tools suggests that the internal consistency is not stable for all the items concerning digital use, so it should be interpreted cautiously. The current study explored the relationship between the use of digital tools and employee burnout, work engagement and job meaningfulness in Finland. Overall the findings revealed mixed associations between the use of digital tools and outcomes of employees' well-being.

5.1 The Use of Digital tools and Burnout

By using the JD-R Theory (Demerouti et al., 2001; Bakker & Demerouti, 2017) and Technostress Theory (Tarafdar et al., 2015) the use of digital tools can be considered both as job demand and job resource.

According to JD-R Theory (Bakker & Demerouti, 2017), the demands of the job such as constant connectivity, workloads and the pressure of meeting deadlines can affect employees both mentally and physically, which leads to burnout if resources such as organisational support and autonomy are not available. Additionally, Techno stress Theory (Tarafdar et al., 2015) states that technological factors such as techno-overload, invasion, and complexity increase the strain when employees lack coping resources or organisational support.

On the basis of these theories and the previous literature, initially it was hypothesised that the use of digital tools would have a positive relationship with burnout, but the findings only partially supported this hypothesis. Overall, the current study revealed that there is a weak and statistically non-significant relationship between the total use of digital tools at the workplace and employee burnout. These findings suggest that in the Finnish context, using digitalised tools at the workplace does not contribute to burnout among employees. One of the reasons for this could be that Finnish organisations are supportive and provide sufficient resources, which assist employees to manage job demands effectively.

This contextual outlook aligned with Finland's developed digital infrastructure, high level of digital literacy and extreme focus on employees' wellbeing. For instance, while exploring the impact of the digital transformation on employees' well-being, Helms et al. (2024) found that the impact of the digital transformation depends on the type of job and life stage of the employees. Moreover, employees working in highly digitalised industries are less affected compared to those employees working in less digitalised industries. Finnish employees may encounter few negative outcomes because of a well-supported and digitally mature environment. Similarly, Sun et al. (2022) indicate that digital tools can be used to enhance mental health outcomes provided that the tools are structured to promote the well-being of employees. In the current study non-significant relationships might indicate that organisational resources and support might mitigate the adverse effects of digitalisation.

Moreover, prior Finnish research has also highlighted the psychological demands related to digital tools. For instance, Virtanen et al. (2023) conducted a study on Finnish physicians. The findings of the study revealed that frequent teleconsultations and the use of electronic documentation significantly increased system-related stress, particularly with less experienced physicians**.** This corresponds with our findings in a significant way. Although our data do not show a direct relationship between burnout and digital usage, it might be possible that there are other underlying factors that mediate this relationship. In a Finnish context, this reflects that there is a balance maintained by the organisations between job demands and job resources due to which in our sample burnout did not increase in employees working in a digital environment, which aligns with JD-R Theory,

which suggests that burnout is caused when the demands of the job exceed the resources. It also shows that technostress is not universal, rather it occurs in a specific context.

5.1.1 Digital Usage and Burnout

The Subscales of digital tools were examined in relation to burnout. Based on the frameworks of JD-R Theory, Technostress Theory and previous literature it was expected that digital usage at the workplace would be strongly related to burnout levels. The findings of the current study supported this assumption and the relationship between digital usage and burnout revealed that digital usage was weakly correlated with increased levels of burnout, but the relationship between them is significant. These results suggest that employees who use digital applications frequently experience higher levels of burnout.

The findings of the present study are consistent with Technostress Theory (Tarafdar et al., 2007), which stresses that constant connectivity and information overload cause psychological strain, especially when technology increases the work tasks. For instance, Marsh et al. (2024) suggest that fear of missing out and information overload are related to stress at the workplace, which are critical predictors of emotional exhaustion. Similarly, research on the side effects of digitalisation (Zhang et al., 2025) has indicated that enterprise digitalisation is positively linked to role overload and burnout among young employees. The results of the previous studies emphasize that the frequency of digital usage does not affect employees' well-being, rather the way digital tools are integrated has a stronger impact.

The findings are consistent with JD-R Theory (Bakker & Demerouti, 2017), which states that when available resources at the workplace are insufficient and job demands are higher than the employees' capacity, burnout arises. In digital work environments, constant availability, information overload, and lack of recovery time increases stress.

Additionally, Meyer and Tisch (2024) found that employees who experienced technology induced interruptions reported higher levels of burnout. Correspondingly, Borle et al. (2021) found that components of technostress such as overload, invasion and techno insecurity are positively related to burnout. Although in the present study the relationship between burnout and digital usage was weak, it supports the general trend that higher

digital usage is linked to higher burnout especially when the digital environment is not stable.

In the Finnish context, the relatively weak strength of the relationship might be due to the supportive environment. Although some technostress is still present, due to strong resources and effective management but it does not lead to severe burnout.

5.1.2 AI Usage and Burnout

Regarding the application of AI, the frameworks of JD-R Theory and Technostress Theory offer complementary expectations. AI tools can serve as resources from a JD-R perspective by increasing productivity and lowering the cognitive load. However, from a technostress perspective, poorly executed AI systems may cause additional stress due to their complexity or lack of security.

In the current study, the relationship between AI usage and burnout was statistically non-significant, and the strength of the relationship was also weak. These findings suggest that AI usage at the workplace does not have a negative impact on employee's psychological well-being, especially the burnout levels. In the Finnish context, it might be the case that Finland has launched proper training sessions for the employees to adapt to AI technologies, due to which instead of creating stress AI tools reduce cognitive overload, which might reduce the stress and burnout levels.

Finding from Dawa et al. (2025) indicate that healthcare workers who use digital technologies, especially AI driven diagnostic tools, experience less burnout due to better work life efficiency. Linking with the JD-R Theory (Bakker & Demerouti, 2017), AI usage is considered a job resource rather than a demand, which offers employees greater efficiency. Therefore, AI usage may act as a resource that supports employees at work rather than creating stress or burnout symptoms. In the current study, it is suggested that if technology is integrated effectively it will enhance wellbeing rather than affecting it negatively.

5.1.3 Social Media usage and Burnout

According to JD-R Theory and Technostress Theory, social media can have both positive and negative effects. It can serve as a resource by enhancing social communication and connections or as a demand by creating distractions and information overload.

A t- test was conducted to determine the mean difference between social media usage and burnout. The findings revealed that there was no significant difference between employees who used social media at work and those who did not use social media at work regarding burnout. The results of the study suggests that in Finland social media usage at the workplace is either very limited or managed effectively in a way that prevents it from creating technostress.

This is in line with the previous studies which suggests that digital platforms have mixed impacts based on their purpose and context. In the first case, social media at the workplace will positively affect communication and the sense of belonging, whereas in the second case, it will cause distraction and information overload, which can lead to technostress (Tarafdar et al., 2015). The non-significant outcome of this study may signify Finnish workplace norms, where employees tend to manage their social media activity more effectively, or that the use of social networks is not high within the professional environment to induce burnout. It may also indicate organisational rules that dictate appropriate trends of digital interaction. According to Helms et al. (2024), the effects of digitalisation vary depending on the field and the stage of life, which implies that the effects of using social media may vary with the generational or professional-related factors. In Finland, employees are mostly digitally literate, and they are able to manage digital boundaries, which reduces the risk of burnout.

5.1.4 Virtual Collaboration and Burnout

Further, the results reveal that there was no significant difference between the employees who collaborated virtually or those who collaborated in-person regarding burnout levels, although the mean burnout was slightly higher for employees who collaborated virtually. This means that digital collaboration on its own does not imply burnout, but can cause it under some circumstances.

This can be explained by using the previous studies. Fernandez et al. (2023) demonstrated that technostress in teleworking conditions led to higher levels of anxiety and lower job satisfaction. These results are comparable to the current study where the weak trend is the increased burnout of employees who are involved in virtual cooperation. Nevertheless, Sun et al. (2022) found that the undesirable effect of online collaboration might be mitigated by proper management and sufficient training. In this way, virtual collaboration can become the source of burnout only in case of the failure of the organisational structures to offer enough time to rest or distinct communication standards.

In Finland, employees are given enough resources including training, flexibility, and clear communication norms to offset potential technostress. Thus, the weak relationship in this study reflects a well-managed balance between virtual demands and job resources**.**

The findings of the current study align with the JD-R Theory and Technostress Theory as they highlight the importance of the active balance between job demands and job resources as the determinant of the outcomes of digitalisation. In the JD-R theoretical model, burnout is held to occur when the work demands (as in digital workload, perpetual connectivity, or information overload) exceed the personal and organisational resources. The empirical results suggest that Finnish workers have adequate resources (e.g., digital literacy, autonomy, and organisational facilitative practices) to alleviate such demands, hence resulting in generally non-significant relationships between the use of digital tools and burnout.

At the same time, Technostress Theory provides a complement to the explanations of mechanisms of strain in the digital realm. Technological transitions become managed, and there is a possibility to reduce technostress under the condition of providing employees with sufficient support and training. Digital tools and artificial intelligence technologies can, therefore, be used as context-specific resources and be more efficient and engaging instead of being a factor in burnout.

Altogether, the findings of the present study help to understand workplace digitalisation, suggesting that the interaction of digital demands, coping strategies, and organisational support affects the overall wellbeing of employees rather than technology alone. This

illustrates the way theoretical frameworks of the JD-R and Technostress theories work together to explain the complex relationship between employee well-being and digitisation.

5.2 Use of Digital tools and work engagement

In the current study the relationship between digital tools and work engagement was explored. Based on JD-R Theory (Demerouti et al., 2001; Bakker & Demerouti, 2017), Technostress Theory (Tarafdar et al., 2007, 2015) and in the light of existing literature it was hypothesised that use of digital tools has a positive relationship with work engagement. The findings of the study support the hypothesis that the use of digital tools has a significant positive relationship with work engagement but the strength of the relationship is weak. The findings suggest that digital tools enhance motivation and dedication modestly though the effect size is limited.

These findings are consistent with the study conducted by Hooi and Chan (2023) who found that the use of digital tools at the workplace increased work engagement especially, in the presence of transformational leadership and innovative culture. Similarly, Stachova et al. (2024) investigated the impact of digital interaction platforms on employee engagement. The results of their study revealed a weak correlation between digital engagement and digital interaction platforms, which suggested that the direct impact of digital tools on employee engagement is limited.

Interestingly, in the present study, burnout outcomes were non-significant, but engagement showed weak positive correlations, suggesting that in the Finnish context, digital tools may enhance motivation more than they increase strain.

From the perspective of JD-R Theory (Bakker & Demerouti, 2017), the current results indicate that digital tools are job resources, as they are used to perform tasks in an efficient way, provide effective communication, and develop skills in the employees. These resources increase motivation by fulfilling the need for competence and autonomy (Bakker and Demerouti, 2017). However, the strength of the relationship is weak might be due to low digital literacy, lack of organisational support, or poor technology integration.

Employee digital competence is important in this context. Employees with no or a low level of digital skills may experience frustration when using technologies at their

workplace due to low competence, which may diminish the engagement potential. On the other hand, individuals with high levels of digital competency may consider it an empowering resource that increases their engagement.

5.2.1 Digital Usage and Work Engagement

From the perspective of the JD-R and Technostress frameworks, the amount of digital tool use will not necessarily enhance engagement unless employees perceive technology as a useful and manageable resource.

In the present study, the relationship between digital usage and work engagement was non-significant which was opposite to our expectations. These findings suggest that only using digital tools has no impact on employees' work engagement. This result highlights the importance of the change in employee attitudes under digitalisation. Digitalisation is an adoption that can have motivational impacts depending on how the employees perceive it as an opportunity or threat, according to Zhan & Xie (2025). Those employees who find digitalisation to be a challenge, intrusive, or cognitively challenging can find themselves experiencing technostress instead of engagement. Similarly, Stofberg et al. (2021) concluded that the quality of implementation and employee perceptions are very crucial to the success of digitalisation, and that a poorly executed shift to digitalisation may create frustration, demotivation, and disengagement.

Theoretically, the non-significance of the correlation may be explained within JD-R and Technostress Theory. Digital tools may both function as job resources (improving autonomy, efficiency, and connection) and become job demands (increasing workload, complexity and connectivity pressure) within the JD-R Theory. The level of engagement cannot be improved when the perceived resources are less than the demands. The Techno stress Theory (Tarafdar et al., 2015) also supports this clarification by stating that too many digital demands (e.g., information overload, being constantly connected, or anxiety because of technology) may reduce the benefits.

This interpretation can be explained by a number of empirical studies. The study conducted by Nuutinen & Bordi (2024) revealed that techno strain has adverse effects on engagement, but these changes may be moderated by institutional support. The same was found by Ragu-Nathan et al. (2008), who showed that techno stress reduces job satisfaction and

commitment. However, Makiniemi (2022) found that employees become engaged in techno-work when digital tools can encourage collaboration and novelty in a positive environment. This way, the lack of significance of the relationship in this paper could be due to rival effects: on the one hand, technological tools offer certain values of resources; on the other hand, their demanding nature and lack of support can balance the benefits of engagement.

Overall, this finding shows that the amount of digital use is not as significant compared to its quality and contextualisation. Gaining digital exposure alone does not necessarily lead to increased engagement; employees need to feel that technology is valuable, empowering, and well-supported in order to realise the motivation power.

5.2.2 AI usage and Work Engagement

In the present study, it was found that there was a significant relationship between AI usage and work engagement, but the strength of the relationship was weak. These findings reveal that AI tools can have an impact on engagement during work as they help to improve task efficiency and reduce repetitive work.

The JD-R Theory suggests that AI tools are both cognitive and structural resources, which makes employees focus on more important parts of the work. This fact is consistent with the statement by Zhan and Xie (2025) that those employees who perceive digitalisation as a developmental opportunity experience increased engagement. However, the low correlation value provided shows that the benefits gained by AI are not equal among all employees. According to Brougham and Haar (2020), workers who think of automation as a threat are likely to develop job insecurity and reduced interest. Therefore, organisational support, training, and clear communication are needed to ensure that AI does not become a demand but a resource.

The study reveals that the strength of the relationship between AI usage and Work engagement is weak, which can be explained by the Technostress Theory (Tarafdar et al., 2015). According to this theory, employees might have a fear of using AI technologies that can replace them, or may have difficulty using AI tools at work. Due to these stressors, the level of engagement can be low if not managed properly. Although AI tools helps to

improve efficiency and workflow, which increases engagement, its benefits largely depend on organisational support and individual competence.

However, in the Finnish context, AI is more likely to be taken as an engagement-enhancing resource rather than a stressor, as training and structural AI adoptions are common.

5.2.3 Social Media Usage and Work Engagement

According to the JD-R Theory, digital platforms like social media can be viewed as a social resource which encourages connectedness and belongingness, which are most important to maintain the motivation of employees. When employees interact in these virtual environments, they may have both practical and social support, which enhances engagement by strengthening a sense of relatedness and community (Bakker & Demerouti, 2017). Within the view of Technostress Theory, social media use can have a negative impact by blurring work-life boundaries and may also cause an increase in information overload (Tarafdar et al., 2015).

A t- test was applied to find out the mean difference between social media usage and work engagement. The results reveal that there is a significant difference in the engagement levels for employees who use social media at work and those who do not use social media at work. Employees who use social media have slightly more engagement than those who do not use social media at work. A Finnish study conducted by Oksa et al. (2021) illustrates that professional social media use was positively associated with work engagement, task resources, and social support, both before and during the COVID-19 pandemic.

Social media usage can play a role in reducing work engagement. Employees who use excessive virtual tools at work including messages, emails and online meetings may experience emotional exhaustion, difficulties concentrating and cognitive overload (Marsh et al., 2024).

Therefore, moderate use of social media increases work engagement by functioning as a digital resource, but excessive use can lead to stress and reduced engagement. The dual nature of social media forces us to realise the importance of organisational norms and digital boundaries in regulating the association between social media use and engagement.

5.2.4 Virtual Collaboration and Work Engagement

The mean difference between virtual collaboration and work engagement was statistically significant. Employees who collaborated virtually experienced slighter higher work engagement compared to employees who did not collaborate virtually. These results show that virtual collaboration plays a significant role in maintaining work engagement.

Makiniemi (2022) conducted a qualitative study on techno work engagement among educators in Finland. The findings of the study suggest that participants reported higher levels of engagement when working collaboratively. The study further indicated that digital technologies enhanced engagement by promoting a sense of progress and novelty within a positive work environment**.**

Viewing it from the perspective of JD-R Theory, these collaborations increase work engagement by fulfilling the basic needs of connectedness and relatedness. However, research done by Nuutinen & Bordi (2025) on Finnish school teachers during COVID-19 revealed that technostrain was negatively associated with work engagement but school support reduces the negative impact of technostrain on emotional exhaustion. These studies highlighted that institutional support in maintaining engagement, especially during the times of disruption is very important.

Together, these findings shows a dual trend in line with the combination of JD-R and Technostress theories. Digital tools can act as motivational sources that improve engagement when they augment autonomy, flexibility and connectedness (Bakker & Demerouti, 2017). At the same time, they may also place demands on employees, such as constant connectivity, cognitive complexity, or information overload, which can lead to stress and lower engagement (Tarafdar et al., 2015).

This study demonstrates the coexistence of weak positive and non-significant correlations, which implies that employees have the experience of both effects of digitalisation, which can empower and exhaust them at the same time. Nuutinen and Bordi (2024) demonstrated that strong institutional support can offset technostrain to reduce engagement, but Hooi and Chan (2023) and Boccoli et al. (2024) noted that transformational, digitally fluent leadership is a beneficial factor in sustaining engagement at the time of digital transitions. This implies that digitalisation as a resource potential is conditional in that it can only be

activated when the organisations can offer appropriate support, training, and a culture that can appreciate digital innovation.

Thus, the current research supports the two-sidedness of the digital transformation: it can become both a driving force and a source of strain. Digitalisation, when managed in a strategic way, that is, with the involvement of the leadership and well-defined boundaries, serves as a resource to improve engagement. Under its mismanagement, it can be a demand that compromises the well-being of employees.

5.3 Use of Digital tools and Job Meaningfulness

Based on JD-R, Technostress Theory and previous literature, initially we hypothesised that the use of digital tools would have a positive relationship with job meaningfulness. However, in the current study, the relationship between the total use of digital tools and job meaningfulness was non-significant, which was opposite to our initial expectations. These findings suggest that in the Finnish context, using digital tools is quite normal, so simply using technology does not contribute to meaningfulness of the job unless it empowers the employees rather than increasing the work burden. The outcome also highlights the significance of attitudes and perceptions of the employees towards digitalisation. This can also be explained by the study based on the transactional theory of stress done by Zhan & Xie (2025), who found that digital tools can be viewed either as challenges (which assist engagement) or threats (which intensify stress), depending on the employees' digital literacy and the perceived support.

On the theoretical level, JD-R Theory and Technostress Theory can be used to explain the non-significant relationship. In JD-R Theory (Bakker & Demerouti, 2017) digital tools can serve as both job resources and job demands. In workplaces where the perceived demands exceed resources, it is not likely that employees will experience increased meaningfulness. This perspective is backed by the Technostress Theory (Tarafdar et al., 2015), which holds that high demands in regard to the use of technology, whether it is information overload, continuous connectivity, or the fear of digital work, may weaken the favourable effects of the use of technology on work outcomes. Similarly, Stofberg et al. (2021) found that employees' perceptions and digital implementation are key, and they determine whether digitalisation is frustrating or motivating.

This interpretation is aligned with the empirical evidence. Aleksic et al. (2024) found that the effect of techno-invasion leads to frustration, which reduces the perception of meaningfulness among employees. Similarly, Chadee et al. (2021) and Ragu-Nathan et al. (2008) found that high digital demands cause disengagement and reduced job satisfaction. On the other hand, Xu et al. (2023) showed that digital tools could increase meaningfulness provided that they allow job crafting, autonomy, and work control. Hence, the fact that the current study found no significant correlation could be due to counteracting forces: though digital tools can be a source of potential resources, they also have aspects that are demanding, and thus both aspects can cancel each other out, creating a non-significant effect.

5.3.1 AI Usage and Job Meaningfulness

From the perspective of JD-R Theory, AI technologies could be used as cognitive and structural resources, which would simplify repetitive tasks and enable employees to concentrate on higher-value activities. However, the findings of the current study revealed a non-significant relationship between AI usage and job meaningfulness. This implies that AI tools are not likely to enhance the perception of meaningful work by employees, although they may be beneficial in certain situations. These findings align with the research done by Wulff & Finnestrand (2024) and Ghosh & Sadeghian (2024), who found that AI can increase job meaningfulness when it complements human skills and contributions and will not eliminate the employee's decision making power or their sense of agency.

In the Finnish context, the non-significant relationship might indicate that Finns are quite well aware of AI tools in the workplace. Using AI at work is normal for them unless and until it gives them something new or more empowering. This findings can be interpreted from the perspective of Techno stress theory that employees might feel stressed or even anxious when they are not familiar with AI and feel threatened of being replaced. However, in the Finnish context, employees are already aware of using AI with proper rules and regulations so these stressors are less significant. Although AI can be efficient and meaningful, its effectiveness is based on organisational support, training, and effective communication, which can transform AI as an alleged need to a useful resource.

This is also aligned with research by Hamid (2022), which investigated the technology readiness of employees related to adaptive performance, in which job meaningfulness significantly mediated this relationship. The weak correlation affirms that not every employee enjoys such benefits equally. Others might consider AI as a threat to their jobs that will create employment insecurity or worry of being made redundant (Brougham and Haar, 2020).

5.3.2 Social Media Users and Job Meaningfulness

Reviewing it from the perspective of JD-R theory, the social media platforms may serve as both cognitive and social resources that facilitate the engagement, cooperation, and motivation of the employees in the workplace.

The result of the current study revealed that there was a significant difference between job meaningfulness and social media users and non-users. Employees who use social media at the workplace show a higher job meaningfulness as opposed to those who do not use social media at work. It means that using social media in professional activities can have a positive impact on the employees' meaningfulness in their job. This indicates that social media is a motivational job resource that contributes to improving the psychological engagement of employees by supporting the connection, visibility, and collaboration at the workplace.

The findings are consistent with the previous studies that highlighted the importance of online and collaborative tools in defining work experiences. Xu et al. (2023) reveals that job crafting is facilitated by technology characteristics like customization and reconfigurability, through which employees are able to shape their work in a way that would make it more meaningful.

Although use of social media seem to act as a job resource, it is also known to cause some form of demands as explained in the Technostress Theory. According to Technostress theory (Tarafdar et al., 2015) technology may cause strain due to information overload and constant connection. Workers undergoing such pressures may be distracted which affects their focus and concentration. It has been proved by the research of Aleksic et al. (2024) and Chadee et al. (2021) that over-digitizing connectivity has the ability to exhaust self-control and emotional fatigue, which further

lead to lower job satisfaction and engagement. Therefore, the moderate and intentional use of social media can actually improve the meaning of life, but the unregulated or compulsory use can work vice versa.

In this regard, the interaction between social media and job meaningfulness is relative. Social media facilitates collaboration, recognition, and self-expression is a job resource. On the other hand, it causes a job demand when it produces technostress or lowers perceived autonomy. The results of the present study indicate that workers who can engage with social media positively with the supportive organizational environment find more meaning in their jobs because digital communication helps them feel valued and belonging to the community.

5.3.3 Virtual Collaboration and Job Meaningfulness

Reviewing virtual collaboration from the JD-R perspective, when employees are provided with social support, opportunities for contribution and feedback, virtual collaboration can act as a resource, whereas if it is linked with too much monitoring or complexity, it will function as a demand which creates stress and affects employee's well-being.

However, there was a statistically non-significant difference between employees who collaborate virtually and those who do not collaborate virtually in terms of job meaningfulness. These findings reveal that engaging in virtual collaboration does not have any effect on the perceived meaningfulness of the work. Although the mean for virtual collaborators was slightly high, the findings were not significant. Prior research also supports this dual nature. For instance, Martin et al., (2022) suggest that the frequent use of collaboration tools can increase job productivity but it reduces job satisfaction leading to high levels of stress. Similarly, Kinowska & Sienkiewicz (2023) highlighted how algorithmic management and task monitoring can negatively affect autonomy and well-being.

In Finland, many employees do remote work, so virtual collaboration is expected as part of the daily work and it does not play any role in the meaningfulness of the job. Technostress Theory further explains that virtual collaboration can act as a job demand when associated with complexity, monitoring, or excessive digital communication, leading to stress and reduced well-being (Tarafdar et al., 2015). Thus, the non-significant result

likely reflects the balancing of resource and demand effects: virtual collaboration can both enhance and inhibit meaningfulness depending on its implementation and context.

Overall, the current study gives insight into the conditional nature of the association between digital tools and job meaningfulness. It can be seen that collaborative tools and social media can help in enhancing meaningfulness by providing autonomy and sense of connectedness. Digital tools function both as demands and resources, as explained by the JD-R Theory and Technostress Theory.

5.4 Structural Equation Modelling

The present study investigated the relationship between the use of digital tools at the workplace and their impact on burnout, work engagement and job meaningfulness in the Finnish context. The number of participants included in the study was 1260 employees. SEM revealed RMSEA and SRMR values that indicate an acceptable fit and the chi-square was also significant. The measurement model was reliable as all factor loadings for the latent construct were significant.

The construct for the use of digital tools consisted of four items including digital usage, AI usage, social media usage and virtual collaboration. The strongest indicators of the use of digital tools were AI usage and digital usage which shows the increasing significance of digital tools in the workplace (Singh & Hess, 2020). Similarly, burnout also consisted of four subscales that included mentally exhausted, not interested, not concentrated and emotional control, which show the diverse nature of burnout, as explained by Maslach & Leiter (2000) and Tarafdar et al. (2015). The indicators of work engagement included energetic, enthusiastic and immersed aspects, which are well aligned with theoretical constructs (Schaufeli et al., 2002) and job meaningfulness having a single item was also well explained in its construct (Rosso et al., 2010).

It was hypothesised that use of digital tools would have a positive relationship with burnout, work engagement and job meaningfulness in Finland. Contradictory to the hypothesis, our findings revealed that the use of digital tools was not a significant predictor of burnout, work engagement or job meaningfulness. These results suggest that using digital tools alone at the workplace may not directly impact employees' well-being. This can be explained by Job Demand Resource theory (Bakker & Demerouti, 2017) in that

digital tools can have both positive and negative effects. Sometimes the use of digital tools functions as a job demand due to constant connectivity or emotional load, while on the other hand their usage may act as a job resource that offers autonomy and flexibility. The non-significant path illustrates the harmony between positive and negative influence of digital tools.

Moreover, previous studies also highlighted the contextual and organisational factors and their influence on employee well-being. For instance, research by Zhang et al. (2025), Boccoli et al. (2024), and Xu et al. (2023) illustrates that leadership support, job crafting and training are able to moderate the effects of digital tools which transform them into resources rather than stressors. Similarly, research in the healthcare sector reflect that well-supported digital tools increase work engagement and job meaningfulness, whereas poorly integrated tools create stress, which leads to burnout (Virtanen et al., 2023; Fernandez et al., 2023; Makiniemi, 2022). These studies reflect that the use of digital tools alone is not enough to directly impact the well-being of employees. However, the relatively low reliability of the digital tools construct ($\alpha = 0.39$) may limit the strength of the observed relationships.

Overall, the SEM results reinforce the idea that digitalisation's impact on well-being is context-dependent and moderated by organisational and personal factors, rather than being a direct determinant.

5.5 Conclusion

The current study gives a comprehensive review of the role of workplace digitalisation on employee burnout, work engagement, and job meaningfulness in Finland. Based on the JD-R and Technostress theories, the study revealed that the impact of digital tools is dual and context-dependent. It was found that digitalization itself does not directly determine employees' well-being, as the overall use of digital tools does not significantly predict burnout, engagement, or job meaningfulness. Despite that, certain elements of digitalization, including digital usage and AI adoption, are positively associated with burnout and engagement, illustrating that the effects of digital tools are context-dependent and not universal.

The current research emphasized on the significance of digital tools as both job demands and job resources. Digital tools, including AI tools, social media and virtual collaboration platforms serve as job resources which enhances efficiency of employees, connectedness and autonomy, thereby increasing engagement and the perception of meaningful work. Besides that, digital tools also create job demands which can lead to burnout due to information overload, constant connectivity, and complex technologies. Primarily, the weak or non-significant relationships observed in this study suggest that in the Finnish work environment employees has high digital literacy, strong organisational support, and a culture of employee well-being, which protects many employees from the negative effects of digital demands, therefore maintaining a balance between stressors and resources.

AI tools reduces repetitive tasks and mental overload therefore employees feel more engaged with their work. Using digital tools for collaboration, such as social media or other virtual tools, increases engagement among employees as they feel connected to each other which increases their sense of belongingness. However, if digital tools are integrated poorly it will lead to stress. This highlights that the effects of digitalisation are situational and organisational, including employee training, and digital competence.

The results of the study support the JD-R theory by illustrating how digital tools can simultaneously act as resources and demands. Digital tools can make employees more powerful, engage them better, and help to make work meaningful, but all these can be achieved only when the technological needs are matched with adequate resources and assistance. In line with Technostress Theory, information overload and connectivity pressure emerged as digital stressors. On the other hand, digitalisation may yield a tension when there is a lack of proper training, integration, or when the demand is too high. This study adds to the advanced comprehension of how digitalisation affects the well-being of employees by proving the conditional character of the effects of digital tools and the relevance of organisational approaches that treat technology as a resource and a demand.

Implications

The findings of the present study will advance the research on digitalisation and employee well-being by providing evidence from Finland's national-level dataset. As in the current

study, weak relationships have been found between use of digital tools and burnout, work engagement and job meaningfulness, which implies that the use of digital tools alone might not be used to determine the psychological outcomes of employees. This indicates that the effect of digitalisation is context dependent, and may be influenced by factors such as employees' digital competence, level of autonomy, or the degree of organisational support. These findings underscore the need to take into consideration the quality and context of technology rather than focusing on the frequency of digitalisation. Theoretical research might advance in the future by investigating the mechanisms by which digitalisation positively affects well-being, especially in terms of an interaction effect, boundary condition, or employee appraisal processes.

From a practical point of view, use of digital tools frequently does not always leads towards higher engagement or job meaningfulness, or increase burnout levels among employees. This indicates that HR professionals and organizations should not only considered the frequency of digitalisation but rather the introduction, support, and integration of digital tools in daily work. Training programmes offered by the organisations should focus on digital self-management and information filtering along with technical training, and teach the employees to set healthy boundaries to avoid overload. Furthermore, HR should ensure that digital tools help to increase clarity, independence, and efficiency and not lead to exhausting cognitive processes. Evident organisational guidelines, including those regarding after-hours communication or computer access, can assist workers to be in control and avoid digital exhaustion. Overall, these findings underscore the importance of adopting a human-centric approach to digitalisation, in which technology is implemented alongside appropriate support mechanisms rather than being assumed to have inherently positive effects.

Limitations

Although the academic literature on the connection between the use of digital tools and employee well-being is growing, too much reliance on single-occasion or correlation data inhibits the ability to see the directional or causal effects of these constructs. Although the direct relationship between use of digital tools, burnout, work engagement and job meaningfulness is assessed, it does not determine how it evolves. Secondly, the current study relied on self-report survey data, which can give biased results due to social

desirability or the subjective perception of the questions. The construct of job meaningfulness was assessed with only one item, which also limits its reliability. Thirdly the reliability of the use of digital tools construct had a Cronbach's alpha score of 0.39, which indicates that not all aspects of the digital tools were well interrelated with each other. The low internal reliability might contribute to non-significant and weak associations between burnout, work engagement and job meaningfulness. It does not include any mediator or moderator which might influence the relationship. Lastly the data is representative of the Finnish population so it cannot be generalised to other cultural or organisational contexts with different digital infrastructures, working norms and employee attitudes towards technology.

Future Directions

To address the limitation of the current study, future researchers could examine the longitudinal effects of digitalisation on employees' well-being to examine the versatile effects on burnout, work engagement and job meaningfulness. This would allow researchers to identify causal mechanisms via mediation or moderation to investigate under what circumstances digital tools act as demands or resources.

Future more, a mixed methods study could be done by integrating quantitative surveys with qualitative interviews. This could reveal how employees interpret digitalisation's impact on their daily experience. Cross cultural comparisons could also be done to see whether the impacts can be generalised or not. To increase the reliability of the use of digital tools construct, research could be be done to develop a multidimensional high reliability scale that not only measures the frequency but also the purpose and perceived usefulness of these tools.

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Appendices

Model Information

Items	Value
Estimator	ML
Optimization method	NLMINB
Number of model parameters	47
Number of observations	1261

Model Test User Model:

Statistics	Value
Test statistic	593.640
Degrees of freedom	103
P-value (Chi-square)	0.000

Model Test Baseline Model:

Statistics	Value
Test statistic	3335.940
Degree of freedom	138
P- value	0.000

User Model versus Baseline Model:

Comparative Fit Index (CFI)	0.847
Tucker-Lewis Index (TLI)	0.794

Loglikelihood and Information Criteria:

Loglikelihood user model (H0)	-14345.526
Loglikelihood unrestricted model (H1)	-14048.706
Akaike (AIC)	28785.052
Bayesian (BIC)	29026.616
Sample-size adjusted Bayesian (SABIC)	28877.322

Root Mean Square Error of Approximation:

RMSEA	0.061
90 Percent confidence interval - lower	0.057
90 Percent confidence interval - upper	0.066
P-value H_0: RMSEA <= 0.050	0.000
P-value H_0: RMSEA >= 0.080	0.000
Standardized Root Mean Square Residual:	0.048

Parameter Estimates:

Standard errors	Standard
Information	Expected
Information saturated (h1) model	Structured

Latent Variables:

Variables	**Estimate**	**Std.Err**	**Z-value**	**P(>|z|)**
Digital Tools				
Digital Usage	1.00			
AI Usage	0.746	0.102	7.308	0.000
Social Media usage	0.105	0.028	3.716	0.000
Virtual collaboration	0.305	0.042	7.230	0.000
Burnout				

Mentally exhausted	0.68			
Not interested	0.63	0.092	16.981	0.000
Not concentrated	0.65	0.069	14.498	0.000
Emotional control	1.000	0.038	9.649	0.000
Work Engagement				
Energetic	1.000			
Enthusiastic	1.006	0.041	24.488	0.000
Immersed	0.644	0.043	14.840	0.000
Job Meaningfulness				
Meaningful Work	1.000			

Regressions

Variables	**Estimate**	**Std.Err**	**z-value**	**P(>|z|)**
Burnout				
Digital tools	0.052	0.032	1.652	0.098
Gender	0.050	0.028	1.754	0.079
Full_part_ Time	0.214	0.050	4.320	0.000
Age (18-24)	0.085	0.084	1.005	0.315
25-34	0.046	0.083	0.562	0.574
35-44	0.032	0.084	0.378	0.706
45 above	-0.101	0.084	-1.208	0.227

Work engagement				
Digital tools	0.057	0.037	1.563	0.118
Gender	0.103	0.033	3.093	0.002
Full_part_time	-0.224	0.057	-3.935	0.000
Age (18-24)	-0.030	0.098	-0.310	0.756
25-34	0.072	0.096	0.745	0.456
35-44	0.100	0.098	1.022	0.307
45 above	0.158	0.098	1.616	0.106
Job Meaningfulness				
Digital tools	-0.043	0.040	-1.078	0.281
Gender	0.135	0.036	3.762	0.000
Full_part_time	-0.164	0.061	-2.665	0.008
Age 18-24)	0.191	0.107	1.785	0.074
25-34	0.273	0.105	2.608	0.009
35-44	0.364	0.106	3.423	0.001
45 above	0.459	0.106	4.331	0.000

Covariances

Variables	**Estimate**	**Std Error**	**Z-value**	**P(>|z|)**
Burnout				
Work engagement	-0.161	0.013	-12.560	0.000
Job Meaningfulness	-0.108	0.011	-10.090	0.000

Work engagement				
Job meaningfulness	0.161	0.012	13.458	0.000

Variances

Variables	Estimate	Std Error	Z-value	P(>|z)
Digital usage	0.790	0.062	12.66	0.000
AI usage	1.118	0.055	20.44	0.000
Social media usage	0.179	0.007	24.56	0.000
Virtual collaboration	0.094	0.006	14.98	0.000
Mentally exhausted	0.450	0.020	22.20	0.000
Not interested	0.215	0.020	10.70	0.000
Not concentrated	0.435	0.020	22.10	0.000
Emotional control	0.212	0.009	24.34	0.000
Energetic	0.210	0.012	17.42	0.000
Enthusiastic	0.121	0.010	12.34	0.000
Immersed	0.430	0.018	23.72	0.000
Meaningful work	0.000			
Digital tools	0.387	0.064	6.037	0.000
burnout	0.184	0.020	9.377	0.000
Workengagement	0.263	0.019	14.06	0.000
Job meaningfulness	0.395	0.016	25.06	0.000