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Personal use of smartphones in the workplace and work–life conflict: a natural quasi-experiment

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Abstract

Purpose – Prior research has extensively examined how bringing technology from work into the non-work life domain creates conflict, yet the reverse pathway has rarely been studied. The purpose of this study is to bridge this gap and examine how the non-work use of smartphones in the workplace affects work–life conflict.

Design/methodology/approach – Drawing from three literature streams: technostress, work–life conflict and role boundary theory, the authors theorise on how limiting employees' ability to integrate the personal life domain into work, by means of technology use policy, contributes to stress and work–life conflict. To test this model, the authors employ a natural experiment in a company that changed its policy from fully restricting to open smartphone access for non-work purposes in the workplace. The insights gained from the experiment were explored further through qualitative interviews.

Findings – Work–life conflict declines when a ban on using smartphones for non-work purposes in the workplace is revoked. This study's results show that the relationship between smartphone use in the workplace and work–life conflict is mediated by sensed stress. Additionally, a post-hoc analysis reveals that work performance was unchanged when the smartphone ban was revoked.

Originality/value – First, this study advances the authors' understanding of how smartphone use policies in the workplace spill over to affect non-work life. Second, this work contributes to the technostress literature by revealing how, in specific situations, engagement with ICT can reduce distress and strain.

Keywords Smartphone, Intervention, Role boundary theory, Work–life conflict, Stress, Quasi-experiment, Technostress

Paper type Research paper

1. Introduction

The boundaries between work and personal life continue to dissolve, due in large part to the ubiquity of the smartphone. While much research has considered the implications of smartphone mediated work issues seeping through to the non-work domain (Butts *et al.*, 2015; Chen and Karahanna, 2018), very few studies have considered the reverse situation, i.e. the implication of non-work issues entering the work domain through the personal use of smartphones in the workplace (PUSW; see Chen and Karahanna, 2014; Yin *et al.*, 2023 as exemplar studies). This study contributes to the latter stream by investigating the effect of PUSW on work–life conflict (WLC; i.e. the perceived conflict between the demands of work and non-work life domains).

In many organisations, the PUSW, such as managing non-work oriented tasks, has become accepted practice during work hours. The work from home policies mandated throughout the Covid-19 pandemic have further blurred the boundaries between work and

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non-work life, with many employees now expecting to use their smartphone to manage personal issues when they return to the workplace (Qualtrics, 2021). However, with reports suggesting workers use their smartphones for an average of 56 min during the working day for non-work related tasks (Office Team, 2017), managers are concerned about the impact on important organisational outcomes.

Some organisations have introduced smartphone bans in the workplace for health and safety reasons. For example, Amazon warehouse employees who work alongside fast-moving machinery were required to leave their phones at home or in their vehicle before stepping inside the premises. However, Amazon has recently reversed the phone ban as employees felt controlled by the policy (Bloomberg, 2022). At the same time, other firms are implementing similar blanket bans on personal mobile devices in the workplace in order to assuage the productivity declines and potential security threats posed by PUSW (Malvern, 2019). The practice is widespread. One-fifth of companies based in Berlin currently implement some form of smartphone ban in the workplace (Chadi *et al.*, 2022). In parallel, workers themselves are freely choosing to eschew smartphones in order to maintain focus on work related tasks and to regain a desired work–life balance (WLB). While such interventions are well intentioned and presumably designed to improve the quality and quantity of work output in one's non-work and work life domains, we have a limited understanding of how the ability or inability to use smartphones in the workplace affects the work–life interface. For example, it is possible the ability to manage family issues "on the fly" through Snapchat messages during work hours reduces WLC as issues are resolved before the family reassembles in the evening. It is important to focus on the association between PUSW and WLC as the walls between work and non-work life are continually crumbling due to ubiquitous affordances of the smartphone. WLC is strongly tied to employees' wellbeing (Derks *et al.*, 2014b; Sarker *et al.*, 2012), a factor that can affect both employee behaviours and firm outcomes (Ahuja *et al.*, 2007). Moreover, managers should care about WLC experienced workplaces as a meta-analysis of over 400 studies confirms WLC strongly predicts absenteeism, work performance, organisational commitment and turnover intentions (Amstad *et al.*, 2011).

Our study focuses on PUSW which is a subset of the broader scholarly conversation concerning the personal use of technology at work (PUTW). In addition to smartphones, the PUTW literature examines the impact of employees using organisational ICTs for personal purposes (e.g. accessing Facebook through company Wi-Fi) and the use of personal ICTs such as tablets, laptops, smartwatches for non-work related activities while at work. Within the PUTW literature, there are opposing viewpoints as to the outcomes associated with such ICT use (Jiang *et al.*, 2023). Some studies report on the positive implications of PUTW, such as facilitating mental recovery (Reinecke, 2009; Syrek *et al.*, 2017) and enhanced job performance (Chen *et al.*, 2022), while other studies suggest more negative outcomes like procrastination (Lim, 2002), mental overload (Yin *et al.*, 2018) and decreases in performance (Cao and Yu, 2019). However, these existing studies tend to focus on the performance implications of PUTW within the work domain. To accurately inform organisational policies and individual decisions about PUTW, it is important we have a comprehensive picture of the full range of outcomes associated with smartphone use. As recently argued by Magni *et al.* (2023, p. 254), we currently do not have this knowledge; ". . . phenomena rooted in the interface between the work and the family domains are inherently multifaceted, and previous research falls short in providing a better understanding of the potential paradox between the benefits (i.e. productivity) and the costs (i.e. well-being) associated with excessive mobile use." In response to these limitations, and to help resolve the tension in the PUTW literature, our purpose in this paper is to consider an important but understudied implication, namely the effects of PUTW on WLC. In response to these limitations, and to help resolve the tension in the PUTW literature, our purpose in this paper is to consider an important but understudied implication, namely how the effects of PUSW spill over affects

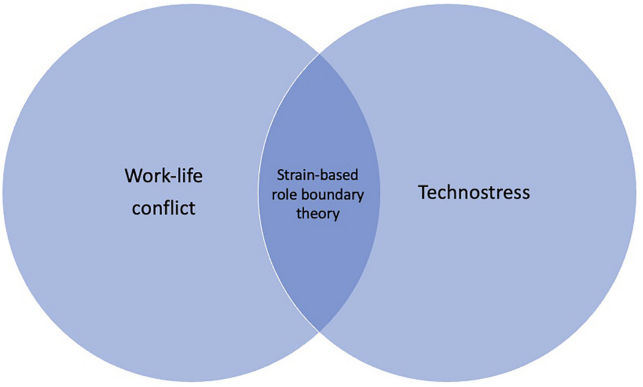
WLC in non-work settings. As such, our study addresses recent calls for future research to investigate the effects of PUTW on outcomes beyond performance (Jiang *et al.*, 2023), and how the stresses associated with using technology at work spill over to affect the non-work life domain (Benlian, 2020).

Motivated by these research gaps, our study integrates role boundary theory with the WLC and technostress literature, to examine if and how WLC changes when employees are able to use personal smartphones in the workplace. Similar to the Amazon case above, we were presented with a unique opportunity to conduct our study at a company which was in the process of changing its PUSW policy from a blanket ban to open access. Our study site is typical of many busy workplaces where employees work alongside industrial equipment and inventory. The workplace ban on smartphones, which has recently been overturned, was initially enforced in the 1990s as smartphone use was considered a potential distraction and hazard in the industrial surroundings. Thus, the IT artefact at the centre of our study is the PUSW policy, which aligns with both the "Impact" and "IT managerial, methodological, and operational practice" elements of the IT artefact as conceptualised by Benbasat and Zmud (2003). Data were gathered through a natural quasi-experiment with 82 of the company's employees. Out of whom, 39 began using their smartphone for non-work purposes at work after a ban on smartphone use at the workplace was lifted, and 43 did not bring their phones to the workplace after the ban was removed and served as a natural control group. Participants completed a pre and post intervention survey, about one year apart, to capture their PUSW frequency, and perceptions of stress and WLC. We then conducted a qualitative investigation to test congruence with the quantitative findings, as well as to explore why these findings emerged.

This study makes key contributions to the literature. Firstly, our work contributes to the technostress literature by revealing how, in specific situations, engagement with ICT can reduce distress and strain. While calls have been made for research to consider the positive aspects of technostress (Tarafdar *et al.*, 2019), existing studies have been limited to eustress (Benlian, 2020; Califf and Sarker, 2020) – how the pressures from ICT use can lead to positive outcomes – rather than mitigating the negative effects of stress. This contribution is important because there is growing evidence in support of the positive role of leisure technologies in one's work and life domains, for example, through affording detachment (Mäntymäki *et al.*, 2022). Secondly, the ripple effects of ICT from work to private life does not occur in a vacuum, with mediating factors explaining why such relationships exist. Contribution to the PUTW literature, we identify the specific stress mechanisms through which PUSW relates to WLC. Our findings suggest the agency to self-determine family interactions through mobile communications suppresses WLC, but only when employees actively use their smartphones at work. Thirdly, within the broader information systems (IS) literature, a shift in focus towards the negative implications of ICT over the positives has recently been noticed (Myers, 2021). Our critical perspective shifts the discussion about PUSW away from a focus on the negative consequences to a greater appreciation of the positive outcomes that can emerge (without discounting the importance of negative consequences). Studies of PUTW often frame the activity as a deviant behaviour (e.g. Lim, 2002; Liberman *et al.*, 2011). Our natural experimental data confirms that the ability to use smartphones in the workplace attenuates WLC. Such insight will be pertinent to managers and employees when designing policies around PUSW, whilst also bringing balance to the positive-negative focus of IS research.

2. Related literature

As illustrated in Figure 1, we draw from three strands of literature to underpin our study. The WLC literature reveals the spillover effects evident when ICT is used in one domain for an



Source(s): Author's own creation/work

Figure 1.
Alignment between theoretical bases

alternative purpose. Next, we review the technostress literature to help conceptualise how engagement with ICT can have positive as well as negative consequences for strain. The emerging technostress literature also provides the themes for our qualitative study where we interpret how PUSW reduces WLC. We then use role boundary theory, and specifically the strain-based approach, as a theoretical bridge between WLC and technostress.

2.1 ICT and work–life conflict

The growing ubiquity of electronic communications and its implications for WLB has received significant attention from both IS and organisational psychology scholars. WLB describes the degree to which an individual is simultaneously able to balance the temporal, behavioural and emotional demands between paid employment and non-work responsibilities (Hill *et al.*, 2001). Lack of WLB leads to WLC, which has been defined as the inter-role conflict arising when the demands created by either the work or non-work life domain interfere with performing responsibilities in the other domain (Netemeyer *et al.*, 2004). Role demands are a function of the expectations placed on the worker from both domains, as well as the values held by the worker as to their own work and non-work life behaviour (Boyar *et al.*, 2008). For example, the work role may demand that employees do not use personal smartphones in the workplace, as was the case in the company where we gathered our data. Yet, family and friends may place demands on the worker to be available to them through their smartphone. When non-work demands are not met during work hours, this may manifest as greater conflict in the non-work life domain.

Within the IS discipline, two streams of WLC research are evident. The first focuses on WLC amongst IT professionals, whom it is argued are more disposed to WLC due to challenges such as travel requirements, coordination issues across global teams, requirements instability and prescribed use of certain systems methodologies (Sarker *et al.*, 2010). Studies in this stream consider how issues such as flexible work schedules (Sarker *et al.*, 2018), time differences (Sarker *et al.*, 2010) and perceived work overload (Ahuja *et al.*, 2007) influence WLC for IT professionals. While valuable, this research is not directly relevant to the current study as the focus is on the circumstances of the employee, rather than their engagement with digital technology.

The second stream of research does consider how engagement with work matters through digital technology at home influences WLC. Such actions have been viewed as a violation of the work – home boundary resulting in greater WLC (Sarker *et al.*, 2012; Turel *et al.*, 2011), with individual differences related to ambition and job involvement salient in explaining technology use

after hours (Boswell and Olson-Buchanan, 2007). Processing work communications during non-work hours restricts personal and family time, leading to higher WLC (Cho *et al.*, 2020), as does perceptions of negative tone in the sender's message (Butts *et al.*, 2015). The use of mobile phone after hours can feed into the need many workers have to stay on top of developments, which can lead to personal health and wellbeing problems (Sarker *et al.*, 2012). The flexibility and productivity afforded by smartphones also contribute to WLC indirectly through work overload, resulting in higher stress and ultimately a greater resistance to using smartphones for work purposes (Yun *et al.*, 2012). Indeed, the flexibility of mobile technology can be a double-edged sword with some teleworkers reporting a thriving family life, while other teleworkers from the same organisation suggesting the enhanced flexibility creates conflict by blurring the work and family domains (Hill *et al.*, 1996). These differences in perceptions of WLC may be explained by worker autonomy. One recent study concludes that workers can temper the negative effects of mobile technology on WLC when they possess more control over their work situation (Tams *et al.*, 2020).

One might expect work performance to benefit from work-related smartphone use in off-job hours, yet this seems not to be the case (Chen and Karahanna, 2018). Instead, such work interruptions during off-job time are associated with enhanced work exhaustion (Chen and Karahanna, 2018; Derks *et al.*, 2014b). Whether the impact of work-related smartphone use in off-job hours is positive or negative may depend on the specific technology used for communication. Phone calls and instant messaging generate negative outcomes through interruption overload, while e-mail leads to both positive and negative outcomes through task closure and psychological transitioning respectively (Chen and Karahanna, 2018).

While a consensus is largely evident on the consequences of after-hours work-related technology use, a similar consensus as to the effects of PUTW has not yet developed. In a systematic review of 137 studies on PUTW, Jiang *et al.* (2023) identified numerous studies providing evidence of either positive or negative outcomes. In terms of the negative outcomes, some studies report that PUTW leads to poorer job performance (Cao and Yu, 2019), procrastination and negative emotion (Lavoie and Pychyl, 2001), lower creativity (Kühnel *et al.*, 2017) and decreased work engagement (Syrek *et al.*, 2017). Conversely, PUTW studies focussing on the non-work use of social media at work, report better WLB (Kühnel *et al.*, 2017), improved job performance (Chen *et al.*, 2022) and the within person effect of enhancing work engagement through the mental recovery afforded (Syrek *et al.*, 2017).

The divergent findings in prior PUTW studies could be due to the exclusive reliance on correlational survey designs which do not compare ICT users with non-users. This is understandable as PUTW is a nascent stream of research and previous investigations did not have a mechanism to support a more systematic approach to study causality in a natural setting. Focussing on WLC, our aim is to move the discussion on PUTW forward by determining causation effects in natural settings through a natural experiment. As stress in the workplace can spill over to affect home life, we now draw from the technostress literature to guide the development of our conceptual model.

2.2 Technostress

Stress was originally conceived as a physiological reaction to taxing stimuli (Selye, 1956). Contemporary thinking now considers stress to be a process whereby the individual continually evaluates if their environment is *harmful, threatening, or challenging*, and whether these pressures exceed their resources and threatens wellbeing (Lazarus and Folkman, 1984). In contrast to the initial conceptualisations which did not consider perceptions of stress to be important, perception or situational awareness are central in the process-based view of stress (Fischer *et al.*, 2021). Aligned to the process-based view is the concept of "stressors", the sources of stress formed through the ongoing relationship between an individual and their environment, and "strain," which refer to the adverse outcomes related to stressors (Cooper *et al.*, 2001; Lazarus and Folkman, 1984). In our conceptualisation, the (in)ability to use

smartphones for non-work reasons in the workplace is a stressor that generates stress, which ultimately manifests as the strain of WLC largely experienced in the non-work life setting.

It has been well documented in both the practitioner and academic literature that the personal uses of ICT can generate stress (Korzynski *et al.*, 2021; Suh and Lee, 2017; Whelan *et al.*, 2022). The term technostress is widely used to describe this association between ICT and stress. Ragu-Nathan *et al.* (2008, pp. 417–418) defined technostress as "[a] phenomenon of stress experienced by end users in organisations as a result of their use of [ICT]." Building on this widely used definition, Riedl (2013, p. 18) suggested the indirect interactions, the "... perceptions, emotions, and thoughts regarding the implementation of ICT in organisations and its pervasiveness in society in general" should also be added to the technostress definition. The perception addition to technostress is important for the current study, as is the notion that technostressors – the antecedents of technostress – are not constant but change in relevance as ICT capabilities evolve (Fischer *et al.*, 2021). For example, the inability to keep abreast of non-work issues while at work may not have been a stressor prior to the smartphone becoming ubiquitous, as employees would not have an easy mechanism to access such information. With the emergence of apps such as WhatsApp and Snapchat, many employees now have this expectation and stress may emerge when a modern common portal to the non-work world is unavailable.

Prior technostress studies have documented a multitude of maladaptive outcomes associated with the use of ICT, including reduced job satisfaction (Suh and Lee, 2017) and organisational commitment (Ragu-Nathan *et al.*, 2008), dissatisfaction with work IT systems (Tarafdar *et al.*, 2011), negative psychological responses (Califf and Sarker, 2020), burnout (Pflügner *et al.*, 2021) and lower performance (Whelan *et al.*, 2022). Technostress also has relevance to WLC, a central construct in the present study. The few studies investigating the link between technostress and WLC generally find that technostressors are associated with enhanced WLC (Harris *et al.*, 2022) or reduced WLB (Ma *et al.*, 2021) and these relationships are moderated by factors such as social stressors (Harris *et al.*, 2022) and support from leaders (Harris *et al.*, 2015).

The study of technostress has been firmly housed within research pertaining to the dark side of ICT use (Salo *et al.*, 2018). Yet, the broader work stress literature has recognised from an early stage that certain stressful conditions which exceed employees' abilities can lead to positive outcomes (Lazarus and Folkman, 1984). Aligned to this perspective, more recent conceptual (Tarafdar *et al.*, 2019) and empirical (Benlian, 2020; Califf and Sarker, 2020; Shirish *et al.*, 2021) IS works have shed light on the potential bright side of technostress by theorising and validating the positive influence ICT use can have on eustress (good stress), alongside the conventional notion of distress (bad stress). For example, while Benlian's (2020) daily diary study confirmed that experiencing technology hindrance stressors in the workplace (e.g. a customer relationship management system freezes while uploading a document) spill over to the family domain to adversely affect a partner's satisfaction at home, the same study also identifies the positive implications of work technology stressors on the work-family interface. Technology driven challenge stressors in the workplace (e.g. succeeding in tweaking spreadsheet features to simplify a complex work routine) had a substantial positive effect on partnership satisfaction via the upbeat mood of the worker (Benlian, 2020).

Emerging technostress research has also considered how people cope with distress when faced with negative incidents, such as the inability to synchronise a smartphone (Salo *et al.*, 2022) or living through stressful life events (Bae, 2023). Emotional rationalisation, where the user reappraises the phone incident to be less relevant, has been found to be an effective coping mechanism (Salo *et al.*, 2022). Similarly, coping mechanisms such as venting can help protect against the negative impact of technostress on IT-enabled productivity (Pirkkalainen *et al.*, 2019).

Although the recent focus on coping mechanisms (Pirkkalainen *et al.*, 2019; Salo *et al.*, 2022) and "good" stress (Benlian, 2020; Califf and Sarker, 2020; Shirish *et al.*, 2021) creates a more holistic conceptualisation of technostress, what is still missing in the technostress

literature is an appreciation for how ICT use can reduce "bad" stress, especially in the work-family interface. Our literature search has uncovered one cross-sectional study which confirms that the work-related use of mobile technologies by salespeople during work hours does reduce role stress (Román *et al.*, 2018). Absent in the research literature is an understanding of how PUSW affects similar outcomes. To develop the conceptual foundation for how the PUSW can reduce stress and WLC, we now draw from role boundary theory.

2.3 Role boundary theory

Role boundary theory explains that workers develop boundaries of varying strengths around work and non-work life domains, and that transitioning between these domains can either reduce or enhance WLC, depending on the nature of these transitions (Ashforth *et al.*, 2000; Hecht and Allen, 2009). Finding a harmonious balance between work and non-work life roles is a struggle for many workers. WLC reflects role demands that are mutually incompatible so that meeting demands in one domain makes it difficult to meet demands in the other (Greenhaus and Beutell, 1985). Three main forms of WLC exist (Greenhaus and Beutell, 1985). Time-based conflict is the result of time devoted to one domain at the expense of another. Certain tasks remain unfulfilled when a person's time has to be divided between competing roles. Behaviour-based conflict emerges when behaviours learned or accepted in one environment are incompatible with role demands in another, and the person is unable to transition between the two worlds (Edwards and Rothbard, 2000). For example, the use of bad language may be accepted behaviour in the workplace but viewed as inappropriate in the home. Strain-based conflict reflects the notion that workers have limited resources and the strain resulting from performing in one domain (e.g. stress, distraction, tension, anxiety and fatigue) make it difficult to meet demands in another domain (Grandey and Cropanzano, 1999). Strain-based conflict purports that mere engagement in one arena will have consequences for the completion of tasks in another (Edwards and Rothbard, 2000).

In this present study, we draw from the strain-based form to hypothesise how the removal of a PUSW ban explains changes in WLC over time. The strain-based form of WLC is the most appropriate for our study as it explains how a potential stressor in one domain (e.g. the inability to use a smartphone for non-work purposes at work) leads to strain in another domain (e.g. difficulties performing non-work duties). Drawing from strain-based conflict, we include stress as a mediating variable in order to confirm that changes in PUSW are associated with changes in stress and ultimately WLC. Both behaviour and time conflict are unlikely to be highly relevant in our context. Our dependent variable is WLC, which is a psychological strain rather than an observable behaviour. While time-based conflict can be relevant (e.g. when using the phone for non-work domain issues during work-hours), it is often confounded with strain-based conflict. This happens because the inability to complete work tasks due to personal issues during working hours is typically stressful; but inability to deal with non-work issues as they unfold during working hours can also be stressful (Piszczek *et al.*, 2016). Additionally, as we observed at our study site, the amount of time employees spent on their smartphone after the ban was removed was very low, which suggests time-based conflict would not be an appropriate lens. In our conceptualisation, as illustrated in Figure 1, strain-based conflict provides the theoretical bridge linking the technostress and ICT driven WLC literature.

The concept of WLC can be specified more precisely as work-to-life conflict and life-to-work conflict, depending on how demands from one domain (i.e. work or non-work life) makes a person less able to cope with the demands from another domain. In this study, we specifically measure work-to-life conflict as the strain associated with (not) having access to a smartphone is experienced at work and may spill over to the non-work life domain. Thus, in our context, the strain-based role boundary perspective can bridge between the technostress and WLC literature, by explaining that stress in one domain translates into adverse outcomes

in another. This perspective is needed to supplement typical stress process models (Lazarus and Folkman, 1984) because, first, such models typically focus on the same domain (e.g. non-work life) and do not explain between-domain spill over, and second, it can explain why technology ban policies that create artificial barriers between life domains act as stressors.

3. Hypotheses development

Definitions for the variables central to our hypotheses are provided in Table 1. Our first hypothesis argues that differences in WLC reported before and after the ban are dependent on PUSW status. We develop that argument further in our second hypothesis which considers how a more nuanced use of smartphones, PUSW frequency, is associated with WLC via stress.

Control over the boundaries between work and non-work life is important to people (Mellner *et al.*, 2014). When this separation is absolute and is forced on employees, it is reasonable to expect that it is not aligned with the preferences of some employees. Most people prefer to have control over their boundaries (Piszczek, 2017). Flexibility exists if the boundary can be relaxed to meet specific responsibilities from the other domain. This means that when PUSW is forbidden, the boundary between work and life domains cannot be relaxed to meet specific responsibilities from the other domain. It follows that employees who favour greater flexibility should experience less conflict between work and non-work life when they engage with a technology which can dissolve the boundaries between the two worlds. If the work–life demarcation is controlled by the organisation and not the worker, such as a blanket ban on smartphones in the workplace, it will lead to reactance, which is a source of stress (Buboltz *et al.*, 2003). According to the strain-based approach of WLC (Ashforth *et al.*, 2000; Grandey and Cropanzano, 1999), such stress can create strain that may spill over to the non-work life domain. As such, WLC under a PUSW ban is likely to be elevated due to the mismatch with worker preferences and the stress generated by a total ban will spill over to the non-work/family domain. Thus, we propose our first hypothesis;

H1. Employees who have access to their smartphones at work will experience less WLC, when compared to employees who do not have access to their smartphones at work.

Hypothesis 2 implies a mediated model, as depicted in Figure 2 above. As explained by strain-based conflict perspective (Ashforth *et al.*, 2000; Grandey and Cropanzano, 1999), WLC can arise when the stress associated with operating in one domain spills over to the other domain. It can be argued the more workers use the smartphone for managing non-work/family issues (work tasks are handled via work-related programs), the more stressors mentioned in H1 background are likely to be alleviated. The use of mobile technologies during work hours has been found to enhance psychological control over how employees get their job done, which in turn is associated with lower stress (Román *et al.*, 2018). PUSW allows people to control their

Variable	Definition
PUSW status	A binary condition reflecting the worker's decision, after the intervention, to access their smartphone in the workplace or not
PUSW frequency	An ordinal scale reflecting the number of days per week workers used their smartphone in the workplace for non-work purposes
WLC	The worker's perception of WLC one year after the smartphone ban was lifted, controlling for perceptions of WLC when the ban was *in situ*
Stress	The worker's perception of stress one year after the smartphone ban was lifted, controlling for perceptions of stress when the ban was *in situ*

Source(s): Authors' own creation/work

Table 1.
Variable definitions

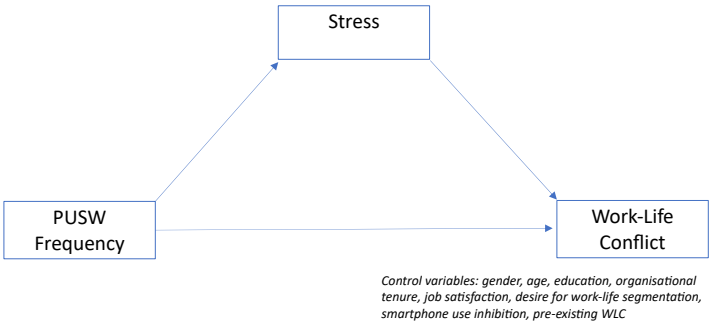


Figure 2.
The mediated research model

Source(s): Author's own creation/work

boundaries as they can use smartphones if they want to. It can increase employees' ability to cater to unfolding personal issues and hence reduce stress associated with worrying about friends and family (Crouter, 1984). Smartphones provide the opportunity to take microbreaks from work stresses, which enable worker recovery when the break is short and voluntary (Kim *et al.*, 2017). Such technologies afford detachment and replenishing depleted mental resources (Mäntymäki *et al.*, 2022). Without such technology mediated microbreaks, people work longer stretches with consequently higher stress (Mark *et al.*, 2018). PUSW can lead to stress reduction but only if workers choose to leverage the new policy that allows use of the phone. Those who still never or rarely use their smartphone at work despite a policy that allows so, will experience lower changes in stress.

In our context, not using personal smartphones at work may also affect employees' family and friends, who under ban conditions (or when selectively choosing not to use a smartphone at work), are unable to engage the relevant employees in important non-work issues as they unfold in real time. This (initially forced through policy) segmentation between non-work issues and work can lead to clashes with one's friends and family, given the reasonable expectation for people to be reachable. Thus, the spill over mechanisms described in H1 are not the only mechanisms that drive WLC. It is possible that the use of smartphones influences WLC through changes in employee stress levels. Thus, we propose that;

H2. The relationship between PUSW frequency and WLC will be mediated by stress.

4. Methods

4.1 Study setting

The study was conducted at the European branch of a global pharmaceutical company. At the time the study began, 250 people were employed at the branch. Approximately half of the people employed were in pharmaceutical specific roles such as small molecule scientist, or biochemist. The remaining staff were evenly split between manufacturing, maintenance and office workers. Prior to December 2017, branch policy did not allow employees, other than the senior management team (SMT), to bring their own mobile phones with them to the workplace. The ban was initially implemented in the mid-1990s for health and safety reasons as there were concerns employees may be distracted by their phones while working around potentially dangerous chemicals. A decision was taken in 2017 to reverse the policy and allow employees to use their own phones in the workplace for non-work purposes. The change in policy was driven by three factors. Firstly, employee representatives had requested the change in phone policy to enable staff to respond to non-work matters during work hours.

Secondly, the branch was in competition with other global branches to win business from company headquarters. The SMT believed the branch was viewed as "technophobes" because of the phone ban, and this perception was hampering competitiveness. Thirdly, the SMT realised that the PUSW could enable future efficiencies in the workplace, such as multi-factor authentication systems and contactless payment in the staff canteen.

4.2 Research design

A two-study sequential mixed method research approach was adopted for this study. In the sequential approach, the insights from the initial quantitative study are explored further with a qualitative study (Ang and Slaughter, 2001). Venkatesh *et al.* (2016) highlighted that such designs are appropriate when extant research on a topic is either fragmented or missing, as in the case of WLC in the context of PUSW. The objective of the second study is to shed light and add nuance and context to the findings of the first study.

4.2.1 Natural quasi-experiment. Study 1, a quantitative longitudinal (pre-post) natural quasi-experiment, was first conducted to test the hypotheses. It used a natural quasi experiment that relied on a PUSW policy change at the branch of the global pharmaceutical company. The policy before the change prevented employees from bringing mobile phones into the workplace. Baseline survey measures were taken one week before the change in company policy which reversed the ban and allowed PUSW. Data were collected about one year after this intervention and differences between the pre-intervention (t1) and post-intervention (t2) stages were recorded.

The initial survey was issued to all 221 full-time employees of the branch who had been employed there for at least 6 months. Members of the SMT were excluded as they were exempt from the phone ban. In total, 118 employees fully completed the survey at t1 and 102 at t2. We did not directly contact respondents from t1 to complete the survey at t2 as all responses were anonymous (as requested by branch SMT). Instead, each respondent created their own unique 6-digit code when completing each survey (i.e. the digits of the month they were born, the last two digits of their mobile phone number, and the first two digits of their social security number). When surveys were matched using this code, 82 employees fully completed both surveys. A-priori sample size analysis for a repeated measures ANOVA (RM ANOVA) revealed a minimum sample size of 82 was required to meet the 80% power value. The actual power value for the mediation model is 93% at 0.15 f^2 effect size, which is a commonly used medium effect size in regression models (Cohen, 1988). A power value above 80% is considered to be sufficient. Thus, while the sample size may be perceived as small, the statistical power it provides is appropriate.

The second survey asked respondents how often they now used their smartphone in the workplace. We used a timeframe of a week, a commonly measured timeframe in IS engagement studies, to balance too-low (e.g. monthly) and too-high (e.g. hourly) specificity. The week-long timeframe strikes a balance between these issues (Turel, 2015; Venkatesh *et al.*, 2008; Whelan *et al.*, 2020). In total, 43 employees (52%) stated they never use their phone at work, while 39 employees (48%) stated they use their phone at work at least some days. Thus, the change in policy created a natural experimental setting, in which 39 employees responded to the treatment (i.e. the new phone policy) by bringing their smartphones to work, with 43 employees still choosing to not bring their phones to work. We refer to the employees who bring their phones to work as the "treatment group" and employees who do not bring their smartphones to work after the natural intervention as the "control group". In addition to a ban on smartphones, the company continued to enforce strict rules about who can access Internet-enabled computers in the workplace. As a result, contact with family members or any external party was rare during work hours when the smartphone ban was in existence. When the ban was lifted, the smartphone was the medium available to initiate and receive

personal communications. Thus, communication with external parties through other technologies was not a potential confound in this study.

All multi-item scales were adapted from well-established research instruments and were measured on 7-point Likert-type scales (see Appendix 1 for survey items). WLC was measured using the scale developed by Netemeyer *et al.* (1996) while stress was measured with the perceived stress short version scale (Cohen *et al.*, 1983). We included desire for work–life segmentation as a control variable, measured using the scale developed by Rothbard *et al.* (2005), as previous studies confirm people its link to WLC (Derks *et al.*, 2014b, 2016; Sarker *et al.*, 2012; Yang *et al.*, 2019). Similarly, as change in job satisfaction between t1 and t2 is a potential confounding variable, we included this variable as a control measured with the standard three item scale (Janssen, 2001; Venkatesh and Morris, 2010). Smartphone use inhibition was also included as a control and measured using a scale developed by Turel (2017). Cronbach's α for WLC, stress and job satisfaction at t1 were 0.93, 0.72, 0.94 and 0.94, 0.79, 0.93 at t2, and Cronbach's α for desire for work–life segmentation was 0.88, suggesting sufficient construct reliability. Our preliminary investigation revealed employees varied in the number of days they choose to use their smartphones at work. Thus, the independent variable in our mediation model, PUSW frequency, was measured by asking respondents at t2 how often they now used their smartphone in the workplace (not at all, some days, more than half the days, nearly every day). The granularity of this smartphone use scale was suggested by the branch IT manager who was observing how staff used phones after the ban was lifted, and the organisation's leadership team who wanted to reduce burden on employees participating in this study by giving them realistic and easy to recall choices.

To provide a more holistic understanding of the impact of the new phone policy, we also conducted a post hoc analysis to determine the impact of PUSW on work performance. It is possible that WLC decreases when employees are allowed to use personal phones in the workplace, but these benefits could be offset against a decline in work performance. We measured work performance using the seven-item scale developed by Welbourne *et al.* (1998). Indicating sufficient construct reliability, Cronbach's α for work performance was 0.87 at t1 and 0.89 at t2.

4.2.2 Qualitative investigation. After significant differences were identified in WLC in the treatment group, study 2, a qualitative investigation incorporating both open survey responses and semi-structured interviews with employees, was conducted to test congruence with the quantitative findings, to gain a deeper understanding of why these findings emerged, and to compensate for the limitations of survey methods. This approach thus adheres to the "explanatory" approach advocated by Creswell (2013), whereby qualitative data is used to help explain or elaborate quantitative results. It also serves the complementarity, completeness, expansion and compensation purposes of mixed-methods research proposed by Venkatesh *et al.* (2013).

For the qualitative investigation, the findings from study 1 were presented to all employees of the branch. Through an open response survey ($n = 86$) and semi-structured face-to-face interviews ($n = 8$; 5 phone users, 3 non phone users), employees were asked for their opinions on why they believe these findings emerged. For example, one question in the open response survey stated:

> When compared to the time when the phone ban was in place, staff who now use their smartphones in [company name] reported a significant decrease in conflict between their work and personal lives. Why do you think this is the case?

To enhance our understanding of how the PUSW policy impacted WLC, we conducted a thematic analysis (Braun and Clarke, 2006). Specifically, we engaged in an inductive analysis following Braun and Clarke's (2012) six-phase approach wherein we analysed the responses to all questions and allowed themes to emerge from the data. We relied on the Fischer *et al.*

(2021) development of a contemporary understanding of technostressors, the digital stressors scale (DSS), to inform theme aggregation. Aligned with the Fischer *et al.* (2021) conceptualisation, two main themes emerged which shed light on how the change in PUSW policy reduced stress and the strain of WLC. These are *lack of control of ICT*, which describes how access to ICT inhibits the autonomy of the individual and the degree of control they have over their workday; and *social environment*, which describes how the characteristics of ICT created unwanted norms and expectations that individuals may have to deal with and may deviate from their actual desires. In terms of qualitative data analysis, we applied open coding to distinguish relevant data (Auerbach and Silverstein, 2003). Sample screenshots of our coding scheme are provided in Appendix 2.

5. Results

5.1 Natural experiment results

Demographic details for the control and treatment groups are provided in Table 2. No significant demographic differences were found between the groups. One-way ANOVA also demonstrated that WLC, stress levels and pre-existing desires for work–life segmentation did not differ between the groups before the new phone policy was introduced. Thus, the groups were deemed to be equivalent in pertinent attributes.

To test H1, we conducted a RM ANOVA with the PUSW choice as the between-group factor, and the survey measures for WLC at t1 and t2 as the within-group factor. RM ANOVA designs are commonly used in IS research when the goal is to determine the causal effects of an IT related intervention on users (Jahn *et al.*, 2022; Moravec *et al.*, 2019; Turel *et al.*, 2021). The "between group" results show that WLC at t2 was significantly lower for employees in the treatment group than for those in the control group ($M = 14.67$ vs 18.05, $F(1, 80) = 4.44$, $p < 0.05$). As depicted in Figure 3, a further analysis revealed the "within group" differences were significant for the treatment group ($M = 18.55$ @ t1 vs 14.67 @ t2, $p < 0.01$), but not significant for the control group ($M = 17.48$ @ t1 vs 18.05 @ t2, $p > 0.05$). Therefore, H1 is supported. Additionally, the R^2 of 0.40 obtained for the experimental model for WLC indicates that the model does adequately represent the experimental situation by explaining 40% of the

	Post-intervention phone status		
Demographic	Bring smartphone to work	Does not bring smartphone to work	Difference between groups
Average age	43.22	41.17	No, $p = 0.359$
Education	Secondary school: 3% Some university but no degree: 10% Bachelor's degree: 41% Postgraduate: 44% PhD: 3%	Secondary school: 14% Some university but no degree: 14% Bachelor's degree: 30% Postgraduate: 28% PhD: 14%	No, $p = 0.325$
Gender	58% female, 42% male	54% female, 46% male	No, $p = 0.871$
Desire for work–life segmentation	8.33	7.26	No, $p = 0.308$
Stress @ t1	12.77	11.95	No, $p = 0.442$
Organisational tenure	9.83 years	10.03 years	No, $p = 0.814$
Mean organisation level (5 levels)	2.25	2.25	No, $p = 0.063$
Work performance @ t1	17.46	17.00	No, $p = 0.394$

Source(s): Authors' own creation/work

Table 2. Comparison of demographic data

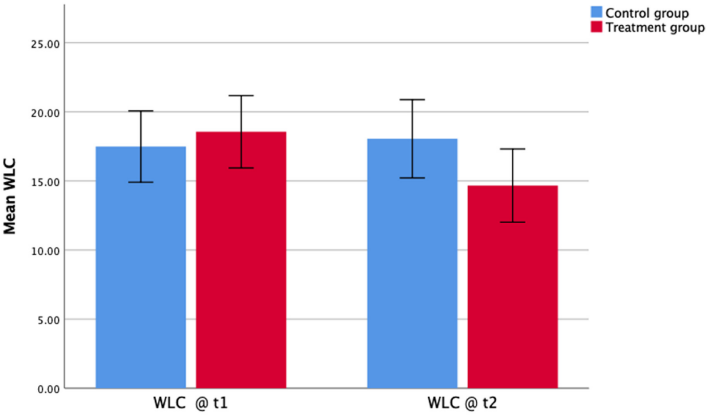


Figure 3.
Change in WLC for treatment and control group from t1 to t2

Source(s): Author's own creation/work

variance for in WLC at t2. We also tested H1 using the raw WLC change score from t1 to t2 in RM ANOVA (Cardinal and Aitken, 2013). H1 was also supported using this approach, the results of which are presented in Appendix 3.

We followed common mediation testing procedures (Hayes, 2022) to test H2. The indirect effect was tested using a bias-corrected bootstrap estimation approach with 10,000 samples (Shrout and Bolger, 2002) implemented with the PROCESS macro Version 4 (Hayes, 2022). Indicating sufficient convergent and discriminant validity, all AVE values were above 0.50. Additionally, the square root of the AVE for each construct was higher than the correlations between that construct and all other constructs in the model (see Table 3). As all item loadings were greater than 0.7, we used index scores (averages) in subsequent analyses.

The mediated model relied on t2 measures of stress and WLC, while controlling for stress and WLC at t1, smartphone use inhibition at t2, desire for work–life segmentation at t2, change in job satisfaction, age, gender, education and organisational tenure.

The indirect effects are statistically different from zero, as revealed by a 95% bootstrap confidence interval that is entirely below zero [95% bootstrap (CI = −1.49, −0.19). Even though the direct effects of PUSW on WLC is not significant (zero present in the confidence interval range −2.56 to 0.16), mediation [1] is evident (Hayes, 2022) supporting H2. The results of the mediation tests are presented in Table 4. The mediated model explained 51% of the variance in WLC.

5.2 Post hoc analysis

In terms of work performance, we found no significant "between group" or "within group" differences between the control and treatment groups. The results of the RM ANOVA tests for WLC and performance are provided in Table 5.

The central finding from the quantitative aspect of the study is that the PUSW policy decreased stress and WLC for the treatment group but did not have any significant impact on work performance. We now explore this result more deeply in the qualitative aspect of our study.

5.3 Confirming and explaining quantitative findings

The qualitative aspect of the study aimed at confirming the findings of study 1 and expanding them to shed light on additional reasons why WLC decreased for employees who

	1	2	3	4	5	6	7	8	9	10	11	12
1. Age	*1*											
2. Education	0.28	*1*										
3. Gender	NA	−0.26	*1*									
4. Job satisfaction	−0.18	−0.06	−0.10	*0.95*								
5. PUSW	0.01	0.14	−0.18	0.20	*1*							
6. Smartphone use inhibition	−0.06	0.08	0.05	−0.01	0.13	*0.82*						
7. Desire for work–life segmentation	0.07	0.01	0.15	−0.08	0.09	−0.03	*0.88*					
8. Stress @ t2	−0.06	0.17	0.02	−0.34	0.03	0.07	0.31	*0.83*				
9. Stress @ t1	0.07	0.11	−0.02	−0.45	0.11	0.15	0.18	0.42	*0.84*			
10. Organisational tenure	0.21	0.32	0.12	−0.01	0.16	−0.02	0.26	0.21	0.01	*1*		
11. WLC @ t2	0.10	0.05	−0.08	−0.29	0.05	0.27	0.23	0.39	0.53	0.18	*0.94*	
12. WLC @ t1	0.03	0.07	−0.08	−0.22	−0.02	0.28	0.27	0.48	0.41	0.20	0.82	*0.92*

Source(s): Authors' own creation/work

Table 3.
Correlations between latent variables with square root of AVEs in italic

Variable	Coeff	SE	*P*	LLCI	ULCI
Direct effect of PUSW and control variables on WLC @ t2					
(constant)	1.79	5.85	0.76	−9.90	13.48
Age	−0.01	0.48	0.99	−0.97	0.96
Education	0.68	0.80	0.39	−0.91	2.29
Gender	−0.50	1.66	0.76	−3.84	2.83
Job satisfaction	−0.10	0.18	0.58	−0.47	0.26
PUSW	−1.20	0.68	0.08	−2.56	0.16
Smartphone use inhibition	−0.12	0.22	0.43	−0.27	0.33
Desire for work–life segmentation	0.09	0.18	0.61	−0.26	0.45
Stress @ t2	0.54	0.17	0.00	0.19	0.88
Stress @ t1	−0.11	0.21	−0.60	−0.55	0.32
Organisational tenure	0.09	0.21	0.66	−0.34	0.53
WLC @ t1	0.52	0.10	0.00	0.30	0.74
Indirect effect of PUSW on WLC @ t2 via stress @ t2					
Indirect effect	−0.54	0.38	n/a	−1.49	−0.19

Source(s): Authors' own creation/work

Table 4. Results for the direct and indirect effect

	Sum of squares	df	Mean squared	F	*p*
WLC					
Between groups	309.70	1	309.70	4.44	0.03
Within groups	287.07	1	287.07	10.21	0.00
Performance					
Between groups	3.21	1	3.21	0.43	0.51
Within groups	18.63	1	18.63	4.66	0.34

Source(s): Authors' own creation/work

Table 5. Results of RM ANOVA tests

brought their phones to work after the ban was lifted. This approach aligns with the interpretive case study genre as conceptualised by Sarker *et al.* (2018) as the purpose of the data and analysis is to present an accurate representation of reality. Table 6 provides a summary of how the qualitative findings complement the quantitative findings.

5.3.1 Lack of control. Participants explained that not having control over their access to personal phones was a source of stress and the removal of this stressor was the primary cause for the decrease in WLC. Personal issues do not cease once the workday begins. Many employees were caring for children or elderly parents and needed to be contactable if an issue with a family member arose. However, contacting an employee was a cumbersome process when the smartphone ban was in place. As the majority of employees were not desk workers, they would have to be tracked down to take an incoming call, usually on one of the landlines in busy open plan spaces. Such a situation is not ideal when discussing sensitive personal matters. For these reasons, employees were rarely contacted at work. As one employee explained, when the smartphone ban was in place "... there always seemed to be a wall around the site." The removal of this wall decreased stress levels for many employees, as explained in the following quote:

> Not knowing, not being contactable, that was stressful. [The new smartphone policy] removes the need to go to your car at lunchtime to check for critical messages and removes any stress that school or other emergencies may not be able to contact me.

Quantitative results	Qualitative results
H1: PUSW is associated with lower WLC	• *Lack of control* – not having control over access to personal phones was a source of stress, and the removal of this stressor was the primary reason for the decrease in WLC • *Social environment* – not being contactable by external parties placed more strain on the employee's partner who had "to pick up the slack" which generated more WLC. Being contactable during work helped reduce after-work tensions
H2: The relationship between PUSW and WLC is mediated by stress	• *Lack of control* – having the ability to decide, through the new phone policy, if they wanted to be contacted during work about non-work issues lowered stress • *Social environment* – being able to deal with non-work issues at work reduced stress in the evening as important messages were not missed

Source(s): Authors' own creation/work

Table 6. Summary of quantitative and qualitative findings

While many employees did bring their phones to work when the ban was removed, the actual use of personal smartphones in the workplace was quite low. Data gathered from the surveys, interviews and the first author's own observations when visiting the site, confirmed a low level of use among staff. As evident in the following quote, just possessing the autonomy to be directly and instantly contactable by external parties through a WhatsApp or text message was enough to decrease stress levels amongst staff, even if they did not actually use the phones:

> People use their phone as a way to feel connected to others, even if they don't use the phone at all during the day. Simply having the ability to be contacted is enough to remove stress.

Lack of PUSW control can be a double-edged sword. Allowing smartphones into the workplace also affects the control employees have over when and where they can be contacted by external parties. Some interviewees cited this lack of control over their communications as the primary reason they still did not have a smartphone on their person in the workplace after the ban was revoked. As evidenced in the exemplar quote below, there was a belief among this cohort of employees that the PUSW impinged on job autonomy:

> I think people in my age group probably didn't really want [the phone ban reversed], because we were like 'Oh it's just going to distract us'. I do use social media to connect with my mates, but now I still leave my phone in my locker. If it's sitting on my desk, I'll keep getting notifications and feel obliged to respond. I just don't want that distraction when I am working.

5.3.2 Social environment. A number of employees explained that the fact they were not contactable at work placed extra stress on that person's partner who would be the sole person managing all family issues during the workday. Among the couple's friends, it was a norm that both parents would manage family issues as they arose throughout the workday. This was not possible for these employees when the phone ban was in place, which led to tensions in some relationships:

> For years, kindergarten, care-takers, and schools could not contact me directly unless I was at my desk. This meant that my husband had to take all the calls. While this was a solution for us, he travels a lot and therefore there was always a worry/struggle when he could not be available as required. The smartphone allows equal sharing and less stress.

The new phone policy resulted in stress changes that spilled over from the workplace to the non-work life domain. A number of respondents stated they now feel more relaxed after work

as they do not have to respond to a multitude of messages when work is finished. Instead, as suggested in the exemplar quote below, workers are now able to check and respond to messages through their phone periodically throughout the workday, which provides piece-of-mind and is more conducive to a harmonious WLB:

> I am more responsive to texts that are sent, rather than not having time to read all the texts in the evening, which was the case before. I can now get important messages [at] work. It was stressful when I only realised in the evening that I missed an important message from the school or whoever.

The social environment created by PUSW and the stress associated with that environment, was also pertinent to those employees who still did not bring their smartphones to work. These employees explained that the norms and expectations around smartphone use in modern society contradicts their own desires. They felt smartphones created unwanted social norms, such as the expectation to deal with a non-work issue instantly, even when in the workplace. As per the quote below, such social norms led some employees to decide to remain separate from their phone during work hours:

> I find work can be a great place to get a break from the phone. I don't want to have it on me 24 hours a day. A lot of us still enjoy not having mobiles . . . we get a break from them [in the workplace].

6. Discussion

Through their smartphones, workers can choose to engage in work or non-work related activities independent of place or time. Recent studies indicating the use of smartphones is associated with performance and productivity declines (Hawi and Samaha, 2016; Lepp *et al.*, 2014; Ward *et al.*, 2017) can concern management and employees alike, as will reports highlighting the ever-increasing time workers spend on their phones for non-work related tasks (Office Team, 2017). While policies to prevent (restrict or ban) PUSW may be motivated by productivity concerns, findings from our longitudinal natural experiment suggest such initiatives are ineffective from at least two angles. First, removing the policy does not seem to reduce productivity as captured by job performance. Thus, a full ban policy does not seem to have the desired effects on performance. Second, such policies have the unintended consequence of increasing WLC through heightened stress.

Specifically, supporting our first hypothesis, WLC declines when a ban on PUSW is revoked, but only for those employees who choose to access their phones at work. Moreover, our post hoc analysis also confirms that work performance did not decline for those employees who choose to use their phones in the workplace for non-work purposes. Our second hypothesis is also supported. The inverse relationship between the post-intervention PUSW frequency and WLC is mediated by the change in stress. The qualitative study served to support and expand the data obtained from the experiment by isolating two specific technostress mechanisms through which PUSW reduces stress and the strain of WLC. These findings offer important theoretical contributions which we discuss in the next subsection.

6.1 Theoretical contributions

In his seminal work on what constitutes a legitimate theoretical contribution, Whetten (1989) posited such arguments should be based around questions of how, why and when. We follow this logic in arguing how our study makes theoretical contributions.

Firstly, a contribution should demonstrate "*how*" the new insights affect the accepted relationships between the variables. The strain-based conflict form of role boundary theory reflects the notion that workers have limited resources and the strain resulting from performing in one domain makes it difficult to meet demands in another domain (Grandey and Cropanzano, 1999; Greenhaus and Beutell, 1985). Our study demonstrates that strain-based conflict can

materialise through other mechanisms where the affordances of ICT play a central role. Specifically, stress is reduced when employees engage in PUSW, in part for resolving and staying informed on non-work issues in the family domain, which ultimately manifests as lower WLC. The control group, which exhibited similar characteristics to the treatment group, did not experience changes in WLC after they could freely choose to access their smartphones at work. Consistent with stress coping theories (Lazarus and Folkman, 1984), our findings suggest it is the reduced stress that stems from PUSW that drives changes in WLC. This finding helps provide a more holistic understanding of technostress coping mechanisms by revealing how PUSW itself can directly reduce stress. Up to now, previous studies have only demonstrated how the non-ICT coping mechanisms (e.g. venting, positive reinterpretation) benefit people in coping with IT failures (Pirkkalainen *et al.*, 2019; Salo *et al.*, 2022) and other stressful situations (Bae, 2023). PUSW itself can be a vehicle for stress reduction, as it prevents the emergence of external life stressors while at work. Interviewees further explained the change in smartphone policy reduced stress both in the workplace itself, as workers no longer had to ruminate over not being informed of emerging non-work life issues and during non-work time as they were not overloaded with developments as soon as work ended, with partners perceiving a more just distribution of daily family management. By demonstrating that the PUSW can reduce WLC, our study helps to address recent calls to investigate the effects of PUTW on outcomes beyond performance (Chadi *et al.*, 2022; Jiang *et al.*, 2023).

Secondly, *"why"* theoretical contributions emerge when a study's findings challenge underlying principles supporting generally accepted theories (Whetten, 1989). The IS discipline has generated rich insights concerning how the use of ICT can be a source of stress, namely, technostress (Ayyagari *et al.*, 2011; Tarafdar *et al.*, 2007; Whelan *et al.*, 2022). Studies show the afterhours use of mobile phones for work purposes can generate stress and conflict (Derks *et al.*, 2014a, 2016; Yun *et al.*, 2012). In contrast, but without discounting the validity and importance of prior findings which focused on other life domain interfaces, our study demonstrates that PUSW can actually reduce stress. This finding complements and extends recent research which suggests the use of personal mobile technologies for *work purposes* is associated with positive well-being for remote workers (Yin *et al.*, 2023). Our study extends the positive impacts to the use of personal smartphones in the workplace for *non-work purposes*. When the phone ban was in place, some workers reported high levels of stress, which was experienced in the workplace. When those workers were allowed to use their smartphone for personal reasons in the workplace, that stress declined significantly which materialised as less conflict in the non-work domain. This is also consistent with findings that social media use helped reduce pandemic related stress (Bae, 2023), using mobile devices to access work related information reduced role stress for salespeople (Román *et al.*, 2018), and playing video games aid recovery after a stressful workday (Reinecke, 2009). These studies contribute to an emerging understanding of how ICT can help lower stress and not just be a generator of stress. Yet, the technologies that these previous studies focused on were work or leisure related. In the current study, we focus on ICT that allows closer connection to non-work life during work time (i.e. a personal smartphone), which adds a unique perspective to this emerging literature. Therefore, when combined with the small number of previous studies, our work suggests the underlying principles of technology as a stressor need to be reconceptualised to acknowledge how ICT can reduce stress in certain situations, such as using a mobile phone to be reachable at work or in emergency situations. Recent conceptual (Tarafdar *et al.*, 2019) and empirical works (Benlian, 2020; Califf and Sarker, 2020; Shirish *et al.*, 2021) do advance our understanding of technostress by acknowledging and validating the positive relationship between ICT use and eustress, alongside the conventional notion of distress. Our study brings forth an alternative path – how ICT use reduces distress (independently of eustress) and related outcomes – a pertinent observation that has hereto now not been considered in the technostress literature.

Delving deeper into this perspective, our qualitative study reveals two specific technostress mechanisms through which PUSW can reduce stress: eliminating the lack of control of ICT (i.e. how bans on ICT use can limit autonomy) and enabling a more desirable social environment (i.e. how bans on ICT use creates unwanted norms and expectations). In the Fischer *et al.* (2021) study which conceptualised 15 modern digital stressors, lack of control was removed from the scale development process which ultimately reported 10 digital stressors, one of which was social environment. One possible reason why lack of control of ICT did not form part of the final digital stressor sale (DSS), but was very prominent in our study, may be due to the explicit focus in the Fischer *et al.* (2021) study on work-related technologies. Our study focused on the work-family interface and PUSW. In that context, lack of control of ICT is an important technostress mechanism. Thus, the DSS and other scales that comprise various techno-stressors may be limited in their potential to capture stress changes associated with engagement in personal/leisure technologies.

Thirdly, a *"when"* theoretical contribution explains when something new is learned about the pre-existing model or theory itself when it is applied to a new situation (Whetten, 1989). Existing literature has predominantly focused on how the after-hours use of ICT for work purposes affects the work–life interface (Butts *et al.*, 2015; Chen and Karahanna, 2018; Cousins and Robey, 2015; Derks *et al.*, 2014b; Turel *et al.*, 2010). The consensus established in this body of work implicates the technology mediated intrusion of work activities upon the non-work domain as a significant contributor to WLC. Our study extends this important perspective on technology effects of the work–life interface to a new situation, i.e. how the (in) ability to engage with personal ICT in the workplace affects WLC. Specifically, our work suggests the conflict experienced when the affordances of ICT enable non-work issues to penetrate work boundaries is remarkably different to the reverse situation. For some employees, the smartphone affords them with the ability to manage arising personal issues while at work, which reduces stress and WLC. However, as we also uncovered in our qualitative study, PUSW can potentially be a stressor for a minority of employees who want a break from the societal pressures to be constantly connected by a smartphone. This particular finding helps address the recent calls in the IS literature to advance theory linking WLC to mobile technology use by examining boundary conditions (Tams *et al.*, 2020), which in our case includes situations when employees have/do not have the agency to decide to use smartphones in the workplace.

Our study also provides a methodological contribution to the emerging PUTW literature. As discussed in our literature review, opposing sets of findings are evident in existing PUTW studies. Up to now, PUTW studies have tended to investigate relationships between ICT and job performance variables though correlational survey designs (Jiang *et al.*, 2023). Our study helps to expand and also bring consensus to the PUTW literature by showing that PUTW can have a positive impact on important issues outside the workplace. The unique opportunity to conduct a natural quasi-experiment with a company that changed its PUSW policy enabled us to go beyond correlation inferences and reveal the causal factors at play. Yet, we must preface this by acknowledging that our study focused on only one type of PUTW, i.e. a worker's personal smartphone. Our findings are likely to be relevant to other personal mobile devices which are used in the workplace, such as smartwatches and tablets. PUTW also encompasses the non-work use of organisational IT resources. Our findings are less relevant to the PUTW literature in such situations. For example, it is less likely that an employee would use an organisational desktop and email server to resolve private family issues while at work as such exchanges could be monitored by the employer.

As the vast majority of studies on the effects of smartphones are cross-sectional, they can only test associations and not causal mechanisms. The lab experiments that do exist are tightly controlled and use student participants (Hartanto and Yang, 2016; Tams *et al.*, 2018; Ward *et al.*, 2017), which limits external validity. To the best of our knowledge, our work is the

first longitudinal study of a smartphone intervention to be conducted in the users' natural setting. Adhering to calls to address the dearth of mixed method IS research (Venkatesh *et al.*, 2013), we conducted follow-up qualitative investigations with employees, and held discussions with the SMT regarding the study's implications (discussed below), which added further robustness and external validity to the findings.

6.2 Implications for practice

Our study has important implications for practice. Possibly fuelled by the recent explosion in books and mainstream media articles on the distractive effects of digital technology, organisational leaders and employees alike are implementing procedures to prevent and restrict PUSW. While some employees may have positive work reactions to such interventions, preventing PUSW can also lead to WLC, which in turn has significant implications for work performance, satisfaction, absenteeism, turnover intentions, as well as general wellbeing (see Allen *et al.* (2000) for review). While advances in digital technology enable some employees to work remotely, as witnessed extensively during the Covid-19 pandemic, many other workers, such as the pharmaceutical specialists in our sample, cannot engage in their profession outside of the physical workplace. Workers in industries such as retail, healthcare, transportation and industrial processes do not have the option to work from home. Indeed, one large scale survey finds most workers would prefer to return to the office for part of the week in the post pandemic world (Whitaker Institute, 2022). Attempting to reverse the ICT mediated integration between the work and non-work life domains for such professionals may be harmful. To highlight one example of the practical contribution of this study, the findings were discussed with the SMT of the company, who ultimately decided to maintain the open smartphone use policy at the branch site, but also to overturn a similar smartphone ban in a sister site. Rather than enforcing a ban on PUTW, our experiences in tracking the introduction of smartphones in this company suggests a more effective strategy would be to establish an organisational climate where the company expectation for smartphone behaviours are known (i.e. not used in meetings or canteen etc.), with adherence monitored by employees themselves.

6.3 Limitations and future research

Our study is subject to some limitations which future research should aim to address. The first limitation relates to the use of the natural experiment methodology. Natural experiments are observational studies and not true experiments (Dunning, 2008). The researcher cannot manipulate the social world to assign subjects to treatment and control conditions. As in our study, there is an element of self-selection which could bias outcomes. While our comparison between the control and treatment groups along numerous variables showed no significant differences (see Table 2), there is still the possibility that there are confounding variables we did not capture. For example, we wished to gather data on the specific non-work demands each respondent faced (e.g. number of dependent children, external pursuits, volunteering activities, etc.), but for privacy reasons, the company did not grant access to such information. While all employees are presented with non-work issues that need to be managed, it is possible that the personal situation facing employees would act as a confounding variable influencing our models. Future studies should control for such factors and can also test if different family situations assuage the relationship between non-work related smartphone use in the work domain and WLC.

Second, while our sample size provided sufficient statistical power, it was taken from an industrialised workplace in one country. Thus, the generalisability of our findings should be extended in future research by examining different workplace settings in different countries.

Third, our findings should also be interpreted with caution as the culture of the company investigated here may not generalise to others. Even after the policy change, the use of

smartphones by employees remained quite low. The legacy of the phone ban was clearly evident one year after the new policy was implemented. Our findings should not be interpreted to mean that WLC will decline the more employees in other organisations use their smartphones for non-work matters while at work. It is possible that a U-shaped relationship exists in organisations where PUSW is long established, i.e. WLC declines up to a certain amount of non-work related smartphone use but increases beyond that point. Future research could determine if such a curvilinear relationship exists in settings where PUSW is the norm.

Fourth, our data suggests that the introduction of smartphones into the workplace had no adverse consequences on work performance. This may be because the stress associated with smartphones could be too distal to have a significant impact on performance, the engagement with smartphones in this company remained low, and/or our sample size being small. Future studies can complement our work by gathering data from a larger sample of intense smartphone users before, during and after a period of abstinence, and by theorising how mediating variables such as work autonomy, mindfulness and social support mediate the relationships between the PUSW and WLC. In addition, validating the relationships between "lack of ICT control," "social environment" and WLC should be considered as our qualitative analysis suggests these technostressors are most pertinent in situations where access to personal technology is restricted.

Note

1. We do not use the terms partial or full mediation following the recommendation of Hayes (2022).

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Appendix 1

Factor and reference	Measurement items
Work–life conflict (Netemeyer *et al.*, 1996)	*Consider your work–life balance and state how strongly you agree with these statements. [1 = strongly disagree, 7 = strongly agree]* • The demands of my work interfere with my home and family life • The amount of time my job takes up makes it difficult to fulfil non-work responsibilities • Things I want to do in my personal life do not get done because of the demands my job puts on me • My job produces strain that makes it difficult to fulfil non-work duties • Due to work-related duties, I have to make changes to my plans for personal activities
Perceived stress (Cohen *et al.*, 1983)	*Please reflect on your life situation over the LAST WEEK, and state how often you have felt like the statements below. In the LAST WEEK . . . [1 = never, 5 = very often]* • . . . how often have you felt that you were unable to control the important things in your life? • . . . how often have you felt unconfident about your ability to handle your personal problems? • . . . how often have you felt that things were not going your way? • . . . how often have you felt difficulties piling up so high that you could not overcome them?
Job satisfaction (Janssen, 2001; Venkatesh and Morris, 2010)	*Regarding your current level of job satisfaction, please state how strongly you agree or disagree with the following statements. [1 = strong disagree, 7 = strongly agree]* • Overall, I am satisfied with my job • I would prefer another, more ideal job (R) • I am satisfied with the important aspects of my job
PUSW frequency	*How often do you now use your smartphone in the workplace* (not at all, some days, more than half the days, nearly every day)
Work performance (Welbourne *et al., 1998*)	*Please evaluate your own work performance along the following aspects (1 = needs much improvement, 7 = excellent)* • Quantity of work output • Quality of work output • Accuracy of work • Coming up with new ideas • Working to implement new ideas • Finding improved ways to do things • Creating better processes and routines
Desire for work–life segmentation (Rothbard *et al.*, 2005)	*How much of the characteristic do you personally feel is acceptable, or just enough to give you what you want? Some people prefer more or less of some job characteristics than others – we want to know how much you personally feel is acceptable [1 = not at all, 7 = very much]* • Not being required to work while at home • Being able to forget work while I am at home • Not having to think about work once I leave the workplace • Not being expected to take work home

(*continued*)

Table A1. Measurement instrument

Factor and reference	Measurement items
Smartphone use inhibition (Turel, 2017)	*Please indicate your level of agreement with the following statements regarding your use of your mobile phone [1 = strongly disagree, 7 = strongly agree]* • I find it difficult to overrule my impulse to use this phone to communicate with friends or family • I find it difficult to overcome my tendency to use this phone to communicate with friends or family • It would be difficult to control my propensity to use this phone to communicate with friends or family • It is hard to restrain my urge to use this phone to share information with friends or family

Table A1. **Source(s):** Authors' own creation/work

Appendix 2

Theme	Category	Code	Case	Text	Coder	Date	Words	Code
Control	Pressure	Overload	24	Definitely - there is not that added pressure of feeling you have to check up on everything when you sit into your car after your day at work. I think people definitely feel more in control of things being able to check their phone during work hours.	Admin1	06/05/2019	47	ACC
Control	Accessibility	Lack of access	19	I think its important that people feel in control of what is going on in their lives as life is very busy for a lot of people. Being able to check your phone and follow up on any personal calls which are urgent while at work removes a lot of stress for people which in turn helps with positive behaviour.	Admin1	06/05/2019	60	BEN
Control	Uncontactable	Outside contact	56	Not knowing, not being contactable, that was stressful. [The new smartphone policy] removes the need to go to car at lunchtime to check for critical messages and removes any stress that school or other emergencies may not be able to contact me.	Admin1	11/05/2019	42	TAK
Control	Accessibility	Lack of access	7	Accessibility. When you are running from meeting to meeting and not able to be near a phone or answer calls via laptop having phone accessible (message/whatsapps) is hugely valuable for connectivity. Did have a family emergency situation some time back.	Admin1	11/05/2019	40	FRO
Control	Accessibility	Emergency situations	45	People are more contactable in the case of an emergency - also critical family items can be dealt with when they arise by being contactable by mobile phone during the day (i.e. school phone calls, kids activity schedule changes etc)	Admin1	11/05/2019	34	FRO
Social Env	Stress	Workplace barrier	66	It reduces stress to know that you can stay in touch with family - and more importantly that they can stay in touch with you during office hours. This is particularly relevant as our phone system masks phone number ID - so created a psychological wall of sorts around the 'phonability' of employees when we are at work. Telling family that we can be contacted on our 'normal mobile number' reduces that stress of thinking we are not easily contactable when inside the gates at XXXX. Additionally, from a social and cultural point of view generally - almost everyone is now accustomed to having constant access to their phone and being permanently contactable and able to contact all family members at all times.	Admin1	06/05/2019	123	WHE
Social Env	Stress	Family issues	43	For years, kindergarten, care-takers, and schools could not contact me directly unless I was at my desk. This meant that my husband had to take all calls. While this was a solution for us, he travels a lot and therefore there was always a worry/struggle when he could not be available as required. The smartphone allows equal sharing and less stress	Admin1	06/05/2019	61	FRO
Social Env	Stress	Responsiveness	13	I am more responsive to texts that are sent, rather than not having time to read all the texts in the evening which was the case before. I can now get important messages in work. It was stressful when I only realised in the evening that I missed an important message from the school or whoever.	Admin1	08/05/2019	56	OWE
Social Env	Dependency	Workplace barrier	26	Because I think the use of personal mobile phones have reduced the dependency of finding a landline on which to call out/into the site, for me its the same level of traffic but more convenient and efficient when mobile phones are available.	Admin1	11/05/2019	42	PER

Source(s): Author's own creation/work

Table A2.
Samples of qualitative coding analysis

Appendix 3
Testing models with raw change scores

A. Test of within-group and between groups effects on WLC using change scores

The results showed that within the overall group of 82 employees, there was no significant main effect of the change in phone policy on WLC ($F(1, 80) = 2.039$, $p = 0.157$, $\eta p^2 = 0.025$). Likewise, no significant between group main effect was observed for the treatment on WLC ($F(1, 80) = 0.997$, $p = 0.326$, $\eta p^2 = 0.012$). However, there was a significant interaction between time and treatment in terms of WLC

scores (F(1, 80) = 7.549, p = 0.009, ηp^2 = 0.094). The changes in WLC were only significant when respondents were classified into the treatment or control groups, and were pronounced only when employees capitalised on the new policy to access smartphones at work.

Table A3.
Test of within-group and between groups effects on WLC using change scores

		SS	df	MS	f	p	Partial $\eta 2$
Within group effects	Time	54.792	1	54.792	2.039	0.157	0.025
	Time * treatment	202.892	1	202.892	7.549	0.009	0.094
	Error (Time)	2079.29	80	26.875			
Between group effects	Treatment	113.293	1	113.293	0.997	0.326	0.012
	Error	9275.901	80	115.949			

B. The mediation model using change scores
The indirect effects of Δstress on the relationship between PUSW frequency and ΔWLC is supported [95% bootstrap (CI = −1.358, −0.036). Thus, mediation is evident.

Source(s): Authors' own creation/work

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