SA Journal of Industrial Psychology
ISSN: (Online) 2071-0763, (Print) 0258-5200

Technology readiness, technology acceptance, and work engagement: A mediational analysis

Authors:
Thembekile K. Khoza[1]
Tshegofatso Mabitsela[1]
Petrus Nel[1]

Affiliations:
[1]Department of Industrial Psychology and People Management, School of Management, College of Business and Economics, University of Johannesburg, Johannesburg, South Africa

Corresponding author:
Petrus Nel,
petrusn@uj.ac.za

Dates:
Received: 07 Aug. 2023
Accepted: 06 Dec. 2023
Published: 19 Mar. 2024

How to cite this article:
Khoza, T.K., Mabitsela, T., & Nel, P. (2024). Technology readiness, technology acceptance, and work engagement: A mediational analysis. *SA Journal of Industrial Psychology/SA Tydskrif vir Bedryfsielkunde, 50*(0), a2131. https://doi.org/10.4102/sajip.v50i0.2131

Orientation: Organisations are increasingly integrating technology to enhance employee productivity and strategic goals. However, the acceptance of such technology is dependent on employees' attitudes.

Research purpose: This study seeks to understand: (1) the influence of employees' levels of technology readiness and technology acceptance on their work engagement and (2) whether technology acceptance mediates the relationship between technology readiness and work engagement.

Motivation for the study: Drawing from the Technology Readiness and Acceptance Model (TRAM), the Worker-Centric Design and Evaluation Framework for Operator 4.0 and the Job Demands-Resources (JD-R) theory, we posit that technology readiness and acceptance function as resources aiding employees in effectively navigating workplace technology, potentially fostering greater engagement.

Research approach/design and method: Using a quantitative, cross-sectional approach, we examined 143 working adults' technology readiness, technology acceptance and work engagement. Structural equation modelling (Partial Least Squares) guided the evaluation of hypotheses.

Main findings: Results revealed a positive relationship between technology readiness and work engagement. Interestingly, technology acceptance showed a negative link with work engagement. Furthermore, technology acceptance partly mediated the direct link between technology readiness and work engagement. Notably, the significant and negative indirect effect suggests a potential suppressor variable role for technology acceptance.

Practical/managerial implications: Practically, organisations should recognise the dual impact of technology on work engagement. When technology is perceived as a demand, interventions are crucial to counteract its adverse effects on engagement.

Contribution/value-add: The study brings a multidisciplinary perspective to understanding how personal resources in the face of workplace technology can foster work engagement.

Keywords: technology readiness; technology acceptance; work engagement; personal resources; job demands.

Introduction

The use of technology in organisations has become more pronounced during the coronavirus disease 2019 (COVID-19) pandemic, where employees were required to work from home using technology (Khan, 2021). Although the use of technology for remote work purposes is not new, the sudden implementation by organisations of both technology and working from home to ensure business continuity created new and additional challenges (Shamsi et al., 2021; Wang et al., 2021).

The rapid transition triggered by the pandemic may have offered employees an opportunity to become more self-assured in accepting technological systems for repetitive, labour-intensive tasks, decreasing the need for more labour (Coombs, 2020). As individuals become at ease and familiar with utilising technological systems, their trust in these tools will improve their chances and create opportunities for long-term adoption (Coombs, 2020). It is likely that technology acceptance can act as a positive motivational variable influencing employees to make an effort in using technology, leading to higher levels of work engagement allowing them to be persistent in successfully dealing with the use of technology in the work environment (Molino et al., 2020).

However, according to the Technology Readiness and Acceptance Model (TRAM) (Lin & Hsieh, 2007), individuals' acceptance of technology is, in turn, influenced by their levels of technology readiness, which refers to the eagerness of individuals to adopt and utilise new technologies to attain goals at their homes and at work (Lin & Hsieh, 2007). It is viewed as a general state of mind occurring from a psychological enabler and inhibitor that mutually defines the ability of a person to use new technologies (Lin & Hsieh, 2007). It has been found that having a positive attitude towards the use of technology may influence employees' willingness to use such technology (i.e. acceptance) in the execution of their work duties. Individuals' interactions, experiences and how they use innovative technologies are thus influenced by certain personality factors (Godoe & Johansen, 2012).

The Worker-Centric Design and Evaluation Framework for Operator 4.0 goes further explaining the influence of user acceptance, user experience and usability (to mention just a few) on work well-being, which consists of job satisfaction, job motivation and work engagement. This particular framework suggests that a user's acceptance of technology (i.e. technology acceptance) is a mediator between individual and organisational antecedents (i.e. independent variables) and work well-being (which includes work engagement) (Kaasinen et al., 2019).

Research purpose and objectives

The primary aim of the present study is therefore to investigate the influence of employees' levels of technology readiness and technology acceptance on their levels of work engagement. The secondary aim is to investigate the possibility that technology acceptance mediates the relationship between technology readiness and work engagement.

Literature review

Job demands-resources theory and work engagement

The Job Demands-Resources (JD-R) theory provides guidance in understanding and explaining the influence of several variables on individual performance via well-being (i.e. burnout and engagement) (Bakker et al. 2023). More specifically, the JD-R theory suggests that individuals experience work demands in the execution of their duties. To successfully deal with such work demands, employees can access certain resources, minimising the influence of job demands. When job demands exceed the available resources, employees are likely to experience burnout. However, when employees have enough resources to deal with job demands, they are more likely to experience work engagement (Bakker et al. 2023). According to Schaufeli et al. (2002), work engagement is described as an affirmative, satisfying, working-related state of mind defined by vigour, dedication and absorption (Schaufeli et al., 2002). A distinction is drawn between individual-level and organisational level antecedents/resources: the former relates to personality characteristics (e.g. optimism, self-efficacy and self-esteem), while the latter relates to organisational resources (e.g. organisational justice, task variety and career prospects). Having access to these resources activates a motivational process that influences employees' levels of work engagement and subsequently work performance (Bakker et al. 2023).

Technology acceptance

The Technology Acceptance Model (TAM) is widely used to describe the factors that influence technology acceptance among employees (Davis et al., 1986). These researchers introduced the term technology acceptance, which they define as a person's willingness to utilise new technology, which is influenced by their apparent ease of use and apparent usefulness of the technology. Employees might have the means and the resources to use the technology effectively, but their perception of the technology affects how they will use it (Davis et al., 1986). Perceived usefulness and perceived ease of use are assumed to be two major factors that influence an individual's acceptance of technological systems (Davis, 1985). Perceived usefulness is defined as the level to which a potential user of a technological system assumes that using a certain technology will improve their job performance, whereas perceived ease of use refers to the level to which a potential user assumes that it would be effortless to use a specific system (Davis, 1985; Davis et al., 1986).

Technology readiness

The technology readiness (TR) construct has four subcomponents, namely, optimism, innovativeness, discomfort, and insecurity (Lin & Hsieh, 2007; Sun et al., 2019). In this context, optimism refers to a positive outlook of the technology and a conviction that technology provides greater control, versatility and productivity (Lin & Hsieh, 2007). Innovativeness relates to a desire to be a forerunner in technology and a trailblazer in thought (Lin & Hsieh, 2007). Discomfort relates to feelings of having less control over a system or technology and a sense of being confused by it (Lin & Hsieh, 2007). Insecurity involves technological distrust and scepticism about its ability to function properly (Lin & Hsieh, 2007). In short, TR motivators are optimism and innovativeness, while inhibitors are discomfort and insecurity (Lin & Hsieh, 2007). A recent meta-analysis confirmed that TR is best conceptualised as a two-dimensional construct, consisting of inhibitors and motivators (i.e. drivers) (Blut & Wang, 2020).

Technology readiness and acceptance model

The TRAM provides the foundation to better understand how technology readiness influences technology acceptance. The TRAM thus integrates both technology readiness and technology acceptance (Lin & Hsieh, 2007). More specifically, the TRAM integrates personality constructs of technology readiness (shared in the previous section) with the constructs

of the TAM. Therefore, it describes how individuals' interactions, experiences and how they use innovative technologies are influenced by certain personality factors (Godoe & Johansen, 2012). A recent meta-analysis found that technology readiness does not directly influence technology usage but indirectly via mediators (such as technology acceptance). Interestingly, the meta-analysis suggested that researchers would do well to include both motivators and inhibitors when testing models, given that TR motivators had stronger relationships with the mediators compared to the TR inhibitors (Blut & Wang, 2020).

Worker-centric design and evaluation framework for operator 4.0

Kaasinen et al. (2019) developed a Worker-Centric Design and Evaluation Framework for Operator 4.0 that explains the influence of user acceptance, user experience and usability (to mention just a few) on work well-being, which consists of job satisfaction, job motivation and work engagement. The purpose of this model is to assist organisations designing work within future factories (which will take advantage of technology) that will increase work well-being. This particular framework suggests that technology acceptance is a mediator between individual and organisational antecedents and work well-being (which includes work engagement).

The present study therefore suggests the integration of the TRAM, Worker-Centric Design and Evaluation Framework for Operator 4.0 and JD-R theory to explore how technology readiness and technology acceptance can be used as resources by individuals to influence their well-being and more specifically work engagement.

The relationship between technology readiness and work engagement

Verry little empirical research has been conducted to investigate the relationship between technology readiness and work engagement. Joseph et al. (2021) found that the drivers of technology readiness (optimism and innovation) were significantly and positively related to teacher engagement. In contrast, the inhibitors of technology readiness (discomfort and insecurity) were not significantly related to teacher engagement.

Given that very little published explanations are available, the following section puts forward possible explanations for this relationship, emphasising the drivers of technology readiness.

In the broader context of wellness, the following arguments have been put forward.

When employees have access to multiple resources (e.g. training, managerial support), these resources can alleviate the effect of demands on their well-being (Imran et al., 2014). The optimism and innovativeness components of technology readiness can be viewed as positive personal resources to tackle work-related demands, eventually leading to higher levels of wellness and work engagement (Sun & Zhang, 2006):

> **H1:** Technology readiness is significantly related to work engagement.

The relationship between technology acceptance and work engagement

Molino et al. (2020) used parts of the Worker-Centric Design and Evaluation Framework for Operator 4.0 (Kaasinen et al., 2019) to investigate the antecedents and impact of technology acceptance. Based on a sample of 378 blue-collar factory workers, these authors found a significant positive relationship between technology acceptance and work engagement. Molino et al. (2020) went further suggesting that technology acceptance could be viewed as a personal resource that could increase work engagement by fostering the motivational process. This argument is based on the fact that the JD-R theory explains the relationship between personal resources and work engagement (Bakker et al. 2023).

Integrating both the TAM (a precursor to the TRAM) and JD-R theory, Shamsi et al. (2021) argued that when individuals find technology easy to use and useful in the execution of their work-related responsibilities, they are more likely to accept such technology, which in turn will increase their levels of work motivation and engagement allowing them to achieve their work goals. Their results pointed to a significant positive relationship between technology acceptance and work engagement.

However, there are conflicting results regarding the influence of technology acceptance and adoption on work engagement and work-related well-being. Some studies have found that technology acceptance and adoption acts as a job resource that positively influences work engagement (Molino et al., 2020; Shamsi et al., 2021). As a resource, technology acceptance allows employees to successfully communicate and interact with co-workers irrespective of their location. In contrast, technology adoption acts as a job demand that negatively influences work-related wellbeing (Bordi et al., 2018; Zeike et al., 2019). As a demand, technology acceptance may increase employees' workload and effort required to use the technology that facilitates remote working (Shamsi et al., 2021):

> **H2:** Technology acceptance is significantly related (either positively or negatively) to work engagement.

Technology acceptance as a mediator between technology readiness and work engagement

As alluded to earlier, the present study argues for the integration of the TRAM, Worker-Centric Design and Evaluation Framework for Operator 4.0, and JD-R theory to explore how technology readiness and technology acceptance can be used as resources by individuals to influence their well-being and more specifically work engagement.

Relationship between technology readiness and technology acceptance

To explain the above relationship, both the TRAM and JD-R theory should be consulted. The latter could provide theoretical support for the role that personal resources (such as the personality characteristics associated with technology readiness) play when dealing with job demands (such as using technology to perform work-related tasks and working from home), while the former explains the relationship between technology readiness and technology acceptance.

Walczuch et al. (2007) looked at the impact that the factors of technology readiness have on the dimensions of technology acceptance. Walczuch et al. (2007) firstly looked at the effect that optimism has on the perception of technology. The authors state that optimists are more eager to leverage emerging technologies. They are unlikely to concentrate on negative incidents and therefore more directly challenge technology. They are much more inclined to accept their circumstance than escapists. Walczuch et al. (2007) assume that optimistic individuals view a given technology as being useful and easier to utilise as the individual is not concerned about potential adverse results.

Walczuch et al. (2007) secondly looked at the effect innovativeness has on the perception of technology, and the authors postulate that individuals who have high scores on innovativeness are most likely to think that if they do not try new technology, they may lose those benefits. Overall, they have a favourable view of it. Thus, optimism and innovativeness are perceived to result in a high level of perceived usefulness and perceived ease of use of a particular technological system (Godoe & Johansen, 2012).

Thirdly, Walczuch et al. (2007) looked at the effect of insecurity on the perception of technology. They believe that individuals who feel insecure would have low perceived ease of use of technology. Fourthly, Walczuch et al. (2007) looked at the effect of discomfort on the perception of technology. They postulate that individuals with a high score on the discomfort attribute tend to observe technology as more complex and therefore less easy to consume. Thus, insecurity and discomfort are proposed to hinder perceived usefulness and perceived ease of use (Godoe & Johansen, 2012). Lastly, Walczuch et al. (2007) looked at the effect of ease of use and usefulness. Walczuch et al. (2007) state that provided that perceived usefulness is characterised as the perceived likelihood by a potential user, utilising a particular technology leads to an improvement in their job performance; therefore, it can be deduced that these two dimensions will be correlated positively.

Esen and Erdoğmuş (2014) further state that innovativeness has negative effects on perceived usefulness. That finding was not anticipated. One potential reason is that innovative individuals tend to be more sceptical of technology because they know of the latest technologies and the likelihood of it meeting great demands (Lam et al., 2008). There is therefore likely to be a positive link between innovativeness, particularly in the area of technology (i.e. innovativeness as a component of technology readiness) and technology-acceptance behaviour. Hence, an innovative individual looking forward to trying new technology because of a perceived belief that it will improve one's job performance or offer other positive attributes has the potential to make employees more engaged with that technology. It can therefore be argued that innovativeness (as a component of technology readiness) can influence work engagement through technology acceptance.

As expected, discomfort has had a negative outcome on perceived ease of use (Esen & Erdoğmuş, 2014). Employees who score high on this level feel confused by the technology's complexity. As a result, a high score on discomfort leads individuals to struggle with the belief of having a lack of control over technology and it being user-friendly, and they end up being overwhelmed by it (e.g. exhaustion) (Walczuch et al., 2007). Discomfort as a component of technology readiness can therefore lead to negative effects on well-being through technology acceptance (i.e. perceived ease of use).

More recently, Sun et al. (2020) investigated the influence of the two positive dimensions of technology readiness (optimism and initiative) on hotel employees' levels of technology acceptance (perceived ease of use and perceived usefulness). They found that both optimism and innovativeness had significant positive relationships with both components of technology acceptance (perceived ease of use and perceived usefulness).

Relationship between technology acceptance and work engagement

To explain the above relationship, both the JD-R theory and Worker-Centric Design and Evaluation Framework for Operator 4.0 should be consulted. The former could provide theoretical support in explaining the importance of personal resources in mitigating job demands and facilitating individuals' levels of work engagement. Of relevance to the present study is the theoretical support that technology acceptance can act as a possible mediator when investigating personal and organisational antecedents that influence employees' levels of work engagement – which is possible when consulting the Worker-Centric Design and Evaluation Framework for Operator 4.0.

Previous research (Shamsi et al., 2021) investigated the mediating role of technology acceptance in the relationship between virtual job characteristics (cognitive load and perceived team support) and work-related wellbeing (work engagement). They argued that when individuals find technology easy to use and useful in the execution of their work-related responsibilities, they are more likely to accept such technology, which in turn will increase their levels of work motivation and engagement allowing them to achieve their work goals. Their results supported the argument that technology acceptance mediated the relationship between virtual job characteristics and work engagement. Molino

et al. (2020) also found that technology acceptance mediated the relationship between organisational and personal antecedents and work engagement.

Therefore, according to the findings of Blut and Wang (2020), Erdoğmuş and Esen (2011), Esen and Erdoğmuş (2014) and Walczuch et al. (2007), it can be argued that technology readiness affects the dimensions of technology acceptance either positively or negatively and as a result posing implications to the well-being (e.g. work engagement) of individuals. In addition, the relationship between technology readiness and well-being (e.g. work engagement) can possibly be explained through technology acceptance:

H3: Technology acceptance mediates the relationship between technology readiness and work engagement:

Research design

Research approach

The present study employed a quantitative, cross-sectional survey research design to collect data to investigate the three hypotheses.

Participants

Using convenience sampling, the present study collected data from 143 working adults. Table 1 presents the distribution of relevant biographical information about the participants. Females were slightly in the majority (56%). Most of the participants (58%) identified as black. The average age of the participants was 32 years. It should also be noted that data was collected during lockdown of the COVID-19 pandemic.

Measuring instruments

Work engagement

The Utrecht Work Engagement Scale (UWES) is widely used to research work engagement in employees and volunteers (Vallières et al., 2017). The UWES-9, which is a shortened form of the UWES-17, was designed to evaluate three related work engagement factors: vigour, dedication (commitment) and absorption (Vallières et al., 2017). Vigour consists of three items, dedication consists of three items and absorption consists of three items (Schaufeli et al., 2006; Vallières et al., 2017). Examples of the items are: 'At my work, I feel that I am bursting with energy. At my job, I feel strong and vigorous. I am enthusiastic about my job' (Schaufeli et al., 2006, p. 714). The factorial validity of the UWES-9 was illustrated utilising confirmatory factor analysis (CFA), with strong internal consistency and test-retest reliability of the three scales (Schaufeli et al., 2006). The Cronbach alpha (α) of the UWES-9 ranges from 0.89 to 0.97 (Schaufeli & Bakker, 2004).

TABLE 1: Frequency distributions (Biographical variables).

Variable	Frequency	%
Female	78	54.5
Male	65	45.5
Afrikaans	16	11.2
English	38	26.6
Nguni (IsiZulu, IsiXhosa, SiSwati, IsiNdebele)	49	34.3
Sotho (Sepedi, Sesotho, Setswana)	29	20.3
Tshivenda and/or Xitsonga	6	4.2
Asian people	11	7.7
Black African people	83	58.0
Coloured people	9	6.3
Indian people	25	17.5
White people	13	9.1
Employment status (Permanent)	91	64
Employment status (Contract)	30	21

Technology readiness

The Technology Readiness Index (TRI 2.0) was used to measure individuals' readiness to use technology (Parasuraman & Colby, 2015). The TRI 2.0 uses a 5-point Likert scale consisting of 16 items (Parasuraman & Colby, 2015). The items measure the four dimensions of technology readiness: optimism, innovativeness, discomfort, and insecurity (Parasuraman & Colby, 2015).

Using the TRI 2.0 instrument, the four components are reliable with the discomfort showing the lowest reliability Cronbach alpha (α), which is 0.70, and innovativeness having the highest reliability, which is 0.83 (Parasuraman & Colby, 2015). All the dimensions meet the minimum requirement for satisfactory discriminant validity (Parasuraman & Colby, 2015).

Technology acceptance

The present study adapted items from a scale developed by Malhotra and Galletta (2005) to measure the following dimensions of technology acceptance: perceived usefulness (6 items), perceived ease of use (4 items), behavioural intention/acceptance (4 items) and attitude (4 items). To contextualise the questions, the present study adapted the questions to reflect the computer programmes used by employees to do their work. These are some of the examples of the items: Using technology (e.g., e-mails, Skype, MS Teams, MS Office) would improve my work performance. Using technology (e.g., e-mails, Skype, MS Teams, MS Office) in my work would enable me to accomplish my tasks more quickly. I would find the use of technology (e.g., e-mails, Skype, MS Teams, MS Office) useful in my work.

The authors of this scale reported the following reliability coefficients: perceived usefulness (α = 0.96), perceived ease of use (α = 0.95), behavioural intention/acceptance (α = 0.81) and attitude (α = 0.83) (Malhotra & Galletta, 2005).

Given that perceived usefulness and perceived ease of use are assumed to be the two major factors that influence an individual's acceptance of technological systems (Davis, 1985), the present study only used these two indicators in all its analyses.

Research procedure and ethical considerations

After gaining ethical clearance from the Departmental Ethical Clearance Committee (IPPM-2020-422(M)), individuals were invited via LinkedIn to participate in the study. The

researchers also invited individuals in their wider networks to consider participating. Participants were informed that their participation was voluntary. No identifying biographical information was collected that ensured anonymity. Participants were informed that the data will be used for research purpose and the findings could be published in journals. Those that clicked on the link to the online survey consented to participate.

Statistical analysis

To determine the reliability of each of the measuring instruments, Cronbach's Alpha was determined. To investigate the three hypotheses, the present study employed partial least squares structural equation modelling (and more specifically mediation analysis) using JASP 0.17.2.1 (JASP Team, 2023). When using this approach, a two-stage process should be followed (Henseler et al., 2009). During the first stage, the quality of the measuring instruments to be used should be evaluated using various quality criteria (e.g., Cronbach's α and Dijkstra-Henseler's ρ). Once the outer model (i.e., measurement model) has been evaluated, the inner model (i.e., structural model) can be investigated. The latter emphasises the extent to which the proposed path coefficients are statistically significant, as well as the explanatory power of the model (R-squared).

To investigate possible mediation, the indirect and direct effects need to be consulted. If both the indirect and direct effects are statistically significant, this would provide evidence of partial mediation. However, when the indirect effect is statistically significant, but the direct effect is non-significant, this will point to full mediation (Hayes, 2018).

Ethical considerations

Ethical clearance to conduct this study was obtained from the Department of Industrial Psychology and People Management (IPPM) Research Ethics Committee (No. IPPM-2020-422[M]).

Results

Table 2 reports the reliability estimates of the measuring instruments used by the present study. It is evident that all the instruments had acceptable reliabilities, ranging between 0.792 and 0.955.

The study continued to evaluate the three hypotheses using partial least squares structural equation modelling, emphasising mediation. As stated earlier, the outer model (i.e., measurement model) needs to be evaluated before the inner model (i.e., structural model) can be used to evaluate the three hypotheses. From Table 3, it is evident that all the indicators used to evaluate the three hypotheses have acceptable levels of reliability (as quality criteria to evaluate the outer model). Given that work engagement was measured using a composite score, the reliability estimate is equal to 1. In addition, all the indicators have significant loadings with their respective latent variables (see Table 4). These two tables provide evidence that the outer model adheres to the guidelines set in terms of reliability and significant loadings.

TABLE 2: Reliability estimates.

Variable	Number of items	Cronbach's Alpha
Optimism (Technology readiness: Driver)	4	0.816
Innovativeness (Technology readiness: Driver)	4	0.831
Discomfort (Technology readiness: Inhibitor)	4	0.838
Insecurity (Technology readiness: Inhibitor)	4	0.792
Perceived usefulness (Technology acceptance)	6	0.955
Perceived ease of use (Technology acceptance)	4	0.929
Work engagement	9	0.914

TABLE 3: Outer model (reliability estimates).

Latent variable	Cronbach's Alpha	Dijkstra-Henseler's ρ
Technology acceptance	0.913	0.939
Technology readiness (Drivers)	0.583	0.617
Technology readiness (Inhibitors)	0.660	0.915
Work engagement	N/A	1.00

N/A, not applicable.

TABLE 4: Outer model (indicator loadings).

Latent variable	Indicator	Estimate	Standard error	*p*
Technology acceptance	P_USE	0.844	0.102	< 0.001
	P_EASE_USE	0.993	0.070	< 0.001
Technology readiness (Drivers)	OPT	0.752	0.248	0.001
	INNOV	0.544	0.149	< 0.001
Technology readiness (Inhibitors)	DISC	0.633	0.189	< 0.001
	INS	0.776	0.182	< 0.001
Work engagement	WE	1.00	0.000	< 0.001

P_USE, perceived usefulness; P_EASE_USE, perceived ease of use; OPT, optimism; INNOV, innovativeness; DISC, discomfort; INS, insecurity; WE, work engagement.

The results associated with the inner model (i.e., structural model) must be consulted to determine whether the proposed relationships (i.e., paths coefficients) are statistically significant, which is a key requirement before conducting mediation analysis (Hayes, 2018). It is evident from Table 5 that all the path coefficients were statistically significant, except between technology readiness (inhibitors) and technology acceptance ($p = 0.602$).

Given that the path between technology readiness (inhibitors) and technology acceptance was not statistically significant, the present study did not investigate the possible mediating effect of technology acceptance on the relationship between technology readiness (inhibitors) and work engagement.

To investigate the mediating effect of technology acceptance on the relationship between technology readiness (drivers) and work engagement, the results of Table 6 and Table 7 should be consulted. It is evident that all the proposed paths are statistically significant (see Table 6). Support was found for Hypothesis 1 indicating that technology readiness was significantly related to work engagement with the drivers having a positive influence on work engagement ($p = 0.009$). In addition, technology acceptance had a significant

TABLE 5: Inner model (path coefficients) (Round 1).

Path	Estimate	Standard error	*p*
TA -> WE	-0.142	0.057	0.012
TR_D -> TA	0.410	0.105	< 0.001
TR_I-> TA	-0.042	0.081	0.602
TR_D -> WE	0.187	0.075	0.013
TR_I->WE	-0.135	0.055	0.014

TA, technology acceptance; TR_D, technology readiness (drivers); TR_I, technology readiness (inhibitors); WE, work engagement.

TABLE 6: Inner model (path coefficients) (Round 2).

Path	Estimate	Standard error	*p*
TA -> WE	-0.136	0.058	0.019
TR_D -> TA	0.414	0.105	< 0.001
TR_D -> WE	0.198	0.076	0.009

TA, Technology Acceptance; TR_D, Technology readiness (drivers); WE, work engagement.

TABLE 7: Indirect effect (mediation).

Path	Estimate	Standard error	*p*
TR_D -> TA -> WE	-0.056	0.028	0.043

TA, technology acceptance; TR_D, technology readiness (drivers); WE, work engagement.

(but negative) relationship with work engagement ($p = 0.019$). Although surprising, it was not unexpected given the conflicting results reported by previous studies. The results therefore point to support for Hypothesis 2.

Although the indirect effect is statistically significant ($p = 0.043$) and negative (–0.056) (see Table 7), the direct effect (0.198) (the relationship between the drivers of technology readiness and work engagement) is also statistically significant ($p = 0.009$) but positive. Firstly, this implies that technology acceptance partially mediated the relationship between the drivers of technology readiness and work engagement, given that both the direct and indirect effects were statistically significant. Secondly, it should be noted that technology acceptance could act as a suppressor variable (Cohen et al., 2003) (given the negative value associated with the indirect effect), counteracting the positive effect technology readiness may have on individuals' levels of work engagement. These results therefore provide partial support for Hypothesis 3. It should also be noted that this mediating model explained 6.2% of the variance in work engagement, which is weak/small (Chin, 1998).

Discussion

The results revealed that there was a positive path coefficient between technology readiness (i.e., optimism and innovativeness) and work engagement. These results suggest that those who score higher on innovativeness and optimism are more engaged with their work. These findings are supported by Joseph et al. (2021) who found that the drivers of technology readiness (optimism and innovation) were significantly and positively related to teacher engagement. Optimism in this context refers to a positive outlook of technology and a conviction that technology provides greater control, versatility and productivity (Lin & Hsieh, 2007). Walczuch et al. (2007) suggest that technology is regarded by optimists as valuable and easy to utilise, which makes them less concerned about the potential negative/undesirable outcomes. Previous research has found that optimistic individuals (in general) have higher levels of work engagement. It is suggested that being optimistic assists employees to overcome challenging work demands by generating new ideas and approaching problems from a fresh perspective. They view job demands as challenges that can be successfully dealt with (Lussier & Hartman, 2017). It is therefore likely that individuals who are optimistic about technology are more likely to use that technology to control how work is done. It is also possible that being optimistic about technology allows individuals to use different types of technology to successfully complete their work facilitating their levels of work engagement. Innovators view technology as a possible resource to successfully complete their work. Innovativeness relates to a desire to be a forerunner in technology and a trailblazer in thought (Lin & Hsieh, 2007). Individuals who view technology from an innovative perspective are more likely to think that if they do not try new technology, they may lose those benefits (Walczuch et al., 2007) that could influence how they engage with their work.

The present study also found that technology acceptance has a significant negative path coefficient with work engagement. These results imply that those who have higher levels of technology acceptance have lower levels of work engagement, meaning that the more acceptant you are of technology, the less engaged you are likely to be. Previous research found that when employees experience work overload (as a result of technology use), their levels of psychological detachment increased (Sandoval-Reyes et al., 2019). It is possible that technology use may increase the amount of time employees spend on work, increasing the demands placed on them by their work and making it difficult to recuperate to continue working (Derks et al., 2014 as cited by Sandoval-Reyes et al., 2019). In short, employees may not have enough time to replenish their resources to stay engaged at work. This is supported by the Stressor-Detachment Model (Sonnentag et al., 2015 as cited by Sandoval-Reyes et al., 2019), which suggests that employees must be able to psychologically detach from job stress (such as technostress/techno-invasion/technology overuse), allowing them to physically and mentally disengage from their work to recuperate.

Using technology to facilitate work from home does not always have positive outcomes. For example, individuals may experience some technostress where computers and technology are used in the workplace (Srivastava et al., 2015). When technology is perceived as invasive (e.g., blurring the lines between work and home domains), it may have a negative influence on both employees (in the form of burnout) and organisations (in the form of lower productivity) (Tarafdar et al., 2015). These findings are in line with studies by Day et al. (2010), Sandoval-Reyes et al. (2019) and Shamsi et al. (2021), who found that the adoption of technology can be stressful for employees. From this viewpoint, it can be deduced that technology acceptance can be perceived as a job demand that adds to job pressure, effort and workload. Furthermore, being acceptant of technology can impact

negatively on employees' well-being who either work in the office or from home (Day et al., 2010). Previous research found that some employees felt that excessive acceptance of technology could lead to addiction (i.e., relates to individuals engaging in certain behaviours for motivation, ease or relief, and this may lead to a certain kind of unease or discomfort when discontinued), which can spill over to their personal lives and can decrease their levels of well-being (e.g., work engagement) (Porter & Kakabadse, 2006).

Lastly, the results indicated that technology acceptance partially mediated the relationship between the drivers of technology readiness and work engagement. It should also be noted that this indirect effect was small (–0.056) compared to the direct effect (0.198), with technology acceptance acting as a suppressor variable. The positive path coefficient (0.414) between technology readiness (drivers) and technology acceptance is supported by the TRAM with those employees with a positive predisposition (i.e., being technology ready) are more likely to accept technology. More specifically, individuals who have personal resources (e.g., optimism and innovativeness) are more likely to have positive perceptions of the use and ease of use of technology doing their work. However, in the present study, technology acceptance could have acted as a job demand (being perceived as invasive) that adds to job pressure, effort and workload counteracting the positive influence technology readiness has on work engagement. Given that the data was collected during COVID-19, this seems plausible. Furthermore, being acceptant of technology can impact negatively on employees' well-being who either work in the office or from home (Day et al., 2010; Shamsi et al., 2021). This argument seems to be supported by the findings reported by Pansini et al. (2023) based on a systematic literature review. These authors provided evidence of research that suggested that technology may act as a job demand. Highlighting research from Day et al. (2012), technology can become a demand if it leads to employees experience higher workload, learning expectations, and the overuse of technological devices (to mention just a few).

In summary, access to personal resources such as optimism and innovativeness (i.e., drivers of technology readiness) has a stronger influence on work engagement (as evident from the positive direct effect), whereas actually using these resources to constantly engage with technology doing one's work (technology acceptance) may negatively influence levels of work engagement.

Practical implications

The present study found that both technology readiness and acceptance influenced individuals' levels of work engagement. More specifically, it seems as if innovation and optimism (regarding the use of technology) are the positive drivers of work engagement. Organisations would do well by providing employees with the necessary exposure to technology to improve their perceptions of technological innovations and how this can make their work easier to complete. In addition, organisations are encouraged to provide training interventions in the use of various technologies used to improve employees' levels of confidence in using technology to complete their work. However, the need to use technology wisely in the completion of one's work is important because of the possible demand it may place on individuals.

Limitations and recommendations

No study is without limitations. Although the present sample provides some support for the use of technology readiness and acceptances as drivers of work engagement, the relatively small sample may limit the generalisability of the findings. Future researchers are encouraged to replicate the present study using a bigger sample to determine the validity of the obtained results. In addition, a larger sample should also be considered to increase the statistical power of the present study. Although the majority of the research objectives were achieved, the mediating effect of technology acceptance on the relationship between technology readiness and work engagement was only partially supported. A bigger sample could possibly find a full mediating effect.

Although the above methodological recommendations are suggested, future studies would do well to also deal with conceptual matters. Given that the present study only focused on technology acceptance as a possible mediator, future research should consider the inclusion of other mediators. For example, technostress (Mahapatra & Pati, 2018; Srivastava et al., 2015) is a worthwhile strain (i.e., demand) to include in the mediation model. Hence, the extent to which the use of technology leads to the experience of technostress, ultimately influencing work engagement should be investigated.

Conclusion

The present study provides empirical evidence regarding the influence of personal resources employees can access when technology is being introduced in the workplace. The positive influence of technology readiness on work engagement suggests that employees' levels of optimism and innovativeness (as it relates to technology) are key drivers to be considered when introducing technology in the workplace. However, the possibility that technology acceptance acted as a suppressor variable, counteracting the influence of technology readiness on work engagement should not be ignored. Organisations would do well to understand both the positive and negative influence that technology may have on employees' levels of work engagement. When the use of technology is perceived as a job demand (either in terms of learning or an increase in workload), organisations need to develop interventions to mitigate its negative influence on work engagement.

Acknowledgements

This article is based on the author's thesis entitled 'The influence of technology readiness and acceptance thereof on employees' levels of wellbeing: A job demands-resources perspective' towards the degree of Master's of Commerce (Industrial

Psychology) in the Department of Industrial Psychology and People Management, University of Johannesburg, South Africa in May 2022, with supervisor: Professor Petrus Nel and Co-supervisor: Dr. Tshegofatso Mabitsela. It is available here: https://hdl.handle.net/10210/502449

Competing interests

The authors declare that they have no financial or personal relationships that may have inappropriately influenced them in writing this article.

Authors' contributions

T.K.K. was responsible for the data-gathering, writing of the draft article, project administration and obtaining the necessary resources and writing of the discussion and conclusion. T.M. was involved in the conceptualisation of the research and the review and editing of the article and supervision. P.N. was responsible for the conceptualisation of the research, methodology, data analysis and writing of the discussion and conclusion.

Funding information

This research received no specific grant from any funding agency in the public, commercial, or not-for-profit sectors.

Data availability

Data sharing is not applicable to this article as no new data were created or analysed in this study.

Disclaimer

The views and opinions expressed in this article are those of the authors and do not necessarily reflect the official policy or position of any affiliated agency of the authors.

References

Bakker, A.B., Demerouti, E., & Sanz-Vergel, A. (2023). Job demands-resources theory: Ten years later. *Annual Review of Organizational Psychology and Organizational Behavior, 10*, 25–53. https://doi.org/10.1146/annurev-orgpsych-120920-053933

Blut, M., & Wang, C. (2020). Technology readiness: A meta-analysis of conceptualizations of the construct and its impact on technology usage. *Journal of the Academy of Marketing Science, 48*, 649–669. https://doi.org/10.1007/s11747-019-00680-8

Bordi, L., Okkonen, J., Mäkiniemi, J.P., & Heikkilä-Tammi, K. (2018). Communication in the digital work environment: Implications for wellbeing at work. *Nordic Journal of Working Life Studies, 8*(S3), 29–48. https://doi.org/10.18291/njwls.v8iS3.105275

Chin, W.W. (1998). The partial least squares approach for structural equation modeling. In G.A. Marcoulides (Ed.), *Modern methods for business research* (pp. 295–336). Lawrence Erlbaum Associates Publishers.

Cohen, J., Cohen, P., West, S.G., & Aiken, L.S. (2003). *Applied multiple regression/correlation analysis for the behavioral sciences* (3rd edn.). Erlbaum.

Coombs, C. (2020). Will COVID-19 be the tipping point for the intelligent automation of work? A review of the debate and implications for research. *International Journal of Information Management, 55*, 1–4. https://doi.org/10.1016/j.ijinfomgt.2020.102182

Davis, F.D. (1985). *A technology acceptance model for empirically testing new end-user information systems: Theory and results*. Doctoral dissertation. Massachusetts Institute of Technology.

Davis, F.D., Bagozzi, R.P., & Warshaw, P.R. (1986). User acceptance of computer technology: A comparison of two theoretical models. *Management Science, 35*(8), 982–1003. https://doi.org/10.1287/mnssc.35.8.982

Day, A., Paquet, S., Scott, N., & Hambley, L. (2012). Perceived Information and Communication Technology (ICT) demands on employee outcomes: The moderating effect of organizational ICT support. *Journal of Occupational Health Psychology, 17*(4), 473–491. https://doi.org/10.1037/a0029837

Day, A., Scott, N., & Kelloway, E.K. (2010). Information and communication technology: Implications for job stress and employee well-being. In P.L. Perrewé & D.C. Ganster (Eds.), *New Developments in Theoretical and Conceptual Approaches to Job Stress* (Research in Occupational Stress and Well Being, Vol. 8) (pp. 317–350), Emerald Group Publishing Limited, Leeds.

Erdoğmuş, N., & Eden, M. (2011). An investigation of the effects of technology readiness on technology acceptance in e-HRM. *Procedia – Social and Behavioral Sciences, 24*, 487–495. https://doi.org/10.1016/j.sbspro.2011.09.131

Esen, M., & Erdoğmuş, N. (2014). Effects of technology readiness on technology acceptance in E-HRM: Mediating role of perceived usefulness. *The Journal of Knowledge Economy & Knowledge Management, 9*(1), 7–21.

Godoe, P., & Johansen, T.S. (2012). Understanding adoption of new technologies: Technology readiness and technology acceptance as an integrated concept. *Journal of European Psychology Students, 3*(1), 38–52. https://doi.org/10.5334/jeps.aq

Hayes, A.F. (2018). *Introduction to mediation, moderation, and conditional process analysis. A regression-based approach* (2nd edn.). The Guilford Press.

Henseler, J., Ringle, C.M., & Sinkovics, R.R. (2009). The use of partial least squares path modeling in international marketing. In R.R. Sinkovics, & P.N. Ghauri (Eds.), *New challenges to international marketing* (Advances in International Marketing, Vol. 20) (pp. 277–319). Emerald Group Publishing Limited.

Imran, M., Maqbool, N., & Shafique, H. (2014). Impact of technological advancement on employee performance in banking sector. *International Journal of Human Resource Studies, 4*(1), 57–70. https://doi.org/10.5296/ijhrs.v4i1.5229

JASP Team. (2023). JASP (Version 0.17.2.1) [Computer software].

Joseph, G.V., Thomas, K.A., & Nero, A. (2021). Impact of technology readiness and techno stress on teacher engagement in higher secondary schools. *Digital Education Review, 40*(40), 51–65. https://doi.org/10.1344/der.2021.40.51-65

Kaasinen, E., Liinasuo, M., Schmalfuß, F., Koskinen, H., Aromaa, S., Heikkilä, P., Honka, A., Mach, S., & Malm, T. (2019). A worker-centric design and evaluation framework for operator 4.0 solutions that support work well-being. In B.R. Barricelli, V. Roto, T. Clemmensen, P. Campos, A. Lopes, F. Gonçalves, & J. Abdelnour-Nocera (Eds.), *Human work interaction design. Designing engaging automation*. HWID 2018 (Vol. 544) (pp. 263–282). IFIP Advances in Information and Communication Technology. Springer, Cham.

Khan, A.N. (2021). A diary study of psychological effects of misinformation and COVID-19 threat on work engagement of working from home employees. *Technological Forecasting and Social Change, 17*, 120968. https://doi.org/10.1016/j.techfore.2021.120968

Lam, S.Y., Jeongwen, C., & Parasuraman, A. (2008). The effects of the dimensions of technology readiness on technology acceptance: An empirical analysis. *Journal of Interactive Marketing, 22*(4), 19–39. https://doi.org/10.1002/dir.20119

Lin, J.S.C., & Hsieh, P.L. (2007). The influence of technology readiness on satisfaction and behavioral intentions toward self-service technologies. *Computers in Human Behavior, 23*(3), 1597–1615. https://doi.org/10.1016/j.chb.2005.07.006

Lussier, B., & Hartmann, N.N. (2017). How psychological resourcefulness increases salesperson's sales performance and the satisfaction of their customers: Exploring the mediating role of customer-oriented behaviors. *Industrial Marketing Management, 62*, 160–170. https://doi.org/10.1016/j.indmarman.2016.08.009

Mahapatra, M., & Pati, S.P. (2018). Technostress creators and burnout: A job demands-resources perspective. *In Proceedings of the 2018 ACM SIGMIS conference on computers and people research* (pp. 70–77). https://doi.org/10.1145/3209626.3209711

Malhotra, Y., & Galletta, D. (2005). A multidimensional commitment model of volitional systems adoption and usage behavior. *Journal of Management Information Systems, 22*(1), 117–151.

Molino, M., Cortese, C.G., & Ghislieri, C. (2020). The promotion of technology acceptance and work engagement in industry 4.0: From personal resources to information and training. *International Journal of Environmental Research and Public Health, 17*(7), 2438. https://doi.org/10.3390/ijerph17072438

Pansini, M., Buonomo, I., De Vincenzi, C., Ferrara, B., & Benevene, P. (2023). Positioning technostress in the JD-R model perspective: A systematic literature review. *Healthcare, 11*(446), 1–23. https://doi.org/10.3390/healthcare11030446

Parasuraman, A., & Colby, C.L. (2015). An updated and streamlined technology readiness index: TRI 2.0. *Journal of Service Research, 18*(1), 1–16. https://doi.org/10.1177/1094670514539730

Porter, G., & Kakabadse, N.K. (2006). HRM perspectives on addiction to technology and work. *Journal of Management Development, 25*(6), 535–560. https://doi.org/10.1108/02621710610670119

Sandoval-Reyes, J., Acosta-Prado, J.C., & Sanchís-Pedregosa, C. (2019). Relationship amongst technology use, work overload, and psychological detachment from work. *International Journal of Environmental Research and Public Health, 16*(23), 4602. https://doi.org/10.3390/ijerph16234602

Schaufeli, W.B., & Bakker, A.B. (2004). Job demands, job resources, and their relationship with burnout and engagement: A multi-sample study. *Journal of Organizational Behavior, 25*(3), 293–315. https://doi.org/10.1002/job.248

Schaufeli, W.B., Bakker, A.B., & Salanova, M. (2006). The measurement of work engagement with a short questionnaire: A cross-national study. *Educational and Psychological Measurement, 66*(4), 701–716. https://doi.org/10.1177/0013164405282471

Schaufeli, W.B., Salanova, M., González-Romá, V., & Bakker, A.B. (2002). The measurement of burnout and engagement: A two sample confirmatory factor analytic approach. *Journal of Happiness Studies, 3*(1), 71–92. https://doi.org/10.1023/A:1015630930326

Shamsi, M., Iakovleva, T., Olsen, E., & Bagozzi, R.P. (2021). Employees' work-related well-being during COVID-19 pandemic: An integrated perspective of technology acceptance model and JD-R theory. *International Journal of Environmental Research and Public Health, 18*(22), 11888. https://doi.org/10.3390/ijerph182211888

Srivastava, S.C., Chandra, S., & Shirish, A. (2015). Technostress creators and job outcomes: Theorising the moderating influence of personality traits: Technostress creators and job outcomes. *Information Systems Journal, 25*(4), 355–401. https://doi.org/10.1111/isj.12067

Sun, S., Lee, P.C., Law, R., & Hyun, S.S. (2020). An investigation of the moderating effects of current job position level and hotel work experience between technology readiness and technology acceptance. *International Journal of Hospitality Management, 90*, 102633, https://doi.org/10.1016/j.ijhm.2020.102633

Sun, S, Lee, P., & Law, R. (2019). Impact of cultural values on technology acceptance and technology. *International Journal of Hospitality Management, 77*, 89–96. https://doi.org/10.1016/j.ijhm.2018.06.017

Sun, H., & Zhang, P. (2006). The role of moderating factors in user technology acceptance. *International Journal of Human-Computer Studies, 64*(2), 53–78. https://doi.org/10.1016/j.ijhcs.2005.04.013

Tarafdar, M., D'Arcy, J., Turel, O., & Gupta, A. (2015). The dark side of information technology. *MIT Sloan Management Review, 56*(2), 600e623. Retrieved from https://sloanreview.mit.edu/article/the-dark-side-of-information-technology/

Vallières, F., McAuliffe, E., Hyland, P., Galligan, M., & Ghee, A. (2017). Measuring work engagement among community health workers in Sierra Leone: Validating the Utrecht work engagement scale. *Journal of Work and Organizational Psychology, 33*(1), 41–46. https://doi.org/10.1016/j.rpto.2016.12.001

Walczuch, R., Lemmink, J., & Streukens, S. (2007). The effect of service employees' technology readiness on technology acceptance. *Information & Management, 44*(2), 206–215. https://doi.org/10.1016/j.im.2006.12.005

Wang, B., Liu, Y., Qian, J., & Parker, S.K. (2021), Achieving effective remote working during the COVID-19 pandemic: A work design perspective. *Applied Psychology, 70*(1), 16–59. https://doi.org/10.1111/apps.12290

Zeike, S., Choi, K.-E., Lindert, L., & Pfaff, H. (2019). Managers' well-being in the digital era: Is it associated with perceived choice overload and pressure from digitalization? An exploratory study. *International Journal of Environmental Research and Public Health, 16*(10), 1746. https://doi.org/10.3390/ijerph16101746