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Contextual resources and digital attitudes (CResDA) supporting technology acceptance: measurement and conceptual validation

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ABSTRACT

The success of digital transformation depends in part on employees' attitudes towards technology (*digital attitudes*) and how supportive the organisational context is for digital change (workplace *contextual resources*). Previous digital attitude measures suffer from conceptual overlap and do not consider the role of contextual resources in shaping attitudes which means that research and practice may not be fully capturing the complexity of factors influencing digital attitudes within digital change contexts. This paper creates and validates a new comprehensive measure of **C**ontextual **Res**ources and **D**igital **A**ttitudes (CResDA). Conceptual validation was conducted with experts in digital transformation, generating an item bank for CResDA. Two samples of employees ($N = 1108$) going through digital transformation were recruited using Prolific Academic and completed the survey at two time points. Exploratory and confirmatory factor analyses revealed that CResDA consists of six digital attitudes – Win-Win Mindset, No-Win Mindset, Fixed Digital Mindset, Technology Competence, Trust in Technology, and Personal Innovativeness – and four contextual resources – Team Support, Line Manager Support, Change Leadership Support, and Organisational Support. CResDA exhibited good psychometric properties, predictive validity, and minimal risk-of-bias. This work contributes to previous literature by providing a multi-level measure of contextual resources and refining/synthesising digital attitude concepts for predicting technology acceptance in digital transformation.

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Digital attitudes; organisational support; digital transformation; scale validation; technology acceptance; scale development

Businesses are rapidly undergoing large-scale digital transformation (European Investment Bank 2023), which involves implementing new technologies that can alter established ways of work, organisational processes, and structure (Rachinger et al. 2019) to increase organisational productivity (Cheng, Zhou, and Li 2023) and to achieve sustainability goals (Feroz, Zo, and Chiravuri 2021). Amidst these changes, employees play a key role in promoting the success of digital transformation by driving forward different projects, which may vary in their size, complexity, and timing of technology implementation (Ellström et al. 2022). This dynamic context can prompt employees to experience swift changes to their work tasks due to the increased use of robotics, machine learning, and AI (Loebbecke and Picot 2015), and to fear that digital transformation will lead to extensive retraining, having to occupy unfamiliar roles, or having their jobs replaced by the technology (Birkel et al. 2019). These fears can prompt employees to develop negative attitudes towards such new technologies (Shojaei and Burgess 2022) and reduce technology use (Henderson, Bradford, and Kotb 2016), particularly when they do not perceive that sufficient organisational support for navigating the digital change has been provided (Kane et al. 2015). Therefore, as changes in employee attitudes towards new technologies can affect the extent to which employees accept and use them (Cavalcanti, Oliveira, and de Oliveira Santini 2022), businesses should prepare and support their workforces for using the new digital technologies (Gupta 2018). To achieve this goal, businesses should comprehensively measure employees' perceptions of within-organisation support (which we refer to as *contextual resources*) and their

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attitudes and beliefs towards workplace technologies (which we refer to as *digital attitudes*) before and during the digital transformation process to identify gaps and areas for improvement.

Attitudes and beliefs are considered forms of mental representation with attitudes representing specific evaluations of positivity or negativity towards a certain object, and beliefs referring to the attribution of whether something is true or not (Kruglanski and Stroebe 2005). For reasons of parsimony, and because the evaluation of the attitude object consists of the individual's belief patterns and affective responding to this object (Eagly and Chaiken 2007), we subsume attitudes and beliefs towards technology under the umbrella term of 'digital attitudes' in the current research. The technology acceptance literature (e.g. Solberg, Traavik, and Wong 2020; Venkatesh et al. 2003) demonstrates that having positive digital attitudes is associated with technology acceptance (perceptions that technology is useful and easy to use, Venkatesh et al. 2003), greater intentions to use technology, and increased use of technology (Chen and Zhou 2022; Santini et al. 2019). Two meta-analyses (Blut et al. 2022; Cavalcanti, Oliveira, and de Oliveira Santini 2022) illuminate important digital attitudes that can influence the success of digital transformation initiatives, such as personal innovativeness (Rogers 2003), technology enthusiasm (Hampel et al. 2022), computer self-efficacy (Compeau and Higgins 1995), and perceived threat from adopting technology (Clauson 2022). Other important digital attitudes include beliefs about the role of technology in the workplace – fixed digital mindset (belief that one's ability to use technology is not subject to change; Rasmussen-Moseid and Botero 2020) and zero-sum mindset (belief that new technologies will lead to benefits only for the organisation; Kloven and Carlsen 2020). Assessing such a wide array of digital attitude concepts can help to illuminate the varied tendencies of different parts of the workforce to accept new technologies introduced during digital transformation.

Despite calls for measuring multiple digital attitudes simultaneously to better predict technology acceptance (Blut et al. 2022; Cavalcanti, Oliveira, and de Oliveira Santini 2022), most studies examine only a subset (e.g. Chen and Zhou 2022; Henderson, Bradford, and Kotb 2016). For example, Hampel et al. (2022) measured some digital attitudes (perceived threat, enthusiasm, job insecurity) towards the adoption of robots but not other digital attitudes that may have also influenced the acceptance of this technology. While measuring multiple digital attitudes can help to establish which attitudes best predict technology acceptance, current digital attitude concepts may exhibit conceptual similarity (Blut et al. 2022; Cavalcanti, Oliveira, and de Oliveira Santini 2022) and have been mostly developed outside of digital transformation contexts (e.g. affinity for technology; Edison and Geissler 2003). Consequently, existing digital attitude measures may not sufficiently capture the complexity of how introducing new technologies in modern workplaces can influence changes to the work processes, structures, and roles within an organisation. Therefore, examining where conceptual overlap occurs and refining or synthesising digital attitude measures where appropriate will help to address redundancy and create distinguishable attitude constructs that predict technology acceptance in digital transformation contexts.

To support their employees in developing positive digital attitudes and accepting new technologies, businesses can develop an organisational context in which resources for promoting digital transformation are plentiful. Resources are defined as 'physical, psychological, social, or organisational aspects of the job that are functional in achieving work goals or stimulate personal growth and development' (Demerouti et al. 2001, 3). Examples of contextual resources can include leveraging social influence for using technology within teams (by encouraging team members to use technology; Venkatesh et al. 2003), fostering an innovation climate (by encouraging innovative behaviour; Guo, Wang, and Feng 2019), and providing training for using new technologies (Chen and Zhou 2022). Providing various contextual resources represents the foundational support that can enable employees to develop positive digital attitudes towards the technologies being implemented (Hampel et al. 2022) and to accept these technologies (Venkatesh et al. 2003).

Contextual resources have previously been found to be related to support for digital transformation activities (Gupta 2018; Trenerry et al. 2021), yet most empirical studies examine specific resources that affect only employees, management, or organisational processes (for some examples see Guo, Wang, and Feng 2019; Henderson, Bradford, and Kotb 2016; Paganin and Simbula 2021). After systematically examining this literature, Trenerry et al. (2021) highlight important factors at the employee, group and organisational/leadership levels and suggest that their impact on digital transformation activities needs to be measured and examined together. As digital transformation can necessitate employee retraining as well as alterations to work design, work processes, and organisational structure (Rachinger et al., 2018), providing support to employees should extend beyond simply familiarising them with the newly-implemented technologies. Thus, it is important to examine how contextual resources from different levels influence digital attitudes and technology acceptance.

To address these gaps and limitations in the literature, this paper sets out to develop a comprehensive

measure of **C**ontextual **Res**ources and **D**igital **A**ttitudes (CResDA), which predicts technology acceptance in digital transformation contexts. This paper has two aims: 1) to develop a measure that assesses employee perceptions of support (contextual resources) during digital transformation, and 2) to develop a comprehensive measure of digital attitudes that are conceptually appropriate for digital transformation contexts.

We develop CResDA within a nomological network that draws on Conservation of Resources (COR) theory (Hobfoll et al. 2018) and the IGLO framework (Nielsen et al. 2018). COR theory proposes that employees experience the need to preserve resources in the workplace (such as contextual resources) and that those resources can foster more personal psychological resources such as positive attitudes (Hobfoll et al. 2018). We apply the IGLO framework (Nielsen et al. 2018) to categorise the different contextual resources within organisations at distinct levels of influence (i.e. the individual, group, leader, and organisational level) and discuss the impact of each of these levels on fostering digital attitudes and technology acceptance.

1. Literature review

1.1. Contextual resources that promote positive digital attitudes

COR theory (Hobfoll et al. 2018) proposes that resource caravans can form where workplace resources (i.e. different forms of support) can foster the development of other, more personal resources, such as positive attitudes towards work. Following this line of reasoning, ten Brummelhuis and Bakker (2012) argue that important contextual resources (providing workplace support, offering opportunities for feedback, upskilling employees through education and training, and increasing employees' sense of autonomy) can create an environment which promotes personal psychological resources. Applying the COR framework to the use of AI in organisations, Bankins et al. (2024) argue that organisational resource investment (such as promoting learning or fostering a safety culture) can promote personal resources (such as positive emotions or attitudes towards AI). Christ-Brendemühl and Schaarschmidt (2020) also consider optimism towards technology – an example of a digital attitude – as a personal psychological resource. Due to this evidence, we treat support from different levels within the organisation as contextual resources and digital attitudes as personal psychological resources in line with the COR framework.

In COR theory (Hobfoll et al. 2018), contextual resources are proposed to influence personal resources (e.g. positive attitudes) as well as subsequent behaviour. Extrapolating this logic to the context of digital change, we expect that both types of resources (i.e. personal digital attitudes, and contextual organisational support) will predict employee behaviour (such as the extent to which they accept the technology). To develop and validate a comprehensive multi-level measure of contextual resources as part of CResDA, we use the IGLO framework as a structural heuristic.

1.1.1. The IGLO framework

The IGLO framework (Nielsen et al. 2018) provides a structure to help identify resources at the *individual*, *group*, *leader*, and *organisational* levels, which can help to explain the success of, and positive attitudes towards organisational interventions. Providing support at these different levels during organisational interventions has been proposed to promote personal psychological resources and positive organisational outcomes such as performance (Nielsen et al. 2017). Applying this reasoning to the digital transformation context, we posit that the provision of group, leader, and organisational resources can influence digital attitudes (Bankins et al. 2024; Hampel et al. 2022) as well as technology acceptance (Venkatesh et al. 2003). We describe resources that belong to these levels next.

At the group level, D'angelo, Ghezzi, and Cavallo (2024) suggest that the presence of role models can promote a positive attitude towards new technologies amongst team members. Gupta (2018) suggests that employees from the same team who support each other in learning about new technologies can exhibit openness to the digital transformation. Establishing psychological safety (Edmondson 1999), a team atmosphere in which it is safe to discuss the opportunities and challenges of adopting new technology, can also stimulate positive attitudes towards technology use (Wong et al. 2023). Therefore, we included items relating to these contextual resources at the group level in the development of CResDA.

The change management literature notes the importance of providing support from management to facilitate employee acceptance of digital technologies (Bellantuono et al. 2021). Similarly, the leadership literature suggests that types of leadership – such as transformational leadership – can influence employee innovative behaviour within changes in the IT sector (Rehmani et al. 2023). Line managers can also exert an influence on fostering digital attitudes, intentions to use new technology, and usage behaviours (Hess et al. 2016). For example, line managers may encourage positive digital attitudes through adopting transformational leadership behaviours (Andersen 2016), by reassuring employees that digital transformation projects

do not pose a threat to their jobs (Henderson, Bradford, and Kotb) and by being open to two-way feedback (Toves, Graf, and Gould 2016). Therefore, we include items capturing line managers' actions, which could foster positive digital attitudes and technology acceptance. Additionally, change leaders are a key point of leadership support for employees, such as through involving them in the design of digital transformation projects (Ullrich et al. 2023), by creating common goals and practices for everyone to follow (Jiang, Klein, and Fernandez 2018), and by providing communication about why technology is being used and how (Ellström et al. 2022). These change leadership support activities are likely to be important in fostering positive digital attitudes, and so we include items from these contextual resources to assess employees' perception of support at the change leader level.

Support at the organisational level includes providing training (leading to greater self-efficacy; Chen and Zhou 2022), forging collaborations between employees with complementary skills (reducing the threat from technology; Jacob, Sanchez-Vazquez, and Ivory 2020), and establishing an innovation culture (facilitating positive digital attitudes such as digital self-efficacy; Paganin and Simbula 2021). In line with this, the change management literature notes the importance of building a transformational organisational culture which supports innovation and change in dynamic environments as employees who work within such cultures can exhibit enhanced motivation (a personal psychological resource) to meet organisational goals (such as accepting new technologies) (Parry and Proctor-Thomson 2002). Building on COR theory, Bankins et al. (2024) suggest that organisations can design and implement technology that complements employees' skills, which reduces employees' perceptions of threat from technology and increases their trust in technology. As these types of organisational support are likely to facilitate the development of positive digital attitudes, we include items that assess contextual resources at the organisational level.

1.2. Digital attitudes at work

We adapt Kocak and Pawlowski (2023, 17)'s definition of attitudes and apply it to the context of technology; thus, digital attitudes are defined as 'mental states of readiness structured by experience that guide individuals' responses' towards digital technologies. As previously argued, because attitudes are formed as a result of individual belief patterns as well as their affective responses to an object (Eagly and Chaiken 2007), we consider both attitudes and beliefs towards digital technologies as digital attitude concepts within the current work. Digital attitude concepts have theoretical underpinnings in multiple disciplines, including marketing (e.g. affinity towards technology, Edison and Geissler 2003), economics (e.g. zero-sum mindset, Solberg, Traavik, and Wong 2020), information management (e.g. trust towards technology, Arfi et al. 2021) and psychology (e.g. computer self-efficacy, Compeau and Higgins 1995). This diffusion across disciplines could have contributed to the development of constructs that overlap in meaning. For example, fixed digital mindset and computer self-efficacy may conceptually overlap as they both refer to an ability to use technology, with the former referring to employee beliefs about how static their core ability to learn about and use technology is (Solberg, Traavik, and Wong 2020) and the latter referring to a belief in one's ability to use technology for completing work tasks (Compeau and Higgins 1995). Furthermore, some items from digital attitude scales may overlap in meaning and thus be redundant. For example, items from fixed digital mindset (Rasmussen-Moseid and Botero 2020) and affinity for technology (Edison and Geissler 2003) scales both refer to employees' abilities to learn about new technologies. Due to these reasons, we integrate these constructs together into one holistic sub-measure of CResDA to explore how distinct they are (Blut et al. 2022) and to assess the relationships between them and technology acceptance.

1.2.1. Digital attitude concepts

A recent literature review (Zhang et al. 2025) suggests that different digital attitudes are important in predicting technology acceptance in digital transformation settings. Following this work, we include the following categories of key digital attitude concepts that have been previously suggested as possible predictors of technology acceptance for examination in CResDA.

Affinity for technology (Edison and Geissler 2003) refers to a general orientation and enjoyment towards using technology and has been linked with greater technology use (e.g. low-code IT solutions; Elshan, Dickhaut, and Ebel 2023) and increased technology acceptance (Castritius et al. 2020). Employees with a greater affinity towards technology may also feel more competent in using digital tools as Mason and Woodward (2025) found that psychologists who liked using telehealth services to work with their patients held stronger beliefs in their ability to use the telehealth service. Therefore, we include items from a previous measure of affinity towards technology.

Believing that one is competent enough to use new technologies is also central in forming employees'

digital attitudes. One such construct, computer self-efficacy (Compeau and Higgins 1995), represents a belief in one's ability to use technology for completing work tasks. Computer self-efficacy has been previously associated with technology acceptance (Santini et al. 2019) and use (Chen and Zhou 2022) and thus can be seen as an important positive digital attitude in the context of digital transformation. Due to these reasons, we include items relating to computer self-efficacy.

How employees expect to learn about and use technology may also inform their attitudes towards it. Having a fixed digital mindset means holding a belief that one's ability to learn about and use any technology is permanent and not subject to change (Solberg, Traavik, and Wong 2020). Maintaining this mindset has been associated with technology avoidance (Rasmussen-Moseid and Botero 2020). A more positive digital attitude – personal innovativeness – refers to the general willingness of individuals to try out new technology (Rogers 2003) and has been associated with greater perceptions of technology as being useful and easy to use (Meng, Kim, and Hwang 2015; Turan, Tunç, and Zehir 2015). As fixed digital mindset and personal innovativeness have been previously associated with technology acceptance, we include items relating to these constructs.

Employees may also form digital attitudes by reflecting on whether technology implementation will result in benefits for employees as well as for the organisation. A construct that represents this – expandable-sum mindsets – refers to believing that implementing technology can lead to positive changes for employees' job design and job security. Holding expandable-sum beliefs about technology might lead to faster technology acceptance (Solberg, Traavik, and Wong 2020) and readiness for digital transformation (Kloven and Carlsen 2020). As expandable-sum mindsets relate to employees' perceptions of new technology (Kloven and Carlsen 2020), we include items relating to expandable-sum mindsets in the measure.

Other optimistic attitudes about the effects of technology are also likely to foster technology acceptance. Such optimism might include believing that technology implementation will lead to better outcomes for the organisation (Li, Hess, and Valacich 2008), achieving satisfaction from interacting with technology (Bhattacherjee 2001), and seeing the implementation of technology as an opportunity for upskilling rather than displacement (Schneider and Sting 2020). Optimism about the effects of technology has also been previously related to increased use of technology in professional settings (Celik and Yesilyurt 2013). To capture this positive attitude, we include items that relate to optimistic job prospects from technology, achieving satisfaction from interacting with technology, and seeing technology as an opportunity for upskilling.

However, technology apprehension can prevent the successful implementation of digital transformation initiatives (Birkel et al. 2019) and can lead employees to use new technologies less (Henderson, Bradford, and Kotb 2016). The inverse of expandable-sum mindsets – zero-sum mindsets – represent beliefs that the introduction of new technology will lead to detrimental consequences for employees' job security and undesirable changes to their job design. Such changes in employees' job design (Ebert and Duarte 2018) can reduce the meaningfulness of their work and cause them to experience job insecurity (Hampel et al. 2022). Employees may also perceive new technology as threatening to their jobs if they are not informed about the positives from digital transformation (Shojaei and Burgess 2022). Furthermore, employees may not trust that new technologies will be accurate or help them in their job and instead choose to rely on their own experience and intuition in dealing with an issue (Poncette et al. 2019). To capture these more negative attitudes, we include items to measure different aspects of technology apprehension, including zero-sum mindsets, perceived threat from technology, and lacking trust in technology.

2. Materials and methods

2.1. Procedure

To create and validate CResDA, we received ethical approval via the University of Sheffield's Ethics Review Procedure, as administered by Sheffield University Management School with number 044285. We followed best practice recommendations in work and organisational psychology (Wright et al. 2017). We first included items that related to existing digital attitude measures: affinity for technology (Edison and Geissler 2003), computer self-efficacy (Edison and Geissler 2003), fixed digital mindset (Rasmussen-Moseid and Botero 2020), and personal innovativeness (Mohr and Kühl 2021), and kept those in line with their initial formulations. We adapted the wording of items that related to zero-sum and expandable-sum mindsets (Kloven and Carlsen 2020) to refer to attitudes towards new technologies introduced as part of digital transformation more generally rather than one specific technology (such as Microsoft Teams in Kloven and Carlsen 2020).

In addition, we conducted an initial set of interviews with employees and consultants with experience in

digital transformation to ascertain whether we covered all contextual resources and digital attitudes that might be important in digital transformation. We interviewed experts rather than shop floor employees because we expected that the experts would be more familiar with how digital transformation changes organisational processes, structures, and work designs. The interviews revealed the importance of measuring contextual support at IGLO levels, as well as focusing on technology apprehension and optimism about technology as important sets of digital attitudes. Previous literature has largely neglected the role of contextual resources in promoting digital attitudes during digital transformation (c.f., Hampel et al. 2022), and so we developed new items for contextual resources on all IGLO levels by using the interview data (e.g. 'The people responsible for implementing this new technology in my organisation use language people understand'). Previous measures of trust in technology (Li, Hess, and Valacich 2008) and perceived threat from technology (Clauson 2022) did exist but we considered those inappropriate for inclusion because they differed from the descriptions of these concepts in the interviews, which focused more on advanced technologies such as those involving algorithmic decision-making (see the Supplementary Online Material, SOM). For example, the existing measure of technology threat (Clauson 2022) focuses on struggling to learn technology, making mistakes in using it, or risk of physical injury, and the existing trust in technology measure (Li, Hess, and Valacich 2008) concerned trust in national security systems. These issues were not raised in our interviews, and so we developed items that referred to areas that the interviewees considered important when working with advanced technologies such as those using algorithmic decision-making in digital transformation settings. Example items include: for technology apprehension (e.g., 'I am concerned that roles will be lost in my organisation as we use more technology') and optimism about technology (e.g. 'New technologies can be trusted to do a good job').

To conceptually validate CResDA, eight experts with considerable experience of digital change completed all items and gave their feedback in subsequent interviews (to see the full list of items considered for inclusion in CResDA, please consult the SOM). We also asked the experts whether the items within each construct represented that construct fully (to examine content deficiency, Colquitt et al. 2019) and whether they felt that any items needed rewording or whether the items should be moved elsewhere or deleted. We did not measure content validity in a quantitative way (e.g. through card-sorting; Colquitt et al. 2019) because we expected that constructs may overlap in meaning with each other, which would make this task less appropriate. Additionally, the number of items initially considered for inclusion in CResDA (90 items across 14 constructs) would likely have introduced a high cognitive load for the participants, making this task overly burdensome. The research team discussed the potential conceptual overlap between the digital attitude items and judged that the new items captured different and non-overlapping digital attitudes. Following the experts' feedback, the research team revised the wording of some pre-existing items (for example, we reworded the item 'Though people can sometimes learn new things, you can't really change people's basic talent for adapting to new technology' from the fixed digital mindset scale (Rasmussen-Moseid and Botero 2020) to 'Though I can learn new things, I can't really change my basic talent for adapting to new technologies').

We performed separate factor analyses to create sub-measures of contextual resources and digital attitudes. For each of these sub-measures we first conducted an exploratory factor analysis using one sample and a confirmatory factor analysis using a second sample to ensure that CResDA was validated using two distinct samples. We then tested for convergent, discriminant, and predictive validity as well as for test-retest reliability (see details in the Results section). Finally, we tested whether the new sub-measures differed between employees with different tenure, across age profiles, and across stages of digital transformation to assess whether the new sub-measures were biased towards specific employee groups. All data were collected solely for the purpose of validating CResDA.

2.2. Survey participants

We collected two samples of data from Prolific Academic, which is an online research platform that enables research participants to complete a survey in exchange for set payment (in this case £2.25, based on completing a 15-minute questionnaire at a rate of £9 per hour). This was the standard participation rate as suggested by the Prolific platform and thus was unlikely to attract participants who were solely motivated by financial gain. Participants completed the survey twice, four weeks apart, as this time lag between measures enabled testing for predictive validity and test-retest reliability. As per the recommendations of Polit (2014), we chose the four-week time lag to safeguard against participant response fatigue from being asked to complete two surveys close together, whilst simultaneously reducing participant attrition (if measurement was too far apart). Participants were invited to participate if their organisation

was undertaking digital transformation. We filtered the Prolific database and sent invitations to participants who resided in the UK, who worked part-time or full-time, and who used technology at work at least once a week. Sample 1 data (Time 1: $N = 374$, Time 2: $N = 374$) was collected between June and July 2022, and Sample 2 data (Time 1: $N = 742$, Time 2: $N = 725$) between February and March 2023. Through filtering on the platform, Sample 1 participants could not complete the surveys in Sample 2. To further ensure that we used high-quality data, we removed from the final analysis all participants who either answered all items with the same scale response point (e.g. only answering with *Strongly agree*), did not provide a name for their digital transformation project (or provided an unintelligible name), or those participants who answered each question at an average speed of two seconds or less (Bowling et al. 2023), which left 734 participants for Time 1 in Sample 2, and 626 participants for Time 2 in Sample 2. The overall sample was 49.72% female, and participants had mostly worked in their current position for 1–3 years. Thirty-five percent of participants indicated that their project was in the planning phase, 47.20% indicated that their project was in the delivery or implementation stage, and 17.80% indicated that their project was in the evaluation stage or was fully completed.

2.3. Measures for testing validity of CResDA

We added a measure of a closely related construct to digital attitudes – learning goal orientation (Guo, Wang, and Feng 2019), which refers to a general orientation towards developing competence and task mastery – to provide evidence for the convergent validity of the digital attitudes sub-measure. As the concept of resource caravans within COR theory suggests that the promotion of personal psychological resources (such as learning goal orientation) can lead to the promotion of other such resources, we expected that attitudes encompassing enjoyment of, competence with, learning about, and optimism or apprehension towards technology would be related to learning goal orientation. We specified the following hypotheses:

> H1. Digital attitudes will be associated with general learning goal orientation, such that positive constructs (e.g. trust) will be related positively, and negative constructs (e.g. insecurity) will be negatively related to learning goal orientation.

As the contextual resource items were newly created for CResDA, there were no existing similar scales to compare them to for convergent validity purposes. However, to establish discriminant validity, we included a personality inventory of extraversion and conscientiousness (Gosling, Rentfrow, and Swann Jr 2003) as there were no expected relationships between personality variables and contextual resources or digital attitudes. Albarracin and Shavitt (2018) distinguish between specific and dispositional attitudes and suggest that more dispositional attitudes – those entrenched into the self-concept – can be influenced by one's personality. Aligning with this logic, digital attitudes can be considered specific attitudes that have digital technologies as their referent, and as such we did not expect that these would be related to stable measures of personality. Similarly, we argue that the perception of dynamic provision of support in digital transformation settings would not be related to one's personality. Thus, we hypothesised that:

> H2. Contextual resources and digital attitudes will not be significantly correlated with the personality indices of extraversion and conscientiousness.

To test for test-retest reliability, we also expected that CResDA sub-measures would correlate with themselves at a future measurement point. More specifically,

> H3a. Time 1 contextual resources will be positively correlated with Time 2 contextual resources.

> H3b. Time 1 digital attitudes will be positively correlated with Time 2 digital attitudes.

We included perceived usefulness and ease of use of technology (Venkatesh et al. 2003) to establish predictive validity for CResDA sub-measures. As digital transformation is a dynamic process (Ellström et al. 2022) where different projects vary in size, complexity, and timing due to updating legacy infrastructure and changing organisational cultures (Kraus et al. 2021), we expected that different projects would vary in how the contextual resources and digital attitudes changed or remained stable over the four-week time period. Therefore, to test for predictive validity we examined how change in the antecedents predicted change in outcomes as lagged correlations would not be appropriate given the multiple contexts and different change rates inherent in the data. Drawing on the resource caravan concept from COR theory (Hobfoll et al. 2018), the provision of contextual resources (such as workplace support) external to the employee can promote the development of personal psychological resources (such as digital attitudes). Similarly, the IGLO framework (Nielsen et al. 2018) suggests that multi-level support within organisations can promote positive employee attitudes within workplace interventions. In applying these concepts to the dynamic digital transformation

context, we expect that changes in contextual resources will be significantly associated with changes in digital attitudes and technology acceptance.

H4a. Changes in contextual resources will be associated with changes in digital attitudes.

H4b. Changes in contextual resources will be associated with changes in technology acceptance outcomes.

Finally, we tested whether changes in digital attitudes predict changes in the technology acceptance outcomes. COR theory suggests that personal psychological resources (such as digital attitudes) can be retrieved to meet work goals (such as accepting new technologies). In line with this logic, the digital attitude concepts we considered for inclusion in CResDA have been associated with technology acceptance in previous research.

H5. Changes in digital attitudes will be associated with changes in technology acceptance outcomes.

Figure 1 presents the expected nomological network for CResDA.

3. Results

3.1. Contextual resources

Using Sample 1 Time 1 data, we conducted an exploratory factor analysis using principal axis factoring with direct oblimin rotation in SPSS 28 (Field 2013) because the IGLO framework suggests that different contextual resources are intercorrelated (Nielsen et al. 2018). The sample size in Sample 1 ($N = 374$) allowed us to detect significant item loadings exceeding .3; thus, we only considered item loadings which were above the threshold of .3 for inclusion in the final factors (Hair et al. 2013). Any items which cross-loaded on different factors within .2 of each other in initial factor solutions were removed in future factor analysis iterations (Howard 2016). Following the exploratory factor analysis, we assessed whether the remaining items fit conceptually to form a unitary contextual resource factor through team discussions.

We extracted five factors, as the Organisational level items initially created two distinct factors. However, as one of these factors exhibited poor internal consistency ($\alpha_1 = .45$; $\alpha_2 = .34$), we collapsed them into one factor (called Organisational Support). As all other items in Organisational Support referred to receiving support from the organisation, we removed the item *In my organisation, there are consequences (e.g. sanctions) for not using new technology* as this item referred to punitary actions which are the opposite of support. The Organisational Support factor included items related to creating an innovation culture (Paganin and Simbula 2021) and offering training/support when implementing new technologies (Chen and Zhou 2022). These areas of Organisational Support represent issues discussed by the expert interviewees about encouraging individual adoption and assessing the local context to provide the needed infrastructure. However, it does not include other suggested areas relating to adopting new ways of working and choosing to invest in digital technologies. Thus, the Organisational Support factor may not cover all areas of organisational support considered important by managers or change leaders but may instead represent areas that are more evident to employees who are experiencing digital transformation.

A Team Support factor was extracted with items related to having a role model, mutual support for learning about technologies, and psychological safety within the team. These dimensions of Team Support mapped onto the dimensions discussed within the expert interviews which suggests that the Team Support factor exhibits good conceptual coverage.

A Line Manager Support factor also emerged and contained items related to encouraging the use of new technologies, explaining why new technologies are introduced, and encouraging creativity when using new technologies. The final distinct factor that emerged – Change Leadership Support – included items related to ensuring effective two-way communication with employees, involving employees in the design and testing of technologies, and providing examples of how the technology will be used. The items within these two factors mapped well onto the dimensions discussed within the expert interviews, which demonstrates good conceptual coverage. These four factors accounted for 52.98% of the shared variance in contextual resources (Table 1) and the confirmatory factor analysis revealed that the four-factor structure exhibited the best fit to the underlying data when compared to a baseline and a one-factor model (Table 2). The final four factors exhibited adequate internal consistency in both Sample 1 and Sample 2: Change Leadership Support ($\alpha_1 = .93$; $\alpha_2 = .94$), Line Manager Support ($\alpha_1 = .95$; $\alpha_2 = .94$), Team Support ($\alpha_1 = .81$; $\alpha_2 = .79$), and Organisational Support ($\alpha_1 = .72$; $\alpha_2 = .75$).

3.2. Digital attitudes

We conducted an exploratory factor analysis via principal axis factoring with direct oblimin rotation as different digital attitudes are likely to theoretically overlap (Blut et al. 2022; Cavalcanti, Oliveira, and de Oliveira Santini 2022). We followed the same recommendations for conducting exploratory factor analysis as with the

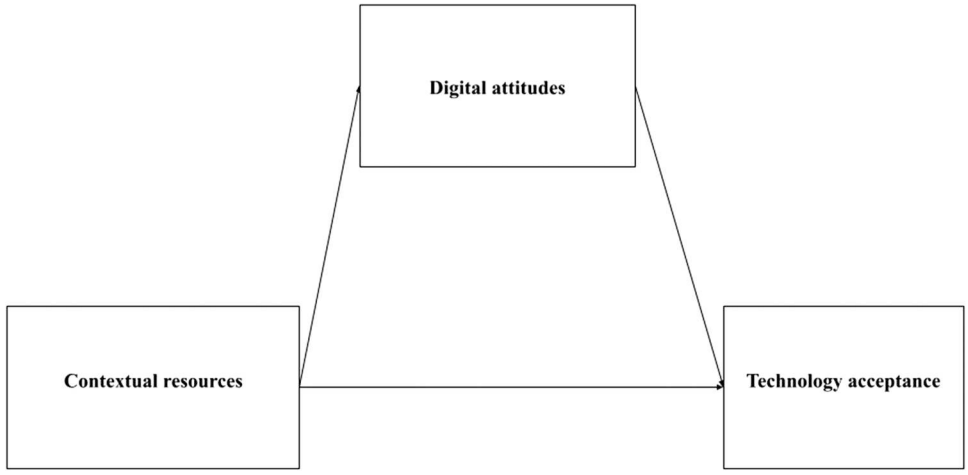

Figure 1. Expected nomological network for CResDA.

contextual resources sub-measure. We extracted eight factors but removed two factors which each consisted of two items that we judged to overlap conceptually with items in other factors. Therefore, we continued with a six-factor structure for Digital Attitudes.

In line with Wieland et al. (2017), we removed several items if we judged that they did not fit with the remaining factor items, exhibited small correlations with the remaining items within each factor, reduced the overall Cronbach's alpha of their respective factors, or exhibited poor item-scale correlations (see SOM). We assessed whether the remaining items fit conceptually to form a unitary digital attitude factor through team discussions. The final factor structure (Table 3) consisted of 28 items loading onto six factors which accounted for 49.44% of the shared variance in digital attitudes.

The confirmatory factor analysis (Table 2) revealed that the exploratory factor analysis model fits the data better compared to a baseline and a competing model, in which all 28 items were included in a seven-factor model (affinity for technology, computer self-efficacy, fixed digital mindset, personal innovativeness, expandable-sum mindsets, technology optimism, and technology apprehension). We kept the original names of scales if they included the same items as in their original measure but adopted new names of factors that combined items from different measures. The final six factors exhibited adequate internal consistency in both Sample 1 and Sample 2: Win-Win Mindset ($\alpha_1 = .83$; $\alpha_2 = .78$), No-Win Mindset ($\alpha_1 = .86$; $\alpha_2 = .84$), Trust in Technology ($\alpha_1 = .81$; $\alpha_2 = .80$), Technology Competence ($\alpha_1 = .78$; $\alpha_2 = .72$), Fixed Digital Mindset ($\alpha_1 = .71$; $\alpha_2 = .70$), and Personal Innovativeness ($\alpha_1 = .86$; $\alpha_2 = .84$).

Win-Win Mindset – a belief that new technologies augment current ways of working and are beneficial for employees' job prospects – combines items from the expandable-sum mindset and the optimistic job prospects measures. This factor offered good conceptual coverage of the concept of positivity and optimism about the opportunities at work offered by new technology as described by the interview participants. No-Win Mindset – a belief that new technologies introduce job insecurity and negative work redesign – included items from a previous measure of zero-sum mindset and new items measuring perceived threat from technology. This factor presented good conceptual coverage as it built on previous broader formulations of zero-sum mindset by considering how technologies can negatively impact specific job roles and interconnected work. Trust in Technology was composed of new items which measured a positive belief that new technologies provide accurate and useful results. This factor demonstrated good conceptual coverage of the key dimension of dealing with uncertainty and risk when using advanced technologies such as those that use algorithmic decision-making as described in expert interviews. Technology Competence was formed of items that were combined from previous scales of affinity for technology and computer self-efficacy (both from Edison and Geissler 2003), which formed a synthesised factor of technology competence, highlighting the interconnection between feeling up to date with technologies in comparison to others and employees' belief in using it effectively. Fixed Digital Mindset (reduced to three items from its previous five-item measure) referred to employees' perceptions that they cannot change their ability to work with technology. We deleted the other two items because they loaded on their own exploratory factor which we removed, and one of these items cross-loaded on the Technology Competence factor. The three remaining items captured immutable beliefs about employees' ability to update their technology skills,

Table 1. Factor loadings for the contextual factors sub-measure.

Item description	Factor loading 1	2	3	4
Factor 1: Change Leadership Support				
The people responsible for implementing this new technology in my organisation involve the right people at the right time.	1			
The people responsible for implementing this new technology in my organisation share progress, including any issues and delays.	.67			
The people responsible for implementing this new technology in my organisation ensure people from different teams work together.	.70			
The people responsible for implementing this new technology in my organisation share positive examples of how this technology will be helpful to people like me.	.72			
The people responsible for implementing this new technology in my organisation give people opportunities to provide feedback.	.67			
The people responsible for implementing this new technology in my organisation make it clear how we will use this technology.	.76			
The people responsible for implementing this new technology in my organisation involve people who will use the technology in developing it.	.68			
The people responsible for implementing this new technology in my organisation consider the implications for people and processes.	.76			
The people responsible for implementing this new technology in my organisation are more concerned with doing things properly than doing them quickly.	.56			
The people responsible for implementing this new technology in my organisation make it clear what support we will have after the project is finished.	.75			
The people responsible for implementing this new technology in my organisation prioritise making the technology easy to use.	.77			
The people responsible for implementing this new technology in my organisation make it clear what is going to happen when.	.72			
The people responsible for implementing this new technology in my organisation make it clear why the organisation is making this change.	.73			
The people responsible for implementing this new technology in my organisation make it clear how the benefits will relate to the time and money the organisation is investing.	.69			
The people responsible for implementing this new technology in my organisation use language people understand.	.60			
Factor 2: Line Manager Support				
My line manager is enthusiastic about new technologies.		1		
My line manager encourages our team to use technology to do things differently.		.77		
My line manager encourages our team to talk about any worries about new technologies.		.75		
My line manager encourages our team to be creative in how we use new technologies.		.77		
My line manager encourages our team to use new technologies.		.76		
My line manager recognises our team for using new technologies.		.73		
My line manager makes it clear how technology will contribute to our long term goals.		.78		
My line manager regularly discusses how we are getting on with new technologies that are brought in.		.75		
My line manager lets our team take the time we need to learn about new technologies.		.73		
My line manager is clear about how and when we should use new technologies.		.78		
My line manager is open and honest with our team about new technology projects.		.78		
Factor 3: Team Support				
In my team we have people who are keen to try new technologies.			1	
In my team we are able to see how other people use new technologies as part of their work.			.69	
In my team we take time to share best practice on how to use new technologies.			.85	
In my team we help each other to use new technologies.			.73	
Factor 4: Organisational Support				
In my organisation, we understand how regulation, standards and legal requirements apply to our use of technology.				1
In my organisation, we develop new technologies with other organisations and external stakeholders.				.43
In my organisation, we consider the wider implications of the technology we use for our supply chain.				.68
In my organisation, I am confident that after implementing new technologies, there will be ongoing support available to me.				.75
In my organisation, appropriate training is provided to help me use new technologies.				.69

Note. $N = 734$. The extraction method was principal axis factoring with a direct oblimin rotation. Factor loadings below .30 are not presented for conciseness.

thus demonstrating cleaner conceptual coverage. Personal Innovativeness (consisting of the same four items from its pre-existing measure) represented employees' willingness to try out new technology.

Table 2. Goodness-of-fit indicators of CResDA Models.

Model	$\chi 2$	*df*	χ^2/df	CFI	RMSEA	SRMR
Digital attitudes						
Baseline model	8141.40***	378	21.54	.00	.17	.26
Final model	1065.56***	335	3.18	.91	.06	.07
Competing model	1660.01***	331	5.02	.83	.07	.10
Contextual Resources						
Baseline model	14931.42***	595	25.10	.00	.18	.39
Final model	1371.52***	554	2.48	.94	.05	.03
Competing model	4082.56***	560	7.29	.75	.09	.08

Note. $N = 734$. ***$p < .001$. CFI values of > .90, RMSEA and SRMR values of < .07 are considered acceptable (Field 2013).

3.3. Convergent and discriminant validity

Convergent validity analysis revealed significant correlations between digital attitude concepts and the learning goal orientation scale (see Table 4). As predicted, positive correlations with learning goal orientation were observed for the positive digital attitudes (Win-Win Mindset, Trust in Technology, Technology Competence, and Personal Innovativeness) and negative correlations existed for the negative digital attitudes (No-Win Mindset and Fixed Digital Mindset). Altogether, these results provided evidence for H1 and support the construct validity of the new digital attitude scales.

To test H2, we found that positive correlations existed between the contextual resources and the two

Table 3. Factor loadings for the digital attitudes sub-measure.

	Factor loading					
Item description	1	2	3	4	5	6
Factor 1: Win-Win Mindset						
I believe that my role will become more meaningful as technology becomes more capable.	1					
I believe that my job will change for the better as we use more technology.	.73					
I believe that increased use of technology will make work more efficient.	.62					
This new technology will increase opportunities for employees to succeed in their jobs.	.59					
When this new technology is introduced, employees will benefit.	.68					
Factor 2: No-Win Mindset						
This new technology will mean there will be fewer jobs for employees.		1				
This new technology will lead to employees having less control in their job.		.71				
This new technology will reduce the opportunities for employees to succeed in their jobs.		.66				
This new technology will lead to employees losing their jobs.		.83				
I am concerned that roles will be lost in my organisation as we use more technology.		.55				
I am concerned that how I work with other people will change as we use more technology.		.50				
Factor 3: Fixed Digital Mindset						
My technological ability is something fixed about me, and there isn't much that I can do to change it.			1			
Not much can be done to change how I will keep pace with technological change.			.60			
Though I can learn new things, I can't really change my talent for adapting to new technologies.			.64			
Factor 4: Technology Competence						
I can solve the problems I face in my job when using technology at work.				1		
I am confident that I can deal with unexpected setbacks when using technology in my work.				.71		
I know how to deal with technological malfunctions or problems.				.68		
I feel as up-to-date with regard to technologies as my peers.				.57		
Factor 5: Trust in Technology						
I believe that I can trust new technologies.					1	
I can depend on new technologies to do the right thing.					.75	
New technologies can be trusted to do a good job.					.74	
Outputs from new technologies are clear and transparent.					.62	
I am concerned that new technologies are not safe or secure. (R)					.43	
I tend not to trust new technologies. (R)					.52	
Factor 6: Personal Innovativeness						
I like to understand how new technologies (tools and software) work.						1
I enjoy learning how to use new technologies.						.83
I enjoy exploring what new technologies can be used for.						.81
I often seek information on new technologies.						.68

Note. $N = 734$. The extraction method was principal axis factoring with a direct oblimin rotation. Factor loadings below .30 are not presented for conciseness.

measures of personality. For further tests of discriminant validity, we applied the Fornell-Larcker criterion (Fornell and Larcker 1981) in which the average variance extracted (AVE) from each of the four new factors and the measures of extraversion and conscientiousness must be higher than the squared correlation between each new factor and each personality measure. The contextual resources met the Fornell-Larcker criterion which suggested that they were different from both measures of personality (see SOM). Although some digital attitudes exhibited significant correlations with extraversion and with conscientiousness in partial support of H2, all six new digital attitudes also met the Fornell-Larcker criterion (see SOM) which suggested that they differed in meaning from the personality indices. These results provide further evidence for the construct validity of CResDA.

Table 4. Zero-order correlations between CResDA factors and convergent and discriminant validity measures.

Scale	LGO	EXT	CON
WWM	.34***	.10**	.06
NWM	−.15***	−.03	−.08*
FDM	−.13***	.01	−.06^{+}
TRUST	.38***	.11**	.17***
TC	.27***	.02	.12***
PI	.46***	.03	.13***
CHAN	.35***	.16***	.14***
LINE	.30***	.15***	.09*
TEAM	.32***	.09**	.16***
ORG	.29***	.15***	.10***

Note. Time 1 data only ($N = 1105$). *WWM* = Win-Win Mindset; *NWM* = No-Win Mindset; *FDM* = Fixed Digital Mindset; *TRUST* = Trust in Technology; *TC* = Technology Competence; *PI* = Personal Innovativeness; *CHAN* = Change Leadership Support; *LINE* = Line Manager Support; *TEAM* = Team Support; *ORG* = Organisational Support; *LGO* = Learning Goal Orientation; *EXT* = Extraversion; *CON* = Conscientiousness. ***$p < .001$; **$p < .01$; *$p < .05$; $^{+}p < .10$.

3.4. Test-Retest reliability and predictive validity

To test for test-retest reliability and predictive validity, we combined Sample 1 Time 1 and Sample 2 Time 1 data and did the same with the Time 2 samples. The descriptive statistics and zero-order correlations for all CResDA factors and technology acceptance measures are presented in Table 5.

In partial support of H3a, Change Leadership Support ($b = .07$, $p = .02$) and Organisational Support ($b = .07$, $p = .03$) positively predicted themselves at Time 2, Team Support ($b = .06$, $p = .06$) marginally

Table 5. Descriptive statistics and zero-order correlations between CResDA factors and technology acceptance outcomes.

Scale	$M(SD)_1$	$M(SD)_2$	WWM	NWM	FDM	TRUST	TC	PI	CHAN	LINE	TEAM	ORG	PEOU	PU
WWM	3.20 (.51)	3.74 (.62)	–	−.36***	−.15***	.65***	.49***	.52***	.54***	.45***	.47***	.52***	.52***	.70***
NWM	2.41 (.83)	2.49 (.81)	−.37***	-	.41***	−.33***	−.18***	−.19***	−.22**	−.16***	−.24***	−.14***	−.25***	−.23***
FDM	2.51 (.82)	2.50 (.82)	−.14***	.38***	-	−.15*	−.19***	−.23***	−.03	−.07*	−.12***	.04	−.18***	−.11***
TRUST	3.60 (.60)	3.55 (.61)	.61***	−.32***	−.04*	-	.44***	.48***	.48***	.40***	.38***	.49***	.48***	.49***
TC	3.73 (.62)	3.72 (.62)	.44***	−.15***	−.15***	.44***	-	.64***	.35***	.37***	.35***	.41***	.48***	.35***
PI	4.02 (.66)	3.96 (.67)	.51***	−.15***	−.18***	.46***	.61***	-	.33***	.35***	.34***	.38***	.41***	.40***
CHAN	3.78 (.66)	3.69 (.67)	.51***	−.20***	−.05+	.44***	.35***	.36***	-	.61***	.59***	.62***	.45***	.49***
LINE	3.78 (.75)	3.75 (.73)	.45***	−.15***	−.03	.40***	.34***	.39***	.58***	-	.65***	.60***	.33***	.37***
TEAM	4.01 (.64)	3.97 (.65)	.43***	−.18***	−.06*	.38***	.32***	.39***	.54***	.61***	-	.58***	.39***	.45***
ORG	3.70 (.66)	3.66 (.67)	.49***	−.13***	.01	.44***	.40***	.37***	.63***	.59***	.54***	-	.43***	.46***
PEOU	3.98 (.61)	3.89 (.60)	.57***	−.23***	−.16***	.44***	.50***	.45***	.43***	.35***	.36***	.44***	-	.55***
PU	4.00 (.68)	3.91 (.72)	.67***	−.28***	−.13***	.43***	.32***	.35***	.45***	.37***	.38***	.39***	.59***	-

Note. Time 1 data below the diagonal, Time 2 data above the diagonal. *WWM* = Win-Win Mindset; *NWM* = No-Win Mindset; *FDM* = Fixed Digital Mindset; *TRUST* = Trust in Technology; *TC* = Technology Competence; *PI* = Personal Innovativeness; *CHAN* = Change Leadership Support; *LINE* = Line Manager Support; *TEAM* = Team Support; *ORG* = Organisational Support; *LGO* = Learning Goal Orientation; *EXT* = Extraversion; *CON* = Conscientiousness. *** $p < .001$; ** $p < .01$; * $p < .05$; $+p < .10$.

predicted itself at Time 2, whereas Line Manager Support ($b = .03$, $p = .37$) did not. This suggests that Line Manager Support may not remain stable over the four-week measurement period due to changes in the demands during digital transformation.

In partial support of H3b, Win-Win Mindset ($b = .10$, $p = .003$), Trust in Technology ($b = .07$, $p = .03$), and Technology Competence ($b = .10$, $p = .007$) positively predicted themselves at Time 2, whereas No-Win Mindset ($b = .04$, $p = .20$), Fixed Digital Mindset ($b = .02$, $p = .59$), and Personal Innovativeness ($b = .05$, $p = .11$) did not. This suggests that the latter three digital attitudes have a propensity to vary across even relatively short periods of a digital transformation (i.e. a four-week measurement period).

To test for predictive validity, we assessed whether changes in the contextual resource factors predicted changes in the digital attitudes (H4a) and changes in technology acceptance (H4b) by constructing longitudinal change score models (Kievit et al. 2018). We chose this type of analysis rather than lagged correlations because we expected that changes in digital transformation activities would produce dynamic changes in employees' contextual resources and digital attitudes in some organisations whilst remaining more stable in others. In this way, we account for varying rates of digital change across organisations within our sample. Table 6 revealed partial support for H4a, as change in Team Support was significantly associated with change in Win-Win Mindset ($b = .10$, $p = .01$), No-Win Mindset ($b = -.11$, $p = .002$), and Fixed Digital Mindset ($b = -.09$, $p = .01$), as well as marginally associated with change in Personal Innovativeness ($b = .07$, $p = .07$). Change in Change Leadership Support was significantly associated with changes in Win-Win Mindset ($b = .19$, $p < .001$), No-Win Mindset ($b = -.07$, $p = .03$), and Trust in Technology ($b = .16$, $p < .001$). Changes in Organisational Support were associated with changes in Win-Win Mindset ($b = .18$, $p < .001$), Trust in Technology ($b = .17$, $p < .001$), Technology Competence ($b = .15$, $p < .001$), and Personal Innovativeness ($b = .13$, $p < .001$). However, change in Line Manager Support was not significantly associated with change in any of the digital attitudes.

The results in Table 7 provided partial support for H4b as changes in Team Support, Change Leadership Support, and Organisational Support were associated with change in the Perceived Usefulness of Technology. Changes in Change Leadership Support and Organisational Support were also related to change in the Perceived Ease of Use of Technology.

As changes in Line Manager Support were not related to changes in digital attitudes or technology acceptance,

Table 6. Predictive validity results for contextual resource factors predicting changes in digital attitudes.

Predictor	Estimate	SE	*p*
Change in Win–Win Mindset			
WWM (T1)	−.61	.04	<.001
ΔLINE	.04	.03	.31
ΔTEAM	.10	.03	.01
ΔCHAN	.19	.03	<.001
ΔORG	.18	.03	<.001
Change in No-Win Mindset			
NWM (T1)	−.69	.03	<.001
ΔLINE	.04	.04	.23
ΔTEAM	−.11	.04	.002
ΔCHAN	−.07	.04	.03
ΔORG	.01	.04	.81
Change in Trust in Technology			
TRUST (T1)	−.64	.03	<.001
ΔLINE	.06	.04	.10
ΔTEAM	.02	.04	.63
ΔCHAN	.16	.04	<.001
ΔORG	.17	.04	<.001
Change in Technology Competence			
TC (T1)	−.65	.03	<.001
ΔLINE	.07	.03	.07
ΔTEAM	.05	.03	.17
ΔCHAN	.05	.03	.17
ΔORG	.15	.03	<.001
Change in Fixed Digital Mindset			
FDM (T1)	−.70	.03	<.001
ΔLINE	.01	.04	.79
ΔTEAM	−.09	.04	.01
ΔCHAN	.04	.04	.30
ΔORG	.00	.04	.99
Change in Personal Innovativeness			
PI (T1)	−.66	.03	<.001
ΔLINE	.06	.03	.09
ΔTEAM	.07	.04	.07
ΔCHAN	.02	.03	.57
ΔORG	.13	.03	<.001

Note. *WWM* = Win-Win Mindset; *NWM* = No-Win Mindset; *FDM* = Fixed Digital Mindset; *TRUST* = Trust in Technology; *TC* = Technology Competence; *PI* = Personal Innovativeness; *CHAN* = Change Leadership Support; *LINE* = Line Manager Support; *TEAM* = Team Support; *ORG* = Organisational Support.

we conducted a series of nested latent change score models to examine whether Line Manager Support is associated with changes in these outcomes when we did not account for other contextual resources (the full analyses are presented in the SOM). These analyses suggested that changes in Line Manager Support were associated with changes in positive digital attitudes (Trust in Technology, Personal Innovativeness, Win-Win Mindset, and Technology Competence) and technology acceptance in the absence of either Organisational Support or Change Leadership Support. Changes in Line Manager Support were related to changes in No-Win Mindset only when no other contextual resources were accounted for and were not related to changes in Fixed Digital Mindset in any of the models.

Table 7. Predictive validity results for contextual resource factors predicting changes in technology acceptance.

Predictor	Estimate	SE	*p*
Change in Perceived Usefulness			
PU (T1)	−.91	.03	<.001
ΔLINE	−.02	.03	.65
ΔTEAM	.14	.04	<.001
ΔCHAN	.18	.04	<.001
ΔORG	.10	.03	.01
Change in Perceived Ease of Use			
PEOU (T1)	−1.09	.03	<.001
ΔLINE	−.02	.03	.54
ΔTEAM	.06	.03	.12
ΔCHAN	.15	.03	<.001
ΔORG	.13	.03	<.001

Note. *LINE* = Line Manager Support; *TEAM* = Team Support; *CHAN* = Change Leadership Support; *ORG* = Organisational Support; *PU* = Perceived Usefulness; *PEOU* = Perceived Ease of Use.

Table 8. Predictive validity results for digital attitudes predicting changes in technology acceptance.

	Estimate	SE	*p*
Change in Perceived Usefulness			
PU (T1)	−.54	.03	<.001
ΔWWM	.46	.04	<.001
ΔNWM	.08	.02	.01
ΔTRU	.06	.03	.05
ΔTC	−.02	.03	.47
ΔFDM	−.02	.02	.44
ΔPI	.06	.03	.06
Change in Perceived Ease of Use			
PEOU (T1)	−.63	.03	<.001
ΔWWM	.18	.04	<.001
ΔNWM	−.02	.02	.51
ΔTRU	.15	.03	<.001
ΔTC	.15	.03	<.001
ΔFDM	−.07	.02	.01
ΔPI	.01	.03	.75

Note. *WWM* = Win-Win Mindset; *NWM* = No-Win Mindset; *TRUST* = Trust in Technology; *TC* = Technology Competence; *FDM* = Fixed Digital Mindset; *PI* = Personal Innovativeness; *PU* = Perceived Usefulness; *PEOU* = Perceived Ease of Use.

To test H5, we assessed whether changes in the digital attitudes predicted changes in technology acceptance in another longitudinal change score model (see Table 8). The results indicated that changes in Win-Win Mindset ($b = .46$, $p < .001$), No-Win Mindset ($b = .08$, $p = .01$), and Trust in Technology ($b = .06$, $p = .05$) were related to change in the Perceived Usefulness of Technology. Change in Personal Innovativeness ($b = .06$, $p = .06$) was marginally associated with change in the Perceived Usefulness of Technology. Finally, changes in Win-Win Mindset ($b = .18$, $p < .001$), Trust in Technology ($b = .15$, $p < .001$), Technology Competence ($b = .15$, $p < .001$), and Fixed Digital Mindset ($b = -.07$, $p = .01$) were associated with change in the Perceived Ease of Use of Technology. Figure 2 presents the final nomological network for CResDA.

3.5. Risk-of-bias testing

Between-participants analysis of variance revealed significant differences between employees with different tenures on the Team Support factor ($F(4,729) = 2.50$, $p = .04$) and marginally significant differences between these employees on the Win-Win Mindset factor ($F(4,729) = 2.26$, $p = .06$) and on the Change Leadership

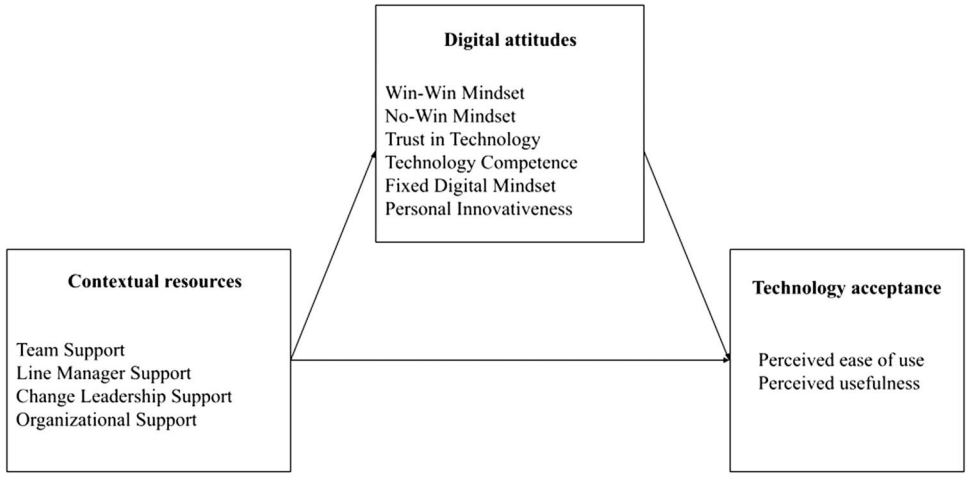

Figure 2. Final nomological network for CResDA.

Support factor ($F(4,729) = 2.16$, $p = .07$). Less-tenured employees scored higher on all of those factors (see SOM), suggesting that younger people perceive more support from their organisations.

Significant differences existed between older and younger employees on the Fixed Digital Mindset factor ($F(4,729) = 3.28$, $p = .01$) and on the Technology Competence factor ($F(4,729) = 4.33$, $p = .002$). There were marginally significant differences between older and younger participants on the Win-Win Mindset factor ($F(4,729) = 2.09$, $p = .09$) and on the Trust in Technology factor ($F(4,729) = 2.07$, $p = .08$). Younger employees scored higher on all of those factors (see SOM).

Employees at different stages of digital transformation also exhibited significant differences in Personal Innovativeness ($F(3,725) = 4.78$, $p = .003$) and in Technology Competence ($F(3,725) = 4.86$, $p = .002$). Employees whose digital project was complete exhibited lower Personal Innovativeness (M = 3.79, SD = .80) than employees whose project was in the evaluation stage (M = 4.03, SD = .57). Employees whose project was in the implementation stage exhibited higher Technology Competence (M = 3.80, SD = .57) than employees whose projects were currently being planned (M = 3.65, SD = .65) or were complete (M = 3.56, SD = .62). This suggests that digital attitudes may fluctuate throughout the course of digital transformation processes.

4. Discussion

This paper outlines the development and validation of CResDA, a comprehensive measure of the contextual resources and digital attitudes that can promote technology acceptance in modern digital transformation contexts. CResDA consists of four contextual resources – Team Support, Line Manager Support, Change Leadership Support and Organisational Support – and six distinct digital attitudes – Win-Win Mindset, No-Win Mindset, Trust in Technology, Technology Competence, Fixed Digital Mindset, and Personal Innovativeness. The development of CResDA bridges the gap between employees' perceptions of digital transformation and the need for modern technology implementation as it offers opportunities for businesses to comprehensively assess these perceptions and conduct actions that can lead to enhanced technology acceptance.

4.1. Theoretical contributions

To build on previous literature, CResDA can help researchers assess contextual resources (i.e. employees' perception of multi-level support in their organisation; Hampel et al. 2022) and personal psychological resources (i.e. conceptually refined or synthesised digital attitudes; Blut et al. 2022) associated with technology acceptance (Cavalcanti, Oliveira, and de Oliveira Santini 2022) in digital transformation contexts.

We develop and validate a contextual resources submeasure with four distinct factors that are consistent with the IGLO framework (Nielsen et al. 2018). These factors indicate that employees can receive multiple levels of support from their organisations to work with new technologies during digital transformation. The Team Support, Line Manager Support, and Change Leadership Support factors included items related to all of the facets of contextual support that we expected at these levels. However, while we considered several different aspects of Organisational Support, the resulting factor was composed of five items related to creating an innovation culture and offering training/support when implementing new technologies. These

Organisational Support areas could relate to building a transformational organisational culture (associated with fostering innovation and change; Parry and Proctor-Thomson 2002) that is experienced as supportive by employees. Other areas of organisational support relating to organisational efforts to invest in technology and to ensure its sharing and use could be considered as more important by senior managers and change leaders but are perhaps less important (or salient) to employees experiencing the change. This logic aligns with the current analysis as we removed items related to ensuring that existing technologies are used as well as items related to sharing new technologies and changing ways of work because these items either cross-loaded on the two leadership support factors or did not load on any factors.

Changes in three of the contextual resources (Team Support, Change Leadership Support, and Organisational Support) are related to changes in digital attitudes. Thus, in line with COR theory and the concept of resource caravans (Hobfoll et al. 2018) and supporting a recent literature review that uses COR theory to highlight the role of contextual resources in promoting digital attitudes (Zhang et al. 2025), the results provide empirical evidence which suggests that contextual resources are related to employee attitudes during digital transformation. Additionally, changes in Change Leadership Support and Organisational Support are associated with changes in both Perceived Usefulness and Ease of Use of technology, and changes in Team Support are related to changes in Perceived Usefulness. Surprisingly, changes in Line Manager Support are not related to changes in digital attitudes or technology acceptance despite previous evidence that leaders can influence employees' digital attitudes (Andersen 2016), their use of technology (Hess et al. 2016), and innovative behaviour (Rehmani et al. 2023). It might be the case that line managers are not as involved in digital transformation in some organisations or are involved only at certain stages of the transformation, which could explain why the Line Manager Support factor was not associated with changes in digital attitudes and technology acceptance. However, the supplementary analyses indicate that changes in Line Manager Support are related to changes in positive digital attitudes and technology acceptance in the absence of Change Leadership Support or Organisational Support. This suggests that line manager support is important where other forms of leadership or organisational support are not available. However, as advised from a change management perspective, change leadership teams should be established to drive forward digital transformation efforts (Bellantuono et al. 2021). Therefore, in many digital transformation contexts, the senior management team is responsible for setting the organisational transformational vision, and the change leadership team is responsible for implementing the digital transformation. Line managers' influence in transformation contexts might therefore be seen as complementary to this senior vision, whereby they help to facilitate the wider vision rather than having a unique or independent effect. Altogether, the results provide empirical evidence that suggests that Team, Change Leadership, and Organisational Support are related to digital attitudes and technology acceptance in digital transformation contexts.

We also heed previous calls for parsimony in measuring digital attitude concepts (Blut et al. 2022; Cavalcanti, Oliveira, and de Oliveira Santini 2022) by removing or combining items throughout the factor analysis to develop six refined or synthesised digital attitudes related to digital transformation. Personal Innovativeness consists only of items from its pre-existing measure, which indicates its distinctiveness from other digital attitude constructs. The Fixed Digital Mindset measure contains three out of five items from its original measure (Kloven and Carlsen 2020) but no new items, and the new measure retained the key concept of lack of belief in one's ability to update technology skills. Thus, as we anticipated, the analysis helped to refine the measures and address the conceptual overlap between Fixed Digital Mindsets and computer self-efficacy.

The factor analysis also helped us to refine and synthesise related digital attitude concepts. Win-Win Mindset contains items that relate to technology's ability to positively influence job design thus combining items from previous expandable-sum mindset and optimistic job prospect measures. No-Win Mindset combines items from the zero-sum mindset and perceived threat measures that relate to technology's perceived ability to eliminate jobs and roles. Technology Competence combines items from existing measures of affinity towards technology and computer self-efficacy (both from Edison and Geissler 2003) which suggests that feelings about technology are related to perceptions of confidence in their ability to use technology at work. The Trust in Technology factor contains items that relate to trusting the integrity, benevolence, and competency of technology outputs, which is consistent with a previous measure (Li, Hess, and Valacich 2008) that focuses on trust in national identity systems. However, the newly developed measure in CResDA focuses on trust towards advanced technologies such as those using algorithmic decision-making. Overall, the factor analysis contributed to creating distinct digital attitude concepts applicable to modern digital change.

The development of CResDA also contributes to the literature on technology acceptance as changes in digital attitudes were associated with changes in technology acceptance. Specifically, changes in Win-Win Mindset and Trust in Technology were associated with changes in the Perceived Ease of Use of Technology as well as Perceived Usefulness, which demonstrates the importance of fostering trust and perceptions of benefits for employees and the organisation within the digital transformation process for all aspects of technology acceptance. However, changes in Technology Competence and Fixed Digital Mindset were only associated with Perceived Ease of Use of Technology, which suggests that these attitudes related to competence and learning should be considered early on in the transformation process (e.g. through providing technology training) to address barriers to using technology. Employees who exhibit higher perceived ability to use technology are likely to find it easy to use, whereas employees who do not believe they have the ability to adapt and learn new technology are less likely to find it easy to use. Thus, changing employees' perceptions of learning and competence may be important to support employees in using new technologies during the digital transformation. The results also indicate that changes in No-Win Mindset and Personal Innovativeness were not related to change in the Perceived Ease of Use of technology. Employees who have high Personal Innovativeness may already see technology as easy to use and so their attitudes do not change much over time, and those high in No-Win Mindset might not have interacted with the technology enough to change their perception of how easy it is to use.

Changes in Personal Innovativeness and No-Win Mindset were, however, (along with changes in Win-Win Mindset and Trust in Technology) associated with changes in the Perceived Usefulness of Technology. Taken together, this suggests that attitudes related to perceptions of the impact on employee jobs (No-Win Mindset, Win-Win Mindset), Trust in what technology can do to support their work (Trust in Technology), and willingness to explore what new technologies can be used for (Personal Innovativeness) should be addressed by organisations who wish to support employees in perceiving new technologies as useful for completing their work. As already mentioned, changes in Technology Competence and Fixed Digital Mindset were not associated with changes in the Perceived Usefulness of technology – even though they were related to Perceived Ease of Use. Thus, employees who have high Technology Competence might believe that they can use any technology to finish their work tasks, but might also understand technology's limitations better, which enables them to see technologies as both useful and not useful for different work tasks. Employees with Fixed Digital Mindsets may not believe that they can learn to use this new technology and thus cannot determine whether the technology is useful or not for their work.

4.2. Practical implications for businesses undergoing digital transformation

Organisations can use CResDA to comprehensively assess employee digital attitudes and employees' perceptions of the multi-tiered support they receive during digital transformation. Providing different contextual resources may also be important to keep all employees engaged in digital transformation as the current results suggest that younger, less-tenured, and employees currently in the midst of digital transformation exhibit higher levels of positive digital attitudes (Win-Win Mindset, Trust in Technology, Technology Competence, and Personal Innovativeness) than other employees at different stages of change. To promote increases in these attitudes, organisations can provide Organisational Support (e.g. providing skills training or promoting an innovation climate) as in the current research this was associated with increases in positive digital attitudes. In addition, organisations can provide Team and Change Leadership Support – by having role models or creating common goals and practices – as Change Leadership Support and Team Support were associated with reductions in No-Win Mindsets and Fixed Digital Mindsets. CResDA can also be used to measure changes in digital attitudes as a result of participative digital transformation initiatives, such as co-designing the way employees will work with the technology. Ullrich et al. (2023) suggest that such active employee involvement in digital transformation can reduce detrimental digital attitudes and lead to increases in technology acceptance.

4.3. Limitations and considerations for future research

A limitation to the data is that CResDA was validated with employees from a panel data collection website who participated in different digital transformation projects at various stages of completion. Whilst the variation of participants could be argued to enable generalisability across contexts, it could be considered to lack ecological validity or provision of insight into change within a particular organisational environment. Therefore, further research examining CResDA within a particular organisation would be beneficial in testing whether the factor structure remains the same within a specific organisation as in the present research. Such

research could also examine what areas of support are considered most important for respondents at different levels of the organisation as some aspects of Organisational Support in the current research (such as adopting new ways of working and choosing to invest in digital technologies) may have been more important for senior leaders and digital transformation experts rather than employees experiencing digital transformation. Research that examines CResDA within a particular organisation would also aid our understanding of which contextual resources and digital attitudes best predict changes in technology use and acceptance at the planning, delivery, implementation, and evaluation stages of digital transformation. More broadly, assessing CResDA in particular companies could determine whether contextual resources and digital attitudes are associated with increases in organisational-level outcomes as previous research suggests that support at GLO levels and individual psychological resources can lead to increases in objective organisational performance (Nielsen et al. 2017).

We were also unable to provide evidence for the test-retest reliability of some of the measures (Line Manager Support, Fixed Digital Mindset and No-Win Mindset). The provision of local resources such as Line Manager Support might have changed in the four-week period of the current investigation, whereas the provision of other contextual resources such as Organisational Support and Change Leadership Support might have remained more stable. It would appear that the more negative digital attitudes (Fixed Digital Mindset and No-Win Mindset) are also more volatile and sensitive to change. We chose the four-week investigation period to assess the test-retest reliability and predictive validity of the measures, while minimising participant fatigue and dropout rates. However, we acknowledge that digital transformation activities in different sectors and organisations may unfold over different time periods, some over longer time periods, others more quickly, as some changes in certain organisational contexts may require more extensive retraining of personnel, updating legacy infrastructure, changes in jobs, and financial costs whereas others may be less complex (Kraus et al. 2021). To account for this possibility, we controlled for the rate of change rather than lagged effects in our predictive validity analyses. Therefore, future research could further examine the volatility and stability of contextual resources and digital attitudes over time.

5. Conclusion

This paper develops and conceptually validates CResDA as a measure of digital attitudes and the contextual resources that promote these attitudes in modern digital transformation contexts. CResDA exhibits sound psychometric properties after a two-sample validation and is linked to changes in technology acceptance outcomes. The development of CResDA helps to build on previous literature as it creates a sub-measure of contextual resources that is associated with digital attitudes and provides a parsimonious set of digital attitudes that are related to positive changes in technology acceptance for organisations undergoing digital transformation.

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Author contributions

CRediT: **Vladislav Grozev:** Formal analysis, Investigation, Methodology, Visualization, Writing – original draft, Writing – review & editing; **Karina Nielsen:** Conceptualization, Funding acquisition, Writing – review & editing; **Nathan Palmer:** Formal analysis, Investigation, Methodology, Writing – review & editing; **Hui Zhang:** Writing – review & editing; **Jo Yarker:** Writing – review & editing
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Data and code availability

The data and analysis code can be found at https://doi.org/10.15131/shef.data.28779341.v1

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