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Traces of Technological Well-being: Digi-uplifters and Digi-downshifters[1]

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ABSTRACT

Digitalization adds demands to contend with technological developments for both employees and organizations. At the same time, technological changes transform work to become more intensive and hectic. This study examined determinants of technological well-being after digitized work. Technological well-being was operationalized as Digi-downshifting where decreased workload associates with job satisfaction and as Digi-uplifting where increased workload associates with job satisfaction. A subsample (N = 3321) of workers at digitalized workplaces from the Finnish Quality of Work Life Survey was used in mean comparisons and binary logistic regression analysis. Digi-uplifters emerged as the most predominant profile among categories of technological well-being and ill-being. Extensive working time with technologies and employees' influencing opportunities at the workplace stood out as the most consistent determinants of technological well-being. Thus, Nordic countries with skilled, technologically oriented workforce and democratic working cultures have particular promise in fostering Digi-uplifting and Digi-downshifting at work.

KEYWORDS

deskilling / digitalization / job satisfaction / motivation / reskilling / technological change / well-being / workload

Introduction

Industries are facing increasing pressures to digitize production and work to maintain their competitiveness and attract skilled workers to the sector. Using modern technologies to the extent of being a frontrunner among competitors is also an image-lifting strategy (Beedholm et al. 2015; Kaasinen et al. 2015). For industries that are

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under significant technological disruptions when, for example, being compelled to take steps toward platform work (Jesnes 2019), the name of the game can be as extreme as 'digitize or demise'.

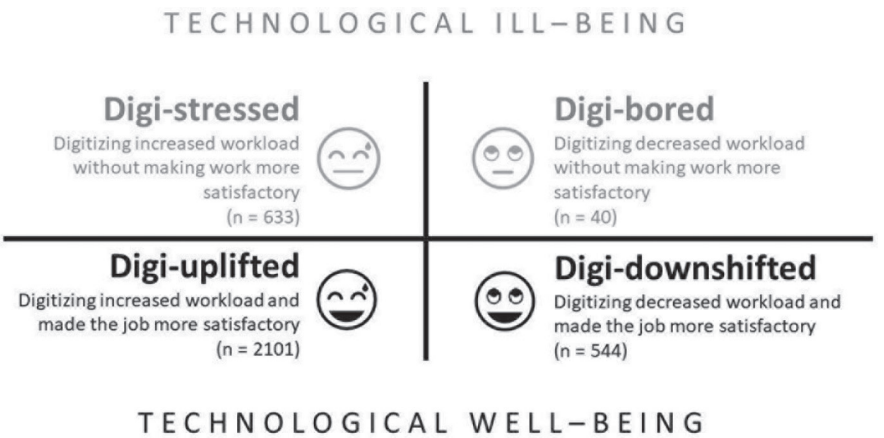
For individual workers, digitalization has added pressure to maintain skills and keep up with technological developments (Green 2006; Rosa 2003). In addition, digitalization has played a part in transforming work to become more intensive and hectic in nature (Mauno et al. 2019; Rosa 2003, 2013). According to prior findings, intensified work can not only increase the demands and negative stress in a job (Bordi et al. 2018; Boxall & Macky 2014) but also support well-being via heightened feelings of commitment, excitement, and motivation (Downes et al. 2020; Mauno et al. 2020; Mazzola & Disselhorst 2019). Sudden changes in society – such as increased teleworking due to a worldwide pandemic – underline how technological changes emerge in workplaces without always waiting for the employees to be prepared for them (Micic et al. 2022). This rationalizes the importance of studying motivational and social psychological factors that can make or break individual job satisfaction after digitalization.

In the objective of increasing knowledge *about* and striving *toward* well-being after work-related digitalization, this paper examines the variance in perceived workload and job satisfaction after digitizing work. The first research question is how digitalization-related workload changes are associated with job satisfaction. The concept of technological well-being arises from the bivariate outcome of perceived workload and job satisfaction after digitizing work. Technological well-being will be studied by working sectors and by factors that contribute to Digi-downshifting or Digi-uplifting as two exemplars of technological well-being. We examine determinants of improved technological well-being due to the influence of either increased or decreased workload and job satisfaction. The interest lies in cases where decreased workload caused by digitalization enables positive downshifting instead of negative boredom, and respectively, in cases where increased workload caused by digitalization is perceived as uplifting instead of a negative stressor.

The study of technological well-being after digitalization uses Finnish Quality of Work Life Survey (QWLS) data, which include workplace and employee information from several sectors including industrial manufacturing and service work. The data allow a unique opportunity to examine the working population's subjective views about digitalized work. In a recent review of digital transformations at work (Micic et al. 2022), one of the conclusions was that individual and organizational factors require more research, particularly which concentrates on different working sectors and industries. The current study will compare a variety of working industries and individuals who have experienced digitalization at work.

Using the QWLS data, this study first operationalized technological well-being and technological ill-being (Figure 1). The respondents who reported that digitizing had added to their workload but made their job more satisfactory were labeled as Digi-uplifted. Those who, on the contrary, felt that digitizing had decreased their workload while making their job more satisfactory were labeled as Digi-downshifted. Digi-uplifting and Digi-downshifting are viewed as types of technological well-being. The respondents who reported that digitizing had added to their workload and not made their job more satisfactory were labeled as Digi-stressed. Those who felt that digitizing had decreased

Figure 1 Typology drawn from the perceptions of digitalized work (N = 3318).



their workload and made their job less satisfactory were labeled as Digi-bored. Hereby, Digi-stress and Digi-boredom are viewed as types of technological ill-being.

As the distinct premise of the study, technological well-being is understood as being either supported or threatened by perceived changes in the workload after digitalization. Hence, the study has a rarely met perspective where the emphasis lies on the multidirectional nature of workload in affecting technological well-being. As a broader, second premise, this study states that digitizing operations is not only about the technology, but also as importantly about the social environment where work is being done. Organizations have to consider the consequences of digitalization: how work is reorganized, what are the skill requirements of the staff, and how will the changes affect employees' physical, psychological, and social well-being (Alasoini 2018). The need to digitize operations in workplaces can emerge from a variety of drivers. Along with the obvious cost-effectiveness of automated work, there are motives to change work to become more interesting and positively challenging by decreasing repetitive tasks and promoting shared responsibility among the staff (Thun et al. 2019; Turja 2022).

Perceived workload and job satisfaction after digitalization

When it comes to digitalization that transforms work in a more challenging direction, the question is about the dynamics between the demands of the job and the positive or negative stress that follows (Mazzola & Disselhorst 2019). Even the heaviest workload can be perceived as promoting or constraining the personal development of an employee and, moreover, increasing or decreasing job satisfaction (Cavanaugh et al. 2000; Podsakoff et al. 2007). In Cavanaugh et al.'s (2000) two-dimensional model, increased workload causing positive stress in a form of welcomed challenges is considered as a *challenge stressor*. If the workload causes negative stress, it is considered a *hindrance stressor*. Digitized work can be viewed as a hindrance stressor especially when it causes the employees

to be subjected to an excessive amount of information – information overload (Bordi et al. 2018; Elciyar 2021) or when it adds to the general intensity of work to the point of lowered well-being (Chesley 2014; Franke 2015).

Intensification of work as a zeitgeist has been identified in studies on wider societal changes, as well as more specific technological and organizational changes (Green 2006; Oinas et al. 2012). Interestingly, work seems to intensify across industries. The concept of perceived workload overlaps with the perceived intensity of work when heightened job demands make individuals work harder, faster, and for longer periods of time for their income (Rosa 2003). This not only applies to knowledge work and the ever-growing service sector where the work pace has been accelerated, but also to industrial manufacturing where automation has made work faster, endorsing the speed of robots (Parent-Thirion et al. 2007). Whereas working at a robotic pace is easy to categorize as a negative stressor, high demands of digitized work can have either a hindering or a challenging effect (Cavanaugh et al. 2000). In some cases, intensified work is known to be especially rewarding (Downes et al. 2020; Mauno et al. 2020), and this seems to apply with technological stress, as well. When digitizing increases workload, it may be perceived as an excessive demand and a hindrance stressor or an uplifting boost and a challenge stressor (Leclercq-Vandelannoitte 2019; Marsh et al. 2022).

Furthermore, negative stress is not always a result of excessive workload, but sometimes the opposite. Work perceived as under-stimulating associates with lower job satisfaction (Harju et al. 2014; Kawada et al. 2022). While digitizing white-collar work has always had the implication of multifaceted motivations to both increase the efficiency and improve employees' well-being, industrial manufacturing has been more straightforward in its cost-efficient logic of rationalizing and fragmenting tasks and processes (Appelbaum 1990). Digitalization may reorganize work in such a way that people end up in monotonous jobs, such as monitoring a robot (Turja et al. 2022). Digitalization can cause negative stress by decreasing the *quantitative* workload by adding the amount of idle time at work, or decreasing the *qualitative* workload in the form of underchallenging tasks.

In line with the idea of increased workload optioned to be either hindrance or challenge stressors (Cavanaugh et al. 2000), also under-stimulating work can either decrease or increase job satisfaction. The flip side of the stress caused by boredom is proposed to be a mindset in which the employee views the decreased amount of work as an opportunity to downshift—to take it slower and to give work less emphasis when it comes to different spheres of life. Downshifting does not only refer to a mindset, but also to concrete means to change one's lifestyle to a slower paced one. In downshifting, decreased workload is understood as a change that promotes personal aspirations rather than hinders personal development (Cavanaugh et al. 2000; Podsakoff et al. 2007).

We expect to see greater job satisfaction to be achieved after both increased (H1a) and decreased (H1b) workload due to digitalization. Perception of either increased or decreased workload together with the perception of a higher job satisfaction will give the indication of perceived workload change being embraced as a challenge stressor rather than a hindrance stressor.

Determinants of technological well-being

Digitalization is a type of a technological change at work in which organizations or whole industries undergo transformations due to novel technologies (e.g., robots), revenue logic innovations (e.g., platform work), or requirements of increasing teleworking. Digitizing certain processes—and sometimes entire job descriptions—have immense potential in modernizing work and facilitating professional growth (Brougham & Haar 2018). However, there are also pitfalls associated with technological changes in workplaces, one of them being the miscalculation of human limits regarding to what extent work can be intensified without a mutually satisfactory change threatened (Rosa 2003; Wilkesmann & Wilkesmann 2018).

In the pursuit of technological well-being during and after digitized work, the most significant human factor to be acknowledged is the amount of technology-related stress (Chesley 2014; Leclercq-Vandelannoitte 2019; Marsh et al. 2022). Information overload has ways to deteriorate motivation for any type of organizational changes (Mayne 2007) but is emphasized in technological changes (Bordi et al. 2018; Elciyar 2021). Excessive use of technology is found to correlate with technology-related stress in a variety of working sectors from industrial manufacturing to knowledge work (Marsh et al. 2022; Sharma et al. 2020).

Technology-related stress can refer to a situation where individuals are not able to control the information overload or to implement technology reasonably in their daily routines. In knowledge and office work, digital solutions enable working from home. Although work–home spillover is mostly considered a negative stressor, opportunities to telework have also managed to support overall well-being and, for example, attentive parenting (Farivar & Richardson 2021; Marsh & Musson 2008). Digitalized meetings have theoretical implications to act as hindrance or challenge stressors. A teleconference phenomenon, or rather a stressor, called 'Zoom fatigue', has been associated with the displeasure with how work-related meetings have moved from work to the home environment (Schlesselman et al. 2020), whereas less is known about the perceptions of teleconferences being uplifting and engaging (Esfahani & Abbasirad, 2021).

On the grounds that the majority of the literature links excessive use of technology to lower well-being, we presume that Digi-uplifting and Digi-downshifting are associated with less frequent use of technologies at work (H2a).

Besides the excessive use of technology, an excessive amount of reorganization of work may also affect technological well-being. In some cases, employees are faced with a constant need to learn about new things and innovations. Working amidst a variety of consecutive, repeating, and demanding changes can lead to change fatigue. Change fatigue is a mindset in which frequent and ongoing changes are perceived as tiresome and frustrating. Instead of discrete events, changes that cause fatigue refer mostly to a continuous flux of initiations and rearrangements (Bernerth et al. 2011). While continuous learning can have this dimension of continuous demands, more typically, continuous learning is valued as an opportunity for positive lifelong workplace learning. Continuous learning at work has been found to exclusively improve well-being rather than being a risk factor for it (Watson et al. 2018). At the same time,

engaged employees are also found to be the individuals most willing and motivated to learn (Rassameethes et al. 2021).

We hypothesize that Digi-uplifting and Digi-downshifting are positively associated with a frequent requirement, or rather an opportunity to learn new technologies (H2b).

Technological well-being can also be affected by the multitasking demands induced by digitalization. Multitasking, as a style of working where various tasks are performed simultaneously, has been associated with the growing complexity of the working life (Gajdos et al. 2019). As opposed to monotone work, multitasking supports a working culture where creativity and dynamicity are valued (Buser & Peter 2011, p. 652). This said, the majority of research literature still considers multitasking adding negative stress to digitized work, primarily because of the interruptions and distractions that come with it (Chesley 2014; Leclercq-Vandelannoitte 2019; Wallin et al. 2020; Wilkesmann & Wilkesmann 2018).

Here, we set a hypothesis where Digi-uplifting and Digi-downshifting associate with a less amount of multitasking (H2c).

Another task-related question in reorganizing work in technological changes is the division of labor between humans and machines. Routine tasks and their delegation to digital systems is, however, a complex issue. On one hand, delegating routine work to technology frees time for more interesting and gratifying tasks, but on the other hand, technology can function as a disruptive force where digitizing routines is considered as 'fixing something that is not broken'. Digitizing work can also increase the overall cognitive workload because of the sudden lack of routine tasks or because of a new need for vigilant monitoring work (Abildgaard & Nickelsen 2013; Wiehler et al. 2022). Especially in service and knowledge work, digitizing repetitive routine work aims, and often succeeds in supporting worker well-being (Wallin et al. 2020; Wilkesmann & Wilkesmann 2018). However, robotizing production in a way that makes employees spend most of their working time operating machines has been shown to decrease job satisfaction (Turja et al. 2022). The latter example underlines the risk underlying situations where repetitive tasks and excessive use of technologies co-exist.

As the next hypothesis, we presume that Digi-uplifting and Digi-downshifting are negatively associated with the repetitiveness of work (H2d).

As a final determinant of technological well-being after digitalization, we emphasize the question of to what degree the staff is included in planning and implementing the technological changes. Transformations in the workplace are found to be especially burdening to the employees who do not have any influence in planning the changes (Alfayad & Arif 2017). In principle, a collaborative work environment is thus considered to be something to foster in technological changes—as in any other organizational changes (Parviainen & Tihinen 2014). Participating in the decision-making at the workplace increases the responsibilities and duties of the individual employee. Still, the increase in responsibility is understood as a positive challenge stressor rather than a negative hindrance stressor. Participating in the decision-making increases the motivation and engagement toward the work and the employer.

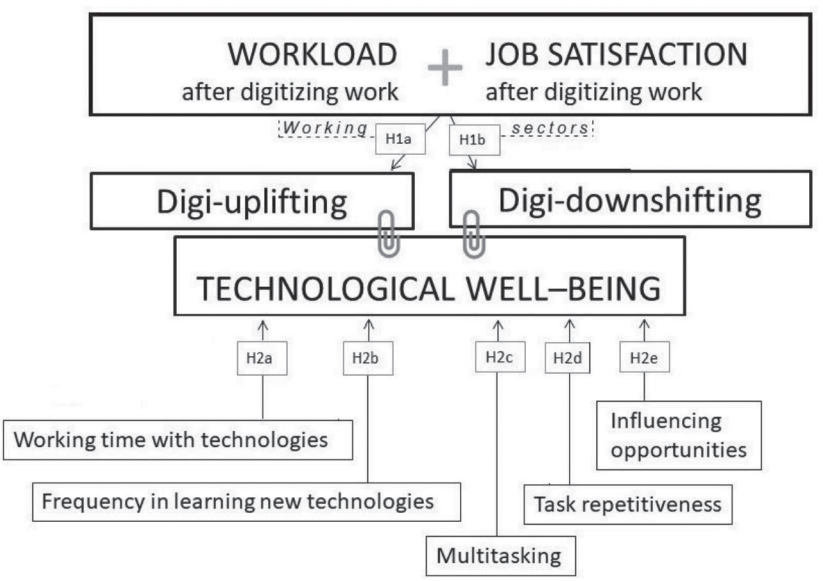
We hypothesize that technological well-being in a form of Digi-uplifting and Digi-downshifting has a positive relation to the employee's perceived opportunities to have influence in the workplace (H2e).

Study design

This study contributes to the research on employees' technological well-being, as a topic yet to be cumulated (Leclercq-Vandelannoitte 2019). The empirical work is divided into three phases. In the first phase, the concept of technological well-being was constructed combining subjective views of job satisfaction and workload. In the second phase, industry-specific differences of technological well-being were analyzed. In the third phase, we looked into the factors that were hypothesized to play a part in Digi-uplifting and Digi-downshifting as types of technological well-being.

The study views technological well-being as greater perceived job satisfaction following workload changes caused by digitized work. Decreased workload refers to Digi-downshifting, whereas increased workload refers to Digi-uplifting. Figure 2 presents the study design and summarizes the previously introduced set of hypotheses.

Figure 2 The study design illustrated.



Method

The study uses QWLS data collected in 2018. The survey, undertaken by Statistics Finland, yielded national interview data and provides a large and presentative sample of Finnish wage earners (N = 4109) working in various occupations and industries. The interviews (median duration = 63 minutes) were conducted either face-to-face (91%) or over the phone (9%), with a total response rate of 66.8% (Sutela et al. 2019). The survey gathered information on the wage earners' physical, mental, and social well-being, as well as their perceptions of their working environment, the content of work, and

changes in work. The subsample used here is formed of the 3321 respondents whose job description included working with digitized systems or devices at the time of the survey. The data include respondents from different working industries. For detailed frequencies and percentages, see Table 1 in Results.

Variables

Dependent variables

To categorize the technological well-being associated with workload change after digitizing, two-dimensional typology was compounded from the items of perceived increased satisfaction and perceived change of workload after digitizing. The questions asked from the respondents who reported working with digitized systems of devices were (1) 'How has digitizing your work affected your workload?', with response categories of (a) *increased it*, (b) *decreased it*, and (c) *neither*; and (2) 'How satisfied are you with your working methods after digitizing?', where the response scale ranged from 1 to 5 (1 = *very satisfied*, 2 = *somewhat satisfied*, 3 = *undecided*, 4 = *somewhat dissatisfied*, and 5 = *very dissatisfied*). Perceived workload was dichotomized into *increase* and *decrease* excluding the responses indicating workload remaining the same after digitalization. Perceived satisfaction after digitizing work was dichotomized into *satisfied with digitalization* (coded 1 for values 1–2) and *not satisfied with digitalization* (coded 0 for values 3–5).

The two-dimensional typology combining perceived satisfaction and workload after digitizing formed categories of technological well-being and ill-being. Technological well-being included profiles of Digi-uplifting and Digi-downshifting, while technological ill-being included profiles of Digi-stressed and Digi-bored. The more detailed construction of the four profiles, as well as the distributions of both the perceived workload and satisfaction after digitizing, are described in the Results section.

Explanatory variables

The relative time spent working with technologies was asked with the question, 'How much of your working time do you spend using digital systems or devices?'. The options for responses were 5 = *Practically all the time*, 4 = *About three-quarters of working time*, 3 = *About half of the time*, 2 = *A quarter of the time*, and 1 = *Less than that*.

Constant learning of new technologies, upgrades, or updates was investigated via the question 'How often do you learn to use new or updated information systems, software, applications, or devices?'. The options for responses were 5 = *Weekly*, 4 = *A couple of times per month*, 3 = *Monthly*, 2 = *Less frequently*, and 1 = *Never*.

The tendency of multitasking and the frequency of short and repetitive tasks were asked in a series of questions under the phrasing 'How much do the following statements apply to your job' with a response scale from 1 (*Does not apply at all*) to 4 (*Applies strongly*): 'I usually have too many different tasks at hand simultaneously', and 'My daily work mostly consists of short and repetitive tasks'.

Perceived opportunities to influence in the workplace were measured in a question, 'How satisfied are you with your opportunities to have influence in the work community?', where the response scale varied from 1 (*very dissatisfied*) to 5 (*very satisfied*).

Descriptive statistics for explanatory variables and covariates are listed in Appendix A.

Covariates

Age, gender, education, current manager status, and balance between work-life and home-life were used as covariates. Along with the traditional sociodemographic background, the manager status was found as an important control variable in the models measuring task-related factors in technological well-being. The manager status was measured using a *yes/no* score used in QWLS for decades of data collection.

The balance between work-life and home-life was selected as a covariate because it has been found to associate with lesser work stress and heightened job satisfaction and engagement (Lee & Sirgy 2019; Wood et al. 2020). The perceived balance between work and leisure time was investigated via the question, 'How satisfied are you with your ability to combine work and other areas of life in your current job?', used, for example, in Pärnänen et al. (2005). The responses were placed on a scale from 1 (*very dissatisfied*) to 5 (*very satisfied*).

Statistical analysis

Comparisons between groups were measured by Chi-square tests (χ^2). Binary logistic regression models were conducted for the multivariate analysis, reporting the results as regression coefficients (B) with their standard errors, odds ratios (OR) with their confidence intervals (CIs), and coefficients of determination (pseudo-R2). In logistic regression, pseudo-R2 indicates model fit between parallel models instead of giving generalized information about the explanatory power of the model.

In the multivariable analysis, age was chosen to be retained as a control variable without adding years of working history to the same model. Working years and age were strongly correlated ($r = 0.90$, $p < 0.01$), as expected, and one or the other had to be chosen in the model. The data analysis was performed in SPSS. The forest plot of ORs was conducted using the open-source software R.

The data also included information about the changes (decreases or increases) in the staff complement 'during the past three years', and as a separate item, information about downsizing resulting from digitalization. These two variables were combined to analyze workplaces that had gone through personnel downsizing because of digitalization. A total of 188 workplaces were identified as such, and because of the relatively small number of cases, the role of this variable was left as a secondary one in the analysis.

Results

In the sample of Finnish workers from various fields of work, digitalization has increased the perceived workload of employees. A total of 1414 (42.6%) of the respondents reported that digitalization had increased their workload, while 584 (17.6%) reported

that digitalization had decreased their workload, and 1323 (39.8%) reported that digitalization had not impacted their workload. Hotel and restaurant sector differed from the other working sectors with the average perception that workload has decreased due to digitalization.

Table 1 Working industries in the order of frequency: Proportional satisfaction with digitized working methods and perceived workload change

Working industry	n	Digitalization satisfaction (%)	Digitalization has increased workload (%)	Digitalization has decreased workload (%)
Health and social work	669 (20.1%)	73	80	20
Industrial manufacturing	492 (14.8%)	78	63	37
Education	338 (10.2%)	82	84	16
Trade	337 (10.1%)	84	62	38
Construction	204 (6.1%)	70	60	40
Science and technology	203 (6.1%)	86	65	35
Government	201 (6.1%)	82	77	24
Information and communication	176 (5.3%)	96	70	30
Logistics	167 (5%)	73	60	40
Finance, insurance, and real estate	127 (3.8%)	89	76	24
Administration	112 (3.4%)	81	63	37
Other services	90 (2.7%)	80	77	23
Hotel and restaurant work	76 (2.3%)	75	49	51
Arts and entertainment	74 (2.2%)	82	53	47
Agriculture and mining	47 (1.4%)	87	58	42
Unknown	8 (0.2%)	75	60	40
Total	3321	80	71	29
		[$\chi^2(15) = 84.66$, $p < 0.001$]	[$\chi^2(15) = 89.87$, $p < 0.001$][a]	

[a] Note: Perceived workload changes only, responses regarding 'no change' excluded.

Distributions of satisfaction with digitized work and perceived workload changes in different industries are presented in Table 1. Almost one-fifth (18.9%) of the respondents were very satisfied with how digitalization had changed their working methods, and the majority of the respondents (61.1%) reported being somewhat satisfied with the change. A rather substantial portion (14.7%) of the respondents could not decide between being satisfied or dissatisfied. Only 4.9% reported being somewhat dissatisfied, and 0.4% very dissatisfied, with how digitalization had changed their work. The variation in digitalization satisfaction is also presented in Figure 3. It provides additional information of

occupational levels within the two major working sectors in the data. For example, in the largest category of health and social work, top-level staff includes medical practitioners and directors, while the working-level staff includes nurses and social workers. Industrial manufacturing sector, respectively, includes the executives and senior specialists as the top level and the factory-floor working level.

Technological well-being and ill-being

In an attempt to differentiate the respondents who have more positive views about workload changes caused by digitalization, we constructed a two-dimensional typology comprising four categories based on (1) whether the respondent reported that digitalization had increased or decreased their workload and (2) whether they felt that digitalization had made their work more satisfactory or not (Figure 1).

Figure 3 Working industries in the order of frequency: Proportional satisfaction with digitized working.

The two-dimensional typology provides categorical opposites depending on perceived workload and job satisfaction after digitalization. Digitalization has decreased workload for both the Digi-bored and Digi-downshifted, but whereas this reflects negatively in the category of the Digi-bored, the effect is positive in the category of the Digi-downshifted, in which decreased workload is viewed as something that has made work both more pleasant. In a similar vein, digitalization has increased workload among both the Digi-stressed and the Digi-uplifted, yet only the latter seems to benefit from the changes in the form of higher job satisfaction.

Although digitizing was perceived as increasing the workload on a general level in the data, many of the respondents also felt that it had changed work in a more satisfactory direction. The Digi-uplifted formed the largest category (63%), providing preliminary evidence of how increased demands of digitalization do not prevent individuals from developing their work in a positive and motivational direction. The second largest category (19%), Digi-stressed, was formed by the respondents who felt that digitalization had increased the quantity of their work without increasing the quality of it. This was closely followed by the Digi-downshifted (16%), who reported that digitalization had decreased their workload and increased their job satisfaction. Digi-bored was the smallest category (1.2%), constituting a combination of decreased workload and job satisfaction after digitization.

Examination by industries

An uplifting effect of digitizing was found to be more probable in certain fields of work than others [$\chi^2(15) = 91.14$, $p < 0.001$). A Digi-uplifting profile was especially represented among those working in information and communication (65.9%) or in finance, insurance, and real estate (62.7%). Fewer represented construction work (37.7%) and the hotel and restaurant sector (37.8%). In a multivariate model controlling for age, gender, education, and perceived balance between working life and leisure time, binary logistic regression analysis confirmed the consistent relationship between the Digi-uplifting effect and the working sectors of information and communication (OR = 1.81, $p < 0.001$) and finance, insurance, and real estate (OR = 1.44, $p < 0.05$). As a secondary finding, among the 123 Digi-uplifted respondents whose workplace had gone through downsizing because of digitalization, information and communication had the highest (83.3%) representation. The interpretation is that information and communication experts are more motivated from the increased workload after digitalization, even after downsizing. While the information and communication industry produced this constant result, only 59% of the finance, insurance, and real estate workers we categorized as Digi-uplifted were respondents whose workplace had gone through downsizing because of digitalization. That is, finance, insurance, and real estate professionals may be more negatively affected by downsizing when it comes to maintaining motivation in digitalization-intensified work.

The Digi-downshifting effect also differed between sectors [$\chi^2(15) = 32.86$, $p < 0.001$)]. Digi-downshifters were most frequently found in arts and entertainment (24.1%) and less frequently found in education (9.5%). In a multivariate model controlling for age, gender, education, and perceived balance between working life and leisure time, binary logistic regression analysis confirmed the consistent relationship between the Digi-downshifting effect and the working sector of arts and entertainment (OR = 2.00, $p < 0.01$). As a secondary and supportive finding, of the 33 Digi-downshifted respondents whose workplaces had gone through downsizing because of digitalization, arts and entertainment had the highest (50%) representation. One interpretation is that creative work may have distinct qualities that support downshifting when operations are digitized in a way that decreases workload after overall downsizing.

Digi-stressed individuals were most frequently found in health and social work (22.3%) and less frequently in information and communications (3.4%) [$\chi^2(15) = 72.33$, $p < 0.001$]. In a multivariate model controlling for age, gender, education, and

perceived balance between working life and leisure time, binary logistic regression analysis confirmed the consistent relationship between the Digi-stressed effect and the working sector of health and social work (OR = 2.03, $p < 0.001$). As a secondary finding, of the 28 Digi-stressed respondents whose workplace had gone through downsizing because of digitalization, education had the highest (27.0%) representation. One interpretation is that, especially in the education sector, a risk of negative stress forms if operations are digitized in a way that increases workload after personnel cuts.

Respondents related to Digi-boredom were also more commonly found in certain fields than others [$\chi^2(15) = 27.08$, $p < 0.05$]. Despite the small subsample of the Digi-bored, they were still met notably commonly in the hotel and restaurant sector (3.6% vs. 2.3%). In a multivariate model controlling for age, gender, education, and perceived balance between working life and leisure time, binary logistic regression analysis confirmed the consistent relationship between the Digi-bored effect and the hospitality working sector (OR = 4.24, $p < 0.01$).

Determinants of Digi-uplifting and Digi-downshifting

The investigation was then directed at technological well-being. The multivariable analysis focused on which factors play a part in whether a worker is uplifted rather than negatively stressed when digitalization increases their workload and whether the worker is downshifted rather than bored when digitalization decreases the workload. Digi-uplifters and Digi-downshifters were analyzed in separate models with identical explanatory factors (Table 2).

Table 2 Binary logistic regression analysis of determinants for workers uplifted or downshifted by digitalization

	Digi-uplifted			Digi-downshifted		
	OR	95% C.I		OR	95% C.I	
		Lower	Upper		Lower	Upper
Age	1.009***	1.004	1.015	0.973***	0.965	0.981
Gender	1.180*	1.029	1.354	0.890	0.733	1.080
Manager status	1.091	0.947	1.258	1.324*	1.084	1.619
Balance between work and leisure time	1.150***	1.061	1.247	1.077	0.957	1.211
Constant learning of technologies	1.033	0.961	1.111	1.109*	1.006	1.222
Working time used with technologies	1.153***	1.102	1.206	1.174***	0.099	1.254
Multitasking	1.121**	1.039	1.209	0.862*	0.774	0.960
Short and repetitive tasks	0.876***	0.819	0.937	1.086	0.986	1.195
Influencing opportunities in workplace	1.173***	1.094	1.259	1.110*	1.002	1.229
Nagelkerke R^2	0.06			0.05		

*$p < 0.05$. **$p < 0.005$. ***$p < 0.001$.

The Digi-uplifting type of technological well-being was associated with higher influencing opportunities at the workplace, a relatively intense working time with technology, a job description heavy in multitasking, only a moderate amount of short and repetitive tasks, a good balance between working life and leisure time, the male gender, and an older age. The Digi-downshifting type of technological well-being was more probable found among the respondents who perceived higher influencing opportunities at the workplace, had a relatively intense working time with technology, had a job description with a moderate amount of multitasking, perceived a constant requirement of learning about new technologies, were younger in age, and had a manager status. ORs and CIs (95%) for each of the explanatory factors are also illustrated in a forest plot (Appendix B).

Regression models were also conducted for the Digi-stressed and Digi-bored, and the tables are presented in Appendix C. The parallel findings were consistent in explaining the variance in technological well-being and ill-being. The model for Digi-bored did not produce significant results because of the sample size.

In a post-hoc analysis, separate models by working industries were examined. The best model fit between a single industry and the selection of explanatory factors in Digi-downshifting was found in the education industry. Among educational professionals, higher probability for Digi-downshifting was associated with less amount of multitasking (OR 0.59, $p < 0.05$), more time used with technologies (OR 1.51, $p < 0.005$), manager status (OR 2.88, $p < 0.01$), male gender (OR 2.67, $p < 0.05$), and younger age (OR 0.96, $p < 0.05$).

Best model fit between an industry and Digi-uplifting was found in industrial manufacturing, trade, health and social work. In industrial manufacturing, higher probability for Digi-uplifting was associated with doing less short and repetitive tasks (OR 0.82, $p < 0.05$), working extensively with technologies (OR 1.18, $p < 0.05$), and well-balanced work and leisure time (OR 1.41, $p < 0.005$). From the trade workers, higher probability for Digi-uplifting was associated with doing less short and repetitive tasks (OR 0.77, $p < 0.05$), working extensively with technologies (OR 1.18, $p < 0.05$), and male gender (OR 1.59, $p < 0.05$). Among health and social workers, higher probability for Digi-uplifting was associated with working extensively with technologies (OR 1.13, $p < 0.05$), well-balanced work and leisure time (OR 1.29, $p < 0.005$), and male gender (OR 1.59, $p < 0.05$).

Overall, the post-hoc examination added greatest support to technological well-being, which is dependent on task-related factors of working extensively with technologies, and having relatively small amount of short and repetitive tasks.

Discussion

The objective of this study was to investigate, first, how digitalization-based workload changes are associated with job satisfaction in various industries and, second, the variation and the determinants of technological well-being after digitizing work. The typologies of technological well-being, Digi-uplifted and Digi-downshifted, were modeled to find relations to the social psychological and task-related factors associated with the positive outcomes of technological changes. Digi-uplifters and Digi-downshifters are both exemplars of individuals who receive workload changes as challenge stressors instead of hindrance stressors (Cavanaugh et al. 2000).

Significant traces of technological well-being emerged in this study, starting with the dominating representation of Digi-uplifters, whose job satisfaction increased along with the increased workload. Digi-uplifting was most common in information and communication industries and finance, insurance, and real-estate industries. When digital solutions change and complicate the work of specialists working in these sectors, higher demands are likely to increase job satisfaction by changing the job description into a more creative or otherwise rewarding direction. Insurance work was one of the first sectors to be heavily computerized, and as a result, customer billing and other low-skill clerical work were reskilled into knowledge work (Appelbaum 1990). In the differentiation theory, deskilling jobs and job descriptions is a negative trajectory, whereas reskilling has the potential to result in higher job satisfaction (Braverman 1974; Dølvik & Steen 2018). Just as digitalization can cause technological ill-being by decreasing the qualitative workload by deskilling (Harju et al. 2014; Weinberg 2016), digitalization can also motivate ambitious individuals in the case of reskilling (Dølvik & Steen 2018).

Supporting the first set of hypotheses, job satisfaction can be associated with increased workload (H1a) or decreased workload (H1b) due to digitalization. Among Finnish workers, Digi-uplifters who seem to welcome the extra challenges brought by digitalization (Cavanaugh et al. 2000; Mauno et al. 2020; Mazzola & Disselhorst 2019) are most likely male senior white-collar professionals (i.e., information, communication, finance, insurance, and real estate workers) who have a relatively long career behind them and who thrive in demanding and hectic jobs but who also have their working life and free time in balance. Digi-downshifters, then, may be viewed as having a laissez-faire mindset when it comes to digitalization decreasing work. Digi-downshifters as those who improve their lives by working less or less intensively (Goulding & Reed 2010) were identified most likely as workers from creative fields of work (i.e., arts and entertainment), who are younger but with managerial experience, and who have a job description that includes only a moderate number of repetitive tasks, as well as a less amount of hectic multitasking.

Our findings also provide partial support to our second set of hypotheses and the prior literature on technological well-being being impacted by task-related factors ranging from work intensity to task variability (Downes et al. 2020). However, the finding of technological well-being being negatively associated with the amount of working with technology is the first to contradict our hypothesis (H2a). Instead of an excessive use of technology being associated with negative stress, in this data on Finnish workers, more frequent technology use meant higher technological well-being. This result is interpreted as those working for the majority of their time with technologies having a strong technological orientation and those for whom the use of technology is more voluntary than mandatory. Voluntary use of technology at work is linked with a higher degree of technology use (Venkatesh et al. 2012). In our case, a higher degree of technology use has a direct relationship with more positive outcomes when digitizing work has changed the workload. In theory, this could be moderated by the voluntariness of technology use. Kaduk et al. (2019) found that the freedom to choose whether to telework correlated with less negative stress among information technology employees.

The hypothesis about a positive association between technological well-being and constant learning of new technologies (H2b) was supported among Digi-downshifters. Continuous learning is hence linked to Digi-downshifting but not to Digi-uplifting.

This may portray Digi-downshifters as enthusiastic about delegating their work to new and improving technologies. The finding is in line with prior studies of the benefits in continuous learning (Rassameethes et al. 2021; Watson et al. 2018), and the implication is that repeated technological changes at work are more about the joy of learning about new things and working methods than frustration about constant changes (Bernerth et al. 2011). Reflecting this in the high presentation of Digi-downshifters in the arts and entertainment industry, this conclusion is further supported on the grounds that creativity is profoundly associated with the motivation of continuous learning (Venckutė et al. 2020).

The hypothesis of multitasking decreasing technological well-being (H2c) was similarly supported only among Digi-downshifters. Although multitasking has been considered as a significant negative stressor in intensified work (Chesley 2014; LePine et al. 2005), this was not generally the case among the Digi-uplifted. Digi-uplifting effect was linked to a greater amount of multitasking corresponding with prior studies presenting a positive side of multitasking (Buser & Peter 2011). Indeed, multitasking has been associated with, not only increasingly complex, but also flexible modern working life (Gajdos et al. 2019). One exception to this was found among educational professionals, whose perception of rarer multitasking associated with Digi-uplifting along with the hypothesis. Overall, however, the hectic nature of multitasking draws the line between Digi-uplifters and Digi-downshifters. Multitasking is a hindrance stressor for Digi-downshifters but a challenge stressor for Digi-uplifters who are more likely to feel rewarded from the reskilling enabled by digitalization (Braverman 1974; Dølvik & Steen 2018).

In contrast to the previous findings, the hypothesis proposing an association between technological well-being and a job description with less repetitive tasks (H2d) was supported only among Digi-uplifters. The uplifting effect of meaningfully diverse tasks is in line with prior studies where ill-being at work has been associated with repetitive routine work (Abildgaard & Nickelsen 2013; Wallin et al. 2020; Wiehler et al., 2022; Wilkesmann & Wilkesmann 2018). Our findings contribute to these prior findings with a novel and specific focus on digitalization.

The perceived opportunities of having influence in the workplace emerged as the most consistent determinant of technological well-being. Higher influencing opportunities were associated with both positive outcomes of Digi-uplifting and Digi-downshifting giving support to our hypothesis (H2e), as well as the literature it was drawn from (Alfayad & Arif 2017; Parviainen & Tihinen 2014). The findings emphasize the motivational importance of collaborative workplaces and joint decision-making. Technological well-being after digitizing was observed mostly in the information and communication (Digi-uplifters) and the arts and entertainment (Digi-downshifters) sectors, both of which are considered industries with high-autonomy employees (Bäcklander et al. 2021; Janíčko & Krčková 2019). The findings together paint a picture of the importance of autonomy of work and voluntary use of technologies. For Digi-stress and Digi-boredom to turn into something positive, employees need to have influence on both the work environment and their own working practices and methods.

Among the covariates, manager status showed to be especially important in the model of different determinants of Digi-downshifting. Managers were found 1.3 times more likely to downshift rather than be bored when digitizing had decreased the workload. This result continues to support the conclusion that downshifting is closely associated with motivation and the power to delegate tasks to technology. The finding is

reflected also on how managers enjoy higher autonomy in their work and, hence, are not always impacted negatively by technological changes (Clegg & Spencer 2007; Parker et al. 2017).

Limitations

The first limitation of this study is rooted in the somewhat blunt measurements, as is typical in the cases of large surveys. For instance, the item measuring the perception of an increased or decreased workload did not include more specific information about the magnitude of the possible change. In other words, the information about how or how much digitizing had impacted the workload could have been a scale to consider in the analysis and in conducting the typology. Also, the neutral positions on workload and job satisfaction changes were not considered a factor in this study which adds to the bluntness of the measurements. Second, without a longitudinal study design, we cannot tell whether the found associations are temporal or trend-like phenomena. It would be interesting to study the history of digitalization among different working sectors and how change-related human factors have varied over time. Finally, a common-method bias in survey studies can be a problem because an individual who has an optimistic perception of one thing is more likely to have all-around optimism. In this study, the method bias was tackled inherently because the data was split into different profiles. For example, the respondents who gave a positive-sided assessment as to their workload after digitizing were divided into those who gave either positive- or negative-sided assessments to their job satisfaction after digitizing.

The findings are generalizable in Finland and cautiously also in other Nordic countries as technologically developed countries (DESI 2022; OECD 2017). The Nordic region may be considered as one of the frontrunners of digitalization and it will be interesting to see if the same effect of technological well-being follows the same traces in other countries in the future. Furthermore, Nordic countries share the ideologies of workplace learning and lifelong learning (Piątkowski 2020), which makes the organizational culture oriented toward upskilling the workforce. The need for future, cross-cultural research is required before making further generalizations about technological well-being after digitizing work.

Practical implementations

Future concerns should perhaps be especially targeted at the working sectors distinguished as loci of technological ill-being, first being the Digi-stressed of the health and social work. In these sectors with strongly digitized systems, the technologies would ideally be autonomous enough to decrease the workload instead of further broadening the job description and intensifying work. Other studies have similarly suggested that work intensification should be reduced especially among healthcare workers (Chowhan et al. 2019). Second, in prior studies, job boredom has been associated with blue-collar work (Harju et al. 2014), but our findings imply that the hotel and restaurant sector, in particular, would suffer from the more specific Digi-boredom. To prevent the loss of skilled staff, organizations in the hospitality industry should identify routine traps in

different job descriptions in an attempt to maintain job diversity and satisfaction also after digitalization.

Digi-bored was the smallest profile in the typology, for which the combination of decreased work and satisfaction can be seen as a reorganization of work in which the human role is reduced to monitoring work. Applied to the hotel and restaurant sector, this may refer to how traditionally customer-centered service work is going through rationalizing and fragmenting due to automation (Appelbaum 1990; Muller 2010). When digital systems take over hospitality work, job satisfaction can decline for the lack of meaningful work to replace automated tasks. This is in line with theories explaining how lower job satisfaction after computerization is caused by tasks becoming duller and the work itself less respected (Braverman 1974). Digitalization of hospitality work may be following the similar path of routinization and boredom that prior studies have revealed regarding other service sectors (Mustosmäki et al. 2013).

This study contributes to the accumulating evidence on the importance of human factors acknowledged in digitizing work. On a practical level, the results are encouraged to be utilized in the promotion of positive outcomes in technological changes. Workplaces have means to support technological well-being instead of technological ill-being, whether that refers to Digi-uplifting with a higher motivation and drive toward challenging tasks or Digi-downshifting with a rewarding way to delegate tasks to technology. In this work, social, discursive, and reskilling practices are recommended to be implemented as a part of shared change management.

Conclusion

In the outstanding profile of Digi-uplifters, increased workload caused by digitalization managed to improve job satisfaction rather than cause negative stress. Similarly, in the profile of Digi-downshifters, decreased workload and changed working methods caused by digitalization were perceived as a positive development instead of making the job more unsatisfactory. This study demonstrates how the outcomes of perceived workload are viewed subjectively, and while some suffer from digitalization-intensified work, even a larger group seems to thrive in increased challenges, demands, and multitasking after technological changes.

The most consistent determinants associated with technological well-being after digitizing work were influencing opportunities at the workplace and a job description that includes a considerable amount of working with technology. These findings are the first to acknowledge when determining how technological well-being would be sustained after digitalization, and how Digi-uplifting and Digi-downshifting are supported over Digi-stress and Digi-boredom. Both of these main determinants speak for a participatory organization culture where employees have access to new technologies and also have an active role in technological changes.

Nordic countries have excellent prospects for fostering Digi-uplifting and Digi-downshifting in digitized work. Extensive technology use at work associated consistently with technological well-being and technological competence is how Finland and other Nordic countries continue to stand out in the global comparisons (DESI 2022; OECD 2017). Also, the more an employee perceived having influencing opportunities

in the workplace, the more likely digitizing resulted in technological well-being. Hence, values characteristic to Nordic working life, such as equality, demography, low hierarchies, and short power distances (Masuda et al. 2019), lay a promising foundation for achieving a collaborative working culture in technological changes.

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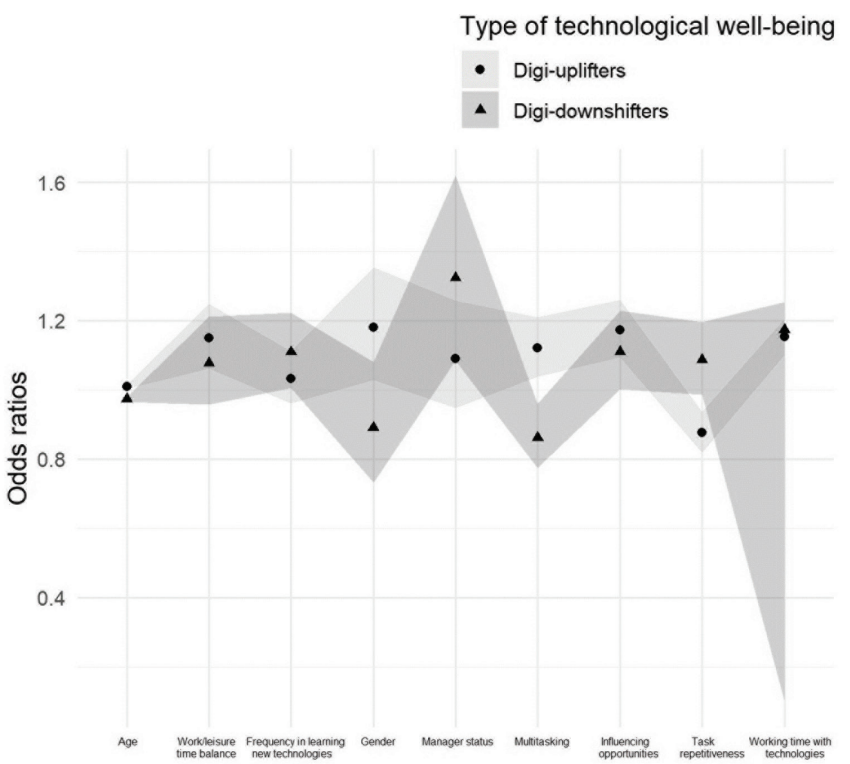
Appendix A

Descriptive statistics for explanatory variables and covariates.

	Percentage	Mean	SD
Gender	*52.3*		
Manager status	44.8		
University level education	51.5		
Age		44.15	11.59
Balance between work and leisure time		4.00	0.87
Constant learning of new technologies		2.71	0.98
Working time used with technologies		2.58	1.54
Multitasking		2.49	0.97
Short and repetitive tasks		2.24	1.02
Opportunities to influence in workplace		3.79	0.99

Appendix B

Forest plot for explanatory factors (alphabetically) of Digi-uplifting and Digi-downshifting.



Appendix C

Regression models for technological ill-being.

	Digi-stressed			Digi-bored		
	OR	95% C.I		OR	95% C.I	
		Lower	Upper		Lower	Upper
Age	1.017***	1.008	1.025	1.004	0.975	1.034
Gender	0.832	0.687	1.007	0.372	0.173*	0.798
Manager status	0.785*	0.642	0.961	1.632	0.790	3.375
Balance between work and leisure time	0.723***	0.651	0.802	0.741	0.512	1.073
Constant learning of new technologies	1.011	0.911	1.123	1.134	0.797	1.614
Working time used with technologies	0.718***	0.674	0.765	0.850	0.673	1.072
Multitasking	1.056	0.950	1.175	0.953	0.646	1.405
Short and repetitive tasks	1.052	0.958	1.154	1.299	0.919	1.837
Opportunities to influence in workplace	0.770***	0.702	0.845	0.804	0.576	1.123
Nagelkerke R^2	0.12			0.05		

*$p < 0.05$. **$p < 0.005$. ***$p < 0.001$.