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Hybrid and virtual work settings; the interaction between technostress, perceived organisational support, work-family conflict and the impact on work engagement

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Abstract

Purpose – The study assessed the impact of technostress creators, work–family conflict and perceived organisational support (POS) on work engagement for employees operating within the virtual and hybrid work settings. The idea is to redefine the antecedents of work engagement in work settings that are characterised by excessive technology and work–family conflict.

Design/methodology/approach – Data gathered from 302 academics and support staff employees at a selected university in South Africa were utilised to assess the abovementioned relationships via variance-based structural equation modelling.

Findings – The combined effect of technostress, work–family conflict and POS on work engagement indicates that work–family conflict is a critical component in the relationship between technostress and work engagement. Although POS is seen as a job resource that lessens stress, the study found that the influence of work–family conflict is stronger than that of POS; hence, a negative influence is reported on work engagement. Despite the presence of support, overwhelming technostress creators and work–family conflict issues increase demands and influence work engagement negatively.

Research limitations/implications – The results noted that, in hybrid and virtual work settings, managers can drive employee engagement by focussing on designing more favourable work–life balance (WLB) policies, providing adequate information communication technology (ICT) support, fostering aspects of positive technology and defining the boundaries between work life and family time.

Practical implications – The managers need to realise the detrimental effects of both technostress and work–family conflict on work engagement in virtual and hybrid work settings. Expanding the personal and job resources of individuals in hybrid and virtual settings is critical to enable them to meet the additional work demands and to manage the strain imposed by technostress. Instituting relevant organisation support has proved to be inadequate to address the challenges relating to technostress and work–family conflict. Therefore, introducing WLB policies that assist employees to set clear boundaries between work and family time to avoid burn out and spillover is critical. This is especially important when dealing with technostress creators in the remote work setting. Additionally, providing adequate ICT support as well as training related to use of different devices and software should be part of the organisational culture.

Social implications – A manageable and reasonable workload should be maintained bearing in mind the complexity and ambiguity associated with the hybrid work setting. Managers should make allowances for employees to adjust managers' schedules to accommodate personal obligations, as well as adjust employees' workloads to accommodate family responsibilities. As for the coping strategy of technostress and work–family conflict, considering the positive effects of the supportive work environment is important.

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Originality/value – This study provides a model on the interaction of the redefined antecedents (technostress and work–family conflict) of work engagement in high-tech environments such as virtual and hybrid work settings.

Keywords Technostress, Work engagement, Stress, Work–family conflict, Virtual and hybrid work settings, Higher education, Perceived organisational support

Paper type Research paper

Introduction

Work engagement is a crucial motivational construct that results in a number of positive organisational outcomes. With the changes that have occurred in the nature and place of work, it is crucial to ascertain the antecedents and outcomes within the virtual and hybrid work settings (Apouey *et al.*, 2020). This is especially important for residential higher education institutions which are beset with problems emerging as a result of the transition from face-to-face settings to virtual and hybrid platforms imposed by the coronavirus disease 2019 (COVID-19). Although most institutions are adjusting their way towards returning to the pre-COVID-19 work settings, hybrid platforms remain relevant and this has exposed employees to much ambiguity and complexity, which can potentially have a negative impact on work engagement (Spagnoli *et al.*, 2020). Navigating the virtual and hybrid work setting is associated with the excessive use of different technological devices and an adaptation to new software, resulting in the manifestation of technostress and work–family conflict, which are both potentially detrimental to work engagement owing to increased job demands (Robinson *et al.* 2016). However, with favourable policies and adequate organisational support based on the Social Exchange Theory (Saks, 2006), work engagement can still be maintained. Thus, investigating the antecedents of work engagement in the new work setting (virtual and hybrid) characterised by the excessive use of technology is significant.

The study gauges the effects of technostress, work–family conflict and perceived organisational support (POS) on work engagement simultaneously in the virtual and hybrid work setting. This is because there is a paucity of empirical research on the association between techno-stressors and work engagement (Karatepe, 2013; Le Roux and Botha, 2021) and between conflicts in the work–family interface and work engagement (De Simone *et al.*, 2014). The preponderance of empirical studies in the virtual and hybrid context has barely made a link between demands/stressors and perceived support to work engagement in a single study, although there are possible interesting interactions between them. The study seeks to determine whether technostress and work engagement are correlated significantly and whether the relationship between them is mediated by work–family conflict and POS.

Literature review and hypothesis development

Technostress and work engagement

Work engagement refers to "a positive, fulfilling, work-related state of mind that is characterised by vigor, dedication, and absorption" (Schaufeli, 2012, p. 162-178). Research has shown that job resources foster work engagement and that individuals working in a resourceful environment are enthusiastic, vigorous and absorbed in their work (Bakker and Demerouti, 2014; Suan and Nasurdin, 2016). However, stressful and demanding situations can erode the work engagement of employees (Coetzee and De Villiers, 2010). Accordingly, technostress creators have been identified as some of the major sources of stress and strain in virtual and hybrid work settings (Tarafdar *et al.*, 2021). The technostress phenomenon is described as the stress that an employee feels owing to the constant presence and change of information and communications technology (ICT) (Ayyagari and Sindelar, 2010; Tarafdar *et al.*, 2007). Both the constant presence and change of ICTs characterise the virtual and hybrid work settings; thus, employees are at risk of developing technostress which may eventually affect work engagement negatively. Studies that have tested an association

between technostress and work engagement directly are still scarce and the findings are hazy. However, evidence indicates that the techno-stressors such as techno-overload, techno-uncertainty, techno-insecurity, techno-complexity and techno-invasion can impair innovation and productivity and reduce the satisfaction of users (Tarafdar *et al.*, 2015), which eventually diminishes work engagement. According to Tarafdar *et al.* (2010), techno-overload is experienced when ICT forces users to work faster and longer. Techno-complexity describes the complexity associated with ICT, which may decrease employee work efficacy whilst increasing the time needed to learn and understand various aspects of ICT (Suh and Lee, 2017). Technostress leads individuals to attempt to accomplish huge amounts of work in less, time resulting in their encountering pressure and nervousness. Techno-invasion connotes a situation in which working hours spill into personal time owing to easy access, which results in work–family conflict (Tarafdar *et al.*, 2011). Consistently, research has discovered positive associations between technostress and burnout, which is opposite to work engagement (Brown *et al.*, 2014; Salanova *et al.*, 2000). A recent study by Park *et al.* (2020) indicates that the use of multiple devices for work-related issues after hours is associated with burnout. Therefore, technostress influences work engagement negatively.

Work–family conflict and work engagement

Work–family conflict refers to the degree of incompatibility between the individual's roles and responsibilities in the work and family domain (Netemeyer *et al.* 1996). This construct is made up of three dimensions, which include time-based conflict, behaviour-based conflict and strain-based conflict. Excessive time in one domain will inevitably affect role completion in the other domain. Research has indicated that family matters exert a negative impact on work or that work interferes with family activities (Robinson *et al.* 2016). It has also been confirmed that the conflicts and contradictions between the two affect the physical and mental health of employees, including feeling stressed (Brough *et al.*, 2005), absences from work (Park *et al.*, 2020), and low levels of engagement (Jain and Nair, 2013). However, a study by Halbesleben *et al.* (2014) notes that dedicated employees maintain their physical and mental energy whilst performing their tasks, clearly understand their work mission and professional roles, keep their minds flexible, engage actively in emotional exchanges and rarely experience work–family conflict. Whilst work engagement means getting involved wholeheartedly into work, being under control and devoting time and energy proactively to given tasks, if employees are caught in a conflicting and unbalanced work–family relationship for a long period of time they experience exhaustion, physical and mental fatigue (Robinson *et al.* 2016). Based on the above inference, this study suggests that work–family conflict influences work engagement negatively.

Perceived organisational support and work engagement

POS is defined as the perception of the individual pertaining to the extent to which their organisation looks after their well-being and values their contribution (Guilbert *et al.* 2018; Karim *et al.*, 2019). It is crucial to determine whether POS may have an impact on work engagement, especially considering the unique virtual and hybrid work settings to which employees are exposed and the changes in the world of work. Based on the Job Demands Resource (JD-R) Model (Demerouti *et al.*, 2001), it is proposed that POS as a job resource may affect the engagement of employees at work in a positive manner. When employees have POS, it reinforces their emotional and cognitive assessment of their organisation and work (Bano *et al.*, 2015). Employees with greater POS may become more engaged in their work and organisations as part of the reciprocity norm of the Social Exchange Theory to help the organisation in the achievement of its goals. Therefore, POS encourages the belief of employees that the organisation will always provide support when there is need. Consistent with that, POS meets the socio-emotional needs of employees, such as affiliation and esteem,

and boosts the intrinsic interest of employees in their tasks by enhancing self-efficacy which facilitates work engagement (Eisenberger and Stinglhamber, 2011). Therefore,

H1. Technostress, work–family conflict and POS have a direct influence on work engagement.

Theoretical framework

The JD-R Model focusses on the interaction between job resources and job demands and how the interaction results in employee engagement (Demerouti *et al.*, 2001). Job demands entail any social, physical or organisational aspects of work that require an individual to dedicate themselves mentally and physically to their work. Job demands are associated with certain psychological or physiological costs (Llorens *et al.*, 2006). These include high work pressure, irregular working hours [interfering with work–life balance (WLB)] or a poor work environment (Demerouti and Bakker, 2011). The JD-R model suggests that excessive job demands result in the depletion of the personal and job resources and energy of employees, which could result in burnout (Hakanen *et al.*, 2008). On the other hand, job resources include organisational, physical and social aspects of the job that enable individuals to manage and take control of their job demands, achieve work-related goals and reduce stress (Llorens *et al.*, 2006). In this study, technostress creators are seen as job demands, which, if not managed, may lead to work–family conflict, which then influences work engagement negatively. ICTs blur the distinction between work and private life with the risk of work–family conflicts; again, they also allow a greater flexibility in handling job demands and organising private-life demands during work time (Robinson *et al.* 2016). In virtual and hybrid work settings, employees are exposed to techno-invasion: they constantly feel obligated to be available to work at all times, thus blurring work–life contexts. It is thus expected that both technostress and work–family conflict will influence work engagement negatively. The combined effect of technostress and work–family conflict may increase the demands imposed on employees, increase workload and complexity and this may be detrimental to work engagement. Therefore,

H2. Work–family conflict mediates the relationship between technostress and work engagement.

POS is seen as a job resource that lessens stress, supports and creates a feeling of security and satisfaction of the psychological and emotional needs of employees for positive effect (Bano *et al.*, 2015). Thus, employees who perceive their organisations as supportive, despite the level of techno-stressors that they are exposed to, have a greater chance of experiencing high levels of work engagement (Mahapatra and Pati, 2018). A recent study indicated that the negative relationship between technostress creators, techno-invasion, techno-complexity, techno-insecurity and elements of work engagement, such as vigour and dedication, was stronger for people with low POS (Srivastava *et al.*, 2015). The negative consequences of technostress consistently include a decrease in physical well-being (e.g., headaches, fatigue and irritability), absenteeism, low levels of engagement and productivity (Tarafdar *et al.*, 2015; Srivastava *et al.*, 2015). Tarafdar *et al.* (2015) noted that, if organisations increase the level of support provided to employees in the form of employee assistance programmes as well as supervisory support, the level of work engagement can possibly improve. Therefore,

H3. POS mediates the relationship between technostress and work engagement.

POS assists individuals in coping with demands relating to technostress and conditions leading to work–family conflict. POS is positioned as an external job resource that counteracts the demands imposed by both technostress creators and work–family conflict, and this, in turn, helps to sustain a continuous positive emotional and psychological state for employees leading to work engagement.

H4. POS and work–family conflict mediate the relationship between technostress and work engagement

In summary, the following four hypotheses guided this exploratory study: (a) technostress, work–family conflict and POS have a direct influence on work engagement; (b) work–family conflict mediates the relationship between technostress and work engagement; (c) POS mediates the relationship between technostress and work engagement and (d) both POS and work–family conflict mediate the relationship between technostress and work engagement.

Methods

The study applied a quantitative research framework. This design was adopted and found appropriate owing to the nature of the study. Consistent with that, the study aimed to test the hypotheses and to describe the relationships between variables (work engagement, POS, work–family conflict and technostress). A cross-sectional survey utilising a self-report questionnaire was applied to collect data for the empirical analysis.

Research procedure

Respondents were recruited from employees at the selected university in South Africa. Ethical clearance was applied for and granted by the Economic Management Sciences Research Ethics Committee (GHREC) with reference number HSD2021/1827/21. After obtaining permission, the survey was distributed via emails with a clause for voluntary participation and a guarantee for both anonymity and confidentiality.

Sample of participants

Data were gathered through online platforms using EvaSys and the sample was made up of academic and support staff from a selected university in South Africa. The procedure followed involved sending an email with an informed consent form, requesting the target sample to participate. The email included a detailed explanation of the objectives of the study and a consent form. After seeking their willingness to participate, the online questionnaire was shared with them through EvaSys. A series of three repeated follow-ups were done to which 302 employees responded with their completed responses and they were included in the study.

The participants completed the survey whilst the virtual and hybrid mode of work was in place. Although lockdown measures were still in place, most employees were working both from home and from their designated offices. Amongst the participants, the majority were female constituting 61%, whilst 39% were males. In terms of age, the majority were between the ages of 31 and 40 (39%), followed by those who were between 41 and 50 (22%). The minority age group was made up of those above 60 years, who constituted 17% of the participants. In addition, the majority of the participants were academics, who constituted 57%, whilst 41% accounted for those individuals working as support staff.

Measures

*Work engagement scale (*the Utrecht Work Engagement Scale (UWES)

Work engagement was measured using the Utrecht Work Engagement Scale (UWES), which consists of a 17-item self-report scale that measures the 3 dimensions of work engagement, namely vigour, absorption and dedication, utilising a seven-point Likert scale (Schaufeli *et al.*, 2002). The internal consistencies of the scale have been found to be acceptable, ranging from 0.8 to 0.9 (Soane *et al.*, 2012; Schaufeli and Bakker, 2004).

Work–family conflict scale. Work–family conflict was measured using the work–family conflict scale (WFC) developed by Chen *et al.* (2021). This is a three-dimensional scale

consisting of strain-based conflict, behaviour-based conflict, and time-based conflict. The internal reliability estimates for the WFC measure were found acceptable in previous studies, ranging from 0.84 to 0.94. The WFC has discriminant validity (Chen *et al.*, 2021) and it has proven to be an accurate measure to assess the level of work–family conflict. Consistent with the above, the current study observed an acceptable internal consistency at ($\alpha = 0.942$).

Technostress questionnaire. To measure technostress, the technostress questionnaire was used. It is made up of five dimensions known as techno-stressors (Tarafdar *et al.*, 2007). The scale consists of 23 items that are assessed on a 5-point Likert scale, with 5 indicating "strongly agree" and 1 indicating "strongly disagree". The scale is reliable with the Cronbach's alpha for all the dimensions ranging from above 0.80 i.e., techno-invasion (0.81), techno-overload (0.89), techno-complexity (0.84), techno-uncertainty (0.82) and techno-insecurity (0.84) (Tarafdar and Stich (2021). The current study obtained an acceptable internal consistency for the technostress questionnaire ($\alpha = 0.927$).

Perceived organisational support scale. POS was measured using the POS scale developed and improved by Eisenberger and Stinglhamber (2011). The original 36-item scale measures POS and its sub-dimensions. However, the current study used the shortened version, which is made up of eight items. The scale is a seven-point Likert scale, where 1 represents "strongly disagree" and 7 represents "strongly agree". According to Worley *et al.* (2009), the questionnaire has an internal consistency of 0.952. Hinschberger (2009) observed a Cronbach alpha of 0.88. The current study observed an acceptable internal consistency for the POS scale at ($\alpha = 0.801$).

Analytical procedure

Preliminary data analysis was completed through the use of Statistical Package for the Social Sciences, which is the SPSS version 29. This included descriptive statistics, test of normality and the Cronbach alpha reliability tests. To determine the psychometric properties of the measures used in the study, the goodness-of-fit statistics were applied, including root mean square residual (SRMR), the root mean square error of approximation (RMSEA) and the comparative fit index (CFI). The measures used were subjected to confirmatory factor analysis using Lisrel 10.3. To test the hypotheses of the study, the variance-based SEM was applied. The two-step model testing process was followed, as instructed by Henseler *et al.* (2012). First, the outer model (i.e. measurement model) was evaluated in terms of relevant quality criteria (validity and reliability). The purpose of the outer model is to determine whether the measurements used to operationalise each of the latent variables (e.g. constructs) are reliable and valid. The acceptable quality criteria for the outer model include (a) average variance extracted (AVE) of 0.5 and higher, (b) composite reliability estimates of 0.7 and higher and (c) indicators (i.e. dimensions of constructs) with significant loadings on their respective constructs. In addition to significant loadings, these should also be 0.7 and higher.

Second, the structural model (i.e. inner model) was evaluated using the following guidelines: (a) significance of the path coefficients, (b) the size of the path coefficients (beta values) and (c) the amount of variance explained in the dependent variable by the proposed model. The statistical analyses were conducted using SmartPLS version 3.3 to address the proposed hypotheses (Bido *et al.*, 2014). The inner model, which is the structural model, was evaluated through determining the size of the path coefficients (using the beta values), assessing the significance levels of the path coefficients and then finally determining the aggregate size of variance explained in work engagement by the proposed model. The mediation proposition was tested using the specific indirect effects provided on the model.

Results

It is evident that all of the constructs met the quality criteria in terms of reliability and validity. Table 1 shows that the Cronbach's alpha scores and the composite reliability scores

Variable	Number of items	Cronbach's alpha
Technostress	21	0.927
Techno-invasion	4	0.833
Techno-overload	4	0.751
Techno-complexity	4	0.892
Techno-insecurity	5	0.870
Techno-uncertainty	4	0.866
Perceived organisational support	8	0.801
Work-family conflict	18	0.942
Time-based conflict	6	0.858
Strain-based conflict	6	0.835
Behaviour-based conflict	7	0.921
Work Engagement	17	0.967
Vigour	6	0.907
Dedication	5	0.928
Absorption	6	0.904

Source(s): Created by authors

Table 1.
Reliability tests

confirmed the internal consistency of the scales. The AVE and the heterotrait–monotrait (HTMT) scores, as well as the confirmatory factor analysis through the goodness-of-fit statistics, confirmed the distinctive, discriminant and the convergent validity of work–family conflict, technostress, POS and work engagement. The reliability scores associated with the dimensions of technostress were good (Table 1), varying from 0.751 for techno-overload to 0.892 for techno-complexity. The internal consistency scores of work–family conflict dimensions were estimated and the following scores were observed: time-based conflict, 0.858; strain-based conflict, 0.835 and behaviour-based conflict, 0.921, all considered as good. The POS scale scored 0.801. The work engagement scale was made up of three dimensions that all scored acceptable internal consistency scores (vigour, 0.907; dedication, 0.928 and absorption, 0.904). More specifically, all the composite reliability estimates were above the recommended value of 0.7.

In terms of validity, all the constructs have values above the recommended 0.5 related to the AVE. To determine model fit to the data, the following goodness-of-fit statistics were used: the standardised SRMR, the RMSEA and the CFI. Mostly, models with RMSEA and SRMR lower than 0.05 and a CFI higher than 0.95 are regarded as representing a very good fit between the hypothesised model and the data (Little, 2013). The measurement model for the three-dimensional model of work engagement was stipulated through allowing each dimension to load on its respective latent factor (for example, six items representing vigour, six items reflecting absorption and five items for dedication). A CFI of 0.824, RMSEA of 0.057 and SRMR of 0.041 were observed. The confirmatory factor analysis model fit indices related to technostress were observed as RMSEA = 0.051, SRMR = 0.057 and CFI = 0.895. Based on the results, the model fit the data well, since all three of the fit statistics observed were statistically adequate. For the work–family conflict, the following fit statistics were discovered: SRMR = 0.063, CFI = 0.953 and RMSEA = 0.133. The model can be considered to be adequate since two of the three fit statistics (SRMR and CFI) were acceptable.

Quality criteria: outer model

To assess the quality criteria, the composite reliability was considered for the internal consistency reliability aspect. Table 2 indicates that the composite reliability for all the variables is above the 0.6 cut-off score; therefore, it can be concluded that all the constructs in the study observed satisfactory composite reliability. The scores are as follows: work

engagement, 0.952; work–family conflict, 0.847; technostress, 0.849 and POS (1.00). The composite reliability scores indicated in Table 2 were all good, according to Pallant (2020). To assess the convergent validity of the measurements, the AVE score was applied and all were observed as acceptable. The reported AVE scores were above the 0.5 cut-off (work engagement, 0.833; work–family conflict, 0.867 and technostress, 0.688).

Table 3 displays the findings for the discriminant validity, indicating the HTMT values observed for the variables: 0.412 for technostress and POS; 0.536 for work engagement and POS; 0.652 for work–family conflict and POS and for technostress and work engagement, 0.499; for technostress and work–family conflict, 0.529; then work–family conflict and work engagement, 0.434. For a good discriminant validity, the HTMT values should be lower than 0.90 as indicated by Hair *et al.* (2019). It is, therefore, evident from the results provided in Table 3 that all the values obtained were lower than the cut-off.

The next step was to determine whether indicators/dimensions of constructs have significant loadings on their respective constructs. Table 4 reports the loadings of each of the indicators in relation to the relevant theoretical construct. All of the indicators have statistically significant loadings on their respective constructs. From Table 4, it is clear that significant loadings were observed for all the indicators loading on their respective constructs, with ($p = 0.000$). The loadings for the indicators were spread from 0.738 (behaviour-based conflict) to 0.960 (vigour). It should be noted that all the loadings are above the recommended value of 0.7. The quality criteria (associated with the outer model), therefore, point to the fact that all the constructs used in the present theoretical model are reliable and valid. Subsequently, the study proceeded with the evaluation of the structural model, reflecting the proposed paths of the conceptual model.

Structural model evaluation

In terms of the measurement model/inner model, Table 5 indicates the path coefficients with the associated p- and t-values. The path coefficients provide an indication of the strength as well as the direction of the proposed theoretical paths. The results indicated that two of the three proposed direct paths to the endogenous variable in the theoretical model are statistically significant at $p < 0.05$. The observed pathway from work–family conflict to work engagement was the strongest (b = −0.726: t = 26.624: mean = 0.726: $p = 0.000$). The least statistically significant path to the endogenous variable was reported from POS to work

Variable	Cronbach's alpha	Composite reliability	Average variance extracted
Work engagement	0.952	0.969	0.833
Work-family Conflict	0.847	0.929	0.867
Technostress	0.849	0.898	0.688
POS	1.00	1.00	1.00

Source(s): Created by authors

Table 2. Quality criteria

	POS	Technostress	Work engagement
POS			
Technostress	0.412		
Work Engagement	0.536	0.499	
Work_family_Conflict	0.652	0.529	0.434

Source(s): Created by authors

Table 3. Heterotrait-monotrait ratio _Discriminant validity

Variable and dimension	Original sample (o)	Sample mean	Standard deviation	T statistics	*P* values
Absorption: Work Engagement	0.949	0.948	0.009	102.514	0.000
Dedication: Work Engagement	0.957	0.957	0.007	138.827	0.000
Vigour: Work Engagement	0.960	0.960	0.006	160.068	0.000
POS: POS	1.000	1.000	0.000		
TC: Technostress	0.855	0.854	0.020	43.026	0.000
TINV: Technostress	0.796	0.796	0.023	34.837	0.000
TINS: Technostress	0.817	0.815	0.024	33.758	0.000
TOLD: Technostress	0.850	0.849	0.019	45.794	0.000
SBC: Work-family Conflict	0.934	0.933	0.010	95.445	0.000
BBC: Work-family Conflict	0.738	0.738	0.026	28.909	0.000
TBC: Work-family Conflict	0.928	0.928	0.010	94.470	0.000

Source(s): Created by authors

Table 4.
Outer loadings

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	*P* values
POS - > Work Engagement	0.121	0.122	0.041	2,935	*0,003*
POS - > Work_family_ Conflict	−0.372	−0.364	0.046	8,114	*0,000*
Technostress - > POS	−0.373	−0.376	0.054	6,867	*0,000*
Technostress - > Work_ family_Conflict	0.492	0.499	0.048	10,274	*0,000*
Work_family_Conflict - > Work Engagement	−0.726	−0.726	0.027	26,624	*0,000*

Source(s): Created by authors

Table 5.
Path coefficients

engagement (b = −0.121: t = 2.935: mean = −0.122: p = 0.003). Technostress had a non-significant direct relationship with work engagement. Significant paths were noted between the exogenous variables with technostress to work–family conflict observing the second strongest link (b = 0.492: t = 10.274: mean = 0.499: p = 0.000), implying that technostress is a strong determinant of work–family conflict. In addition, POS reported a negative but significant path to work–family conflict (b = −0.372: t = 8.114: mean = – 0.364: p = 0.000). Technostress reported a negative but significant path to POS (b = −0.373: t = 6.867: mean = – 0.376: p = 0.000).

As indicated in Table 5, it is evident that two of the three proposed paths to the dependent variable in the theoretical model are statistically significant. Thus, two of the three independent variables (work–family conflict: β = −0.726, p = 0.0000 and POS: β = 0.121, p = 0.003) have a significant and direct influence on work engagement. On the other hand, technostress had a non-significant direct influence on work engagement. Therefore, these results provide partial support for Hypothesis 1: *Technostress, work–family conflict and POS have a direct influence on work engagement*. Note should be taken that, whilst POS exhibited a positive significant influence on work engagement, work–family conflict observed a negative statistically significant influence on work engagement. A combination of all independent

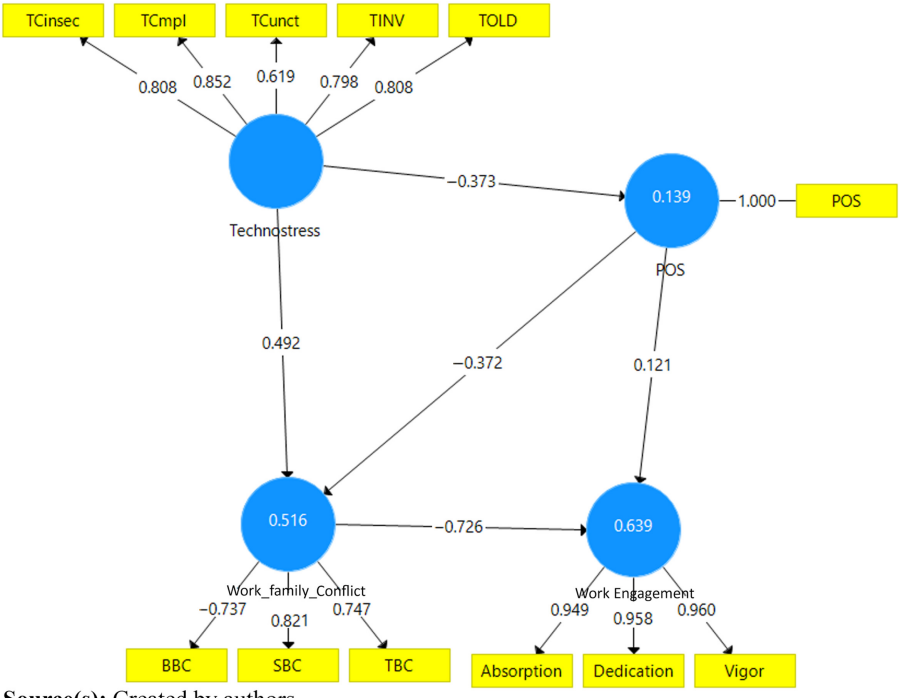
variables in the theoretical model explains approximately 63.9% of the variance in work engagement (see Table 6). This can be interpreted as moderate effect. Figure 1 shows the significant paths from the independent variables to the dependent variable.

To evaluate the remaining three hypotheses (relating to mediation), the indirect effects should be consulted (see Table 7). Thus, Table 7 shows the extent to which POS, technostress and work–family conflict influence work engagement. It is evident that POS has a significant mediating effect ($\beta = 0.045$ and $p = 0.009$) on the relationship between technostress and work engagement. It is also evident that work–family conflict has a significant mediating effect ($\beta = -0.357$ and $p = 0.000$) on the relationship between technostress and work engagement. The mediating effect of work–family conflict on work engagement is bigger compared to the mediating effect of POS ($\beta = 0.045$ vs -0.357). Hence, the results of this study observed full support for Hypothesis 2: *Work–family conflict mediates the relationship between technostress and work engagement*; and for Hypothesis 3: *POS mediates the relationship between technostress and work engagement*. Because the path coefficient between technostress and

	R square	R square adjusted
POS	0.139	0.136
Work Engagement	0.639	0.636
Work_family_Conflict	0.516	0.513

Source(s): Created by authors

Table 6. R square



Source(s): Created by authors

Figure 1. Model for the interaction between technostress, perceived organisational support, work–family conflict and the impact on work engagement

	Original sample (O)	Sample mean (M)	Standard deviation (STDEV)	T statistics (|O/STDEV|)	*P* values
Technostress - > POS - > Work Engagement	0.045	−0.046	0.017	2,608	*0,009*
POS - > Work_family_Conflict - > Work Engagement	0.270	0.264	0.034	7,843	*0,000*
Technostress - > Work_family_Conflict - > Work Engagement	−0.357	−0.362	0.038	9,469	*0,000*
Technostress - > POS - > Work_family_Conflict	0.139	0.137	0.026	5,431	*0,000*
Technostress - > POS - > Work_family_Conflict - > Work Engagement	−0.101	−0.099	0.019	5,348	*0,000*

Table 7.
Specific indirect effects

Source(s): Created by authors

work engagement is not statistically significant, the above two results provide evidence of full mediation.

Note is taken that the mediating effect of both POS and work–family conflict is also statistically significant ($\beta = -0.101, p = 0.000$) and bigger than that of POS alone ($\beta = 0.045$) but smaller than that of work–family conflict alone ($\beta = -0.357$. These results, therefore, observed support for Hypothesis 4: *both POS and work–family conflict mediate the relationship between technostress and work engagement*.

Discussion and conclusion

Summary of the findings. This study investigated four issues: the direct influence of technostress, work–family conflict and POS on work engagement; the mediating effect of work–family conflict on the relationship between technostress and work engagement; the mediating effect of POS on the relationship between technostress and work engagement and finally, the combined effect of technostress, POS and work–family conflict on work engagement. For the first hypothesis (*technostress, work–family conflict and POS have a direct influence on work engagement),* attempts were made to look at the unique contributions of each independent variable to work engagement as the dependent variable. First, with regard to work–family conflict, results suggested that the construct explained a significant proportion of variance in work engagement compared to the other two variables (technostress and POS). Work–family conflict has the strongest negative statistically significant influence on work engagement. Thus, when employees are exposed to work–family conflict, their enthusiasm for work is impacted negatively. Consistent with the above, Wayne *et al.* (2017) noted that, although the main purpose of organisations is to create an energised, dedicated and engaged workforce, the negative influence of work–family conflict on work engagement has been noted through the way conflict attracted emotional exhaustion or made the boundary between work and family domains blurry. In line with that (Robinson *et al.* 2016), noted that diminishing levels of work engagement relates to concerns over deteriorating WLB and the potential of a spillover of work commitments into the family time owing to technology. Work–family conflict includes work interfering with family and family interfering with work, diminishing the degree of concentration on each domain owing to commitments from the other domain (Kim and Gong, 2017).

Second, POS also influenced work engagement significantly. These results are consistent with Kurtessis *et al.* (2017), who noted that POS can have a positive impact on the attitudes

and behaviour of employees as it creates a form of obligation within individuals to return the favour to the organisation. Employees with greater POS may become more engaged in their work and organisations as part of the reciprocity norm of the Social Exchange Theory to help the organisation in the achievement of its goals. POS impacts employee work engagement positively as it reinforces the intrinsic interest of employees in their duties and tasks (Bonaiuto *et al.*, 2022). Accordingly, POS creates an optimal climate in an organisation by promoting better performance and good social relations (Malik and Noreen, 2015), fostering trust in the organisation and being seen as an important driver of work engagement (Bonaiuto *et al.*, 2022).

Third, regarding the impact of technostress on work engagement, unexpected findings were observed. No significant direct influence was observed between technostress and work engagement. This implies that the level of technostress of the participants did not positively or negatively influence work engagement directly. Contrary to these findings, based on the JD-R model, technostress is regarded as a job demand, which exerts strain on individuals through techno-stressors such as techno-invasion, techno-complexity, techno-uncertainty and techno-overload; hence, it is expected to influence work engagement negatively. Similarly, the stress–strain outcome (SSO) model of Cheung and Tang (2010) explains that there is positive association between technostress creators and burnout, which is the opposite of work engagement. Recent research on technostress also indicated that perceived techno-stressors can lead users to have less organisational commitment, low levels of work engagement and low job satisfaction (Fuglseth and Sørebø, 2014; Salo *et al.*, 2019). Specifically, individuals may struggle with concentration and social relations. Techno-uncertainty negatively influences work engagement and this, according to scholars, is because techno-uncertainty involves the continuous changes or upgrades in ICTs that cause ambiguity and stress and add to the daily job demands so that individuals who do not possess the necessary technological skills experience an imbalance between the technological demands and the skills resources that they possess, and this results in low levels of work engagement (Salo *et al.*, 2019). Even though the results are unexpected and contradict previous studies, such as Tarafdar and Stich (2021) and Salo *et al.* (2019), who note that technostress is associated with burnout and poor work involvement, note is taken that the current study discovered indirect effects between technostress and work engagement.

The second hypothesis noted that work–family conflict can mediate the relationship between technostress and work engagement. This proposition was supported. Technostress had an indirect influence on work engagement when work–family conflict was applied as a mediator; note is taken that the relationship direction is negative ($b = -0.357$). Accordingly, a negative significant test ($p = 0.000$) mediating effect of work–family conflict is confirmed in the relationship between technostress and work engagement. Those who experience low technostress tend to be more engaged when they have low work–family conflict. Thus, technostress through work–family conflict is negatively associated with work engagement. This is consistent with the findings of other researchers (Brough *et al.*, 2014; Casper *et al.*, 2018; Powell, 2018), who noted that a few of the dimensions of technostress, including techno-invasion and techno-complexity, invade the family time of individual employees and, in turn, cause burnout and affect work engagement negatively. Consistent with this, Mahapatra and Pati (2018) discovered that some of the techno-stressors, such as techno-invasion, are negatively related to positive organisational outcomes such as well-being, work engagement and productivity. This is because techno-invasion creates distortion lines that separate an individual's life from their occupation. The hybrid and virtual work setting inevitably result in techno-invasion, modify the quality of life at work and accelerate the use of multiple devices, often generating confusion and misunderstanding between employees and employers (Marchiori *et al.*, 2019). University employees and others who were exposed to both remote working and hybrid work settings have been confronted with several difficulties

in organising their own working time; for instance, spaces, devices, Internet connection and coffee breaks have been forcefully shared with the family – a test that may make it difficult to respect the boundaries between work and private life (Ingusci *et al.*, 2021). An attempt to balance all of these aspects might lead to the depletion of personal resources, stress and subsequent burn out and low levels of engagement (Marchiori *et al.*, 2019). Consistent with that, Ingusci *et al.* (2021) noted that techno-stressors such as techno-overload result in work overload, which may spillover into family time, leading to burnout and stress. Techno-overload, techno-uncertainty and techno-complexity all contribute to an increase in job demands which has negative implications on family time (work overload, time pressure, cognitive and emotional demands) then decreasing work engagement (Ingusci *et al.*, 2021). Some studies highlight how remote working and hybrid work settings, especially during the COVID-19 emergency, increased workload as a result of technological complexity. Above that, it also created assumptions of "anytime accessibility" (Wang *et al.*, 2021; Yang *et al.*, 2020). Work engagement means getting involved wholeheartedly in work by devoting time and energy proactively to the tasks and the technology facilitates the dedication and absorption. Based on the above inference, this study concludes that technostress through work–family conflict influences work engagement negatively.

The third hypothesis noted that POS can mediate the relationship between technostress and work engagement. This proposition was supported. Technostress had an indirect influence on work engagement when POS was applied as a mediator. Note is taken that the relationship direction is positive (b = 0.045). Accordingly, a positive significant test ($p = 0.009$) mediating effect of POS is confirmed in the relationship between technostress and work engagement. Thus, technostress influences work engagement through POS. Those who experience technostress with high organisational support tend to display higher levels of engagement. These findings are consistent with previous studies indicating that POS may be considered a potent factor in the interventions aimed to reduce technostress and to improve individual effectiveness (Galanti *et al.*, 2021; Ujoatuonu *et al.*, 2019). This can be due to the fact that when individuals experience techno stress with adequate access to ICT support from their organisations, they remain engaged. In line with the above, the JD-R model (Bakker and Demerouti, 2014) identifies POS as a job resource with the potential to buffer the negative effects of job demands and job strain, such as technostress creators (techno-invasion, techno-complexity and techno-overload). As a job resource, POS facilitates the motivational processes that enable individuals to use techno-stressors as challenges, which calls for growth rather than resulting in problems. Consistent with that, the conservation of resources (COR) theory notes that individuals try to acquire, hold and protect what they consider valuable, including physical, mental, social and personal resources (Halbesleben *et al.* 2014). If people experience stress and strain, it is often because they have lost potential or realistic resources. If organisations provide the needed support (in terms of ICT support and training) as job resources, employees reciprocate through positive organisational outcomes, such as work engagement. Hypotheses 2 and 3 are, therefore, fully confirmed, indicating that POS mediates the relationship between technostress and work engagement and also that work–family conflict mediates the relationship between technostress and work engagement. However, the mediating effect of work–family conflict was stronger (b = −0.357) than that of technostress and POS (0.045).

The fourth hypothesis, which is the ultimate path to the endogenous variable, proposed that work–family conflict through POS mediates the relationship between technostress and work engagement. The hypothesis was supported. Work–family conflict through POS mediates the relationship between technostress and work engagement. These results are consistent with the COR theory, which indicates that WLB and POS are considered to be reserves of job resources and personal resources that individuals can rely upon to maintain work engagement (Hobfoll, 2011). Work–family conflict and POS impact personal burnout,

distress symptoms and employee well-being, which relate well to work engagement (Galanti *et al.*, 2021; Fotiadis *et al.*, 2019). Negative work–family interaction decreases work engagement owing to increased psychological strain and diminished mental resources (Eby *et al.*, 2005). It is expected that when the confidence of being in control over technology, work and family activities is coupled with supervisor and organisational support, employees will display high levels of work engagement. The results are reasonable, considering that the direct effect of work–family conflict on work engagement is high; thus, the intrusion of work into personal life caused by ICT intensifies the negative spillover between work and family and eventually weakens and depletes the job resources supplied through POS, leading to a negative influence on work engagement. In virtual and hybrid work settings, employees experience feelings of always being reachable and attuned to work issues without a break. Such experiences reflect the spillover of work technologies into the family time and result in conflict between work and family roles, which, eventually, cause burnout and influence work engagement negatively.

In conclusion, studies on technostress agree that techno-stressors create more job demands, demanding more time for training to acquire technical skills. The amount of time and energy used in device and software training invade family and personal time, leading to the spillover effect. This diminishes the personal resources that employees have and affects work engagement negatively (Fujimoto *et al.*, 2016). Positive effects of ICT in hybrid work environments are noted, including access to information and greater flexibility (Golden and Geisler, 2007), greater control over work process and improved efficiency (Dewett and Jones, 2001) and increased communication amongst colleagues. These so-called positive effects affect work–family conflict negatively and increase work–life conflicts (Fujimoto *et al.*, 2016; Kelliher and Anderson, 2010). Based on the JD-R model (Demerouti *et al.*, 2001) and its related work–engagement study (Schaufeli and Bakker, 2004), work engagement is diminished by lack of job and personal resources, expanded job demands and emotional exhaustion. Technostress and work–family conflict seem to create additional job demands, diminish personal resources and cause the psychological tension of always having to respond to work demands anywhere and at any time; hence, in hybrid and virtual environments most employees find their job resources inadequate to sustain their work engagement.

Practical and theoretical implications

The most important finding from the study was the positive relationship observed between technostress and work–family conflict, with the ultimate negative impact being on work engagement. When technostress and work–family conflict are high, low levels of work engagement are exhibited. The managers need to realise the detrimental effects of both technostress and work–family conflict on work engagement in virtual and hybrid work settings. Expanding the personal and job resources of individuals in hybrid and virtual settings is critical to enable them to meet the additional work demands and to manage the strain imposed by technostress. Instituting relevant organisational support has proved to be inadequate in addressing the challenges relating to technostress and work–family conflict. Therefore, introducing WLB policies that assist employees to set clear boundaries between work and family time to avoid burnout and spillover is critical. This is especially important when dealing with technostress creators in the remote work setting. Additionally, providing adequate ICT support as well as training related to the use of different devices and software should be part of the organisational culture. A manageable and reasonable workload should be maintained bearing in mind the complexity and ambiguity associated with the hybrid work setting. Managers should make allowances for employees to adjust their schedules to accommodate personal obligations, as well as adjusting employee workloads to accommodate family responsibilities. As for the coping strategies for technostress and

work–family conflict, it is important to consider the positive effects of the supportive work environment.

Taking the hybrid work context into consideration, although the JD-R model provides POS as a job resource that may assist in maintaining or improving work engagement, this study discovered that when individuals are exposed to many techno-stressors and are also working from home and from the office, they tend to experience strain and stress, which impacts negatively on work–family conflict. Despite the support provided by the organisation as a job resource, the work engagement is influenced negatively. Therefore, given the techno-stressors and work–family conflict as antecedents of work engagement in virtual and hybrid work settings, it is critical to expand the JD-R model and to include aspects of positive technology which have proved to be highly effective in reducing technostress (Calvo and Peters, 2014) and to diminish work–family conflict. A combination approach of ICT support and positive technology should be introduced to make it easier for employees to navigate technology and to generate positive experiences. Therefore, the implementation of positive technology-designed solutions in virtual and hybrid work settings presents possible inhibitors of techno-overload, techno-complexity and techno-invasion which, in turn, increase work engagement.

Limitations and future directions

Limitations of the study are acknowledged. The study only examined employees in one institution; therefore, the findings from this study need to be tested in other contexts considering that the experience of employees may differ depending on type of the organisation as well as on the nature of work. Another limitation was the utilisation of a cross-sectional self-report survey which, according to Podsakoff *et al.* (2012), involves possible method bias; thus, it is possible to lose sight of the impact of the time line, especially on the work engagement construct. Future studies may focus on designing a follow-up survey to examine an overall perspective for assessing the effect of the same independent variables on work engagement over time. The third limitation was the difficulty encountered in establishing whether the levels of work engagement actually changed for the participants when the virtual and hybrid work settings were introduced or whether they have remained constant. Finally, although data were gathered with integrity, note is taken that findings should be generalised with caution to employees working in university settings.

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