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Abstract:

Despite the increasing quantum of research on technostress, three particularly noteworthy gaps remain. First, though prior studies have described “technostress creators” through the five dimensions techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty in an aggregated way, they have not adequately considered how these technostress creators individually influence job outcomes. Second, though past organizational research suggests a curvilinear relationship between job stress and job outcomes, research has yet to examine whether the stress-performance dynamics for the technostress context follows the organizational stress literature. Third, even though the literature emphasizes information and communication technology (ICT)-enabled innovation in firms, research has not explored what influence the technostress creators have on ICT-enabled innovation in-depth. Grounding our arguments in the control theory of occupational stress and conservation of resources (COR) theory, we first theorize the linear and curvilinear relationships for each of the five technostress creators with ICT-enabled employee innovation and then test the hypothesized relationships via conducting a survey on organizational employees who regularly used ICTs for professional tasks. The results offer a nuanced understanding about the nature of individual technostress creators and their relationships with ICT-enabled employee innovation. On the practical front, our research paves the way for more meaningful technostress-management strategies in organizations.

Keywords: Technostress, Technostress Creators, Employee Innovation, Curvilinear Relationship, Hindrance and Challenge Stressor.

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1 Introduction

Organizations continue to experiment with emerging information and communication technologies (ICTs) to enable better connected and efficient organizations. Despite their numerous positive affordances, organizational ICTs also tend to promote negative outcomes that arise from an increased workload and stress due to excessive technology dependence (Bulgurcu, Cavusoglu, & Benbasat, 2010; Fuglseth & Sørebø, 2014; Sellberg & Susi, 2014). Work interruptions due to multitasking, unattended emails, busy servers, and connection breakdowns may result in significant psychological costs (Chui et al., 2012). Moreover, managers often expect employees who use new ICTs to perform better (Wang, Shu, & Tu, 2008). Thus, employees need to constantly adapt to new technological applications, functionalities, workflows, and skills, which can result in technostress (Ayyagari, Grover, & Purvis, 2011; D'Arcy, Gupta, Tarafdar, & Turel, 2014b; Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008; Tarafdar, Ragu-Nathan, Ragu-Nathan, & Tu, 2007). Prior research has established that, in situations where employees cannot cope with technostress creators in a healthy and positive manner, one can expect negative job outcomes (Ragu-Nathan et al., 2008; Tarafdar, Pullins, & Ragu-Nathan, 2015). Further, research has found that these negative outcomes tend to neutralize the accrued benefits that employees gain from using new organizational ICTs (Salanova, Llorens, & Cifre, 2013). Given the mixed impact that new organizational ICTs and the associated technostress creators can possibly have on job outcomes, we need to better understand the subject both from a theoretical and a practical perspective.

Recent information systems (IS) research has shown substantial interest in examining technostress from diverse perspectives (see D'Arcy et al., 2014b; Fischer & Riedl, 2017). For example, prior research has examined the impact that technostress creators have on employee productivity (Tarafdar et al., 2007) and end user satisfaction (Tarafdar, Tu, & Ragu-Nathan, 2010); the influence that social overload has on individuals from excessively using social networking services (Maier, Laumer, Eckhardt, & Weitzel, 2014); and the role that technology characteristics (Ayyagari et al., 2011), cognitive factors such as self-efficacy, and technology dependence have in inducing technostress (Lee, Chang, Lin, & Cheng, 2014; Shu, Tu, & Wang, 2011). Further, Srivastava, Chandra, and Shirish (2015) recently examined the joint influence that personality factors and technostress creators have on job outcomes. We summarize key research on technostress in Table 1. One can see that research has significantly focused on examining the relationships between technostress creators and job outcomes. However, all of these studies have conceptualized "technostress creators" as a superordinate construct (Ragu-Nathan et al., 2008).

Hence, despite the growing research on the subject (as Table 1 shows), we note three particularly noteworthy gaps. First, though studies have described technostress creators through a multidimensional superordinate construct that comprises the five dimensions techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty (Tarafdar et al., 2007), they have not yet sufficiently examined the individual impact that each dimension has on job outcomes. An aggregated construct conceptualization does holistically represent the technostress phenomenon, but individual technostress creators conceptually differ; as such, one may need to examine them separately for a more nuanced theoretical understanding (Gerbing & Anderson, 1988; MacKenzie, Podsakoff, & Podsakoff, 2011; Petter, Straub, & Rai, 2007). In other contexts, studies have examined other multidimensional aggregated constructs, such as job characteristics (Hulin & Blood, 1968), job stress (Beehr & Newman, 1978; Edwards, 2001; Schuler, 1980) and organizational commitment (Allen & Meyer, 1990; Meyer, Allen, & Smith, 1993; O'Reilly & Chatman, 1986), in a deconstructed way to more deeply understand the phenomenon. The five technostress dimensions represent different facets of a general concept, and a compelling need to theoretically and empirically refine these distinctions exists. Hence, it would be theoretically and practically interesting to understand how each of the five technostress creators individually influences job outcomes.

Second, research on stress and performance has suggested an inverted U-shaped relationship between stress and job outcomes such that performance requires an optimal amount of stress and described this phenomenon via the Yerkes-Dodson Law (Anderson, Revelle, & Lynch, 1989; Lupien, Maheu, Tu, Fiocco, & Schramek, 2007). Technostress research has also indicated this possibility (Srivastava et al., 2015) but not yet examined such a relationship. Recent calls in organizational psychology literature appeal for the need to include individuals' interpretations of stress creators into stress-performance dynamics in addition to the dominant premise of providing/maintaining an optimal level of stress creators in a work environment. Such a rounded approach can help organizations design more meaningful organizational stress management strategies (Le Fevre, Matheny, & Kolt, 2003).

Table 1. Key Research on Technostress

Technostress study	Technostress creators: construct type	Job outcomes
Ahmad, Amin, & Ismail (2009)	Superordinate construct	Organizational commitment
Brooks (2015)	Superordinate construct	Performance
D'Arcy, Herath, & Shoss (2014a)	Superordinate construct	NA
Eckhardt, Maier, & Buettner (2012)	Superordinate construct	Performance
Fuglseth & Sørebø (2014)	Superordinate construct	User satisfaction
Hung, Chang, & Lin (2011)	Superordinate construct	Productivity
Hwang & Cha (2018)	Superordinate construct	Organizational commitment
Maier, Laumer, Eckhardt, & Weitzel (2012)	Superordinate construct	User satisfaction
Maier, Laumer, Weinert, & Weitzel (2015)	Superordinate construct	User satisfaction
Ragu-Nathan et al. (2008)	Superordinate construct	Job satisfaction
Sellberg & Susi (2014)	Superordinate construct	NA
Shu et al.(2011)	Superordinate construct	NA
Srivastava et al. (2015)	Superordinate construct	Job burnout and job engagement
Tarafdar et al. (2007)	Superordinate construct	Productivity
Tarafdar et al. (2010)	Superordinate construct	User satisfaction
Tarafdar, Pullins, & Ragu-Nathan (2014)	Superordinate construct	Innovation
Tarafdar et al. (2015)	Superordinate construct	Innovation
Tarafdar, Pullins, & Ragu-Nathan (2011a)	Superordinate construct	Performance
Tarafdar, Tu, Ragu-Nathan, & Ragu-Nathan (2011b)	Superordinate construct	Job satisfaction
Tu, Tarafdar, Ragu-Nathan, & Ragu-Nathan (2008)	Superordinate construct	User satisfaction
Wang & Shu (2008)	Superordinate construct	NA
Wang et al. (2008)	Superordinate construct	NA

Third, though leading global corporations such as Apple, 3M, and Proctor & Gamble largely owe their outstanding business performance to successful employee innovation (Schroeder, 2013) and numerous studies have highlighted ICT-enabled employee innovation as a key job outcome that influences business performance (Baker & Sinkula, 2002; Hult, Hurley, & Knight, 2004; Jimenez-Jimenez, Sanz Valle, & Hernandez-Espallardo, 2008), research has yet to examine the influence that technostress creators have on ICT-enabled employee innovation in depth. Moreover, previous technostress literature has focused only the linear influence that aggregated technostress creators have on employee innovation (Tarafdar et al., 2010, 2014, 2015,). Motivated by these significant gaps, we theorize and test the (linear and curvilinear) impacts that individual technostress creators have on one such important job outcome (namely, ICT-enabled employee innovation) in this research (Black & Lynch, 2004; Oeij, Dhondt, Kraan, Vergeer, & Pot, 2012). Specifically, we address two research questions (RQ):

RQ1: How does each technostress creator individually influence employee innovation?

RQ2: Do individual technostress creators demonstrate a curvilinear relationship with ICT-enabled employee innovation?

Our research makes three primary contributions. First, in our study, which we ground in the control theory of occupational stress (Spector, 1998) and conservation of resources theory (COR) (Hobfoll, 1989), we theorize and test the relationships for each of the technostress creators on ICT-enabled employee innovation. As such, our results should help organizations to better understand the influence that employees' interpretations of technostress creators have on employee innovation and, thus, help them design appropriate managerial interventions (Tarafdar, Tu, Ragu-Nathan, & Ragu-Nathan, 2011b). Second, the quadratic influence of individual technostress creators on employee innovation suggests a previously unexamined inverted U-shaped relationship between perceptions of technostress creators and ICT-enabled job outcomes. Such a relationship offers deep insights into the nature of and meanings associated with the individual technostress creators and should stimulate further research on the subject. Third, in our research, we focus on ICT-enabled employee innovation, which describes how employees generate and implement innovative ideas using ICT. Note that employee innovation performance differs from employee performance on other routine tasks. Innovation has prime significance to the growth of the knowledge economy, and organizations often encourage their employees to deviate creatively into non-routine tasks to achieve innovative outcomes (Leung, Huang, Su, & Lu, 2011). Our work contributes to the important literature stream that examines innovation in relation to technostress creators (Tarafdar et al., 2015).

2 Theoretical Background

2.1 Stress and Technostress

Over the past two decades, private employers and governments have increasingly focused on occupational stress since it represents a real threat to employees' quality of life (Le Fevre et al., 2003; Thong & Yap, 2000). The stress literature has shown that high job stress leads to disengagement from work and, thus, in low job performance (Leveck & Jones, 1996; Westman & Eden, 1997). Stress also contributes to organizational inefficiency, high staff turnover, and decreased job satisfaction (AbuAlRub, 2004). Research in this area continues to assess the potential cost of stress to individuals and organizations. In addition, research continues to design interventions that can help organizations manage organizational stress levels and, thus, improve employee performance (Riolli & Savicki, 2003). Researchers have described stress as a set of physical and psychological responses to adverse conditions or influences (Selye, 1964). In addition to physical and psychological responses, some stress studies have also discussed the physiological and behavioral consequences of stress (see Kahn & Byosiere, 1992; Riedl, 2013; Sonnentag & Frese, 2013).The term stressor or stress creator describes the external influence that acts on individuals, while stress denotes the resulting reaction (Le Fevre et al., 2003). Researchers have also conceptualized stress creators as discrepancies between environmental demands and internal standards that upset the state of equilibrium and, thereby, affect individuals' physical and psychological wellbeing and require action to re-establish equilibrium (Lazarus & Cohen, 1977). Environmental demands refer to the contextual social environment that surrounds individuals (Beaudry & Pinsonneault, 2005), whereas internal standards refer to the personal desires or requirements that the environment must meet (see Carver & Scheier, 1982; Edwards, 1992; Powers, 1973). Stress results from an imbalance between an individual's external environmental demands and the individual's internal needs.

The organizational stress management literature recommends that one examine employees' perceptions of stress creators when designing any effective stress-management initiative (Le Fevre et al., 2003). Thus, whether employees interpret environmental demands (stress creators) as positive or negative will determine subsequent employee (reactions) behaviors. The dominant view has advocated for providing an environment that features an optimal level of stress because moderate stress levels should facilitate arousal and, thus, better performance as compared to environments with very high or very low levels of stress (Cohen, 1980). Thus, the majority of the stress management literature builds on the Yerkes-Dodson Law (Yerkes & Dodson, 1908), which suggests an inverted-U relationship between stimulus and performance (i.e., that insufficient stimulus has an inert effect on the employee outcomes while too much has a hyperactive influence). Consequently, an individual may not respond adequately to either too little or too much stimulation. Optimal performance lies somewhere in between these extreme stimulation levels. The "optimal amount of stress stimulus" concept proposes that moderate levels of stress benefits performance and that, at very high levels, the performance declines, which results in an inverted U-shaped curve (Anderson et al., 1989; Certo, 2003; Lupien et al., 2007). Over and understimulation due to too much or too little demand can hinder individuals, while the optimal amount challenges them in a good way (Selye, 1964, 1987). Hindrance stress stimuli essentially bar individuals from accomplishing their goals, while challenge stress stimuli place demands on individuals to learn or accomplish some task. Researchers have identified the strength of stress stimuli and the way in which an individual interprets them as two key elements that define the relationship between stress stimuli and performance (Le Fevre et al., 2003).

The occupational stress literature provides a foundation to understand other kinds of stress perceptions that employees may experience in the organizational context—particularly when information technology mediates the work they perform (Lim & Teo, 1999). For example, employees' growing dependence on ICT coupled with these technologies' ubiquitous and functionally pervasive nature results in five kinds of technostress creators: techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty (Tarafdar et al., 2007). Techno-overload describes situations where new technologies force people to work more and faster. Techno-invasion describes being "always exposed" such that people can be reached anywhere and anytime and feel the need to stay constantly connected. Techno-complexity describes situations where the complex computer systems that people use at work force them to spend time and effort in learning and understanding new applications to update their skills. Techno-insecurity refers to situations where people feel threatened about losing their jobs to those who better understand new gadgets and computing devices. Techno-uncertainty relates to computer systems' short lifecycles and continuous changes that may rapidly outdate employees' knowledge. As we describe above, these five technostress creators may influence employee outcomes differently. In this study, we examine the influence that individual technostress creators have on ICT-enabled employee innovation. These technostress creators do not measure single disruptive events or computer hassles; rather, they describe individuals' perceptions about chronic stressors due to technology in the workplace (Hudiburg, 1989, 1995). To hypothesize linear relationships between technostress creators and employee innovation, we leverage the control theory of occupational stress; however, to hypothesize curvilinear relationships, we need to better understand the research context and the dependent variable.

The dependent variable in our study is ICT-enabled employee innovation. Specifically, we measure the technology enablement or technology appropriation by the human agency to innovate. It encompasses both product and process innovation in its scope (Nambisan, Lyytinen, Majchrzak, & Song, 2017). ICT-enabled innovation differs from the efficiency-based output variables that past studies on occupational stress have examined. To achieve better outputs, efficiency-based output variables (e.g., productivity) require structured compliance to given standards, whereas creativity-based variables (e.g., innovation) require creative deviance from standard norms. While the Yerkes-Dodson law, which relies on an optimal stress paradigm, may pertain to scenarios with efficiency-based outputs (such as productivity), it does not necessarily pertain to creativity-based outputs (such as innovation) due to two primary reasons:

1) An increase in stress from stress creators may increase employee efficiency for repetitive tasks, but it tends to inhibit creative thinking and, thereby, adversely influence innovation, and
2) Efficiency-based repetitive tasks have an output saturation level with the given processes after which increased stress from stress creators may have a dysfunctional influence on employees.

In contrast, for creativity-based output such as innovation, employees should have the requisite amount of motivation, time, and resources to acquire new knowledge to cope with increased stress from stress creators (Galluch, Grover, & Thatcher, 2015). Given this contextual distinction, we use the conservation of resources theory (COR), which describes the motivations that drives individuals to maintain their current and acquire new resources to cope with stress creators, to theorize the curvilinear relationships between individual technostress creators and ICT-enabled employee innovation (Hobfoll, 1989). In Section 2.2, we describe the control theory of occupational stress in relation to technostress, which we use to describe the linear relationships. In Section 2.3, we describe the COR.

2.2 Control Theory of Occupational Stress and Technostress

The control theory of occupational stress rests on the premise that the degree to which an individual perceives control over any stress creator influences the likelihood that the individual will experience the associated stress (Spector, 1998). This theory allows one to examine how an individual interprets stress creators in the organizational context (Le Fevre et al., 2003). Given that recent research has made calls for researchers to examine the phenomenon of positive stress responses to technostress creators (Nastjuk & Kolbe, 2015; Srivastava et al., 2015), we use the control theory of occupational stress to holistically examine the proposed relationships.

Control refers to an individual's ability to have two or more alternatives in a given situation (Ganster & Fusilier, 1989). Past research has used this concept to understand wide-ranging attitudinal and behavioral aspects such as work centrality and frustration (see Lim, Teo, & Loo, 2003; Mueller & Thomas, 2001). Research has shown locus of control—the belief that individuals (rather than outside forces or other individuals) have control over their own activities at work—to moderate how individuals perceive control in a situation (Spector, 1998; Spector & O'Connell, 1994). Control in the workplace may range from complete autonomy in terms of controlling one's own work schedule and workload to complete servitude with no personal control over one's own work schedule and workload (Ganster & Fusilier, 1989). An alternative situation in which one has some degree of autonomy over one's work schedule and workload but only partial control over one's self personal situation also exists. Control in the IT context has three components: control over the work (i.e., how much autonomy users have in their job), control over self (i.e., how well users can adapt to new environment), and control over technology (i.e., how well users can use IT's features and functionalities) (Beaudry & Pinsonneault, 2005). How an individual perceives control influences how the individual perceives stress creators (i.e., as challenging or hindering stressors) (Spector, 1998), which, in turn, can influence their performance in ICT-enabled tasks (Galluch et al., 2015; Tarafdar et al., 2010). However, the way individuals perceive control can depend highly on the context (i.e., on the nature of the task at hand).Organizational technologies can serve an instrument role in externalizing the locus of control from employees to employers and, thus, influence how employees perceive stress (Spector & Fox, 2002). Depending on how strongly employees perceive new technologies as externalizing the locus of control, they may perceive stress that results from the externalization as either positive or negative (Neban & Schneider, 2015), which, in turn, can influence their performance. Situating our arguments in the control theory of occupational stress, we hypothesize the linear effects that technostress has on ICT-enabled employee innovation.

2.3 Conservation of Resources (COR) Theory

Researchers have used the COR theory to explain psychological stress at work (Hobfoll, 1989). The theory fundamentally posits that individuals endeavor to retain, preserve, foster, and accumulate resources—that is, "objects, states, conditions, and other things that we value" (Hobfoll, 1989, p. 514)—in order to better navigate their way through life's demands and challenges. As such, resources can be personal (e.g., internal locus of control, self-esteem etc.) or environmental (e.g., autonomy at work, social support etc.) that contribute positively to individuals' wellbeing and adjustment (Hakanen, Schaufeli, & Ahola, 2008; Halbesleben, 2006; Nelson & Simmons, 2003). The COR theory also involves two other principles: resource spirals and resource caravans. First, a resource spiral refers to the notion that, when individuals lack resources to deal with stressful events, they lose even more resources (i.e., that "loss begets further loss") (Hobfoll, 2001, p. 354), which can reduce their ability to cope with stressful events. A resource spiral can also involve a gain in resources and a corresponding gain in individuals' ability to cope with stressful events. Second, a resource caravan refers to the notion that resources can aggregate and build on each other. For example, if employees experience enhanced control due to technology, they will also become more optimistic about their ability to perform better in the future. Similarly, training and organizational support to deal with the technology may make them feel more confident about seeking further support in the future, which will increase their performance level (Hobfoll, 2001). COR theory accounts for behavior before an individual perceives stress and does not exclusively deal with stress as a response to stress creators unlike many other stress theories. Thus, when people have a priori resource surpluses, they are likely to view the situation as a challenge stressor (Hobfoll, 1989), and, when they have a priori resource deficits, they are likely to view the situation as a hindrance stressor. Consequently, we may view resource accumulation as a type of coping strategy that changes whether individuals appraise a situation as a challenge (during a resource surplus) or hindrance (during a resource deficit).

3 Hypothesis Development

3.1 Linear Relationships between Technostress Creators and Innovation

Organizational employees evaluate and appraise each technostress creator as a separate disruptive event due to their varying internal and external demands (Beaudry & Pinsonneault, 2005). The management literature notes that employees appraise disruptive events depending on the level of perceived control that they have to deal with in a situation. If employees have the necessary control and possess resources to cope with the stress creator, they interpret it as a challenge—an opportunity to improve their job performance. On the other hand, if they have limited resources to cope with the stress creator, they perceive it as a threat, which could attenuate their job performance (Beaudry & Pinsonneault, 2005; Carpenter, 1992; McCrae, 1989). Thus, stress creators have multiple facets and can evoke perceptions of opportunities and threats (Lazarus & Folkman, 1984). The literature describes stress creators that employees view as opportunities as challenge stressors (i.e., demands associated with learning things and accomplishing tasks). On the contrary, the literature describes stress creators that employees view as threats as hindrance stressors (i.e., barriers that prevent employees from accomplishing goals). When employees have enough resources and control to cope with the situation, they feel positively challenged to accomplish the task. In contrast, employees feel threatened under situations when they have limited coping resources and perceive a loss of control. Against this backdrop, based on control theory of occupational stress, we hypothesize linear relationships between each technostress creator and ICT-enabled employee innovation.

Techno-overload, the first technostress creator, occurs when ICT forces employees to work at a fast pace under a tight schedule and to handle a huge workload (Ragu-Nathan et al., 2008; Tarafdar et al., 2007). Techno-overload also occurs when employees need to adapt to new technologies by changing their work habits (Ragu-Nathan et al., 2008; Tarafdar et al., 2007, 2010). In such a situation, individuals may feel threatened because they perceive a loss in control in their work environment (Klein, 1971). For example, the increasing volume of emails and other technologically enabled communication can stress out employees (Barley, Meyerson, & Grodal, 2011). As employees' control over work diminishes, their coping resources such as confidence and self-efficacy also start to deplete. Thus, the increased workload poses as a hindrance stressor for them. Studies have consistently reported that, under the chronic effect that stressors have, even well-trained individuals deviate from their optimal behaviors (Lehner, Seyed-Solorforough, O'Connor, Sak, & Mullin, 1997). Depleting resources under heavy and prolonged workload can also cause fatigue. Prior experimental studies have reported that fatigue negatively impacts even simple jobs such as data entry (Buck-Gengler & Healy, 2001; Fendrich, Healy, & Bourne, 1991). This negative impact increases for complex tasks such as innovation because employees may not have sufficient time to contemplate and reflect (Soetens, Hueting, & Wauters, 1992). Thus, we hypothesize:

> **H1a**: Techno-overload is negatively associated with ICT-enabled employee innovation.

Techno-invasion, the second technostress creator, causes employees to never be free from technology and work. As the boundary between work and home blurs, employees perceive a loss of privacy. Employees might perceive the fact that they are constantly connected to the workplace regardless of time and space as relinquishing control over their work and self. This ICT-impacted privacy intrusion threatens employees by depleting their environmental resources such as autonomy and control at work. In turn, they can perceive this diminished autonomy and control at work as a hindrance stressor, which can reduce their motivation at work and suppresses their performance (LePine, Podsakoff, & LePine, 2005). Moreover, constant connectivity compels employees to focus on current operational tasks and, thus, lack the time for creative thinking and innovation, which often require them to spend much time reflecting. For example, PricewaterhouseCoopers' global human capital business reported reduced innovation capabilities in its employees due to ICT's constant intrusion in their personal lives (Rendell, 2014). Thus, we hypothesize:

> **H1b**: Techno-invasion is negatively associated with ICT-enabled employee innovation.

Techno-complexity, the third technostress creator, intimidates employees since it requires them to expend much time and effort to learn to use new ICTs by upgrading their ICT skills. As employees need to continuously expend time and effort to learn about the new technologies to cope with unexpected disruptions, their resources for handling complex technologies may gradually decrease (Riedl, Kindermann, Auinger, & Javor, 2013), which can threaten them with lesser control over technology, themselves, and their work, which, in turn, can disrupt their state of constancy and, thereby, induce distress. We can see a clear example in high-tech educational institutions that incorporate the latest technologies in the classrooms even as professors prefer traditional teaching methods and hesitate to incorporate new and complex technologies in their curriculum because it stresses them out (Ball & Levy, 2008; Howard, 2013). A study from *MIT Sloan Management Review* and Capgemini Consulting revealed that, in a scenario in which techno-complexity significantly increases, employees may feel overwhelmed and frustrated (Fitzgerald, Kruschwitz, Bonnet, & Welch, 2013). Because employees perceive techno-complexity as a hindrance stressor, they may have less time and motivation to explore new ICT applications, which may diminish the possibility for innovation (Nelson & Kletke, 1990; Tarafdar et al., 2010). Thus, we hypothesize:

> **H1c**: Techno-complexity is negatively associated with ICT-enabled employee innovation.

Techno-insecurity, the fourth technostress creator, arises when employees fear that they may lose their job because they cannot cope with the emerging learning requirements and work process adaptations that rapid technological changes mandate (Tarafdar et al., 2007, 2010). Prior studies have shown that technological advancements tend to reduce employees' bargaining power and job security (Sweeney, 2015). Employees feel a perpetual pressure to update their resources and technological skills to stay current. In fact, employees tend to feel threatened by their coworkers who possess newer ICT skills. A study from *MIT Sloan Management Review* and Capgemini Consulting revealed that employees feel threatened by new technologies at work because they fear that they will lose control over their tasks (D'Arcy et al., 2014b; Fitzgerald et al., 2013). Leveraging control theory, we posit that techno-insecurity threatens employees with a lack of control over work, which diminishes their satisfaction level and, thus, limits their efficiency and effectiveness. Employees can interpret techno-insecurity as a hindrance stressor, which can induce distress in them. Thus, employees will use ICTs only to execute their routine tasks rather than leveraging them to accomplish innovative tasks despite the possibility that they could do so. Thus, we hypothesize:

> **H1d**: Techno-insecurity is negatively associated with ICT-enabled employee innovation.

Techno-uncertainty, the fifth technostress creator, stresses employees due to endless upgrades and the pressure to keep current with new applications. As organizations constantly embrace technological shifts to stay ahead of their competitors, employees with their current pool of resources and skills set may find it difficult to cope with the constant changes. In fact, one respondent from the *MIT Sloan Management Review* and Capgemini Consulting survey noted that:

> *At the operational level, there are some benefits (due to digital transformation), but much of the day-to-day experience is the feeling of being reduced to a Victorian machine minder. Instead of the software servicing the people, it is the other way around.* (Fitzgerald et al., 2013)

Another respondent commented that the pace of digital transformation demanded such speed that it risked "diluting employee morale" (Fitzgerald et al., 2013). These uncertainties threaten employees with reduced control over their work, self, and technology, which induces distress. Thus, techno-uncertainty represents a hindrance stressor that results in a lower motivation to work, suppressed performance, and reduced efficiency (Leung et al., 2011; Tarafdar et al., 2007). Consequently, given their limited cognitive resources, employees feel compelled to stay focused on routine tasks rather than to use ICT for innovative initiatives. Thus, we hypothesize:

> **H1e**: Techno-uncertainty is negatively associated with ICT-enabled employee innovation.

3.2 Curvilinear Relationships between Technostress Creators and Innovation

It makes intuitive sense that technostress creators should act as hindrance stressors and have negative relationships with outcome variables, but that may be because researchers often think about and, thus, examine the relationship between stress and performance in a linear way (Leung et al., 2011). However, studies have found both positive and negative relationships between technostress creators and job outcomes (Srivastava et al., 2015). Consequently, we need to understand whether the relationship between technostress creators and employee innovation varies based on how individuals perceive and the meanings that they associate with stress creators. Since the literature has found both positive and negative relationships between technostress creators and job outcomes, technostress creators may exhibit curvilinear effects. However, we expect the five technostress creators to influence employee outcomes differently because they trigger employees to interpret them differently. In Figure 1, we summarize the theoretical reasoning behind the curvilinear relationships.

As we mention above, in contrast to many prior occupational stress studies that have examined efficiency-based employee output parameters such as productivity, we examine the influence that technostress creators have on innovation (i.e., a creativity-based employee output parameter). Prior work has shown that, among other conditions, in the presence of sufficient resources, stressors can have differential impacts on creativity performance outcomes when individuals experience a sense of progress at work as opposed to setbacks (Amabile, Hadley, & Kramer, 2002). Individuals with a clear mission or goal view stressors such as severe schedule pressures or other significant daily setbacks as a challenge (Amabile et al., 2002). Given this contextual distinction from prior studies, instead of using the Yerkes-Dodson law (Yerkes & Dodson, 1908) to theorize curvilinear relationships (which pertains more to the efficiency-based output scenario), we leverage the conservation of resources theory (COR), which we believe better suits the specific creativity-based context of ICT-enabled employee innovation (Hobfoll, 1989). Hence, contrary to the Yerkes-Dodson law that proposes an inverted U-shaped relationship between stress and performance, we expect and hypothesize the technostress creators to exhibit a U-shaped relationship with ICT enabled employee innovation. By using COR theory, we can study individuals' resilience to stressors based on the resources they anticipate they will accumulate and their motivational drivers to conserve, protect, and preserve resources that arise after they perceive distress. The COR theory uses an individual's perception of stressors as a proxy for the resources the individual has at any given point in time (Hobfoll, 1989). In this study, we do not directly assess individuals' resources, nor do we attempt to carve out which resources flow through resource passageways. Such theorizing would follow the approach that recent studies that have used COR to study stress in general have taken (Kalish, Luria, Toker, & Westman, 2015; Westman, Hobfoll, Chen, Davidson, & Laski, 2005). Rather, we measure perceived stress levels as a proxy for the resources that individuals have lost or gained. In Section 6, we acknowledge the limitation of not measuring actual resources in this study. In Sections 3.2.1 to 3.2.5, we hypothesize about the relationship between each technostress creator and ICT-enabled employee innovation.

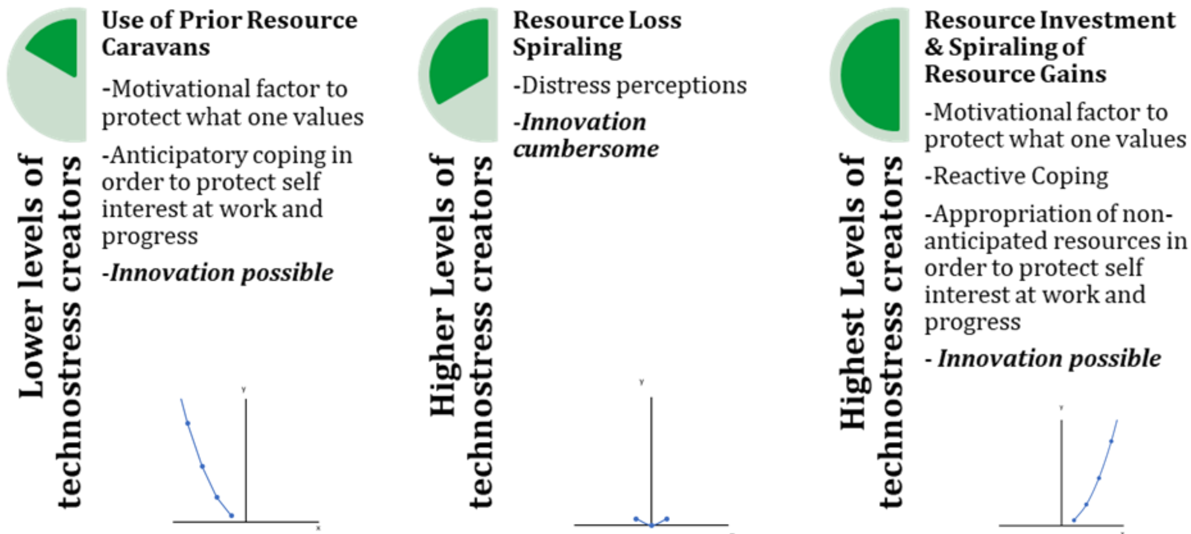


Figure 1. Curvilinear Relationship between Technostress Creators and Employee Innovation

3.2.1 Techno-overload

We believe that, at lower levels of techno-overload, employees have confidence about their ability to counter threats and move effectively through new organizational technologies to handle work overload because they would have some accumulated coping resources in anticipation of the task at hand. Indeed, complementary theories such as job demand-control-support theory, which leverages COR, presents a similar point of view (Johnson & Hall, 1988). This opportunity enhances the employees' feelings of efficacy and ability to cope with the environment; as such, they will not view stressors such as techno-overload as a source of stress when complemented by accumulated resource perceptions that support the employee. However, as techno-overload increases, individuals begin to anticipate the loss of accumulated resources to cope with it, which will make them vulnerable to increased techno-overload, result in their experiencing distress, and lead to lowered innovation performance. With increasing techno-overload perceptions, employees experience a spiraling loss of resources (such as loss of control over task and self and reduced self-efficacy), which results in reduced innovative performance (Byron, Khazanchi, & Nazarian, 2010) until a point of reversal. Beyond this point, as per the COR theory, employees would resort to investing resources in order to strive obtain, retain, foster, and protect the need to experience a sense of progress at work (Hobfoll, 1988, 1989), which will help them achieve innovation performance at work (Amabile et al., 2002). With an increase in techno-overload perceptions, employees would begin to retain and appropriate resources to cope with the emergent distress by effectively spotting/using affordances that organizational structural assurances offer at their disposal. In doing so, employees would learn the required technical skills, which would lead to caravanning and spiraling gain of resources such as experience, skills, and support and, thus, result in enhanced innovation outcomes (Hobfoll, 2001). For example, the techno-overload that Intel employees experienced in handling Intel's work expectations for using social media for collaboration and information sharing became a challenge stressor with proper training (Meister & Willyerd, 2010). Consequently, with an increase of techno-overload beyond the point of reversal, resource caravanning helps employees to learn new ways to leverage increased techno-overload to enhance their innovation performance. Thus, we hypothesize:

H2a: Techno-overload exhibits a U-shaped relationship with ICT-enabled employee innovation such that techno-overload is negatively related to employee innovation until a certain point. Beyond that point, techno-overload exhibits a positive relationship with employee innovation.

3.2.2 Techno-invasion

Techno-invasion simultaneously interferes with one's competing needs for privacy and flexibility. Employees may accept and even desire a low level of techno-invasion initially because it triggers them to communicate and contribute to innovation. Technological connectivity allows employees to have better control over their work and self. It frees employees from time and space requirements that can stifle innovation. By providing employees with more control over work processes and information, they can obtain whatever information they need to accomplish their tasks at any time. This flexibility can facilitate creative thinking and, thus, result in higher employee innovation. However, during the first phase of the curve from low techno-invasion to high techno-invasion, employees use up the caravans of resources that they have already accumulated, such as transparency and trust in the organizations, better interaction with coworkers, enhanced control over work, and increased flexibility that results in their better integrating their work and personal lives in anticipation of techno-invasiveness (Eidelson, 1980; Harrison, 1978). When they have insufficient resources to meet their emergent needs as external demands become high, they perceive a spiraling loss of resources (such as lack of control and reduced autonomy at work), which results lower technology-enabled employee innovation (Edwards, Caplan, & Harrison, 1998). However, beyond the point of reversal, any further increase in techno-invasion perceptions impels employees to accumulate and appropriate further resources they did not initially anticipate to cope with the distress by effectively using the increased techno-invasion to their advantage. For example, by working out flexible work schedules or having unwritten interaction norms with their colleagues, employees may leverage the increased techno-invasion to their advantage. Using their available options, employees build on their resources, which leads to resource caravanning and a spiraling gain of resources such as seamless data sharing across the organization. Consequently, employees gain better control over their work and operational efficiency for innovative performance. We can clearly see as much in Waze, the crowdsourced real-time traffic app that features users who often share their navigational details with the app because they can derive tangible benefits through it (Gartner, 2015). In Waze, users willingly share their information and allow the app to track their navigational route and collect information that it uses to suggest the best possible routes to other users (Couts, 2013). Though the app intrudes on users' privacy, individuals willingly compromise it because they feel in control of the traffic situation while travelling. With the up-to-date data and latest updates on traffic, they experience enhanced control due to technology and eventually become more optimistic about their travel routes. Thus, as techno-invasion increases beyond the point of reversal, resource caravanning motivates employees to learn to use such resources to their advantage (e.g., by seeking help from others and sharing data). Thus, we hypothesize:

H2b: Techno-invasion exhibits a U-shaped relationship with ICT-enabled employee innovation such that techno-invasion is negatively related to employee innovation until a certain point. Beyond that point, techno-invasion exhibits a positive relationship with employee innovation.

3.2.3 Techno-complexity

We believe that, at lower levels of techno-complexity, employees have adequate accumulated personal resources (i.e., skills and abilities) to deal with it. In addition, employees also have sufficient level of environmental resources such as support and training to handle their jobs efficiently. However, as techno-complexity increases, employees may experience an inability to cope with the emergent complex technologies. They may have to spend a lot of time upgrading their skills and seeking technical help when faced with a problem. Employees in such situations will need to deal with unexpected disruptions that they have not prepared for. These disruptions disturb the state of constancy and create a demanding situation for them. Consequently, they may begin to experience a spiraling loss of resources, such as the loss of control over self, technology, and work as a part of coping efforts to handle the stress creators. In turn, this resource spiral may induce distress and, thus, result in lowered innovation performance. But, similar to techno-invasion, as the level of techno-complexity increases, employees begin caravanning and spiraling of resources with optimism such as support, training, experience, and self-efficacy. In doing so, they improve their control over their tasks by adjusting work procedures for a better task-technology fit (Beaudry & Pinsonneault, 2005; Lazarus & Folkman, 1984), which leads to their optimally using technology even for complex tasks such as innovation. Thus, employees will perceive a further increase in techno-complexity as a challenge stressor, and it will encourage them to learn about new technologies and possibly leverage their acquired technological skills for innovative tasks. Opportunities to learn about new technologies will also move them away from relatively dull and boring routine tasks, which will further foster their innovative efforts. Consequently, the ICT-enabled innovation begins to increase so as to offset the current and future perceived loss. Thus, we hypothesize:

H2c: Techno-complexity exhibits a U-shaped relationship with ICT-enabled employee innovation such that techno-complexity is negatively related to employee innovation until a certain point. Beyond that point, techno-complexity exhibits a positive relationship with employee innovation.

3.2.4 Techno-insecurity

At lower levels of techno-insecurity, employees adapt quickly because they have confidence about their accumulated resources and recognize the opportunities that new technologies afford to organize their work and produce better results. In fact, prior research has shown that some insecurity benefits individuals because it keeps them on their toes and motivates them to work harder to retain their jobs (Tugend, 2014). Thus, perceptions of moderate insecurity generate opportunities that challenge employees to attain achievable goals. However, as the level of techno-insecurity increases, employees constantly feel threatened by coworkers with better qualifications and newer ICT skills. Employees may perceive this feeling of insecurity in the face of new and complex ICTs, which results in their having less control over the situation, as a hindrance stressor, and it may interfere with their creative thinking. In such a situation, employees experience the spiraling loss of resources (such as loss of control over work, technology and self, and reduced confidence) that results in reduced innovative performance until a point of reversal. With any further increase in techno-insecurity, employees begin to accumulate the required resources through learning and updating their skills, which helps them to cope with the experienced distress and to acquire, appropriate, and accumulate knowledge resources for dealing with the emergent challenges. Thus, employees start focus on caravanning and a spiraling gain of resources such as updating their skills to avoid new employees from replacing them. Consequently, employees' caravanning the required knowledge resources facilitate enhanced employee innovation performance. Thus, we hypothesize:

H2d: Techno-insecurity exhibits a U-shaped relationship with ICT-enabled employee innovation such that techno-insecurity is negatively related to employee innovation until a certain point. Beyond that point, techno-insecurity exhibits a positive relationship with employee innovation.

3.2.5 Techno-uncertainty

Prior research has shown that employees require a certain level of uncertainty to advance and grow in organizations (Rotman, 2013). Employees continuously adapt to new ICTs. MIT researchers Erik Brynjolfsson and Andrew McAfee have highlighted that new technologies that employees use for both routine and expert jobs in organizations lead to an increase in innovation (Rotman, 2013). Hence, we believe that a low level of techno-uncertainty may sufficiently activate employees to search for creative solutions and that it acts like a challenge stressor that can facilitate ICT-enabled employee innovation. However, fast-paced technological changes and routine job automation beyond a certain level would result in lack of control over task, self, and technology, which would overwhelm and distress employees. But, beyond a certain level of techno-uncertainty, employees would develop ways and means to further develop their skills and resources to be able to cope with the rapid change. In doing so, they would acquire new skills that relate to their present tasks and that equip them for the future. Thus, beyond the point of reversal, for any increase in the level of techno-uncertainty, employees would have already acquired the required resources, which would make the new situation a challenge rather than a hindrance in their job. Consequently, employees will better use the new technologies and become more innovative. Thus, we hypothesize:

H2e: Techno-uncertainty exhibits a U-shaped relationship with ICT-enabled employee innovation such that techno-uncertainty is negatively related to employee innovation until a certain point. Beyond that point, techno-uncertainty exhibits a positive relationship with employee innovation.

4 Method

4.1 Data Collection

We used the survey method to collect data and test the proposed hypotheses. We adapted validated scales from the existing literature to the research context to formulate the questionnaire as we show in Table A1 in the Appendix (see Srivastava & Chandra, 2018; Teo, Srivastava, & Jiang, 2008). To measure the items, we used a seven-point Likert scale. We distributed the questionnaire to senior-level organizational managers who regularly used ICTs to accomplish their professional tasks. Although prior studies have not targeted senior-level managers in the technostress context, we chose our sampling strategy based on data-collection feasibility and partly because we believed that senior managers have a clearer mission in their work situations and, hence, will be more driven to maintain their inner work life balance to achieve progress at work as opposed to junior-level employees (Amabile et al., 2002; Amabile & Kramer, 2007). Moreover, senior-level managers perceive a sense of security at work due to their prior experience and status and, hence, have a greater chance to get involved in creativity deviance (innovative) tasks compared to junior-level employees. Because we examine the influence that technostress creators have on employee innovation, we found such a sampling strategy to adequately respond to our research design. The cover letter in the survey clearly specified ICTs as new technologies that facilitate information flow and collaboration among employees and that incorporate all the communication networks such as enterprise systems, advanced wireless technologies, mobile communications networks, and other tools that the employees we surveyed may have used for collaboration and communication. As such, we defined ICT exhaustively and in a way that aligned to recent studies that have examined the impact of ICTs in the technostress research context (Ayyagari et al., 2011). In addition, the survey described ICT-enabled employee innovation as employees' creating and sharing knowledge with ICT tools that would benefit product innovativeness and new product performance in an organization (Venkatesh, Morris, Davis, & Davis, 2003). We sent email invitations to about 700 senior managers to participate in the survey. We prepared the initial mailing list using executive program alumni lists from two leading business schools, one in Europe and the other in Asia. Further, we also sent invitations to senior executives that our respondents referred who worked at several large corporations and agreed to participate in the study. We attached an online link to the survey to the email invitation along with a letter that informed respondents about the voluntary nature of survey participation and assured their confidentiality. We sent a follow-up reminder a week later after which we finally received 185 responses. Of these 185 responses, 164 were complete and usable for data analysis.

4.2 Validity and Reliability

We checked for three types of validity: content validity, convergent validity, and discriminant validity. Content validity assesses whether the chosen measures appropriately capture the full domain of the construct (Srivastava & Teo, 2007; Teo et al., 2008). In this research, we examined content validity by first checking for consistency between the measurement items and the existing literature and then pre-testing the instrument (Carmines & Zeller, 1979; Haynes, Richard, & Kubany, 1995; Srivastava & Teo, 2009). Convergent validity detects whether the measures for a construct correlate more with one another than with the measures of another construct (Petter et al., 2007). Factor loadings measure the strength of the correlation between each item and the corresponding construct. As Table A2 in the Appendix shows, the factor loading values (shaded) exceeded 0.50, an acceptable minimum value (Chin, 1998), which shows that the indicators strongly correlated with their corresponding constructs. One can see that the loadings in each construct were higher than the loadings across constructs, which demonstrates convergent validity (Wixom & Todd, 2005). We further tested convergent validity by examining the composite reliability (CR) and average variance extracted (AVE: the ratio of the construct variance to the total variance among indicators) for the measures (Hair, Anderson, Tatham, & Black, 1998). Fornell and Larcker (1981) recommend a score of 0.70 as the recommended threshold for CE and 0.50 for AVE. As Table A2 shows, the CR and AVE values were acceptable, which further demonstrates convergent validity.

To verify discriminant validity, we checked how strongly each construct's items loaded on the other constructs (i.e., cross-loadings). From Table A2, we can see that all constructs had quite low cross-loading values, which indicates discriminant validity (Gefen & Straub, 2005). We also verified discriminant validity by checking the square root of the AVE as Fornell and Larcker (1981) recommend. The values of the square root of the AVE (reported on the diagonals in Table A3) were all greater than the inter-construct correlations (the off-diagonal entries in Table A3), which demonstrates satisfactory discriminant validity. From Table A1, we observe that Cronbach's alpha for all research constructs ranged between 0.95 and 0.84 except for the control variable job demand, which we measured with a three-item scale and which scored 0.67—lower than the ideal lower limit 0.70 (Hair, et al., 1998). However, considering the nature of the construct and its CR and AVE scores, we believe that 0.67 meets the minimum acceptable score 0.60 that several studies indicate (see Loewenthal, 2004; Nunnally & Bernstein, 1994; Sekaran & Bougie, 2010). Thus, we conclude that all constructs had adequate reliability.

Because factors other than those in our hypothesized model could influence the dependent variable, we incorporated suitable control variables to account for alternative explanations. Specifically, we included three different types of control variables in the research model: 1) demographics (i.e., age (in years) and gender (dummy variable for male/female: 1 for males and 0 for females) (Teo & Lim, 2000), 2) each respondent's total work experience and work experience with the current employer (in years for each), and 3) job characteristics in terms of job demand.

Furthermore, since we used self-reported data that we collected with the same survey questionnaire during the same period of time with a cross-sectional research design, we tested for common method bias. Variance occurring due to the measurement method may cause systematic measurement error and further bias the true relationship among the theoretical constructs (Chandra, Srivastava, & Theng, 2012). We performed statistical analysis to assess the severity of common method bias in the data using the Harman's one-factor test (Podsakoff & Organ, 1986). Exploratory factor analysis revealed that the maximum variance a single factor explained was 25.3 percent—much less than the prescribed limit (50%). Hence, we conclude that common method bias did not pose a significant problem in the data (Podsakoff, MacKenzie, Lee, & Podsakoff, 2003).

5 Results and Discussion

From analyzing the respondents' demographic information, we found that the average respondent age was 37.67 years old (SD = 6.75) and had 14.52 years (SD = 6.77) of total work experience and 7.20 years (SD = 5.62) of experience with their current employer. Further, 77 percent of the respondents in our sample were male. This high level of work experience indicates that most respondents worked at senior managerial levels in their organizations. Table A3 provides the means and standard deviations for the research variables in the study.

5.1 Hypothesis Testing

In this study, we examine the hypothesized linear and curvilinear relationships between individual technostress creators and ICT-enabled employee innovation. First, we created the quadratic term of each technostress creator by aggregating each one's items and then creating its square term. Because the variable and its squared term may be correlated, we mean-centered all values prior to hypothesis testing according to Aiken and West's (1991) guidelines to reduce collinearity problems. We also checked for multicollinearity and calculated the variance inflation factor (VIF) and found no significant multicollinearity problems (Hair et al., 1998; Kutner, Nachtsheim, & Neter, 2004). Specifically, we used a three-step hierarchical multiple regression analysis to test the linear and curvilinear effects that technostress creators had on ICT-enabled employee innovation. Following procedures that past IS research recommends (Cohen, Cohen, West, & Aiken, 2003; Tabachnick & Fidell, 2007; Tams, Hill, de Guinea, Thatcher, & Grover, 2014), we 1) introduced the control variables, 2) introduced the technostress creators individually to examine the linear relationships, and 3) entered the squared terms of the technostress creator variables into the respective regression equations to further explore the presence of a curvilinear relationship between each technostress creators and ICT-enabled employee innovation (AbuAlRub, 2004; Maruping, Venkatesh, Thatcher, & Patel, 2015). By using this sequence in which we entered the technostress creator variable followed by the squared terms of the technostress creator variable into the regression model, we could examine the additional variance that each quadratic technostress creator variable explained in innovation over and above the variance that the individual technostress creator variable explained (Table 2). We summarize our results in Table 2 and present them in more detail in Table A4.

As the tables show, the control variables together explained 5.2 percent of the variance in ICT-enabled employee innovation. Moreover, among the control variables, gender (male) was significantly related with innovation performance ($\beta = -0.57$, $p < 0.05$), which concurs with past studies that examined IT mediated experiences (e.g., Teo & Lim, 2000). After incorporating the hypothesized linear relationships of the technostress creators into the regression equation (step 2, linear effects model), we observed a significant change in variance (ΔR^2): 2 percent (techno-invasion), 6 percent (techno-complexity), and 9 percent (techno-uncertainty) in addition to the variance that the model's control variables explained. We also observed that techno-invasion ($\beta = -0.13$, $p < 0.05$) and techno-complexity ($\beta = -0.26$, $p < 0.01$) had a significant negative influence on innovation performance, which supports H1b and H1c. Surprisingly, techno-uncertainty ($\beta = 0.28$, $p < 0.01$) had a positive significant relationship on innovation, which does not support H1e. Further, techno-overload ($\beta = 0.00$, NS) and techno-insecurity ($\beta = -0.11$, NS) were not significantly related to innovation performance, which does not support H1a, H1d, and H1e.

Table 1. Hierarchical Regression Model: Variance Explained in Each Step

Regression steps	R^2	ΔR^2	F value	ΔF
Techno-overload				
Step 1 (control variables)	0.05		1.73	
Step 2 (linear effect of techno-overload)	0.05	0.00	1.43	0.00
Step 3 (quadratic effect of techno-overload)	0.09	0.04	2.14*	6.10*
Techno-invasion				
Step 1 (control variables)	0.05		1.73	
Step 2 (linear effect of techno-invasion)	0.07	0.02	2.10	3.80
Step 3 (quadratic effect of techno-invasion)	0.11	0.03	2.72*	6.01*
Techno-complexity				
Step 1 (control variables)	0.05		1.73	
Step 2 (linear effect of techno-complexity)	0.11	0.06	3.29**	10.59**
Step 3 (quadratic effect of techno-complexity)	0.19	0.08	5.28**	15.35**
Techno-insecurity				
Step 1 (control variables)	0.05		1.73	
Step 2 (linear effect of techno-insecurity)	0.07	0.01	1.84	2.33
Step 3 (quadratic effect of techno-insecurity)	0.07	0.01	1.75	1.15
Techno-uncertainty				
Step 1 (control variables)	0.05		1.73	
Step 2 (linear effect of techno-uncertainty)	0.14	0.09	4.15**	15.43**
Step 3 (quadratic effect of techno-uncertainty)	0.15	0.02	4.01**	2.92
* p < 0.05; **p < 0.01.				

Finally, for step 3, we entered the squared terms of the technostress creators individually into the regression equations to further explore the presence of U-shaped relationships between technostress creators and employee innovation performance. We found that the quadratic term of techno-overload was significant ($\beta = 0.12$, $p < 0.01$) and ΔF was significant on adding the quadratic term (ΔF = 6.10, $p < 0.05$), which indicates a U-shaped curvilinear relationship. Thus, we found support for H2a. Next, we found that techno-invasion ($\beta = 0.10$, $p < 0.05$) had a significant curvilinear relationship with employee innovation as a U-shaped curve. We also observed that, for techno-invasion, ΔF was significant (ΔF = 6.01, $p < 0.05$) after we added the quadratic term in the regression equation, which clearly indicates a U-shaped curvilinear relationship. Thus, we found support for H2b. For techno-complexity ($\beta = 0.19$, $p < 0.01$), we again observed a significant U-shaped relationship between technostress creator and employee innovation performance. Similar to the previous two technostress creators, for techno-complexity (ΔF = 15.35, $p < 0.01$), ΔF was significant after we added the quadratic term, which clearly indicates a U-shaped curvilinear relationship. Thus, we found support for H2c. However, we found no curvilinear relationships for techno-insecurity ($\beta = 0.05$, NS) and techno-uncertainty ($\beta = 0.07$, NS). Thus, we did not find support for H2d and H2e. Table 3 summarizes our results.

Table 3. Summary of Results

Hypothesis	Statement	Result
H1a	Techno-overload is negatively associated with ICT-enabled employee innovation.	Not supported
H1b	Techno-invasion is negatively associated with ICT-enabled employee innovation.	Supported
H1c	Techno-complexity is negatively associated with ICT-enabled employee innovation.	Supported
H1d	Techno-insecurity is negatively associated with ICT-enabled employee innovation.	Not supported
H1e	Techno-uncertainty is negatively associated with ICT-enabled employee innovation.	Not supported (significant in the opposite direction)
H2a	Techno-overload exhibits a U-shaped relationship with ICT-enabled employee innovation such that techno-overload is negatively related to employee innovation until a certain point. Beyond that point, techno-overload exhibits a positive relationship with employee innovation.	Supported
H2b	Techno- invasion exhibits a U-shaped relationship with ICT-enabled employee innovation such that techno-invasion is negatively related to employee innovation until a certain point. Beyond that point, techno-invasion exhibits a positive relationship with employee innovation.	Supported
H2c	Techno-complexity exhibits a U-shaped relationship with ICT-enabled employee innovation such that techno-complexity is negatively related to employee innovation until a certain point. Beyond that point, techno-complexity exhibits a positive relationship with employee innovation.	Supported
H2d	Techno-insecurity exhibits a U-shaped relationship with ICT-enabled employee innovation such that techno-insecurity is negatively related to employee innovation until a certain point. Beyond that point, techno-insecurity exhibits a positive relationship with employee innovation.	Not supported
H2e	Techno-uncertainty exhibits a U-shaped relationship with ICT-enabled employee innovation such that techno-uncertainty is negatively related to employee innovation until a certain point. Beyond that point, techno-uncertainty exhibits a positive relationship with employee innovation.	Not supported

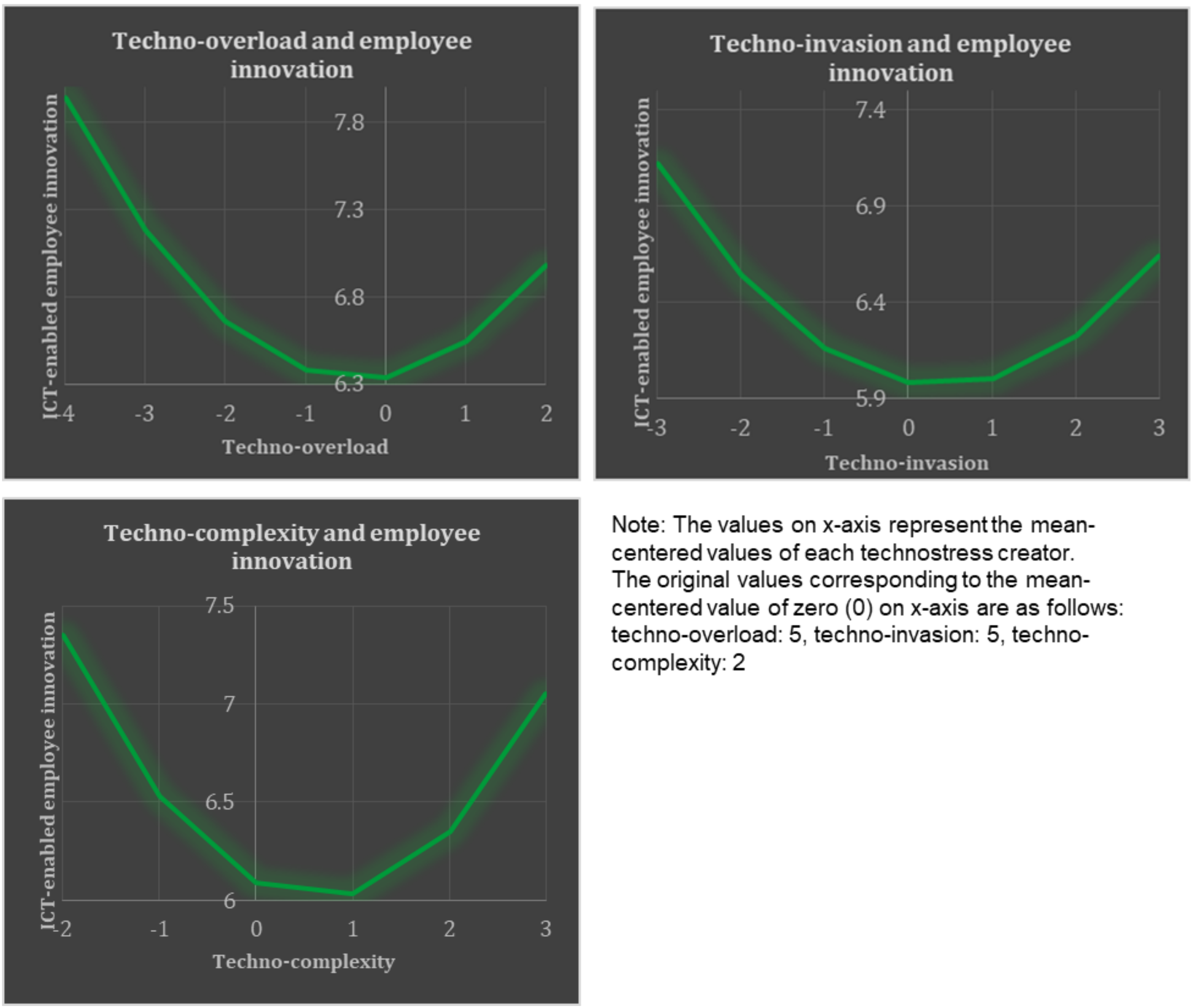
5.2 Discussion

5.2.1 Linear Relationships

From the results in previous section, we can see that our results do not support H1a, H1d, and H1e. We had expected that techno-overload to cause distress among the employees and, thus, result in negative linear effect on innovation (H1a). We can explain our failure to support this hypothesis based on the fact that, though these respondents (mostly senior organizational managers) may view techno-overload as a hindrance stressor, they could plausibly perceive techno-overload as an opportunity due to the enhanced controllability and desirability when cognitively evaluating the situation (Le Fevre, Kolt, & Matheny, 2006). However, we found that techno-overload had both positive and negative influences on employee innovation and, thus, a non-significant relationship. We had also expected techno-insecurity to have a negative linear effect on innovation (H1d). We can explain our failure to support this hypothesis with results from a survey that McKinsey conducted on senior executives. The survey found that, though innovation represents an important driver of organizational growth, most organizations do not integrate it into their strategic management agenda (Barsh, Capozzi, & Davidson, 2008). Senior management employees do not really feel that they will lose their jobs due to their technical limitations. Thus, we may have found a non-significant relationship between techno-insecurity and innovation because we surveyed senior-level managers with several years of work experience. Interestingly, we found a strong positive relationship between techno-uncertainty and employee innovation. The relationship was significant though in the opposite direction. We can explain the positive linear relationship of techno-uncertainty with innovation as opposed to the other technostress creators by referring to prior literature that has found uncertainty to be a determinant in any innovation process (McDermott & O'Connor, 2002; Ortt & Smits, 2006; York & Venkataraman, 2010). The innovation concept as Rogers (2003) describes it refers to an idea, practice, or object that individuals perceive as "new". The newness of the idea means that the innovation process embeds some degree of uncertainty. Uncertainty implies ambiguous and complex situations (e.g., situations with inconsistent or unavailable information). Individuals feel insecure about their own knowledge in uncertain situations (Brashers, 2001). Discussing techno-uncertainty, new and rapidly changing technologies require employees to develop not only new technical skills but also conceptualize new business opportunities to which they can apply their newly acquired technical skills (Vällikangas & Gibbert, 2005). Consequently, techno-uncertainty creates opportunities for employees to innovate using new technologies with the skills and knowledge these technologies demand (Carbonell & Rodrıguez-Escudero, 2009; Nieto, 2004; Ortt & Smits, 2006). As techno-uncertainty poses challenge stressors that can lead to innovation (LePine et al., 2005), we can see why we found that techno-uncertainty had a positive influence on ICT-enabled employee innovation.

5.2.2 Curvilinear Relationships

From the results for the non-linear relationships, we found support for H2a, H2b, and H2c. In other words, we found that techno-overload, techno-invasion, and techno-complexity had a significant curvilinear relationship with ICT-enabled employee innovation. We plot these relationships in Figure 2.



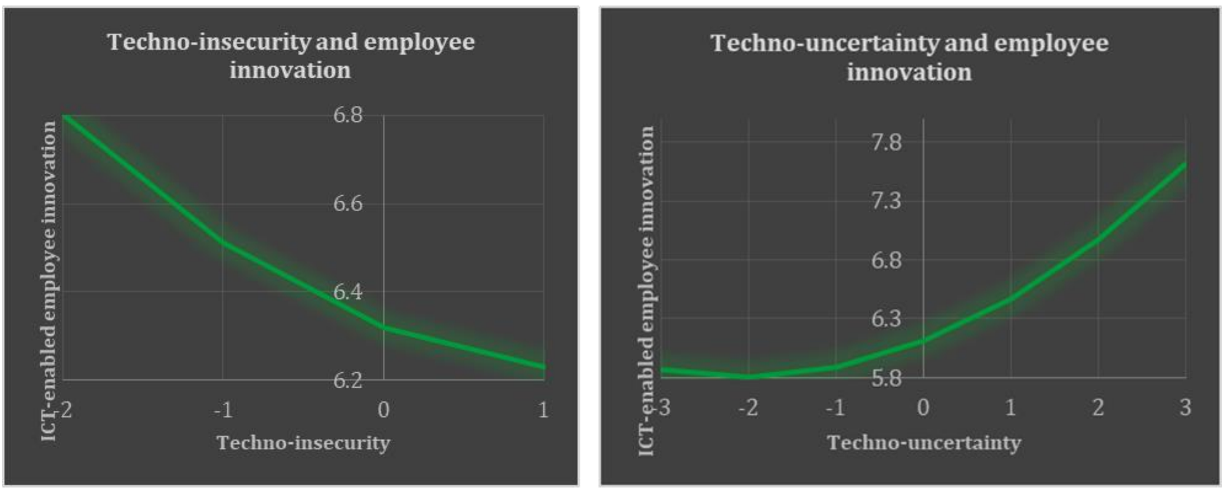
Note: The values on x-axis represent the mean-centered values of each technostress creator. The original values corresponding to the mean-centered value of zero (0) on x-axis are as follows: techno-overload: 5, techno-invasion: 5, techno-complexity: 2

Figure 2. Curvilinear Relationships between the Technostress Creators of Techno-overload, Techno-invasion, and Techno-complexity with Employee Innovation

Together, these results show that techno-overload, techno-invasion, and techno-complexity behave differently to the other organizational stress creators (Anderson et al., 1989; Lupien et al., 2007). The U-shaped relationship (instead of the inverted U-shaped relationship as the organizational stress literature proposes) for the three technostress creators justifies the need to study the individual interpretations of each technostress creators in the research context. In addition, the results also justify the need for careful examination of non-efficiency-based outcomes such as innovation.

Finally, discussing the last two technostress creators, we found that techno-insecurity (β = 0.05, p > 0.05), and techno-uncertainty (β = 0.07, p > 0.05) did not have a significant curvilinear relationship with ICT-enabled employee innovation. Thus, we did not find support for H2d and H2e. For both techno-insecurity (ΔF = 1.15, p > 0.05) and techno-uncertainty (ΔF = 2.92, p > 0.05), ΔF was not significant after we added the quadratic term, which clearly indicates the absence of a curvilinear effect on employee innovation.

Contrary to other technostress creators, the negative linear trajectory of the relationship between techno-insecurity and employee innovation (see Figure 3) demonstrates that techno-insecurity remains a constant threat for employees and that they continue to perceive it as a hindrance stressor. More techno-insecurity negatively influences individuals' physical and mental health by increasing their burnout, reducing their job satisfaction, and reducing their work performance (Tugend, 2014). We can also classify this type of technostress creator as a socially evaluative stressor that individuals continuously interpret negatively (Byron et al., 2010). Though the graph shows a negative trend in relationship, from the results in Table 1, we observe that techno-insecurity did not have a significant linear (β = -0.14, NS) or curvilinear relationship (β = 0.05, NS) with ICT-enabled innovation. As for why, many employees may consider job insecurity as an inherent part of ICT-impacted professions, and, thus, it may not influence their innovation.



Note: The values on x-axis represent the mean-centered values of each technostress creator.
The original values corresponding to the mean-centered value of zero (0) on x-axis are as follows:
techno-insecurity: 6, techno-uncertainty: 4.

Figure 3. Curvilinear Relationships between the Technostress Creators of Techno-insecurity and Techno-uncertainty with Employee Innovation

Further, the positive linear relationship between techno-uncertainty and employee innovation (β = 0.29, p < 0.01) demonstrates that senior employees do not trigger their coping resources under uncertain technological conditions. Indeed, as we state in Section 5.2.1, the literature that has found uncertainty to be a determinant in any innovation process (McDermott & O'Connor, 2002; Ortt & Smits, 2006; York & Venkataraman, 2010), which also implies that innovation entails ambiguous and complex situations that feature unavailable or inconsistent information, and individuals may sometimes feel insecure about their own knowledge (Brashers, 2001). Because individuals perceive techno-uncertainty as a challenge stressor, it leads to innovation performance (LePine et al., 2005), which explains why we found that techno-uncertainty positively influences ICT-enabled employee innovation.

Thus, overall we found that some technostress creators (i.e., techno-overload, techno-invasion, and techno-complexity) had a curvilinear influence on ICT-enabled employee innovation, whereas others (techno-insecurity and techno-uncertainty) had a linear influence. This linear influence represents an avenue for deeper investigation in the future.

6 Limitations and Future Research

Though our study makes many significant contributions to literature, it has some limitations that we acknowledge here. We believe that these limitations can pave the way for other researchers to examine technostress further. First, similar to prior research that has used the COR, we used a cross-sectional research design to explain stress (see Westman et al., 2005). Following such an approach, we explored the nature of individual technostress creators, but we did not examine individuals' perceptions of resources mobilized over time to handle these technostress creators. Using a longitudinal perspective, future research could further apply the COR theory to the technostress and innovation performance context to better understand the dynamic time-related changes. Second, we focused on understanding the linear and curvilinear nature of the individual technostress creators without examining the influence that related contextual variables have on employee innovation. Future research could contextualize our research with several other individual and organizational variables and hypothesize them as mediators or moderators in the relationship between technostress creators and ICT-based innovation. For example, apart from individual differences such as personality traits, future models could examine other factors such as perceived control, self-efficacy, innovation climate perceptions, social support network, meaning of work perceptions, coping behaviors, and coping styles (e.g., Carver, Scheier, & Weintraub, 1989). Third, in applying the COR theory, we used perceptions of technostress creators as a proxy for conceptualizing resources and did not measure actual level of specific resources. Though researchers have commonly used this approach when using the COR theory in the work-related context (see Kalish et al., 2015), researchers could consider analyzing the concept of COR theory in the specific technostress context in organizations to identify actual specific resources that act as a buffer or barrier in the stress-strain-performance relationship. Such an understanding would facilitate appropriate managerial interventions. Fourth, we contextualized our study to senior-level managers since one can assume them to have a clear mission or goals due to their prior experience and status at work. Thus, our findings may pertain only to such individuals and may differ for other sets of populations (e.g., junior employees in terms of tenure and expertise). Future work could examine the theorized model with different samples of population to uncover the contextual differences between their work perceptions (Amabile et al., 2002). Fifth, we defined ICT-enabled innovation as encompassing both product and process innovation. Although such a definition concurs with current notions of digital innovation (Nambisan, Lyytinen, Majchrzak, & Song, 2017), future research could consider examining different aspects of innovation to examine how individual technostress creators influence product and/or process innovation separately. Lastly, we used self-report-based instruments to measure ICT-based innovation. Future research could consider using objective measures to estimate innovation in a way that does avoids respondent bias.

7 Implications

This study has several important implications for theory and practice.

7.1 Implications for Research

First, though past studies have described technostress creators through techno-overload, techno-invasion, techno-complexity, techno-insecurity, and techno-uncertainty, they have largely not explored the influence that each dimensions has on job outcomes. In this research, instead of treating "technostress creators" as one aggregated construct, we theorize and test the relationship of each one with ICT-enabled employee innovation. Our study contributes to more deeply explaining the nature of individual technostress creators. Our findings provide nuanced insights that future research can now examine in different contexts. Our research also answers to the call for examining aggregated constructs in greater detail by deconstructing them (Allen & Meyer, 1990; Edwards, 1992; Hulin & Blood, 1968).

Second, although past research on stress and performance suggests an inverted U-shaped relationship between stress and job outcomes (as demonstrated through the Yerkes-Dodson Law), researchers have not tested the curvilinear relationship in the technostress context. Further, previous stress research has mostly relied on the level of stress rather than the individual's interpretation of stress creators. Further still, past research on technostress has primarily focused on the linear effects of stress in the organizational context for efficiency-related outcomes such as productivity. In this study, we leverage the control theory of occupational stress and the COR theory as our guiding theoretical frameworks to hypothesize and test the quadratic relationships of individual technostress creators with ICT-enabled employee innovation. Thus, we incorporate individual employees' interpretations of stress creators that explain whether they perceive them as a challenge or hindrance. Despite prior allusions to a curvilinear relationship in the technostress context, negligible research has examined this relationship. Technostress and stress-performance relationship has predominantly focused on negative linear theory (Muse, Harris, & Feild, 2003). The current research advances the body of knowledge by more subtly explaining the nature of different technostress creators.

Third, though past research on stress and performance suggests an inverted U-shaped relationship between stress and organizational behavior, we found a U-shaped relationship between three technostress creators and ICT-enabled employee innovation. This result draws research attention to the differences between technostress creators and other occupational stressors. Further, we demonstrate the need to theorize non-efficiency-related organizational outcomes such as innovation, which may behave differently. Our work further justifies the call to examine how individuals interpret a stressful situation in a work environment rather than the stressful situation itself (Le Fevre et al., 2003). Some individual may perceive a stress creator as a hindrance but others as a challenge. This classification also concurs with the concepts eustress and distress (Cavanaugh, Boswell, Roehling, & Boudreau, 2000; LePine et al., 2005). Our research opens up the agenda for examining the concept of eustress in different situations because not all stress is bad. Future research can dig deeper into this interesting agenda by theorizing situations under which stress helps or harms. Though we provide some reasons for the differences we observed in the technostress creators context as compared to organizational stress context, future research can continue to explore this interesting result in greater detail and, thereby, further the agenda for context-specific theorization (Hong, Chan, Thong, Chasalow, & Dhillon, 2014).

Fourth, our research theorizes the curvilinear effects of technostress creators by indicating resource accumulation as a type of coping strategy that does not directly resolve the problem (i.e., not problem directed) but rather changes how one appraises the situation (i.e., the stressor remains but one perceives its effects differently). Future research could investigate into the specific resources and coping strategies that lead to such curvilinear relationships (and the point at which they would lead to a change in the relationship). As such, our research could serve as stimulation for future research in this direction.

Fifth, the counterintuitive result we found for techno-uncertainty requires research to more deeply understand it. It would be interesting to examine whether certain individual factors such as employee personality traits or organizational factors such as organizational climate influence such relationships. Moreover, identifying the pertinent resources (both internal and external) that employees use when faced with technostress creators will enable future researchers to pinpoint how eustress manifests and the ways in which organizations can purposively foster eustress in the organizational context.

7.2 Implications for Practice

On the practical front, organizations should find our results useful when designing appropriate managerial interventions that consider how individual technostress creators influence employee innovation. In general, our findings suggest that organizations should not simply focus on reducing stress in a general way but rather ensuring that specific stress creators optimally stress employees to increase their performance. On the contrary, organizations should actively engage in understanding how employees perceive individual technostress creators and design nuanced strategies based on the perceived employee experience. In particular, our study has four key implications for practice.

First, the results for techno-overload clearly suggest that organizations should continue to more significantly use technologies at work such as Live Meeting, WebEx, Skype, and MS Lync to improve ICT-enabled employee innovation. Such technological aids can help organizations and employees maximize innovation performance. However, organizations need to change employees' mindset to inculcate a culture that appreciates the opportunities that techno-overload offers. Organizations could do so via appropriate education and training. For example, the real-time software tool called the Intel Email Effectiveness Coach, which helps users achieve productive email behavior, teaches email etiquette such as not clicking on "reply to all" unless and until one needs to send the message to everyone in the distribution list (Hemp, 2009). Organizations should train and incentivize their employees to modify their thinking and behavior so as to improve their control over techno-overload-related issues. Such an approach should encourage employees to perceive techno-overload opportunistically as a challenge rather than as a hindrance.

Second, our results highlight that techno-invasion may also assist in employee innovation. The idea to extend regular office hours offers flexibility and better control to employees and can result in enhanced ICT-enabled innovation. According to the person-environment fit theory, stress results from stress creators if a mismatch between a person's (employee's) needs and the environment's (organization's) resource supply exists (Edwards et al., 1998). Hence, in order to reduce the techno-distress due to techno-invasion, organizations should satisfy employees' need for control (Burger & Cooper, 1979). Providing better control to employees to manage techno-invasion may result in techno-eustress and cause employees to want to use such technologies for innovation at work. For example, an organization that directly empowered its employees to conduct innovation activities would increase their skills via coercing them to learn new skills and techniques to responsibly address their needs (White & Burton, 2011). Further, organizations should support employees by allowing them time and training to develop technical skills and regularly counsel them to meet the challenges related to their changing roles.

Third, the results of techno-complexity suggest that management should develop employees' capacity for ICT-enabled innovation by offering skill-development and technical-training programs. Organizations should also provide employees with the right set of tools so that they develop the required technical skills and capabilities to actively participate in the innovation process. Mentoring can be an important strategy to connect employees to the organization as it allows them to learn from one another (White & Burton, 2011). Mentoring should occur both from senior employees to junior employees and from junior employees to senior employees. Such mentoring would help senior employees deal with technical complexities because junior people often have more knowledge about new technologies.

Lastly, our analysis suggests that employees will be willing to use new and complex technologies and experience techno-eustress provided that organizations monitor not only technostress creators but also how employees interpret them. Organizations can do so on a periodic basis through appropriate organizational interventions. Prior research has shown that, in work contexts, employees tend to appraise and react to particular work stress creators in fairly consistent ways (Brief & George, 1991; LePine et al., 2005), which implies that studying a particular employee population resembles identifying the individual differences in that population set. However, individual differences specific to particular employees that require personalized assessment and treatment may exist.

In summary, management should not only provide a supportive environment for innovation that allows employees to accumulate the resources they need to cope with technostress creators but also conduct technostress-inoculation training programs that can strengthen employees' self-efficacy beliefs and alter how they perceive stress creators to reap the benefits that these stress creators can provide (Saunders, Driskell, Johnston, & Salas, 1996) and delay employees from prematurely anticipating resource losses. Moreover, the outlined techniques can empower employees to rebound from a maladaptive coping strategy to address problems in a constructive fashion. Because stress response is a relational concept, personalized managerial interventions may also yield favorable results. Psycho-educational methods and cognitive restructuring have proven useful for preventing and managing stress and may also be suitable for the technostress context. However, employees' nature and profile would play a vital role in determining the specific types of interventions that would suit them in the technostress context (Arnetz, 1996). In the organizational context, ICTs provide more benefits than not when individuals and organizations manage their potential negative effects well.

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Appendix

Table A1. Research Constructs and Their Reliability Assessment

Job outcome (Adapted from Tarafdar et al., 2010)	
ICT-enabled innovation (reliability: α = 0.95)	
ICTs help me to…	… identify innovative ways of doing my job.
	… come up with new ideas relating to my job.
	… try out innovative ideas.
Technostress creators (Ragu-Nathan et al., 2008; Tarafdar et al., 2007)	
Techno-overload (reliability: α = 0.90)	
I am forced by ICTs to…	… work much faster.
	… do more work than I can handle.
	… work with very tight time schedules.
	… change my work habits to adapt to new technologies.
	… handle higher workload because of increased technological complexity.
Techno-invasion (reliability: α = 0.89)	
Due to ICTs…	… I spend less time with my family.
	… I have to be in touch with my work even during my vacation.
	… I have to sacrifice my vacation and weekend time to keep current on new ICTs.
	… I feel my personal life is being invaded.
Techno-complexity (reliability: α = 0.84)	
I do not know enough about the new ICTs to handle my job satisfactorily.	
I do not find enough time to study and upgrade my ICT skills.	
I need a long time to understand and use new ICTs.	
I often find it too complex for me to understand and use new ICTs.	
I find new recruits to this organization know more about ICTs than I do.	
Techno-insecurity (reliability: α = 0.89)	
Due to new ICTs, I feel constant…	… threat to my job security.
	… need to update my skills to avoid being replaced.
	… threat by coworkers with newer ICT skills.
Techno-uncertainty (reliability: α = 0.88)	
In our organization, there are always…	… new developments in the ICTs we use.
	… constant changes in ICT software.
	… constant changes in ICT hardware.
Job demand (Bala & Venkatesh, 2013; Karasek, 1979) (reliability: α = 0.67)	
My job requires me to work hard.	
My job has excessive work to be done.	
My job places conflicting demand on me.	

Table A2. Constructs, Indicators, and Cross-loadings

	TSOV	TSIV	TSCO	TSIS	TSUC	INOV	JDEM
TSOV1	0.85	0.16	0.06	0.02	0.03	0.12	0.01
TSOV2	0.80	0.17	0.16	0.20	0.07	-0.02	0.08
TSOV3	0.82	0.18	-0.04	0.13	0.04	-0.03	0.14
TSOV4	0.77	0.18	0.16	0.04	0.15	0.06	0.15
TSOV5	0.75	0.24	0.13	0.21	0.20	-0.15	0.15
TSIV1	0.37	0.74	0.18	0.04	0.03	0.13	0.06
TSIV2	0.11	0.88	0.02	-0.02	-0.04	-0.18	0.06
TSIV3	0.22	0.79	0.17	0.18	-0.08	-0.09	-0.02
TSIV4	0.29	0.82	0.14	0.17	0.02	-0.12	0.10
TSCO1	0.14	0.08	0.74	0.20	0.05	-0.08	-0.05
TSCO2	0.09	0.06	0.65	0.10	-0.29	-0.14	0.05
TSCO3	0.05	0.08	0.82	0.30	-0.03	-0.13	-0.05
TSCO4	0.04	0.09	0.80	0.29	0.01	-0.14	-0.07
TSCO5	0.09	0.16	0.69	0.01	-0.13	0.05	0.05
TSIS1	0.09	0.06	0.30	0.85	-0.02	-0.11	0.00
TSIS2	0.26	0.16	0.18	0.76	-0.01	0.06	0.10
TSIS3	0.15	0.10	0.34	0.87	0.00	-0.05	0.01
TSUC1	0.02	-0.09	-0.12	-0.10	0.75	0.16	0.10
TSUC2	0.06	-0.05	-0.09	0.03	0.93	0.02	-0.01
TSUC3	0.15	0.03	-0.01	0.05	0.83	0.19	-0.02
TSUC4	0.14	0.04	-0.08	0.01	0.83	0.10	0.08
INOV1	0.04	-0.04	-0.14	-0.06	0.13	0.91	-0.01
INOV2	-0.02	-0.07	-0.09	-0.05	0.19	0.93	-0.03
INOV3	0.01	-0.15	-0.12	0.01	0.15	0.92	-0.05
JDEM1	0.17	0.02	-0.13	0.07	0.17	0.13	0.74
JDEM2	0.12	0.13	-0.17	0.13	-0.10	-0.12	0.83
JDEM3	0.10	0.02	0.25	-0.10	0.08	-0.11	0.72
CR	0.85	0.88	0.86	0.87	0.90	0.94	0.81
AVE	0.64	0.65	0.55	0.68	0.70	0.85	0.58

Notes: TSOV: techno-overload; TSIV: techno-invasion; TSCO: techno-complexity; TSIS: techno-insecurity; TSUC: techno-uncertainty; INOV: innovation; JDEM: job demand, CR: composite reliability, AVE: average variance extracted.

Table A3. Correlations and Descriptives

	TSOV	TSIV	TSCO	TSIS	TSUC	INOV	JDEM
TSOV	0.80						
TSIV	0.51**	0.81					
TSCO	0.25**	0.31**	0.74				
TSIS	0.37**	0.31**	0.51**	0.83			
TSUC	0.21**	-0.02	-0.19*	-0.02	0.84		
INOV	-0.01	-0.18*	-0.26**	-0.11	0.30**	0.92	
JDEM	0.30**	0.18*	0.02	0.11	0.10	-0.08	0.76
Mean	4.58	4.21	3.39	2.82	4.31	5.07	5.35
Standard Deviations	1.55	1.83	1.62	1.55	1.55	1.35	1.02

Notes: TSOV: techno overload; TSIV: techno-invasion; TSCO: techno-complexity; TSIS: techno-insecurity; TSUC: techno-uncertainty; INOV: innovation; JDEM: job demand.
Shaded values on diagonal are square root of average variance extracted (AVE)
Note: ** $p < 0.01$, * $p < 0.05$

Table A4. Hierarchical Regression Analysis: Technostress Creators and ICT-enabled Employee Innovation

Variables	Step 1 Control variables		Step 2 Linear effects		Step 3 Quadratic effects		R^2	ΔR^2	F value	ΔF
	β	t	β	t	β	t				
Control variables							0.05		1.73	
Techno-overload										
Constant	6.29** (1.13)	5.54	6.29** (1.15)	5.46	6.34** (1.13)	5.58				
Age	-0.01 (0.04)	-0.13	-0.01 (0.04)	-0.13	-0.01 (0.04)	-0.17				
Gender	-0.57* (0.23)	-2.46	-0.57* (0.23)	-2.45	-0.60* (0.23)	-2.62				
Total work experience	-0.02 (0.04)	-0.42	-0.02 (0.04)	-0.42	-0.02 (0.04)	-0.40				
Experience with current employer	0.03 (0.02)	1.29	0.03 (0.03)	1.27	0.03 (0.02)	1.34				
Job demand	-0.10 (0.10)	-0.98	-0.10 (0.11)	-0.94	-0.13 (0.10)	-1.26				
Techno-overload			0.00 (0.08)	0.03	0.08 (0.08)	0.88	0.05	0.00	1.43	0.00
Squared term of techno-overload					0.12* (0.05)	2.47	0.09	0.04	2.14*	6.10*
Techno-invasion										
Constant			5.93** (1.14)	5.21	5.98** (1.12)	5.33	0.05		1.73	
Age			0.00 (0.04)	-0.04	0.00 (0.04)	-0.02				
Gender			-0.55* (0.23)	-2.40	-0.52* (0.23)	-2.31				
Total work experience			-0.02 (0.04)	-0.37	-0.01 (0.04)	-0.33				
Experience with current employer			0.03 (0.02)	1.21	0.03 (0.02)	1.13				
Job demand			-0.06 (0.10)	-0.64	-0.13 (0.10)	-1.26				
Techno-invasion			-0.13* (0.06)	-1.95	-0.09 (0.07)	-1.32	0.07	0.02	2.10	3.80
Squared term of techno-invasion					0.10* (0.04)	2.45	0.11	0.03	2.72*	6.01*
Techno-complexity										
Constant			6.19** (1.10)	5.62	6.03** (1.06)	5.72	0.05		1.73	
Age			-0.01 (0.04)	-0.31	-0.01 (0.04)	-0.16				
Gender			-0.50* (0.23)	-2.24	-0.52* (0.22)	-2.40				
Total work experience			-0.01 (0.04)	-0.16	-0.02 (0.04)	-0.47				
Experience with current employer			0.04 (0.02)	1.71	0.04 (0.02)	1.92				

Table A4. Hierarchical Regression Analysis: Technostress Creators and ICT-enabled Employee Innovation

Job demand			-0.08 (0.10)	-0.86	-0.12 (0.09)	-1.33				
Techno-complexity			-0.26** (0.08)	-3.25	-0.25** (0.08)	-3.35	0.11	0.06	3.29**	10.59**
Squared term of Techno-complexity					0.19** (0.05)	3.92	0.19	0.08	5.28**	15.35**
Techno-insecurity										
Constant			6.31** (1.13)	5.59	6.32** (1.13)	5.60	0.05		1.73	
Age			-0.01 (0.04)	-0.20	-0.01 (0.04)	-0.29				
Gender			-0.59* (0.23)	-2.56	-0.61* (0.23)	-2.65				
Total work experience			-0.02 (0.04)	-0.38	-0.01 (0.04)	-0.27				
Experience with current employer			0.03 (0.02)	1.27	0.03 (0.02)	1.21				
Job demand			-0.08 (0.10)	-0.80	-0.08 (0.10)	-0.84				
Techno-insecurity			-0.11 (0.07)	-1.53	-0.14 (0.08)	-1.83	0.07	0.01	1.84	2.33
Squared term of techno-insecurity					0.05 (0.05)	1.07	0.07	0.01	1.75	1.15
Techno-uncertainty										
Constant			6.30** (1.09)	5.80	6.11** (1.08)	5.63	0.05		1.73	
Age			0.00 (0.04)	-0.02	0.00 (0.04)	0.09				
Gender			-0.52* (0.22)	-2.33	-0.51* (0.22)	-2.29				
Total work experience			-0.02 (0.04)	-0.46	-0.03 (0.04)	-0.60				
Experience with current employer			0.03 (0.02)	1.26	0.03 (0.02)	1.14				
Job Demand			-0.14 (0.10)	-1.41	-0.14 (0.10)	-1.45				
Techno-uncertainty			0.28** (0.07)	3.93	0.29** (0.07)	4.02	0.14	0.09	4.15**	15.43**
Squared term of Techno-uncertainty					0.07 (0.04)	1.71	0.15	0.02	4.01**	2.92

Note: * p <0 .05; ** p < 0.01, N = 164.

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