

From IT Mindfulness to ICT-Enabled Innovation: A Moderated Mediation Model with Techno-Invasion, Cyberslacking and Employee Age

As organizations increasingly utilize ICT to foster innovation, understanding the role of individual dynamics and organizational arrangements becomes a necessity to maximize the potential of ICT for innovation. Drawing on affordance theory, the present research aims to examine whether and how IT mindfulness serves as a precursor to ICT-enabled innovation, investigating the mediating effect of techno-invasion and the moderating roles of cyber-slacking and age. Data from 358 public school teachers revealed that IT mindfulness plays a supportive and techno-invasion a constraining role on ICT-enabled innovation. Moreover, the results showed that minor cyberslacking moderates the indirect effect of IT mindfulness and the three-way interaction among techno-invasion, minor cyberslacking and age in explaining ICT-enabled innovation was significant. The research offers insights into the multifaceted dynamics of innovation, emphasizing that technology alone does not ensure innovation; human and organizational factors are essential as well. Furthermore, the results provide insight into the dual role of cyberslacking, as it can either foster or impede innovation.

Keywords: ICT-enabled innovation; IT mindfulness; techno-invasion; cyberslacking; moderated mediation; affordance theory

1. Introduction

While a particular technology utilized in operational or production processes can be a powerful instigator of innovation (Park et al., 2023; Wang, 2019), the way that Information and Communication Technology (ICT) is used in the organizational setting has the potential to play a significant role in enabling and fostering innovation as well (Chandra et al., 2020; Chege et al., 2020; Hou et al., 2023). Hence, today's employees are expected to utilize ICT as a catalyst for innovation by actively engaging in collaborative endeavors, leveraging digital platforms to experiment with novel ideas and approaches, and continuously exploring vast online resources to stay abreast of emerging trends and opportunities within their respective fields (Oldham & Da Silva, 2015; Yin et al., 2024). The use of ICT in this manner is referred to as ICT-enabled innovation, a concept that describes how employees generate, implement and disseminate innovative ideas using ICT (Chandra et al., 2019).

Along with prerequisites such as modern technological infrastructure or research and development efforts, human-technology interaction is also considered a critical factor for ICT-enabled innovation (Kohler et al., 2011; Konrad-Märk & Füller, 2022). Zammuto et al. (2007) particularly mentioned the *sine qua non* association between technology and the “social setting” it is used in. This association is conceptualized as affordances, which can be described as a potential for taking action of a goal-oriented individual, which is realized within a social environment (Jónasdóttir & Müller, 2000) with the use of technology (Markus & Silver, 2008).

According to the theory of affordances, the value of technology used in an organization comes from the degree to which it is aligned with practices of employees and organizational arrangements (Jónasdóttir & Müller, 2020). The affordances offered by ICT are not “built-in features”. Instead, they emerge through the symbiotic interaction between technology and human actors (Sesay et al., 2024; Mitchell, 2021). Information technologies also need to be conveniently integrated with organizational arrangements and practices in order to offer value.

IT and organizational features can exist separately, albeit their significance in elucidating the structure and operation of an organization stems from their collaborative implementation (Zammuto et al., 2007). Affordances of technology are considered to be actualized within the framework of a trifecta involving (1) human actors, (2) the organization, and (3) technology (Jónasdóttir & Müller, 2020). Hence, as affordance theory suggests, along with the technology used, issues related to human actors, namely employees in organizations, and other organizational issues can support or constrain ICT-enabled innovation.

ICT-enabled innovation requires employees to be aware of and detect opportunities for innovating with system use. As a remedy, mindfulness can provide new solutions to problems and address potential future issues by increasing involvement and awareness (Langer & Moldoveanu, 2000). Within the framework of affordances theory, as a human factor, mindful use of IT resources is expected to improve concentration and minimize digital distractions (Wang, 2024), ultimately contributing to increased ICT-enabled innovation (Dernbecher & Beck, 2017). Consequently, the genuine interest in investigation of IT functions and errors, which is referred to as IT mindfulness (Thatcher, 2018, p. 832), can contribute to ICT-enabled innovation by improving how employees use ICT for work-related purposes. However, despite the limited number of studies focusing partly on the antecedents and mostly on the consequences of ICT-enabled innovation, to the best of the authors' knowledge, no study has examined the direct impact of IT mindfulness on ICT-enabled innovation. The present study aims to fill this gap in knowledge and empirically examine the link between IT mindfulness and ICT-enabled innovation on the basis of affordance theory.

Using an affordance lens also suggests that human-organization interaction can be mediated by technology, shaping the pathways through which employees engage with ICT in work environments (Jónasdóttir & Müller, 2020). Within this framework, another aim of this study is to explore the mediating role of techno-invasion. This technology-driven phenomenon is defined as the invasion of pervasive ICT into personal life to an extent that ICT becomes a demand far beyond the user's capacity to handle (Pirkkalainen et al., 2019), serving as another trivet of affordance theory.

Recognizing the balancing act employees often perform to cope with techno-invasion, this study further examines the potential influence of cyberslacking—the voluntary use of the internet, email, and mobile technology for personal purposes during work hours (Gügerçin, 2020)—on the techno-invasion and ICT-enabled innovation link. When employees face increased techno-invasion, they may turn to cyberslacking as a coping mechanism (Page, 2015; Yao et al., 2024). However, this endeavor to mitigate the effects of techno-invasion through cyberslacking paradoxically employs the very technology causing invasion. The use of this technology for cyberslacking by employees who are already invaded by technology can drain their cognitive resources and hinder innovation capacity, suggesting that cyberslacking may attenuate the positive potential of ICT in innovative work behavior. To test this proposition, the moderating role of cyberslacking on the link between techno-invasion and ICT enabled innovation will be analyzed. In sum, this study aims to test a model in which IT mindfulness, techno-invasion, and cyberslacking collectively shape ICT-enabled innovation. To ensure a comprehensive understanding, employee age will also be examined as a moderating variable, given prior research indicating that age can affect ICT usage and innovation capabilities (e.g., Ng & Feldman, 2013b; Tripathi, 2018).

Akin to its pervasive presence across industries, ICT has become an integral facet in education as well. While considerable research delves into the utilization of ICT in learning and teaching processes (LeTendre, 2023), scant attention is directed towards exploring the impact of ICT on teachers' organizational dynamics (Page, 2015). As the 'business professionals' of education industry, teachers are navigating the complexities of ICT integration akin to the employees in all other industries. They need to possess digital competencies, actively integrate ICT into their teaching practices, and acclimate to new software. Moreover, teachers spend considerable time on communicating with parents, students, colleagues and administrators via digital channels. Given these work-related demands and the gap in the existing literature in understanding the impact of ICT on teachers' work behaviors, the present study examines the research model using data gathered from teachers. The present study holds theoretical significance as it examines the widely neglected socio-technical context of ICT and employees affordance

theory to examine the research model. Practically, it paves the way for understanding how teachers' use of digital technology facilitates or hinders innovation.

2. Theoretical framework and hypotheses development

2.1. The association between IT mindfulness and ICT-enabled innovation

Mindfulness has attracted attention from various disciplines; however, limited interest has been given to its application within the context of information technology (Wei et al., 2021). Hence, the concept of IT mindfulness, which is characterized as “a dynamic IT-specific trait, evident when working with IT, ... whereby the user exhibits a genuine interest in investigating IT features and failures” (Thatcher et al., 2018, p. 832), is largely underexplored. The links between mindfulness and IT mindfulness have been studied for more than a decade, albeit the role of IT mindfulness in the context of ICT-enabled innovation is not well understood.

IT mindfulness is related to being fully present in and aware of one's interactions with information technology, leading to a state of focusing on the task at hand and minimizing distractions while using these technologies. Employees with high IT mindfulness are inclined to actively explore new methods of utilizing and engaging with information technology (Carter et al., 2011). IT mindfulness involves understanding the potential and limitations of IT tools and their strategic implications. Hence, IT mindfulness can empower employees to innovate with the use of the system, which can be defined as ICT-enabled innovation.

Affordance theory suggests that for the beneficial use of information technologies, these technologies need to be conveniently integrated with the users. As an affordance of technology, ICT-enabled innovation is only possible when ICT is aligned with the users (Jónasdóttir & Müller, 2020; Mitchell, 2021). Users' attitudes, behaviors, skills, and preferences significantly impact how they use and benefit from ICT. From this point forth, as a dynamic and IT-specific trait, IT mindfulness can be considered a predictor of ICT-enabled innovation. As mindfulness increases, employees are expected to be

able to navigate digital distractions and maintain cognitive concentration (Wang, 2024), recognize environmental changes and seize opportunities for innovation (Fichman, 2004; Langer & Moldoveanu, 2000). Likewise, an IT-mindful individual can stay up-to-date with emerging technologies, can adapt to the shifting IT landscape and create innovative solutions in terms of system use (Ioannou & Papazafeiropoulou, 2017). Since IT mindfulness pertains to active and feature-specific use instead of automatic use (Wu et al., 2022), mindful use of IT resources is expected to unlock one's mindset, ultimately contributing to increased ICT-enabled innovation. Incorporating mindfulness and information technology use can enable employees to identify potential areas where ICT can be utilized to drive innovation.

Employees in all industries are compelled to use ICT at a pace never anticipated due to digitalization efforts. Mindful use of IT resources is expected to improve concentration and minimize distractions, ultimately contributing to increased ICT-enabled innovation (Dernbecher & Beck, 2017). Hence, today, ICT-enabled innovation, which involves leveraging IT resources to enhance innovation, can be leveraged by a high level of IT mindfulness. Empirically, IT mindfulness was found to be positively related to employees' innovative use of the systems (Wei et al., 2021) and to trying to innovate using IT (Thatcher et al., 2018). Drawing from the theory of affordances and limited relevant literature, H₁ is proposed as follows:

H₁: IT mindfulness positively predicts ICT-enabled innovation.

2.2. Techno-invasion as a mediator

Although ICT is essential for business success and provides numerous affordances, it also tends to promote negative outcomes due to its pervasive use, obliging employees to cope with work demands without time and space boundaries. This permeation of work is termed techno-invasion (Ardèvol-Abreu et. al, 2023), referring to the invasive effect of ICT that arises due to constant connectivity of being “always exposed”, blurring desired boundaries between work and personal life (Chen et al., 2022), causing adverse outcomes (Ficapal-Cusí et al., 2024).

As affordance theory suggests, along with the technology used, issues related to human actors, namely the users of technology in organizations, and other organizational issues can support or constrain ICT-enabled innovation. Based on this paradigm, techno-invasion is proposed to act as a constraint, leading to a decreased level of ICT-enabled innovation. Additionally, as a dynamic IT trait, IT mindfulness is expected to support ICT-enabled innovation. Consequently, techno-invasion may mediate the relationship between IT mindfulness and ICT-enabled innovation.

Although no study was found focusing on the mediating role of techno-invasion between IT mindfulness and ICT-enabled innovation, empirical findings support the propositions regarding the relation of techno-invasion with IT mindfulness and ICT-enabled innovation separately. Chandra et al. (2019) found that techno-invasion has a significant negative influence on ICT-enabled innovation, mentioning that continuous connectivity forces employees to concentrate on immediate operational tasks, leaving them with insufficient time for creative thinking and innovation. Hence, the need to stay connected can sometimes cause employees to have little time to think creatively and innovate. Research also found that techno-invasion may consume employee's self-regulatory strength (Chen et al., 2022), which can limit ICT-enabled innovation. Tarafdar et al. (2011) emphasized that techno-invasion, along with the other techno-stressors, decreases user innovation while using IT for work.

Moreover, IT mindfulness is assumed to lower techno-invasion. Maier et al. (2017) proposed that IT mindfulness can determine the perception of techno-invasion since mindful IT users are more inclined to be active and to pay attention to the whole. These users demonstrate a heightened awareness and attentiveness to the interconnected aspects of technology usage, enabling them to take a broad view and make intentional choices that can help them cope with exposure to ICT. This helps them to better distinguish between private and professional spheres. Similarly, Ioannou (2023) claimed that a higher level of IT mindfulness increases the capacity to adapt to different situations. Hence, regarding techno-invasion, IT mindfulness helps to cope with being continuously available to work requests. Likewise, Ioannou and Papazafeiropoulou

(2017) stated that IT mindfulness can work as a barrier for unsettling feelings, engendering an alleviation of techno-invasion. Raza et al. (2022) proposed that IT mindfulness mitigates the effects of technostress creators, including techno-invasion, and Ioannou et al. (2022) empirically supported this proposition. Consistent with the existing research results and the framework of affordance theory, the second hypothesis is proposed as follows:

H₂: Techno-invasion plays a mediating role between IT mindfulness and ICT-enabled innovation.

2.3. Cyberslacking as the first moderator

In addition to the proposed mediation effect of ICT-enabled innovation, its impact might vary among employees due to potential moderating variables. For instance, teachers feeling invaded by ICT-induced technology can engage in cyberslacking activities to cope with work intensification by using the very same technology that led the way for techno-invasion (König & Caner De La Guardia, 2014; Page, 2015). Accordingly, the frequency of cyberslacking behaviors may moderate the impact of IT mindfulness on ICT-enabled innovation through techno-invasion.

The direct relationship between cyberslacking behaviors and ICT-enabled innovation is proposed to be positive, due to the potential of cyberslacking behaviors that foster innovative solutions. Accordingly, Oravec (2002, p. 63) discussed cyberslacking as a tool that can open blocked creative [employee] channels. Ivarsson and Larsson (2011) suggested that cyberslacking should be permitted to some extent to increase creativity. Similarly, Kidwell (2010) and Henle (2024) proposed that cyberslacking can fuel creativity and innovation in work-related matters.

The association between cyberslacking and innovation seems to be an evolving area of research and limited studies exist. Additionally, since cyberslacking has a multi-dimensional nature and is measured by different scales with varying dimensions, it is hard to draw a clear conclusion regarding its impact on ICT-enabled innovation. Still, the common empirical finding is that cyberslacking tends to increase innovation. For

instance, Rahman et al. (2022) found that cyberslacking, which was studied as a unidimensional construct, had a positive direct effect on innovative work behavior.

Although cyberslacking involves a wide range of behaviors from browsing online for personal purposes to gambling during office hours (Venkatesh et al., 2023), a limited number of studies focused on the association between the specific forms of cyberslacking and ICT-enabled innovation. The commonly accepted forms of cyberslacking, which are classified by the intensity and impact of these behaviors (Henle & Blanchard, 2008), are minor and major cyberslacking. Minor cyberslacking involves behaviors such as surfing or browsing the internet for personal purposes or using instant messaging applications for personal purposes, which are common short time actions, but they are still considered morally unacceptable in a work environment (Tageja et al., 2024; Lim & Teo, 2024a). Major cyberslacking involves behaviors such as visiting gambling sites or playing online games, which can seriously drain organizational computing networks and bandwidth (Venkatraman et al., 2018) or cause legal ramifications. In their study, which focused mainly on minor cyberslacking behaviors, Derin and Gökçe (2016) found that minor cyberslacking increased innovative work behaviors. Yoğun (2015) revealed that the informational and social capacity of cyberslacking was positively related to innovative work behaviors, whereas leisure capacity of cyberslacking was negatively related.

It is known that cyberslacking may serve as a means of alleviating the impact of undesired conditions by offering a temporary escape, enhancing mood, providing coping mechanisms, restoring mental resources, and facilitating social connections, thereby providing short-term relief in challenging circumstances (Santos et al., 2020; Lu et al., 2024). Nonetheless, cyberslacking was also discussed to be detrimental, distracting the focus and concentration that should be on the main task in hand (Koay & Poon, 2023). For employees with techno-invasion, cyberslacking behaviors can significantly disrupt work, reduce time and focus available for adapting to new technologies and utilizing them for innovation. Employees who perceive techno-invasion and engage in cyberslacking more frequently can feel distracted and disengaged from work tasks. In the context of the relation between techno-invasion and

ICT-enabled innovation, employees' cyberslacking behaviors who already feel invaded by technology might hinder the cognitive focus and creative thinking required for generating novel ideas or solutions.

Zhong et al. (2022) found that cyberslacking has both negative and positive effects on innovation. Accordingly, despite the direct positive impact of cyberslacking on innovation, when acting as a moderator, cyberslacking can exacerbate the negative effect of techno-invasion on ICT-enabled innovation. Hence, a high frequency of cyberslacking behaviors is proposed to strengthen the negative relationship between techno-invasion and ICT-enabled innovation. When employees who are already invaded by technology spend their time and energy on cyberslacking, their capacity to create ICT-enabled innovation is expected to diminish. Hence, H_{3a} and H_{3b} are formulated as follows:

H_{3a}: Minor cyberslacking moderates the mediation effect of techno-invasion between IT mindfulness and ICT enabled innovation, such that the mediation effect will be stronger when minor cyberslacking is high.

H_{3b}: Major cyberslacking moderates the mediation effect of techno-invasion between IT mindfulness and ICT enabled innovation, such that the mediation effect will be stronger when major cyberslacking is high.

The proposed research model is depicted in Figure 1.

FIGURE 1 AROUND HERE

2.4. Age as the second moderator

Given the increasing cognitive and physical limitations associated with older age (Venkatesh et al., 2003), the prevalent assumption is that older employees are less innovative. However, the mixed findings in the literature regarding age-innovation relationship highlight the importance to understand the effect of age on innovation (Ng & Feldman, 2013a). Additionally, the projections towards extending working lives (Fry

& Braga, 2023) and the rapidly aging labor force suggest that age and its relationship with innovation seems to be a variable that is worth discussing in the near future.

The predominant finding regarding the moderating role of age on technology-related concepts is that on the one hand, older employees struggle to adjust to evolving technological advancements (Tripathi, 2018), may be willing to continue with the status-quo and do not want to take risks for innovation (Wang & Zatzick, 2019), leading to a negative impact on innovation activities (Schubert & Andersson, 2015). Moreover, given the positive effect of training for innovation, older employees are prone to engage in smaller amounts of training efforts (Pfeifer & Wagner, 2012). On the other hand, younger employees are expected to possess a higher level of digital literacy (Jia et al., 2013), which can directly lead to a higher level of ICT-enabled innovation (Yazon et al., 2019).

Along with the aforementioned proposition stating that the indirect effect of IT mindfulness on ICT-enabled innovation through techno-invasion likely depends on cyberslacking, varying age might alter this moderation of cyberslacking on the final link in the mediation model. Accordingly, in order to explain where the mediation effect of techno-invasion between IT mindfulness and ICT-enabled innovation is stronger, cyberslacking and age are examined. Considering the studies examining the relationship between age and cyberslacking, which mostly found that younger employees are prone to cyberslack more than older ones (Lim & Teo, 2024a), it is proposed that the moderation of cyberslacking for the indirect effect of IT mindfulness on ICT-enabled innovation through techno-invasion is contingent on age such that the moderated-mediation relationship will be stronger for younger users who engage in cyberslacking more than for those who do less. Similarly, this moderated moderated-mediation relationship is proposed to be weaker for younger users who engage in cyberslacking less.

H_{4a}: The magnitude of the moderation of minor cyberslacking for the effect of IT mindfulness on ICT-enabled innovation via techno-invasion is moderated by age, such

that the moderated moderated-mediation relationship will be stronger for younger respondents than older ones.

H_{4b}: The magnitude of the moderation of major cyberslacking for the effect of IT mindfulness on ICT-enabled innovation via techno-invasion is moderated by age, such that the moderated moderated-mediation relationship will be stronger for younger respondents than older ones.

3. Materials and Methods

3.1. Procedure and participants

Data were gathered through an online survey on Google forms. The survey form was initially distributed to full-time public-school teachers working in Adana/Turkey, who are either master's degree students at or graduates from Adana Alparslan Türkeş Science and Technology University. The sampling process began as convenience sampling. Participants were reached through various means (e.g., email, WhatsApp, phone calls), without simultaneous contact. They were requested to attend to the survey and also to share the survey link within their professional networks, particularly WhatsApp groups, which are commonly used by teachers to facilitate quick communication regarding their concerns related to work.

The initial selection of participants was based on their dual role as active teachers and master's degree students/graduates, making them a suitable group for the research. This specific group was easily accessible, and their professional networks were leveraged to expand the sample size by forwarding the survey to other teachers in Adana. By having the initial participants share the survey with other teachers they knew, snowball sampling was also applied. Over time, as the survey link was shared further, the proportion of participants who were master's degree students at Adana Alparslan Türkeş University decreased, with the focus shifting to teachers from various schools across Adana.

Informed consent was obtained from all participants before they were allowed to

participate in the study. In the survey form, it was initially declared that enrolling in the survey was voluntary and the form focused on IT-use and work behaviors. Participants were assured that their responses would be kept strictly confidential and analyzed anonymously to reduce the risk of self-reported bias confidentially. Lastly, participants were reminded that they could participate in the study only if they were working as public-school teachers in Adana. Study procedures were approved by the Research Ethics Committee of Adana Alparslan Turkes Science and Technology University (Ref-No.04-01-26.3.2024). After initial data screening to eliminate invalid responses, the final sample comprised 358 surveys. Demographic information of the participants is provided in Table 1.

TABLE 1 AROUND HERE

3.2. *Measurements*

All questionnaires, except those from the Cyberslacking Scale, used a Likert-type format with either 5- or 7-point scales ranging from “strongly disagree” to “strongly agree”. The scale measuring minor and major cyberslacking was scaled from (1) “never” to (5) “a great deal”. Scale formats were preserved in their original form to maintain instrument fidelity, as different scale formats may not produce identical effects, (Weijters, Cabooter, & Schillewaert, 2010), and to minimize common method bias (Podsakoff, MacKenzie, & Podsakoff, 2012). All questionnaires were unidimensional except the Cyberslacking Scale. There were no reverse-coded items. Use of extant-validated and reliable scales from previous research supports the psychometric and measurement properties of the items used.

To measure IT mindfulness, the 4-item Short-form IT mindfulness Scale adapted by Chen et al. (2022), originally used by Thatcher et al. (2018), was used. The scale response options ranged from (1) “strongly disagree” to (5) “strongly agree”. In this study, Cronbach’s alpha for IT mindfulness was 0.93.

Techno-invasion was assessed by the relevant subscale of the Techno-Stress Questionnaire developed by Ragu-Nathan et al. (2008). The three items in the questionnaire were presented on a Likert scale and ranged from (1) “strongly disagree” to (5) “strongly agree”. In the present sample, the Cronbach's alpha was 0.87.

The assessment of ICT-enabled innovation was conducted using the ICT-enabled Innovation Scale, adapted from Tarafdar et al. (2010) by Chandra et al. (2019). The item responses for the ICT-enabled innovation scale ranged from (1) “strongly disagree” to (7) “strongly agree”. The Cronbach's alpha result in the present study was 0.93.

Lastly, minor and major cyberslacking were measured by the Cyberslacking Scale adapted by Güğərçin and Kuss (2025), which was formed by the integration of two seminal scales, namely those by (1) Lim and Teo (2005) and (2) Blanchard and Henle (2008). The items are listed in the Appendix (Table A.1). The 13-item scale focusing on the frequency of cyberslacking behaviors consists of two dimensions using a 5-point Likert frequency scale, ranging from (1) “never” to (5) “a great deal”. Minor and major cyberslacking were measured with nine and four items, respectively. The higher number of items measured by the minor cyberslacking subscale can be attributed to the fact that this form of cyberslacking is labelled as "typical cyberslacking" (Blanchard & Henle, 2008), which is expected to occur in a wide range of forms and to be engaged in much more frequently in comparison to major cyberslacking. The scale, previously used by Güğərçin and Kuss (2025), demonstrated reliability and validity, yielding satisfactory levels of Cronbach's Alpha, Composite Reliability (CR), and Average Variance Extracted (AVE) for cyberslacking as a second-order construct. It is a finer-grained scale since it is grounded in the broadly acknowledged and conceptually established deviant work behavior typology and demonstrates the currently practiced cyberslacking activities. In the present study, the Cronbach's alpha value for the cyberslacking scale was 0.91.

4. Results

4.1. Data analyses

A total of 391 responses were gathered. After the exclusion of 33 invalid responses, data analysis was performed on 358 responses. Before the analysis, common method bias was tested by performing Harman's single factor test (Podsakoff et al., 2003). Un-rotated exploratory factor analysis extracted five factors with eigenvalues greater than one and the first factor explained 31.79% of the variance, suggesting that common method bias was not prominent. In order to examine how well the scale structures fit with the data collected, confirmatory factor analysis was executed. The results suggested that scale structures had an acceptable fit with the data ($\chi^2/df = 2.918$, CFI = 0.924, RMSEA = 0.073, SRMR=0.069, TLI = 0.912).

Following the CFA results, convergent validity, discriminant validity and internal consistency reliability were assessed. Average variance extracted (AVE) was calculated for each construct to analyze convergent validity, which shows how well a construct converges in its indicators. AVE values ranged from 0.57 to 0.81 for ICT-enabled innovation, IT mindfulness, techno-invasion, and minor cyberslacking; all were higher than the acceptable value of 0.50, establishing convergent validity (Table 2). However, the AVE value of major cyberslacking (0.43) was below the cut-off (<0.50), indicating that major cyberslacking inadequately captured half of the variance of its constituent items, thus demonstrating insufficient convergent validity. Hence, it was excluded from the research model. The revised research model of the study is depicted in Figure 2.

FIGURE 2 AROUND HERE

For internal consistency reliability, in line with the suggestion stating that McDonald's Omega (ω) is preferable to Cronbach's Alpha (α) (Hayes & Coutts, 2020), the former was tested. All ω values were found to be between 0.87 and 0.93. Besides, composite reliability (CR) values for all the latent variables ranged from 0.87 to 0.93 (see Table 2).

Since all ω coefficients were greater than 0.70 and lower than 0.95, reliability of the scales was confirmed (Hair et al., 2014).

Next, to assess discriminant validity, the heterotrait-monotrait (HTMT) ratio of correlations was calculated due to its superior performance in comparison to the Fornell–Larcker criterion (Henseler et al., 2015). Since all HTMT values were found to be below the 0.90 cut off, discriminant validity is confirmed (Teo et al., 2008). Additionally, each item factor loaded higher on its assigned variable than on other variables. Hence, except for major cyberslacking, all values in Table 2 support internal consistency reliability, convergent validity and discriminant validity. Item loadings and explained variances for each construct are provided in Table A.1.

Table 2 shows the first-order correlations of each variable along with CR, AVE, and ω values. The correlations show significant relationships among the variables in the mediation model, IT mindfulness, techno-invasion and ICT-enabled innovation. The correlation coefficients indicate significant associations in the hypothesized direction among the mediation model variables. The moderating variable minor cyberslacking was positively correlated with IT mindfulness and ICT-enabled innovation.

TABLE 2 AROUND HERE

4.2. Hypotheses testing

4.2.1. Mediating effect analyses

To test hypotheses H₁ and H₂ in the mediating model (model 4), SPSS PROCESS analysis was conducted. As displayed in Figure 2, the mediation model was established with IT mindfulness as the independent variable, ICT-enabled innovation as the dependent variable, and techno-invasion as the mediating variable. The results showed that IT mindfulness positively predicted ICT-enabled innovation, supporting Hypothesis 1 ($\beta = 0.79$, $t = 13.81$, $p < 0.001$, 95%CI = [0.68, 0.90]), indicating that the direct effect of IT mindfulness on ICT-enabled innovation was significant. When techno-invasion

was added as a mediator, IT mindfulness negatively predicted techno-invasion ($\beta = -0.38, p < 0.001$) and techno-invasion negatively predicted ICT-enabled innovation ($\beta = -0.16, p < 0.001$). Overall, the results revealed a significant indirect effect of IT mindfulness on ICT-enabled innovation via techno-invasion based on bootstrap confidence intervals ($\beta=0.06, 95\%CI = [0.02, 0.11]$). Hence, it was found that techno-invasion partially mediated the relationship between IT mindfulness and ICT-enabled innovation, supporting H₂. The mediation analysis summary is presented in Table 3.

TABLE 3 AROUND HERE

4.2.2. Moderated Mediation Analyses

To test H3, which tests the first-order moderation (whether minor cyberslacking moderates the mediation effect of techno-invasion between IT mindfulness and ICT-enabled innovation), and H4, which tests the second-order moderation (whether the magnitude of the moderation of minor cyberslacking for the effect of IT mindfulness on ICT-enabled innovation via techno-invasion is moderated by age) Model 14 and Model 18 from the SPSS PROCESS macro was used.

The results with 5.000 bootstrap samples in Table 4 showed that the two-way interaction of techno-invasion and minor cyberslacking moderates the mediation effect, visualized in Figure 2 ($\beta = -0.57, t = -3.08, p < 0.05, 95\%CI = [-0.93, -0.20]$). To examine the significance and strength of the conditional effect of techno-invasion, Model 14 from the SPSS PROCESS macro was utilized. Results indicated that the conditional effect of techno-invasion on ICT-enabled innovation was significant for high and moderate levels of minor cyberslacking, but not for low levels. As expected, the conditional effect was stronger for high degrees of minor cyberslacking ($\beta = -0.25, t = -4.24, p < 0.001, 95\%CI = [-0.37, -0.13]$). More precisely, the negative effect of techno-invasion on ICT-enabled innovation was stronger for the respondents who engaged in high levels (+1SD) of minor cyberslacking. Considering the negative effect of IT mindfulness on techno-invasion, the conditional indirect effect of IT mindfulness was found to be stronger when minor cyberslacking was high ($\beta = 0.09, 95\%CI = [0.05,$

0.15]). Thus, minor cyberslacking was found to significantly moderate the effect of techno-invasion on ICT-enabled innovation, supporting H3.

TABLE 4 AROUND HERE

The visual representation of the interaction effect with minor cyberslacking is plotted in Figure 3. As displayed, lower levels of cyberslacking were associated with lower levels of ICT-enabled innovation under the conditions of both low and high techno-invasion. At high minor cyberslacking, the slope for the relationship between techno-invasion and ICT-enabled innovation was more negative than among those who engage in low minor cyberslacking. As techno-invasion increases, the decrease in ICT-enabled innovation was higher for the ones who engage in more minor cyberslacking than low minor cyberslacking. These results corroborate the findings that minor cyberslacking moderates the relationship between techno-invasion and ICT-enabled innovation such that the negative effect of techno-invasion on ICT-enabled innovation was strongest for teachers who engaged in high minor cyberslacking.

FIGURE 3 AROUND HERE

4.2.3. Moderated-Moderated Mediation

Considering the influence of age on minor cyberslacking, H4 takes respondents' age into consideration and tested the conditional indirect effect of IT mindfulness on ICT-enabled innovation through techno-invasion, depending on respondents' engagement in minor cyberslacking and their age. The results of this moderated-moderated mediation process modeling with 5,000 bootstrap samples with Model 18 from SPSS PROCESS macro showed that the conditional indirect effect of IT mindfulness on ICT-enabled innovation through techno-invasion, depending on minor cyberslacking and age, was significant ($\beta = 0.02$, $t = 2.76$, $p < 0.05$, 95%CI = [0.01, 0.02]). In other words, the three-way interaction of techno-invasion, minor cyberslacking and age significantly moderated the mediation effect of techno-invasion in the relationship between IT mindfulness and ICT-enabled innovation. The index of moderated moderated-mediation was significant ($\beta = -0.0054$; Boot se=0.0019; 95%CI = [-0.0094, -0.0021]).

Specific conditional indirect effects are provided in Table 4 and reveal that at high (1 SD above the mean) and moderate levels of minor cyberslacking, the influence of IT mindfulness on ICT-enabled innovation through techno-invasion was significant for all age groups (low, moderate and high). At relatively low levels of minor cyberslacking (1 SD below the mean), the only significant indirect effect of IT mindfulness on ICT-enabled innovation through techno-invasion held true for older employees. In addition, being younger and engaging in higher levels of minor cyberslacking was associated with the highest amount of increase in the indirect influence of IT mindfulness ($b = -0.31$, $p < 0.001$, 95% CI = -0.48 to -0.14), supporting H4. At moderate levels of minor cyberslacking, the negative relationship between techno-invasion and ICT-enabled innovation got stronger as the ages of the employees increased. The visual representation of the three-way interaction can be seen in Figure 4.a and 4.b.

FIGURE 4.A. AROUND HERE

FIGURE 4.B. AROUND HERE

The summary of results of hypotheses testing is presented in Table 5.

TABLE 5 AROUND HERE

5. Discussion

Based on the theory of affordances, a moderated moderated-mediation model was tested in this study to analyze the mechanisms underlying the association between IT mindfulness, ICT-enabled innovation, techno-invasion, cyberslacking and age. It was proposed that ICT-enabled innovation was predicted by IT mindfulness and this relationship was mediated by techno-invasion. Additionally, this mediation effect was hypothesized to be moderated by cyberslacking, both minor and major. Lastly, the magnitude of the moderation of major cyberslacking for the effect of IT mindfulness on ICT-enabled innovation via techno-invasion was proposed to be moderated by age.

As predicted, IT mindfulness was found to directly enhance ICT-enabled innovation. This aligns with previous research that has considered mindfulness as a crucial factor in promoting or accelerating IT innovation (Thatcher et al., 2018; Wei et al., 2021), considering mindfulness as a prerequisite for or an accelerator of IT innovation (Dernbecher & Beck, 2017). Hence, the results add to the evidence that teachers' mindfulness positively predicts innovating with IT (Swanson & Ramiller, 2004).

Another finding was that techno-invasion plays a mediating role between IT mindfulness and ICT-enabled innovation. The results supported previous findings regarding the links from IT mindfulness to techno-invasion (Ioannou et al., 2022; Ioannou, 2023; Ioannou & Papazafeiropoulou, 2017; Maier et al., 2017; Raza et al., 2022) and from techno-invasion to ICT-enabled innovation (Chandra et al., 2019; Chen et al., 2022; Tarafdar et al., 2011) separately. These associations can be discussed within the framework of affordance theory, which is invoked to explain that technology use alone does not guarantee benefit; human actors and organizational issues also play a role. Drawing from affordance theory, it is assumed that along with the technology used within the organization, human actors as the users of this technology, namely teachers in the present study, and other organizational issues, such as the way employees interact with the technology used in the organization, can either support or constrain ICT-enabled innovation. In alignment with the tenets of affordance theory, the results of this study demonstrated that techno-invasion acts as a constraint, leading to a reduced level of ICT-enabled innovation, whereas IT mindfulness supports ICT-enabled innovation.

The research also indicated that minor cyberslacking was positively associated with ICT-enabled innovation. The results supported that minor cyberslacking behaviors can foster ICT-enabled innovation directly. This result is in line with previous findings in the literature (Derin & Gökçe, 2016; Ivarsson & Larsson, 2011; Kidwell, 2010; Oravec, 2002; Rahman et al., 2022; Yoğun, 2015). Although it was aimed to examine the moderation effects of both minor and major cyberslacking, due its low AVE value, major cyberslacking was excluded from the research model and the hypotheses examining major cyberslacking was not tested.

The present study also revealed that minor cyberslacking moderated the effect of techno-invasion on ICT-enabled innovation. Hence, it was confirmed that techno-invasion hindered ICT-enabled innovation, albeit the impact varied due to the frequency of minor cyberslacking. The indirect effect of techno-invasion on ICT-enabled innovation was more pronounced for the teachers reporting higher levels of minor cyberslacking. This leads to the conclusion that the negative effect of techno-invasion on ICT-enabled innovation was strongest for the respondents reporting a high level of minor cyberslacking.

The results suggested that among the teachers feeling invaded by technology, the ones who engage in minor cyberslacking activities more frequently can create lower amounts of ICT-enabled innovation. This finding contributes to the discussions focusing on the effect of cyberslacking on innovation. As Zhong et al. (2022) stated, cyberslacking was found to have both negative and positive effects on innovation. This finding is significant since it explains the context in which minor cyberslacking can fuel innovation or act as a barrier. The findings suggested that despite the direct impact of minor cyberslacking being positive, when acting as a moderator, it exacerbated the negative effect of techno-invasion on ICT-enabled innovation.

The findings in the literature show that cyberslacking may serve as a coping mechanism. Employees are stated to cope with workplace stressors as well as demands from non-work domains such as family responsibilities (Lim & Teo, 2024a). However, the results of the present study reveal a nuanced perspective. While cyberslacking may provide temporary relief from immediate stressors, the findings suggested that it also stifles ICT-enabled innovation, acting more as a hindrance than a solution. This dual nature of technology can be considered a *pharmakon*, both a remedy and a poison, which is often used to reflect on the inherent contradictions and the intertwined nature of opposites within certain concepts or realities (Mahr, Heller & Ruyter, 2023). The very technology that enables cyberslacking and can be used for coping with techno-invasion is actually the source of the problem, causing techno-invasion. Hence, it is clear that the impact of cyberslacking within organizational contexts is complicated.

This study contributes to a deeper understanding of the complexities of cyberslacking, highlighting its multifaceted effects and enriching scholarly discourse on the subject.

Moreover, the results showed that the moderation of minor cyberslacking for the effect of techno-invasion on ICT-enabled innovation is contingent on age such that the moderated moderated-mediation relationship is strongest for younger employees who cyberslack more than for those who cyberslack less. When cyberslacking is high, decreasing levels of age increase the negative effect on ICT-enabled innovation. In moderate levels of cyberslacking, increasing levels of age have the same effect, mitigating the decline in ICT-enabled innovation. A possible explanation for this finding relates to the fact that older employees can better cope with techno-invasion by engaging in high levels of cyberslacking, which in turn minimizes the negative effect of techno-invasion on ICT-enabled innovation.

Overall, the findings provide valuable insights into the complex relationship between ICT-related factors such as IT mindfulness, techno-invasion, and cyberslacking, in fostering ICT-enabled innovation. The results empirically confirmed the discussion in the literature (e.g., Kohler et al., 2011; Konrad-Märk & Füller, 2022), suggesting that along with the prerequisites of modern technological infrastructure or research and development efforts, human-technology interaction should also be considered a critical factor for ICT-enabled innovation. Hence, the findings underscore the need for organizations to consider not only the technological aspects but also the psychological and behavioral aspects of employees when aiming to foster ICT-enabled innovation. Practitioners' and researchers' emphasis should be on both the technology itself and the social setting it is used in.

In line with this study's empirical evidence, it is essential for organizations, particularly in educational settings, to actively support the psychological and behavioral engagement of teachers with technology. This support may include creating a positive atmosphere towards minor cyberslacking behaviors when they are shown to foster innovation. Although the research results stated that minor cyberslacking strengthened the negative relationship between techno-invasion and ICT-enabled innovation, the direct effect of

minor cyberslacking on ICT-enabled innovation was positive. This result suggests that instead of being entirely detrimental, depending on the context, minor cyberslacking behaviors might support engaging in innovative activities. This finding aligns with the dual nature of cyberslacking, which can function as either counterproductive work behavior or a mechanism for recovery, ultimately can enhance performance (Spector, 2024; Lim & Teo, 2024a). However, managers should take the level of cyberslacking into account. Zahmat Doost & Zhang (2024) found that the relationship between social media usage (SMU) at work, which is a specific form of cyberslacking, and job performance followed a reserved U-shaped, suggesting that this positive relationship is holds only up to a point. Beyond this level of social media usage, performance gradually decreases as the SMU increases. Therefore, prolonged engagement in cyberloafing can negatively impact work performance (Lim & Teo, 2024b).

Managers should explicitly recognize minor cyberslacking as a potential creative release or an "incubation" period for innovative thinking, rather than strictly focusing on its negative aspects, while being cautious when employees exceed the optimal level. Additionally, policies could be developed to distinguish between minor, potentially beneficial cyberslacking and more disruptive, major forms. This distinction allows for flexibility and acknowledges employees' different interaction styles with technology. Along with these factors, it is important to recognize that the guidance and communication styles of managers are fundamental to the success of policy implementation (Lim & Teo, 2024a).

Moreover, given the significant role of techno-invasion as a barrier to ICT-enabled innovation, organizations should systematically assess and address teachers' techno-invasion experiences. Implementing regular check-ins or surveys about employees' perceptions of techno-invasion can allow for better-tailored interventions that mitigate its impact. For instance, designing training programs that emphasize mindful ICT usage can help teachers develop coping mechanisms to handle techno-invasion. ICT training should aim to improve teachers' ability to set boundaries, regulate their use, and control their exposure to invasive digital demands. Additionally, helpdesk support can be offered to assist teachers as they adapt to new ICT or struggle to cope with the invasive

effects of ICT that arise from being “always on”. Lastly, integrating “technology-free” periods during the workday may offer employees the opportunity to recover from techno-invasion, creating a healthier work environment conducive to innovation.

The results of this study also indicate that age plays a crucial role in moderating the effects of cyberslacking and techno-invasion on ICT-enabled innovation. Organizations could consider providing age-specific training and support programs. For younger teachers, training might focus on self-regulation strategies that help minimize unnecessary distractions associated with cyberslacking. In contrast, training for older employees can emphasize the productive aspects of controlled, minor cyberslacking as a potential aid for innovative thinking. Furthermore, flexible ICT policies that account for age differences can allow employees to use technology in ways that suit their individual coping capacities.

Lastly, fostering IT mindfulness among teachers is critical. By encouraging teachers to engage in mindful use of ICTs, institutions can enhance their ICT-enabled innovation. To promote mindfulness, management could implement regular workshops on mindful technology usage, including techniques to stay focused and intentional with ICT. These workshops should be tailored to the specific technological context of the organization and designed to improve teachers’ capacity to approach ICT with curiosity, awareness, and a proactive mindset.

In conclusion, the findings emphasize the need for organizations to not only focus on the technological infrastructure but also to develop a nuanced understanding of employees’ behaviors and interactions with technology. Addressing the dual nature of cyberslacking as both a potential benefit and a detriment to innovation may enable organizations to cultivate an environment where ICT-enabled innovation can flourish. By developing policies that both support beneficial forms of cyberslacking and help manage techno-invasion, educational institutions can create a balanced digital workplace conducive to sustainable innovation.

Limitations and Future Research

The present study had several limitations. First, the study was cross-sectional, and therefore could not determine causal relationships between the assessed variables. Therefore, further experimental and longitudinal studies are needed to investigate the causal association. Second, all the questionnaires used in the current study used Likert scales and self-reports. Although it was statistically verified that the collected data had no common method bias, participants might have been engaged in self-serving responses. Third, although age was included to the model as a moderated variable, the absence of other control variables may limit the study's ability to fully account for individual differences, potentially affecting the generalizability of the findings. Fourth, although we addressed non-response bias by comparing early and late respondents, the absence of a single, uniform contact method and the potential for late respondents to have been informed of the survey later rather than intentionally delaying their response may limit the accuracy of our non-response bias analysis. Therefore, while no significant differences were found between early and late respondents, this issue remains a limitation in our study. Finally, since data were gathered from teachers who are students or graduates of master's degree programs, participants of this study consisted of teachers with a high level of education, with 25% having graduated from master's degree programs. This may limit the external validity of the findings to populations with lower-level education. It may be necessary to expand the research to generalize the results. Despite the fact that teachers are navigating the complexities of ICT integration akin to the employees in all other industries, educational institutions largely operate with a specific *modus operandi*, which can limit the generalizability of the findings.

Future research can broaden the range of sample sources and investigate how results vary across different cultural backgrounds, educational levels, and professional careers. Moreover, the significant moderating effect of minor cyberslacking warrants further examination of the contexts in which cyberslacking is supportive or adversary for the productivity of the organizations. Considering that employees are compelled to use ICT at a pace never anticipated due to digitalization efforts, the present study analyzed the associations between the variables, all of which are ICT-related, and is hoped to inspire

possible future studies focusing on the interactions between IT and users in the workplace. Future studies may benefit from incorporating cognitive neuroscience perspectives, potentially offering novel insights into cyberslacking through an examination of the physiological underpinnings of brain structure and function, rather than attitude and attention (Chen et al., 2023). Lastly, future research may analyze cyberslacking in detail as a pharmakon, which has the ability to heal or harm, depending on the context of its use. Examining the potential beneficial and detrimental roles of cyberslacking will enhance comprehension of the phenomenon.

Conclusion

In conclusion, the present study confirmed the positive association between IT mindfulness and ICT-enabled innovation, uncovered the role of techno-invasion as a mediator and the role of minor cyberslacking as a moderator. In the context of affiliation theory, the results supported the constraining role of techno-invasion and the supportive role of IT mindfulness as the variables predicting ICT-enabled innovation. Additionally, age was found to moderate the moderation effect of minor cyberslacking in the relationship between IT mindfulness and ICT-enabled innovation, with techno-invasion as a moderator.

Disclosure statement

The authors report there are no competing interests to declare.

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Table 1. Demographic Information of the Participants

Demographics	Frequency	Percentage
Age (years)		
30 or younger	93	26.0
31-40	158	44.1
41-62	99	27.7
No response	8	2.2
Marital Status		
Single	113	31.6
Married	231	64.5
No response	14	3.9
Gender		
Male	161	45.0
Female	189	52.8
No response	8	2.2
Education		
Bachelor's degree	265	74.0
Master's degree or higher	88	24.6
No response	5	1.4

Notes: $N = 358$.

Table 2. Reliability, Validity and Zero-order Correlations

	CR	AVE	ω	1	2	3	4
IT Mindfulness (1)	0.927	0.761	0.926	0.872			
Techno-Invasion (2)	0.870	0.691	0.870	-0.270*	0.831		
ICT-Enabled Innovation (3)	0.930	0.815	0.930	0.626*	-0.324*	0.903	
Minor Cyberslacking (4)	0.921	0.566	0.921	0.268*	-0.061	0.314*	0.752

Notes: $N = 358$; $*p < 0.001$. CR: composite reliability, AVE: Average variance extracted, ω : McDonald's Omega. Numbers on the diagonal represent the square root of AVE.

Table 3. The Mediating Effect Model

	DV = ICT-enabled innovation			DV = Techno-invasion			DV = ICT-enabled innovation		
	Step 1			Step 2			Step 3		
	Coeff	Se	T	Coeff	Se	T	Coeff	Se	T
Constant	2.34*	0.21	11.07	4.20*	0.27	15.47	3.01*	0.27	11.27
IT mindfulness	0.85*	0.06	15.14	-0.38*	0.07	-5.28	0.79*	0.06	13.81
Techno-invasion							-0.16*	0.04	-3.99
R ²	0.39			0.07			0.42		
F	229.17			27.89			127.32		
P	0.0000			0.0000			0.0000		
Total Effect									
		Total Effect		Se	T		LLCI	ULCI	
		0.85*		0.06	15.14		0.74	0.96	
Direct Effect									
		Direct Effect		Se	T		LLCI	ULCI	
IT-mindfulness ->		0.79*		0.06	13.81		0.68	0.90	
ICT enabled innovation									
Bootstrapping Indirect Effect H2									
		Indirect Effect			BOOT se	BBOT LLCI		BOOT ULCI	
IT mindfulness > techno-		0.06 (-0.38x-0.16)			0.02	0.02		0.12	
invasion > ICT-enabled									
innovation									

Notes: $N = 358$. $*p < 0.001$. Boot LLCI refers to the lower bound bootstrapping confidence intervals.

Boot ULCL refers to the upper bound bootstrapping confidence intervals. The level of confidence intervals in the output was 0.95. The bold values indicate the significant effects.

Table 4. The Moderated Moderated-Mediation Model

DV=ICT-enabled innovation					
	Coeff	Se	T	LLCI	ULCI
IT mindfulness	0.66**	0.06	11.19	0.55	0.78
Techno-invasion	1.77**	0.53	3.33	0.73	2.82
Minor cyberslacking	2.24**	0.52	4.30	1.22	3.26
Techno-invasion x Minor cyberslacking	-0.57*	0.18	-3.07	-0.93	-0.20
Age	0.18**	0.04	4.57	0.10	0.25
Techno-invasion x Age	-0.05**	0.01	-3.41	-0.07	-0.02
Minor Cyberslacking x Age	-0.05**	0.01	-3.64	-0.07	-0.02
Techno-invasion x Minor Cyberslacking x Age	0.01*	0.01	2.76	0.01	0.02
R2	0.48				
F	38.62				
P	0.0000				
R-square change	0.01				
F-change	7.63				
Index of moderated moderated-mediation					
	Index	BootSE	BootLL CI	BootUL CI	
	-0.0054	0.0018	-0.0094	-0.0021	
Indices of conditional moderated mediation by Minor Cyberslacking					
Age	Index	BootSE	BootLLCI	BootULCI	
Low	0.0836	0.0262	0.0356	0.1381	

Moderate	0.0407	0.0172	0.0080	0.0767
High	-0.0129	0.0203	-0.0566	0.0253

Conditional effects of the techno-invasion at values of moderators
(Minor Cyberslacking x Age)

Minor Cyberslacking	Age	Effect	Se	T	p	LLCI	ULCI
Low	Low	0.138	0.08	1.57	0.1173	-0.03	0.31
Low	Moderate	-0.060	0.06	-0.98	0.3265	-0.18	0.06
Low	High	-0.308	0.08	-3.73	0.0002	-0.47	-0.15
Moderate	Low	-0.110	0.05	-2.06	0.0404	-0.21	-0.01
Moderate	Moderate	-0.181	0.04	-4.65	0.0000	-0.26	-0.10
Moderate	High	-0.270	0.06	-4.86	0.0000	-0.38	-0.16
High	Low	-0.312	0.09	-3.59	0.0004	-0.48	-0.14
High	Moderate	-0.279	0.06	-4.75	0.0000	-0.39	-0.16
High	High	-0.239	0.08	-2.94	0.0036	-0.40	-0.08

Notes: $N = 350$. $*p < 0.05$, $**p < 0.001$. Boot LLCI refers to the lower bound bootstrapping confidence intervals. Boot ULCL refers to the upper bound bootstrapping confidence intervals. The level of confidence intervals in the output was 0.95. The bold values indicate the significant effects.

Table 5. Hypotheses Results

Hypotheses	Result
H1: IT mindfulness positively predicts ICT-enabled innovation.	Supported
H2: Techno-invasion plays a mediating role between IT mindfulness and ICT-enabled innovation.	Partially Supported
H3a: Minor cyberslacking moderates the mediation effect of techno-invasion between IT mindfulness and ICT enabled innovation, such that the mediation effect will be stronger when minor cyberslacking is high.	Supported
H3b: Major cyberslacking moderates the mediation effect of techno-invasion between IT mindfulness and ICT enabled innovation, such that the mediation effect will be stronger when major cyberslacking is high.	Not tested
H4a: The magnitude of the moderation of minor cyberslacking for the effect of IT mindfulness on ICT-enabled innovation via techno-invasion is moderated by age, such that the moderated moderated-mediation relationship will be stronger for younger respondents than older ones.	Supported
H4b: The magnitude of the moderation of major cyberslacking for the effect of IT mindfulness on ICT-enabled innovation via techno-invasion is moderated by age, such that the moderated moderated-mediation relationship will be stronger for younger respondents than older ones.	Not tested

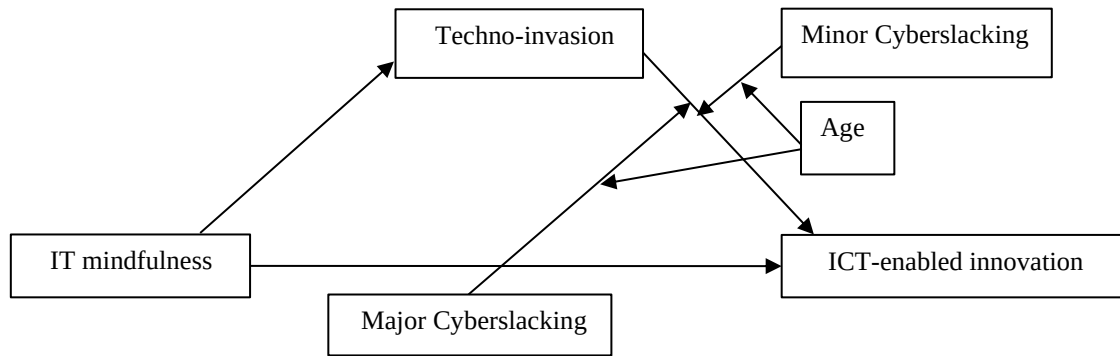


Figure 1. The Proposed Research Model

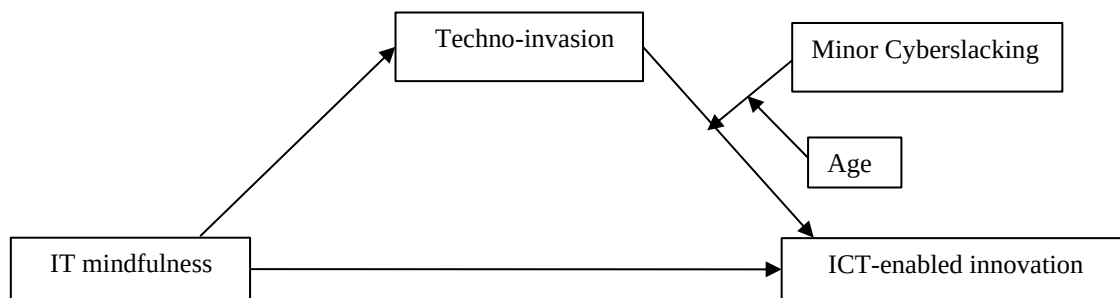


Figure 2. Revised research model of the study

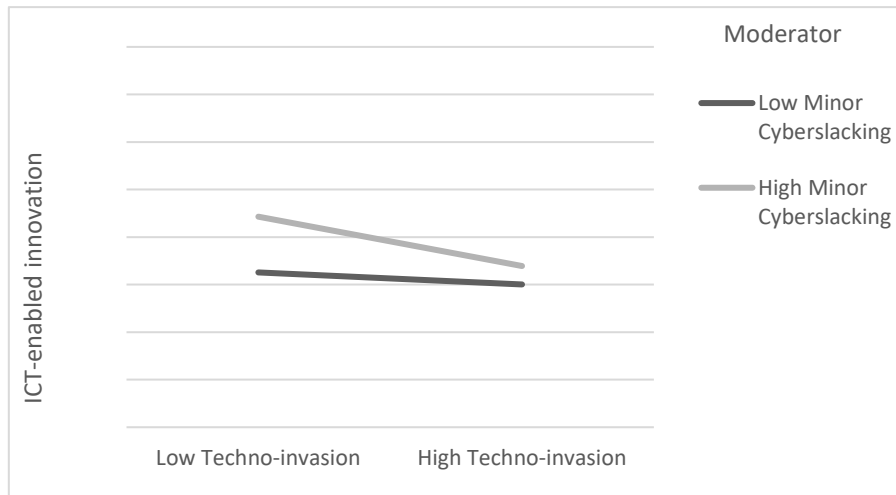


Figure 3. Association between techno-invasion and ICT-enabled innovation at higher and lower levels of minor cyberslacking

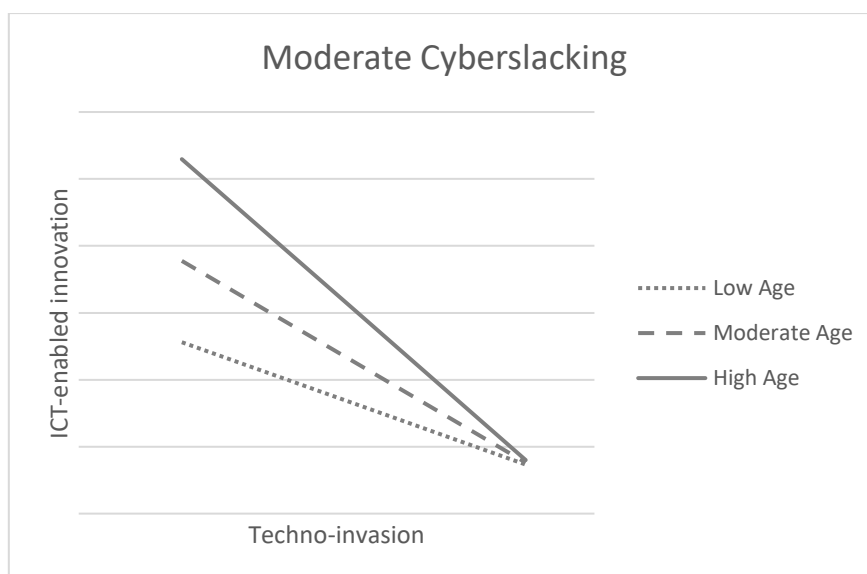


Figure 4.a. Three-way interaction in Moderate Cyberslacking

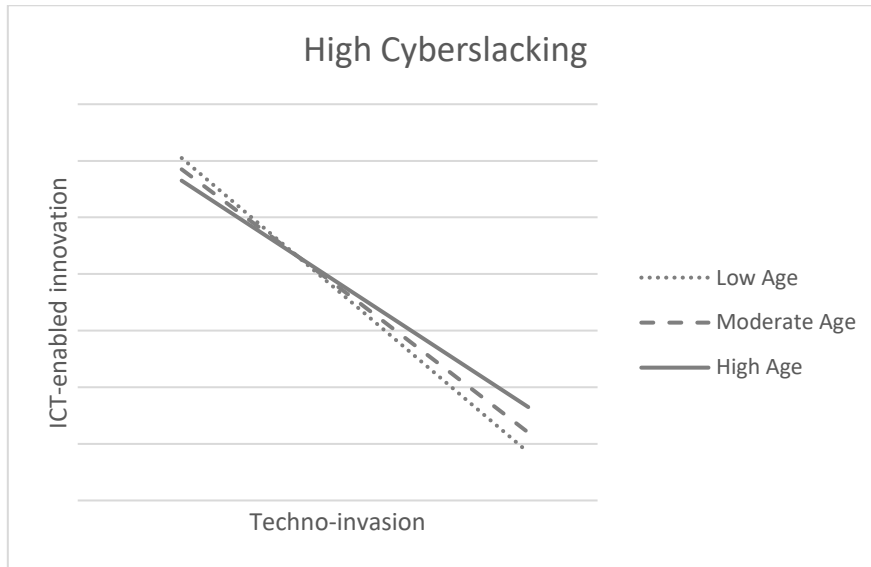


Figure 4.b. Three-way interaction in High Cyberslacking

Figure captions (as a list):

Figure 1. The Proposed Research Model

Figure 2. Revised research model of the study

Figure 3. Association between techno-invasion and ICT-enabled innovation at higher and lower levels of minor cyberslacking

Figure 4.a. Three-way interaction in Moderate Cyberslacking

Figure 4.b. Three-way interaction in High Cyberslacking

Appendix

Table A.1. Item Loadings, Explained Variance and Cronbach's Alpha Values

Questionnaire Item	Loading	Explained Variance
IT Mindfulness (min: 1, max: 5) (<i>M</i> =3.61 <i>SD</i> = 0.98)		.82
1. I am very creative when using IT at work	.76	
2. I am often open to learning new ways of using IT at work	.94	
3. I like to figure out different ways of using IT at work	.93	
4. I am involved when using IT at work	.85	
Techno-Invasion (min: 1, max: 7) (<i>M</i> =2.81 <i>SD</i> =1.39)		.79
1. I have to sacrifice my vacation and weekend time to keep updated on the new IT in my organization	.86	
2. I have to sacrifice my vacation and weekend time to keep updated on the new IT in my organization	.88	
3. I feel my personal life is being invaded by the IT used in the organization	.75	
ICT-Enabled Innovation (min: 1, max:7) (<i>M</i> =5.42 <i>SD</i> :1.33) <i>In general, information technology helps me to ...</i>		.87
1. ... identify innovative ways of doing my job.	.83	
2. ... come up with new ideas relating to my job	.94	
3. ... try out innovative ideas.	.94	
Cyberslacking		.63
Minor Cyberslacking (min: 1, max:5) (<i>M</i> = 2.81 <i>SD</i> = 1.02)		.61

<i>In general, while working ...</i>		
1. ... I check non-work-related emails	.63	
2. ... I visit news and/or sports sites	.72	
3. ... I visit financial news sites for stocks, cryptocurrencies, and other financial instruments (e.g. Google Finance, Bloomberg)	.62	
4. ... I visit banking or investment sites to make transactions	.82	
5. ... I shop online for personal goods	.85	
6. ... I surf or browse on the internet for personal purposes	.85	
7. ... I visit social media platforms such as Facebook, Twitter, and Instagram	.77	
8. ... I use instant messaging applications for personal purposes	.75	
9. ... I watch online videos (from YouTube, TikTok, etc)	.71	
Major Cyberslacking ($M= 1.62$ $SD= 0.76$)		.57
10. ... I play online games	.69	
11. ... I visit job-hunting or employment-related sites	.67	
12. ... I visit gambling websites	.62	
13. ... I visit adult-oriented (sexually explicit) websites	.65	

Note: Major cyberslacking is excluded from the research model due to low AVE value.

About the Authors

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