doi: 10.1111/isj.12042

Technostress: negative effect on performance and possible mitigations

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Abstract. *We investigate the effect of conditions that create technostress, on technology-enabled innovation, technology-enabled performance and overall performance. We further look at the role of technology self-efficacy, organizational mechanisms that inhibit technostress and technology competence as possible mitigations to the effects of technostress creators. Our findings show a negative association between technostress creators and performance. We find that, while traditional effort-based mechanisms such as building technology competence reduce the impact of technostress creators on technology-enabled innovation and performance, more empowering mechanisms such as developing technology self-efficacy and information systems (IS) literacy enhancement and involvement in IS initiatives are required to counter the decrease in overall performance because of technostress creators. Noting that the professional sales context offers increasingly high expectations for technology-enabled performance in an inherently interpersonal-oriented and relationship-oriented environment with regard to overall performance, and high failure rates for IS acceptance/use, the study uses survey data collected from 237 institutional sales professionals.*

Keywords: technostress, context, technology-enabled performance, technology self-efficacy, technology-enabled innovation, sales force automation, sales force performance

INTRODUCTION

Technostress is stress that users experience as a result of their use of information systems (IS) in the organizational context (e.g. Brod, 1982; Weil & Rosen, 1997; Tarafdar *et al*., 2007; Ayyagari *et al*., 2011). With rapid proliferation of IS use across functional areas, it is emerging as an important area for scholarly research in various contexts. Research has identified

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technostress creators (TSC), that is, reasons why individuals experience technostress, and showed that technostress manifests its effects in the form of increased role overload, role conflict, exhaustion and burnout and decreased job satisfaction (e.g. Tarafdar *et al*., 2007; Ragu-Nathan *et al*., 2008; Ayyagari *et al*., 2011), providing a broad and general theoretical foundation for examining technostress. There are also more focus-driven studies such as technostress from the use of electronic and online cataloguing and reference database systems in libraries (e.g. Ennis, 2005), and information and communication technologies in Chinese organizations (e.g. Tu *et al*., 2005).

Stress has been regarded as a context-specific phenomenon that reveals important insights when examined for specific types of outcomes and mitigating mechanisms relevant to the particular setting of the study (Cooper *et al*., 2001). The importance of context-specific studies rests on the need for understanding how general concepts apply to dissimilar contexts (Johns, 2006). There have therefore been calls for continued theoretical and scholarly development in the technostress domain by investigating the technostress phenomenon in particular contexts entailing specific types of technologies, roles or tasks (e.g. Ayyagari *et al*., 2011; Shu *et al*., 2011). In this paper, we examine technostress in the context of the role of the professional salesperson.

The past few years have seen a powerful and pervasive trend of task computerization in roles that are inherently highly human interfacing. The professional sales function, which has seen substantive investments in sales force automation and customer relationship management (CRM) applications (Erffmeyer & Johnson, 2001; Ahearne & Rapp, 2010), provides an appropriate illustration. Use of these applications requires sales professionals to effectively accomplish critical tasks using IS. However, given that salespeople would rather spend time in front of customers than behind a computer screen (e.g. Holt, 1998; Rangarajan *et al*., 2005; Geiger & Turley, 2006), there is an inherent contradiction between a natural orientation towards building relationships with customers (e.g. Crosby *et al*., 1990; Morgan & Hunt, 1994) and expected use of IS that might reduce the time spent in personal interaction with them. The professional sales context thus represents a rich domain for examining technostress; because critical sales tasks and sales innovation often rely on IS (Barker *et al*., 2009), sales professionals are particularly subject to stress in general (Singh, 1998), and IS initiatives are often rejected by sales professionals (Speier & Venkatesh, 2002; Homburg *et al*., 2009) despite substantial investments in sales technology (Erffmeyer & Johnson, 2001; Ahearne & Rapp, 2010). Further, this context can illustrate how technostress might manifest across a variety of service industries and customer interfacing careers.

While conditions that create technostress, that is, TSC, are negatively associated with productivity and user satisfaction with IS (e.g. Tarafdar *et al*., 2007, 2010), their relationship with specific performance outcomes has not been examined. Parallelly, given the strategic importance of the salesperson's role (Hunter & Perrault, 2007; Storbacka *et al*., 2011), sales force IS are intended to enhance his or her performance and facilitate innovation (Ingram *et al*., 2002). Specifically then, the objective of this paper is to examine the impact of TSC on the sales professional's innovation and performance. Noting that organizational mechanisms can alleviate the effects of technostress (Ragu-Nathan *et al*., 2008), and that IS-mediated tasks are particularly stressful for 'those reps that lack the [technical] wherewithal (Rich, 2002)', we examine

respectively, the role of organizational technostress inhibitors (TSI) and the sales professional's technology self-efficacy (TSE) and technology competence (TEC) in countering the impacts of TSC. We integrate logics from the literatures on technostress, social cognitive theory and IS adoption in marketing/sales roles, to theoretically develop hypotheses explaining relationships amongst TSC, TSI, TSE, TEC, technology-enabled innovation (TEI), technology-enabled performance (TEP) and sales performance (SP). We empirically test the hypotheses through structural equation models (SEMs) on survey data from 237 business-to-business sales professionals.

The paper theoretically advances the emerging technostress discourse by demonstrating that stress-creating conditions from the use of IS can manifest in adverse effects on outcomes that are *technology-enabled* and *broader* outcomes of the overall performance in the role. Traditional effort-based mechanisms such as TEC can address the negative impacts on *technology-enabled* outcomes. Enabling or empowerment-oriented routes represented by TSE and TSI are required to counter negative impacts on *overall* performance. As a related contribution, the paper highlights the importance of technostress in the sales literature by suggesting that conditions that create technostress represent a possible reason for low TEI and performance of sales professionals.

We next present theoretical background on technostress, IS use by sales professionals and social cognitive theory. Hypotheses are developed next, followed by methods, analysis and results. We conclude with discussion of contributions and limitations.

THEORY BACKGROUND

Technostress

The phenomenon of 'technostress', first introduced in trade literature (Brod, 1982; Weil & Rosen, 1997), describes the situation of stress experienced by the individual because of an inability to adapt to the introduction of new technology in a healthy manner. In the organizational context, technostress describes the stress phenomenon because of use of IS for organizational tasks and can be attributed to characteristics of modern IS such as constant presence and constant change (Ayyagari *et al*., 2011). Initial studies from psychology (Arnetz & Wiholm, 1997) noted physical impacts such as fatigue, headache, restlessness and irritability from stress associated with increased workload because of IS-enabled process reengineering and increased sensitivity to electric and magnetic fields from prolonged work with computer-based visual display units.

The 'transaction theory' of stress (Lazarus, 1966) from organizational psychology has formed the basis for theoretical conceptualization of the phenomenon of technostress in the IS literature. It describes the phenomenon of stress as a combination of a demand condition that causes the stress (stress creators or 'stressors') and the individual's response to it (manifest adverse outcomes referred to as 'strain'). What is referred to as 'stress' is therefore a phenomenon that encapsulates relationships between these concepts, rather than a single construct (McGrath, 1976; Cooper *et al*., 2001, page 12). Research on workplace stress has focused on different aspects that comprise the stress phenomenon. These include stress creators such as role overload and role conflict (Rizzo *et al*., 1970; Ivancevich & Matteson, 1980;

Kahn *et al*., 1981) and strains such as disruptive behaviour dissatisfaction at work, lack of job involvement and poor job performance (Kahn *et al*., 1981; Jackson & Schuler, 1985; Kahn & Byosiere, 1992). Organizational mechanisms to address stress situations for employees are embodied in 'situational factors' that can reduce the impact of stressors. They include, for instance, job control and social support (Karasek, 1979).

In a similar way, key aspects of the technostress phenomenon (Table 1) are 'TSC' (conditions that create stress because of information and communications technology use), strain (manifest conditions) and 'TSI' (mitigating conditions) (Ragu-Nathan *et al*., 2008). TSC include techno-overload, techno-complexity, techno-insecurity, techno-uncertainty and techno-invasion. They describe, respectively, the stress-creating aspects of application multitasking and information overload technical problems, continual relearning and consequent job-related insecurities, frequent system upgrades and consequent uncertainty, and constant connectivity, associated with organizational use of IS by individuals. Technostress manifests in various conditions such as higher levels of role stressors (Tarafdar *et al*., 2007) and decreased job satisfaction, organizational commitment (Ragu-Nathan *et al*., 2008), productivity (Tarafdar *et al*., 2007) and end-user satisfaction with IS (Tarafdar *et al*., 2010). Work–home conflict, role ambiguity, job insecurity and overload because of characteristics of modern IS are associated with feelings of exhaustion and burnout (Ayyagari *et al*., 2011). Organizational interventions that can reduce strain impacts are called TSI.

Table 1. Key concepts and definitions

Concept	Creators of technostress	Strain	Inhibitors of technostress
Conceptual origin	Stressor: A 'demand' condition perceived by the individual (a) to be greater than his or her ability to handle it; and (b) as having adverse consequences if not handled (Lazarus, 1966; Rizzo *et al*., 1970; McGrath, 1976; Ivancevich & Matteson, 1980)	Outcome: An adverse condition manifest by the individual as a response to the process of stress (Lazarus, 1966; Kahn *et al*., 1981; Jackson & Schuler, 1985; Kahn & Byosiere, 1992; Cooper *et al*., 2001)	Situational condition: Organizational mechanisms to address stress situations for employees (Karasek, 1979; House, 1981)
Definition	Conditions or factors that can create stress because of ICT use:	Manifest outcomes of stress because of ICT use:	Organizational support mechanisms that can mitigate the effects of stress because of ICT use:
	Techno-overload, techno-complexity, techno-invasion, techno-insecurity and techno-uncertainty; technology characteristics such as usefulness, complexity, reliability, pace of change, presenteeism and anonymity	Reduced job satisfaction, productivity, innovation and commitment to the organization. Increased role overload, role conflict, perceptions of being drained and burned out from use of ICT	Facilitate technical literacy, provide technical support and facilitate technology involvement
Literature	Tarafdar *et al*., 2007; Ragu-Nathan *et al*., 2008; Ayyagari *et al*., 2011	Tarafdar *et al*., 2007 Ragu-Nathan *et al*., 2008, Ayyagari *et al*., 2011 Tarafdar *et al*., 2011	Ragu-Nathan *et al*., 2008

A few studies have examined technostress more specifically. One group focused on stress amongst librarians, because of rapid introduction of successive computer-based library cataloguing, retrieval and database systems such as LexisNexis (Van Fleet & Wallace, 2001). It showed that the pace of change of library and reference IS were key causes of technostress (Bartlett, 1995; Ennis, 2005). The strains were computer use-related anxiety, feelings of isolation and frustration, indifference to needs of library users and negative attitudes towards computer-based information sources (Kupersmith, 1992), from which self-paced training, communication and bolstered staffing helped to provide relief (Bartlett, 1995; Ennis, 2005). A second group reporting results from IS use in Chinese organizations found that levels of TSC are positively related to power centralization and an organization culture that encourages innovation (Wang *et al*., 2008) but with no reduction in productivity (Tu *et al*., 2005). It also showed that higher dependence on IS for completion of routine work tasks and lower levels of computer self-efficacy are associated with higher levels of TSC (Shu *et al*., 2011).

In the literature, stress manifests in and is assessed through relevant workplace responses such as lack of job satisfaction, absenteeism, burnout and exhaustion (Jackson & Schuler, 1985; Jex & Beehr, 1991; Kahn & Byosiere, 1992). In particular, reduced job performance is a key manifestation, of significance to the organization and hence an important variable of study (Cooper *et al*., 2001). Studies examining the impact of stressors on performance for different levels of task difficulty (McGrath, 1976) find low levels of experienced stress manifest in better performance at difficult tasks. Stress-creating conditions reduce the individual's job performance and result in increased mistakes and accidents at specific tasks (Kahn & Byosiere, 1992). Trade studies in technostress suggest that it hampers performance in a given job role and results in computer use-related mistakes such as wrong entry of data (Brod, 1982). TSC have been associated with decreasing ability to use IS to improve work (Tarafdar *et al*., 2010). From this (limited) investigation of performance impacts of technostress, we note that TSC can have potentially adverse impacts on the overall performance in the role, *as well as* on performance relating to the individual's use of IS for accomplishing tasks.

Contextualizing technostress

Much of existing research in technostress provides a broad and general theoretical foundation for analysing the phenomenon, primarily articulating different creating conditions and general adverse manifest effects. The use of IS happens in a wide-ranging instantiations of users and usage situations (Lee & Baskerville, 2003). 'Context' refers to specifics of a given situation in which IS are developed or used (Orlikowski & Iacono, 2001). 'Contextualization' involves linking the variables and relationships studied to these specifics. Context-specific theoretical development thus focuses on the interplay among IS, users and usage situations (Lee & Baskerville, 2003) and helps to identify how context modifies understanding of a given IS-related phenomenon (Tsui, 2007). Generalized understanding of a phenomenon can thus yield richer theoretical insight and more practically actionable suggestions if further developed by taking context taken into consideration.

Stress is a context-specific phenomenon; different stress-creating conditions, strains and situational variables are revealed or highlighted depending on the stress-creating situation under

study. For instance, when examined in organizational/work contexts, stress-creating conditions include stress because of role and work task (Kahn *et al*., 1981); strain includes dissatisfaction at work, lack of job involvement and poor job performance (Kahn *et al*., 1981; Jackson & Schuler, 1985; Jex & Beehr, 1991); and situational factors include social support and job control (Karasek, 1979).

Similarly, studies suggest that continued theoretical advances in our understanding of technostress should build on that to reveal insights in *particular* contexts, such as from the use of specific technologies/applications (e.g. mobile devices and 24/7 email applications) or from the perspective of specific types of affected outcomes such as task performance or task attention (e.g. Ayyagari *et al*., 2011; Shu *et al*., 2011). In sum, therefore, context-specific theory development in technostress would focus on the interplay between the characteristics of particular technologies, users and usage contexts. Such contextualization presents an important theoretical development opportunity for understanding this increasingly recognized phenomenon is lacking in the current technostress literature and provides the theoretical backdrop for the focus of this paper.

Use of information systems by sales professionals

In the context of professional sales, 'IS' or 'technology' is defined as 'any type of information technology [or computer application] that can help enable or facilitate the performance of sales tasks' (Ahearne & Rapp, 2010). We describe four key observations that pertain to the use of IS by sales professionals, which make this context an interesting one for studying adverse impacts on performance outcomes from technostress and potential ways to counter them.

First, initial research examined sales technology implementation/adoption (Jones *et al*., 2002; Ahearne *et al*., 2004). They found that introduction of such applications could increase sales employee stress and turnover (Speier & Venkatesh, 2002) and IS-related technophobia (Rich, 2002) during the implementation process. More recently, however, greater attention has been placed on ongoing use and assimilation of IS (Ahearne *et al*., 2004; Rangarajan *et al*., 2005; Ahearne *et al*., 2008; Rapp *et al*., 2008; Ahearne & Rapp, 2010). While use of IS by the sales professional can result in positive effects on administrative performance and customer service (Ahearne & Rapp, 2010), it is also associated with negative behavioural impacts such as increased absenteeism and voluntary turnover and decreased organizational commitment and job satisfaction (Ahearne & Rapp, 2010).

Second, the role of the sales professional, given its relationship orientation, is particularly vulnerable to reluctance to use technology (Buehrer *et al*., 2005). There is strong positive association between time spent with customers and probability of making quota, indicating a conflict between building relationships with customers and expected use of IS that might prevent face-to-face interaction with them (Jones *et al*., 2002). Such a situation could create a potential for sales professionals to experience technostress and possibly affect immediate task performance and overall performance in the sales role.

Third, there is an expectation from the professional sales person to use IS in support of key aspects of his or her role, such as communications and customer relationships (Rodriguez & Honeycutt, 2011). This requires them to utilize IS to cocreate innovative solutions with

customers (Storbacka *et al*., 2011) and adapt to the specific customer situation by using IS. Each of these requires innovation and creativity in using IS (Wang & Netemeyer, 2004) in order for it to be successfully executed.

Fourth, professional salespeople are particularly subject to work stress in general (Goolsby, 1992; Singh, 1998) because of the boundary roles they play, multiple internal and external groups they service and the dynamic environments in which they operate. Given these other stressors already present in the environment, stress because of IS use may be particularly important as an additional stress and a potentially crucial bottleneck to appropriating benefits from the use of IS.

Social cognitive theory

Social cognitive theory (Bandura, 1982) suggests that an individual's beliefs about how well they can perform a certain task shape their attitudes to that task. In particular, self-efficacy, the belief that one has the ability to perform a particular behaviour or task, shapes the individual's responses to demands associated with performing that task. For instance, high TSE could lead to the choice to use the technology and greater effort and persistence when any challenges are faced with its use (Bandura 1982). TSE or technology self-efficacy, particularizing this idea to the context of IS use, represents an individual's judgement about his or her ability to use computers in the accomplishment of a task (Compeau & Higgins, 1995a). Higher self-efficacy is associated with higher levels of computer use (Compeau & Higgins, 1995a), lower computer-related anxiety (Compeau & Higgins, 1995b), higher comfort in using computers (Compeau *et al*., 1999) and a generally positive attitude towards them (Venkatesh & Davis, 1996). However, we do not know how TSE impacts work performance in the context of technostress.

Self-efficacy is particularly important in the sales area and viewed as crucial to success, as salespeople face challenges that are rarely present in other careers areas to the same degree, such as frequent rejection and intense competition (Jones *et al*., 2007). Salespeople who hold self-efficacious beliefs can adapt to challenges more readily and are more persistent in their pursuit of customer satisfaction and making sales (Krishnan *et al*., 2002). The impact of a strong positive belief system is likely to transfer to beliefs about tasks associated with the job, including technology use. Given this, it is important to have a theoretical basis to incorporate the salesperson's self-efficacious beliefs and their impact on performance vis-à-vis technostress.

The sales literature suggests that various self-efficacies of the salesperson are important to different aspects of performance (Brown *et al*., 2007). For instance, task-related self-efficacy positively impacts the salesperson's command over his or her ability to perform well at sales tasks (Kumar & Uzkurt, 2010). In the context of the salesperson's use of IS, TSE leads to increased usage of newly implemented sales IS (Mathieu *et al*., 2007). Sales professionals with higher TSE feel that they have greater control and capability in using sales force IS (Mathieu *et al*., 2007). It is not difficult to imagine then that they would feel more enthusiastic and less threatened or incapable about using IS. Thus, although TSE has not been specifically studied in the context of ongoing use of existing IS by sales professionals, those with higher TSE are less likely to attribute negative impressions to IS.

It is in the backdrop of these observations, namely, research opportunity for contextualization in technostress literature, scant research in specific performance effects of TSC and increasing computerization of the professional sales function that has implications for poor performance that we undertake to examine how conditions that create technostress impact the performance of the sales person.

HYPOTHESES

We propose the research model as shown in Figure 1. We first develop the set of hypotheses (H1 through H3) linking TSC to SP and TEI to TEP. We next develop the second set of hypotheses (H4 through H7) where we examine the role of TSE as a possible moderator of the relationship between TSC and SP, of TSI as a possible reducer of TSC and of TEC as a potential booster of TEI and TEP. The inclusion of variables and relationships is grounded in the specifics of the technostress phenomenon in the context of the sales professional's use of IS, as explained when relevant, in particular parts of the following subsections.

Relationships between technostress creators and sales performance, technostress creators and technology-enabled innovation and between technology-enabled innovation and technology-enabled performance

Sales performance indicates an overall outcome of the sales role and is often measured as performance against sales quota (Chonko *et al*., 2000; Ahearne *et al*., 2004; Sojka & Deeter-Schmelz, 2008). Because the key role of the salesperson is to generate revenue for the firm, this is an important and most typical outcome measure. As such, for a salesperson to successfully have the sale, a number of activities must come to successful completion, such as, but not

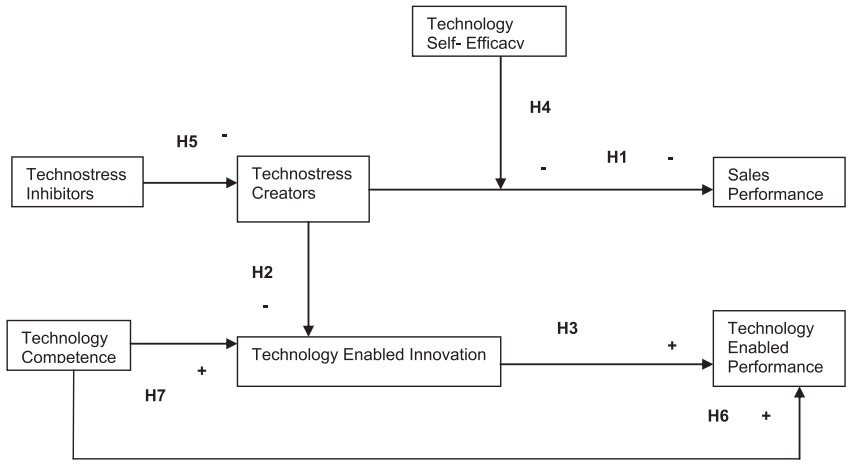

Figure 1. Research model.

limited to successful identification of potential customers, diagnosis and problem-solving of the customers' needs; relationship building activities and follow-up. A deficiency in any step could result in failure to successfully close the business (Plouffe *et al*., 2013). We know that stress because of changes in technology such as introduction of a new CRM system for capturing customer data can manifest in decrease in individual productivity under certain conditions (Nelson & Kletke, 1990; Sainfort, 1990; Ahearne *et al*., 2008; Jelinek, 2013). Specifically in the case of TSC, techno-overload implies greater work required in using IS. For instance, a CRM system may require information about the customer that was previously tacitly held in the salesperson's memory, to be electronically captured and recorded. Techno-complexity entails effort and time in understanding how to use IS. Both may leave little time for other tasks that are necessary for achieving SP. Techno-insecurity might necessitate forced and isolated effort in learning how to use IS, potentially leading to inadequately informed and non-beneficial application of IS to important tasks necessary for achieving quota. Techno-invasion leads to increased demands for working at sales tasks from home, in potential conflict with family activities and priorities. Salespeople may use IS such as CRM applications on smartphones that allow them to be on call with customers at all hours. Individuals feel drained, tired and burned under such a situation (Ayyagari *et al*., 2011), resulting in work-related performance of subpar quality. On the basis of these arguments, it is plausible that TSC prevent the individual from effectively accomplishing tasks necessarily for achieving SP, thereby manifesting in impaired overall SP.[1] We therefore propose the following:

H1: Technostress creators are negatively related to SP.

According to Hunter & Perrault (2007), 'uses of technology have differential effects on various *aspects* of performance…', of the salesperson. Therefore, it is important to examine the impact that TSC might have on outcomes relating to use of IS for sales tasks (e.g. market intelligence collection using a sales force application). In particular, we consider TEI and TEP, because the professional salesperson utilizes IS largely for developing creative solutions for customers and his or her own efficiencies.

The salesperson's success is measured not just in terms of business closed and quota achieved but also in terms of innovative customer service and long-term customer relationships (c.f. Zallocco *et al*., 2009). A key aspect of the salesperson providing value comes from innovations in products/solutions sold and in customer interfacing processes (Walter *et al*., 2001). Innovating by creatively utilizing sales technologies is therefore an expected outcome of their use (Hunter & Perrault, 2007). On the basis of Sun (2006), we define TEI as the development and implementation of creative ideas and solutions for the customer through application of sales force IS.

Stressors place demands on the person experiencing stress and induce an externally controlling situation (Karasek, 1979). According to the cognitive evaluation theory (Deci, 1972; Deci

[1]We did not include 'techno-uncertainty'. Salespeople are frequently remote and not as subject to headquarter or facility application and hardware upgrades as other types of workforces; studies on context-specific theorization (e.g. Whetten, 2009) suggest that where appropriate, context-sensitive versions of variables may be required to make their meaning functionally applicable.

& Ryan, 1985), situations perceived as externally controlling result in an extrinsic orientation, which impairs innovation (Ryan *et al*., 1983), and specific to the sales context, impair the salesperson's ability to innovate (Pullins, 2001). Specifically, the dimensions of TSC reduce the effectiveness with which they can use applications to enhance their innovation at work. For example, because of techno-overload, they multitask with several applications and information processing tasks. Multitasking results in hurried and ineffective information processing, leaving insufficient time and attention for accomplishing tasks in imaginative ways and for exploring creative work processes (Amabile *et al*., 1996). For salespeople, this means they become more routinized and scripted rather than collaborative and value enhancing. In these conditions, they find it difficult cocreate and develop unique solutions with individual customers (Pullins, 2001). Techno-invasion, stemming from IS that include pervasive networks and mobile computing devices, enables 'anytime anyplace' access for salespeople through constant and ubiquitous connectivity. It impairs innovation because of unnecessary interruptions to work that prevent sustained concentration that is required for innovation. Techno-complexity places requirements on salespeople to develop frequent new skills required for using IS, something they are often unwilling or unable to do. As they try to unsuccessfully apply their existing solutions to the new technologies, the extent to which they can perform their technology-mediated tasks innovatively decreases. Salespeople who perceive job-related insecurity and anxiety because of techno-insecurity may experience anxiety and low self-confidence when using IS and hence find themselves unable to be innovative at tasks that involve the use of IS. On the basis of the aforementioned arguments, we frame hypothesis 2:

H2: Technostress creators are negatively related to TEI.

Technology enables performance on various tasks such as satisfying customer needs and communicating with customers. We define TEP as the accomplishment of customer interfacing tasks through use or application of sales force technologies. These types of tasks, particularly in the institutional/business to business context, entail adapting and customizing solutions (Moncrief, 1986) and require an orientation towards innovation and relationship building (Pullins, 2001). Thus, TEP is contingent on the ability to innovate. Limited evidence shows generally that salesperson innovation improves performance (DiLiello & Houghton, 2008), but it has not been investigated in a technology-enabled environment Thus, we propose the following hypothesis:

H3: Technology-enabled innovation is positively related to TEP.

Impacts of computer self-efficacy, technostress inhibitors and technology competence

Individuals having high self-efficacy are likely to feel in greater control and less troubled by stressors that relate to the area of their self-efficacy. Their response to stressors is thus likely to be less extreme (Spector, 1988), suggesting self-efficacy to be a moderator of the relationship between stressor and manifest stress outcome. From the stress literature, we know that individuals with high self-efficacy and higher faith in their ability at their job show a lower strength

of negative relationship between role stressors and job performance (Pierce *et al*., 1993) and are better able to cope with greater job demands (Fox *et al*., 1995; Schaubroeck & Merritt, 1997). In general, self-efficacy can be an effective moderating mechanism, because the stressor condition (i.e. relating to use of IS) is *relevant* to the domain in which the individual feels capable, which is the use of IS (Brockner, 1988; Cooper *et al*., 2001). In the context of IS use by salespersons, therefore, we suggest that TSE has the potential to be a moderator between TSC and SP.

Specifically, techno-overload and techno-complexity embody requirements for *more* work in understanding how to use IS and in actually using IS, potentially taking away time from other tasks necessary for achieving SP. Sundaram *et al*. (2007) suggest that the ability to appropriate improved SP from the use of sales IS depends on experience with respect to IS. In particular, sales professionals who feel positive about their ability to use technology are likely to feel in greater *control*[2] over their ability to use IS. They are likely to be able to achieve a balance between the extent of extra work they do because of IS and the work they do in tasks that are necessary for achieving SP, thus mitigating the negative relationship between TSC and SP. Higher self-efficacy is associated with higher comfort in using computers (Compeau *et al*., 1999); salespeople who have high TSE are expected to be more enthusiastic, confident and relaxed about using them. Techno-insecurity might necessitate forced and ineffective effort in learning how to deal with constantly changing IS. The confidence associated with high self-efficacy can act as a potential dampener on the extent to which this can reduce SP. Techno-invasion leads to increased demands for working at sales tasks such as attending to urgent customer emails from home, creating work–home conflict. Salespeople who are confident and relaxed about using IS are likely to feel less burned out and frustrated in such a situation, thus experiencing a lower adverse effect of techno-invasion on SP.

Given these logics, the sales person with high self-efficacy is likely to interpret the presence of technostress-creating conditions as less threatening and the stress response would be less intense, suggesting computer self-efficacy to be a negative moderator of the relationship between TSC and SP. We thus frame the following hypothesis:

H4: Technology self-efficacy negatively moderates the relationship between TSC and SP.

Organizations can develop support mechanisms and processes directed towards reducing workplace stressors. These include giving employees more job-related information, feedback and training (Beehr, 1998; Jimmieson & Terry, 1998; Cooper *et al*., 2001). In general, support mechanisms influence the stress process in a number of ways – they can moderate the relationship between the stressor and strain variables (Lazarus, 1966) or may affect the direct experience of the stressor, by leading individuals to appraise a lower potential intensity of the stressor (Scheck *et al*., 1997; Cooper *et al*., 2001, pg. 142). For instance, social support has been negatively associated with employees' appraisals of stressors from life events such as death. Frone *et al*. (1995) and Fenlason & Beehr (1994) suggest that when there is a

[2]High job control negatively moderates the relationship between high job demands and strain (Karasek, 1979) and may reduce the impact of job stressors (Jones & Fletcher, 1996).

conceptual fit between a type of stressor and support mechanisms, those support mechanisms can directly reduce the intensity of stressors. That is, the specific form of support should be relevant for alleviation of the stressor in question. In the context of technostress, TSI include three types of organizational mechanisms (Ragu-Nathan *et al*., 2008) – literacy facilitation, technical support provision and involvement facilitation. They provide support to users through mechanisms that are *related to their use of IS* (e.g. technical help through help desks, facilitating sharing of technical knowledge, training and facilitating user involvement and experimentation with IS). We thus suggest that they have potential to reduce the individual's experience of the stressor conditions related to their use of IS, in this case, TSC.

Literacy facilitation includes mechanisms that encourage and foster sharing of IS-related knowledge within the organization. They enable overall understanding and informing of new applications that are implemented in terms of their functionality and how they can be used. They are expected to help sales professionals effectively in corporate IS in their organizational tasks and reduce feelings of having to do 'too much' with IS, of 'being overwhelmed by IS' even outside work and of 'feeling threatened' by potential employment loss because of inability to come to understand new IS. They thus decrease the overload, invasion and insecurity aspects of TSC. Indeed, despite evidence that firms with successful CRM technology applications are more likely to have trained users on the system (Harding *et al*., 2004), we find (e.g. Taylor-West & Saker 2012) that IS training needs for salespeople are often underestimated. Technical support provision describes mechanisms related to end-user support activities and describes the extent to which IS help desk routines are responsive and effective in addressing IS-related problems of users, increasing their level of comfort and assurance. These mechanisms allow for salespeople to be trained, guided and supported in the context of their use of IS, making it easier for them to cope with the demands of learning about new IS and navigating through applications. They alleviate feelings of having to 'constantly learn' new IS use and thus decrease the complexity aspect of TSC. Anecdotally, Hyle (2009) found that technology support helps insurance salespeople to better serve customers. Involvement facilitation measures the extent to which end users are involved/consulted in IS implementations and IS-related changes, encouraged to try out new IS and rewarded for using them. These mechanisms keep users informed about the rationale for introducing new IS. They enable salespeople to appreciate why specific applications are implemented and what their potential benefits might be. They allow salespeople to understand and accept those changes that IS may bring to their tasks and workflows. These mechanisms thus reduce the insecurity aspect of TSC. Evidence from the sales literature (Day & Van den Blute, 2002) shows that mechanisms that promote involvement, such as incentives and accountability, were important elements in achieving better utilization of CRM by sales professionals. Higher levels of IS involvement in IS design and implementation (Tarafdar *et al*., 2010) are associated with lower levels of TSC. On the basis of the aforementioned arguments, we propose the following hypotheses:

H5: Technostress inhibitors are negatively related to TSC.

An important contextual variable that characterizes use of IS by the professional salesperson is TEC (Ritter & Walter, 2004; Walter & Ritter, 2004), defined as his or her ability to use IS

productively and with ease in sales tasks. Distinct from TSE in that it is focused on the ability to use IS (rather than a belief), it results in a higher quality of IS utilization. It is thus expected to impact performance relating to IS use. The ability to use technology tools with competence or savvy (Onyemah *et al*., 2010) can potentially result in the sales professional working with IS in a 'smarter' manner (Hunter & Perrault, 2007). We also know from the IS literature that users who are familiar with system features and application functionality can effectively use IS and gain better utilities from IS in terms of performing tasks that are IS mediated (Jasperson *et al*., 2005). The user's ability to use IS effectively is thus likely to positively influence his or her ability to appropriate benefits from it for their tasks. On the basis of these arguments, we believe that TEC is likely to result in improved performance enabled by IS. Therefore, we hypothesize the following:

H6: Technology competence is positively related to TEP.

There are emerging ideas that salesperson innovation in the context of technology use might be positively impacted by their competence in using that technology (e.g. Kumar & Uzkurt, 2010). Having the ability to gainfully use IS for sales-related activities should realize increased effectiveness (e.g. Rapp *et al*., 2008), including those related to innovative activities required of the new sales role. It is therefore reasonable to expect that TEC would impact TEI; we thus frame the following hypothesis:

H7: Technology competence is positively related to TEI.

METHODS AND RESULTS

We executed this study through survey research conducted in three steps: (1) survey design, (2) data collection and (3) data analysis, as described in the succeeding texts.

Survey design

On the basis of the literature discussed in the Section on Theory Background, we developed survey items for the model's constructs. Items for TSC and TSI were adapted from Ragu-Nathan *et al*. (2008) and those for TSE from Compeau & Higgins (1995a). Items for 'TEI' were drawn from Torkzadeh & Doll (1999) and Sun (2006). The items for these constructs were modified as appropriate for the context of the study. Drawing on traditional measures of overall SP (e.g. Chonko *et al*., 2002; Ahearne *et al*., 2004; Sojka & Deeter-Schmelz, 2008), a two-item measure of overall SP was utilized that asked salespeople to report how well they performed overall and against quota, on a 10-point scale. The items for 'TEC' were drawn from studies that propose this construct and address related constructs such as technology savvy with use IS tools (Ritter & Walter, 2004; Walter & Ritter, 2004; Hunter & Perrault, 2007; Onyemah *et al*., 2010). All of these constructs were defined as being reflective, consistent with literature. 'TEP' was developed for this research to capture the performance aspects that are proposed

in the literature to be most affected by sales technology. These include more productive and professionalism interactions with customers (Barker *et al*., 2009), more time spent with them and improved customer service and relationship building (Ahearne & Rapp, 2010). Each of these aspects reflects that the salesperson is effectively using IS to enhance task performance, that is, performing well, suggesting this construct to be reflective[3] (Plouffe *et al*., 2013). Development of this construct included content validation of items by sales managers and sales researchers, as to their appropriateness and relevance. Specifically, they were tested for face validity by review from five sales managers of two separate sales organizations and two academic researchers in the sales area.

All items other than SP were measured on a 5-point Likert scale: 1 – strongly disagree to 5 – strongly agree. A sixth option of 'not applicable' or 'I do not know' was also provided.

Data collection

To test the hypotheses, the questionnaire survey was provided to sales professionals from three business-to-business organizations (selling business services, building materials and various raw material product categories, respectively). Each of these organizations had sales professionals in a territory sales representative role with similar responsibilities. While the products/services sold varied somewhat, the nature of the customers (business professionals and small business owners), selling process (consultative), selling cycle (short to moderate) and nature of the sales decision-making (cost-oriented) were very similar. Hence, the respondents were largely similar with respect to their sales activities and responsibilities. The applications used were also similar, as was the broad nature of use, and each was typical of the professional sales context. For example, each of the firms had CRM and sales force automation systems that provided standard types of sales technology tools. All the firms had implemented and adopted CRM systems for a reasonably long-enough time such that there were no significant known problems or recent/pending upgrades/changes.

Graduate student researcher assistants from professional sales classes were offered the opportunity to administer the survey for course credit. Students were given training and instructions regarding selection of survey participants (i.e. a business-to-business sales professional) and respondent approval through a signed consent (for identifying their name, title, company and phone/email contact information). Upon receiving the completed surveys, random checks (phone calls to subjects) were conducted on 10% of the sample to verify the accuracy of the data collection method. The process netted a total of 237 questionnaires, from 500 initially

[3]Customers will work with a salesperson and purchase from him or her when she or he is performing at a high level (Weitz, 1978). This might be due to several factors such as using the technology to create better solutions, enhance communication and professionalism and spend more productive time with customers. *Each* of these items *by itself* would be an indicator that the salesperson is performing at a high level, thus demonstrating (or reflecting) that he or she is effectively using technology to enhance performance in role. There is no real way to formatively build each component of what goes into a high performance because every customer relationship is unique. Instead, we measure through items that would indicate that positive performance is perceived to exist because of the technology use. That is, each of the first-order items represents a particular aspect of technology competence, and the direction of causality is from the second-order construct to its facets, the first-order reflectors.

distributed, giving us a response rate of 47%. In terms of sample demographics, about 66% of the respondents were male and 34% were female, more than 70% had a bachelor's degree and above, and their ages were evenly spread in 10 year ranges between 26 and 56 years. In terms of professional sales experience, 65% had an experience of less than 10 years, 23% between 10 and 20 years and 12% greater than 30 years.

Analysis for model testing

We used measurement and SEM techniques to estimate construct item loadings and path parameters, as explained in the following steps.

Psychometric properties of constructs

We first conducted factor analysis in SPSS as an initial test for convergent and discriminant validity of the constructs, as shown in the Appendix Tables 1–3. Items for TSC loaded onto four factors (TSC_1, TSC_2, TSC_3 and TSC_4) and those for TSI loaded onto three factors (TSI_1, TSI_2 and TSI_3), both as theorized. Items for TEP, TEI, TEC and TSE loaded onto their respective constructs. Table 2 shows the construct items and their reliability (Cronbach's alpha) values.

We next conducted analysis using component-based SEM in partial least squares (PLS) as shown in Tables 3 and 4. TSC and TSI are considered as first-order constructs with items TSC_1, TSC_2, TSC_3 TSC_4 and TSI_1, TSI_2 and TSI_3, respectively, as consistent with literature (e.g. Ragu-Nathan *et al*., 2008). Each of these was calculated as the mean of their constituent items from Table 2. Table 3 shows the factors loadings for each model construct (there were no cross-loadings greater than 0.4), and Table 4 shows the construct means, construct standard deviations (SD's), interconstruct correlations and square root of average variance extracted (AVE) values. All the AVE's are greater than the recommended value of 0.5 (Fornell & Larcker, 1981), and all Cronbach's alpha coefficients are higher than the recommended value of 0.7 (Nunnally, 1978). The composite reliabilities of the items are also quite high, greater than or close to 0.80. The square root of the AVE value for each construct is higher than its correlation with all other constructs. These results support good convergent and discriminant validity of the constructs (Wetzels *et al*., 2009). Table 4 in the Appendix shows the composite reliability, communality and redundancy values of the constructs.

Common methods' bias

We evaluated the potential presence of common methods bias, because of data collected from a single respondent using two methods. We used a method factor variable (Lindell & Whitney, 2001; Malhotra *et al*., 2006) and tested two different models. The first model was an all construct correlated model for all the constructs. In the second model, a method factor variable (a first-order factor in which the measures included the indicators of all the constructs in the research model) was introduced (Podsakoff *et al*., 2003; Paulraj *et al*., 2008; Flynn *et al*., 2010), with the following results. One, the correlations amongst the constructs of the first-order correlated model did not substantially change with the introduction of the method factor. Two, the significance of the item loadings of the constructs did not change in spite of the inclusion of a

Table 2. Item descriptions and reliabilities

Factor (reliability)	Item	Item description
SP (0.98)	SP_1	Outcome performance against plan
	SP_2	Overall performance
TSE (0.91)	TSE_1	I would complete this job using the software package if I had seen someone else using it before trying it myself
	TSE_2	I would complete this job using the software package if I could call someone for help if I got stuck
	TSE_3	I would complete this job using the software package if someone else had helped me get started
	TSE_4	I would complete this job using the software package if I had much time to complete the job for which the software was provided
	TSE_5	I would complete this job using the software package if I had just the built-in help facility for assistance
	TSE_6	I would complete this job using the software package if I has used similar packages before this one to do the same job
TEC (0.92)	TEC_1	I can use this technology to improve the quality of my work
	TEC_2	I can use this technology to improve my productivity
	TEC_3	I can use this technology to accomplish more work than would otherwise be possible
	TEC_4	I can use this technology to perform my job better
TSI_1 (0.87)	TSI_1_1	Our organization encourages knowledge sharing to help deal with new technology
	TSI_1_2	Our organization emphasizes teamwork in dealing with new-technology-related problems
	TSI_1_3	Our organization provides sales force training before the introduction of new technology
	TSI_1_4	Our organization fosters a good relationship between IT department and sales force
	TSI_1_5	Our organization provides clear documentation to the sales force on using new technologies
TSI_2 (0.87)	TSI_2_1	Our end-user help desk does a good job of answering questions regarding technology
	TSI_2_2	Our end-user help desk is well by knowledgeable individuals
	TSI_2_3	Our end-user help desk is easily accessible
	TSI_2_4	Our end-user help desk is responsive to end-user requests
TSI_3 (0.88)	TSI_3_1	Our salespeople are encouraged to try out new technologies
	TSI_3_2	Our salespeople are rewarded for using new technologies
	TSI_3_3	Our salespeople are consulted before introduction of new technology
	TSI_3_4	Our salespeople are involved in technology change and/or implementation
TSC_1 (0.90)	TSC_1_1	I am forced by this technology[a] to work much faster
	TSC_1_2	I am forced by this technology to do more work than I can handle
	TSC_1_3	I am forced by this technology to work with very tight time schedules
	TSC_1_4	I am forced to change my work habits to adapt to new technologies
	TSC_1_5	I have higher workload because of increased technology complexity
TSC_2 (0.91)	TSC_2_1	I spend less time with my family because of technology
	TSC_2_2	I have to be in touch with my work even during my vacation because of this technology
	TSC_2_3	I have to sacrifice my vacation and weekend time to keep current on new technologies
	TSC_2_4	I feel my personal life being invaded because of this technology
TSC_3 (0.92)	TSC_3_1	I do not know enough about this technology to handle my job satisfactorily
	TSC_3_2	I need a long time to understand and use new technologies
	TSC_3_3	I do not find enough time to study and upgrade my technology skills
	TSC_3_4	I find new recruits to this organization know more about computer technology than I do
	TSC_3_5	I often find it more complex for me to understand and use new technologies
TSC_4 (0.90)	TSC_4_1	I feel constant threat to my job security because of new technologies
	TSC_4_2	I have to constantly upgrade my skills to avoid being replaced
	TSC_4_3	I am threatened by coworkers with newer technology skills

(Continues)

Table 2. (Continued)

Factor (reliability)	Item	Item description
	TSC_4_4	I do not share my knowledge with coworkers for fear of being replaced
	TSC_4_5	I feel there is less sharing of knowledge amongst coworkers for fear of being replaced
TEI (.90)	TEI_1	This technology helps me to identify innovative ways of doing my job
	TEI_2	This technology helps me to come up with new ideas relating to my job
	TEI_3	This technology helps me to try out innovative ideas
TEP (0.86)	TEP_1	Using technology results in improved customer satisfaction
	TEP_2	Using technology results in more time to meet with customers
	TEP_3	Using technology helps me make my time with customers more productive
	TEP_4	Using technology helps me communicate better with customers
	TEP_5	Using technology helps improve my overall professionalism with customers

SP, sales performance; TSE, technology self-efficacy; TEC, technology competence; TSI, technostress inhibitors; TSC, technostress creators; TEI, technology-enabled innovation; TEP, technology-enabled performance.
[a]'This technology' or 'this software' refers to sales force and other sales applications used by the respondent

Table 3. Construct item loadings (cross-loadings less than 0.4 are not shown for clarity)

	Sales performance (SP)	Technology self-efficacy (TSE)	Technology competence (TEC)	Technostress inhibitors (TSI)	Technostress creators (TSC)	Technology-enabled innovation (TEI)	Technology-enabled performance (TEP)
SP_1	0.99						
SP_2	0.99						
TSE_1		0.64					
TSE_2		0.74					
TSE_3		0.78					
TSE_4		0.78					
TSE_5		0.92					
TSE_6		0.86					
TEC_1			0.81				
TEC_1			0.87				
TEC_1			0.87				
TEC_1			0.89				
TSI_1				0.80			
TSI_2				0.79			
TSI_3				0.69			
TSC_1					0.70		
TSC_2					0.75		
TSC_3					0.79		
TSC_4					0.77		
TEI_1						0.89	
TEI_2						0.94	
TEI_3						0.90	
TEP_1							0.74
TEP_2							0.76
TEP_3							0.84
TEP_4							0.78
TEP_5							0.84

Table 4. Construct correlations

	Sales Performance (SP)	Technology Self Efficacy (TSE)	Technology Competence (TEC)	Technostress Inhibitors (TSI)	Technostress Creators (TSC)	Technology Enabled Innovation (TEI)	Technology Enabled Performance (TEP)
Sales Performance (SP)	0.99						
Technology Self Efficacy (TSE)	0.23***	0.79					
Technology Competence (TEC)	0.02	0.02	0.86				
Technostress Inhibitors (TSI)	0.05	0.16***	0.31***	0.76			
Technostress Creators (TSC)	-0.17***	-0.20***	-0.04	-0.19***	0.75		
Technology Enabled Innovation (TEI)	0.00	0.12**	0.46***	0.41***	-0.21***	0.91	
Technology Enabled Performance (TEP)	0.04	0.21***	0.47***	0.33***	-0.11**	0.57***	0.79
Mean	3.73	7.38	3.94	3.62	2.64	3.69	3.73
Std. Dev.	0.82	1.55	0.64	0.53	0.65	0.72	0.68

Note: Shaded cells show the square root of AVE's for each construct.

method factor. Three, the method factor accounted for 9% of the total variance, and its inclusion only marginally improved the model fit indices. These results indicate low probability of bias, on the basis of which we concluded that common methods' bias would not significantly affect the path model testing for the proposed hypotheses.

Path model

We used partial least squares for testing our hypothesized relationships. The *t*-statistics for the path coefficients were obtained by bootstrapping generated by 200 samples, which is the default resampling option, to provide reasonable standard error estimates (Chin, 1998). Figure 2 shows the structural model with path coefficients, significance levels, *R*-square values and the factor loadings. Results indicate support for all hypotheses, except H4. That is, we did not find TSE to moderate the relationship between TSC and SP. Instead, we found a significant direct relationship between TSE and SP.[4]

We next conducted an analysis to test for possible mediation effects (Baron & Kenny, 1986). We ran a path model that had the following: (a) our hypothesized relationships H1, H2, H3, H5, H6 and H7; (b) a direct relationship between TSE and SP based on the previous step; and (c) direct relationships between TSI and TEI, TSI and SP and TSC and TEP, to test whether the

[4]To create a moderating relationship partial least squares requires a direct path between the moderator variable and the dependent variable.

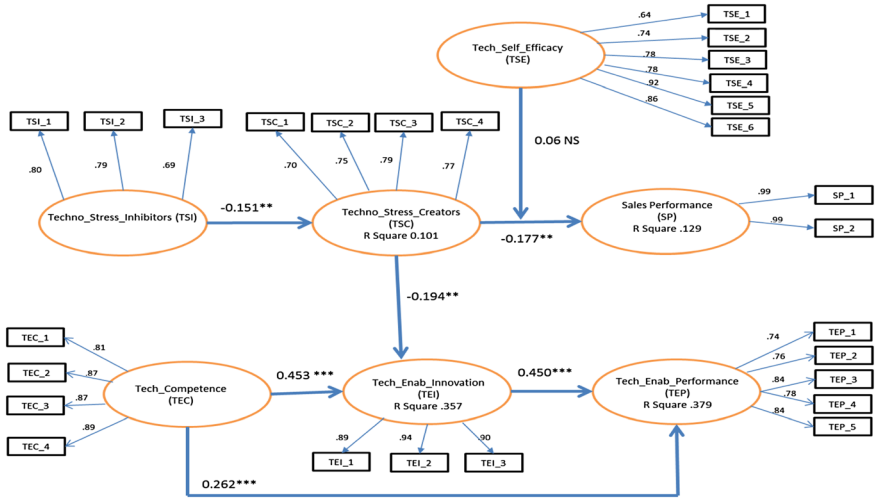

Figure 2. Hypothesized model (***$p < 0.01$; **$p < 0.05$; *$p < 0.10$; NS, non-significant).

variables TSC and TEI fully or partially mediated the respective relationships. We found significant relationships for (a) and (b). For (c), we found a significant relationship between TSI and TEI. Those between TSC and TEP and TSI and SP were non-significant. We therefore ran the final model as shown in Figure 3, after removing the (non-significant) TSC -> TEP and TSI -> SP paths. Figure 3 shows the path coefficients, significance and *R*-square values. We summarize the findings in Table 5.

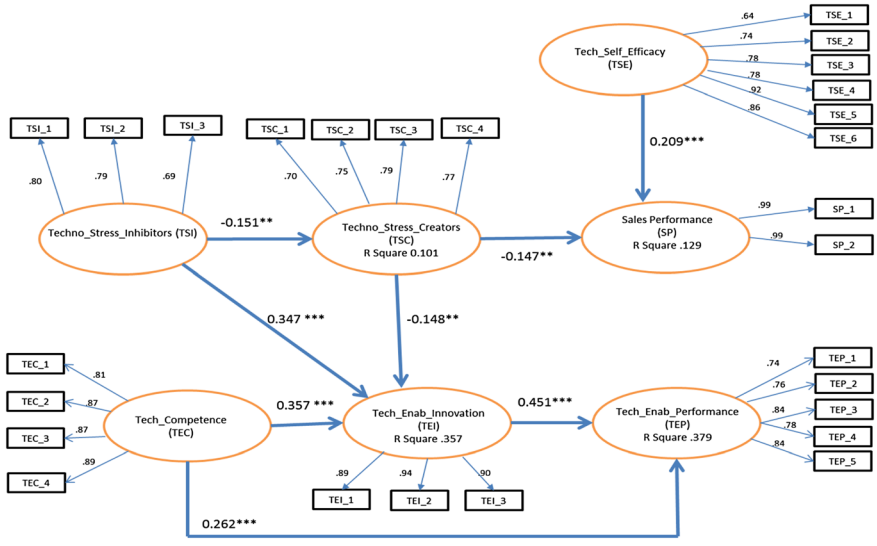

Figure 3. Final model (***$p < 0.01$; **$p < 0.05$; *$p < 0.1$).

Table 5. Summary of results

Hypotheses	Path coefficients	
H1: TSC – SP	−0.147**	Supported
H2: TSC – TEI	−0.148**	Supported
H3: TEI – TEP	0.451***	Supported
H4: TSE moderates the relationship between TSC and SP		Not Supported
H5: TSI – TSC	−0.151**	Supported
H6: TEC – TEP	0.262***	Supported
H7: TEC – TEI	0.357***	Supported
Post Hoc analysis		
TSE – SP	0.209***	
TSI – TEI	0.347***	

SP, sales performance; TSE, technology self-efficacy; TEC, technology competence; TSI, technostress inhibitors; TSC, technostress creators; TEI, technology-enabled innovation; TEP, technology-enabled performance.
***$p < 0.01$, **$p < 0.05$, *$p < 0.10$.

As shown in Table 5, H3 was not significant. That is, TSE did not moderate the relationship between TSC and SP, but it had a direct relationship with SP. We note here that TSE is an indicator of how much control the individual feels he or she has over the use of IS. That is, higher TSE can be taken to mean greater perceived control over IS use based on greater belief in one's ability to use IS. The stress literature provides mixed results vis-à-vis the impact of control on the relationship between workload-related stress and strains such as satisfaction or anxiety (Jex & Gudaowski, 1992). Whereas perceived job control moderates the relationship between workload-related stressors and job satisfaction in some cases (Fox *et al*., 1995), others have not demonstrated such an effect (Perrewe & Ganster, 1989; O'Driscoll & Beehr, 2000). We also find that employees' belief that they have control over their jobs directly impacts the strain variables from work demand stressors, that is, reduces anxiety and increases job satisfaction (Spector, 1985), rather than moderating the relationship between stressors and strain. From the sales literature, we find that when the salesperson does not believe in her or ability to use IS, his or her productivity decreases (Bush *et al*., 2007). TSE, which is a belief-oriented and intrinsic concept, can thus improve SP by facilitating greater inherent control over IS use. We also found that TSC partially mediates the relationship between TSI and TEI, that is, increase in TSI is directly associated with increase in TEI. This can be explained contextually in that research has shown that organizational support to salespeople may enhance intrinsic orientation by providing them with a stronger sense of control and plays an important role in their creating solutions of value for customers (e.g. Heskett & Schlesinger, 1994). Therefore, it can be expected to contribute positively to innovation (Ryan *et al*., 1983; Deci & Ryan, 1985). TSI, representing a set of organizational support mechanisms for salespeople, may thus enhance the salesperson's ability to use technology to innovate. Also, more generally, the link between TSI and TEI can be explained as that between a situational factor and an individual outcome, as explained by the transaction model (Lazarus, 1966; Ragu-Nathan *et al*., 2008).

Control variables

We controlled for the effects of three variables – education, organizational tenure and professional tenure – on SP and TEP. Greater levels of education are associated with greater

perceived ease of use with respect to IS (Igbaria & Parsuraman, 1989; Agarwal & Prasad, 1999) and therefore might be expected to influence the individual's ability to use IS in work tasks. We expected education levels to have a positive association with TEP. Greater organizational tenure increases the individual's ability to navigate organizational policy changes, such as, as pertinent to our study, those related to expectations for IS use for work (Ragu-Nathan *et al*., 2008). Therefore, it might be expected to have a positive relationship to TEP. Professional tenure has been shown to be associated with higher levels of performance (e.g. Churchill *et al*., 1985; Bartkus *et al*., 1989), on the basis of which we expected higher levels of SP to be associated with higher tenure in the sales function. We measured education as high school = 1, 2-year college = 2, bachelor level = 3 and graduate level = 4 and organizational tenure and professional tenure as number of years. We found (Table 5, Appendix) that education levels were positively related with TEP (non-significant relationship with SP), organizational tenure has no significant relationship with either SP and TEP and professional tenure in the sales function had a positive relationship with SP (non-significant relationship with TEP).

CONTRIBUTIONS AND LIMITATIONS

The paper develops an understanding of the phenomenon of technostress in the context of IS use by sales/marketing professionals. It incorporates the context by the following: (a) examining relationships of interest between key constructs identified in the received literature on technostress (i.e. TSC and TSI), and constructs salient to the professional sales area (i.e. SP, TEP, TEI and TSE); and (b) contributing to both literatures that inform the area of study (i.e. technostress and technology adoption by sales/marketing professionals). We reflect on the paper's theoretical contributions, implications for practice and limitations in the succeeding texts.

Contributions to theory

First, we demonstrate that technostress-creating conditions impair innovation and task performance that is mediated through IS, in addition to reducing overall work performance of the individual. Thus, the phenomenon of technostress can embody or manifest as adverse effects on outcomes that are *technology enabled* and *broader* outcomes of the overall performance in the role (in this case, the sales person's role). In looking at TEI and performance, and at broader SP as the dependent variables, the study furthers current literature (e.g. Ragu-Nathan *et al*., 2008; Ayyagari *et al*., 2011) that reports on psychological and physical outcomes such as job commitment, job satisfaction and exhaustion.

Second, then, we present possible methods for counterbalancing these adverse effects. We identify TEC as a means to increase TEI and TEP, offsetting their reduction by TSC. We further identify TSE and TSI, respectively, as potential means to increase SP and reduce TSC. We thus find the existence of two types of ways for addressing the adverse impacts of technostress on performance. The first, characterized by TEC, represents the traditional efforts-based aspect wherein the individual's *ability* to use IS with ease positively associates with their felicity in accomplishing TEI and performance and, through that, counters the impact of TSC on them.

The second, characterized by TSE and TSI, signifies efforts that are more *belief/motivation* or empowerment based and that could foil *broader* negative performance impacts of technostress. That is, the individual's belief in being able to use IS counters the negative impact of TSC on overall SP. Similarly, organizational mechanisms that empower the individual to use IS in a more informed manner reduce TSC and, through that, its negative impact on SP. To the best of our understanding, this is the first study to suggest that while the traditional TEC/ability to use IS route can counter those performance impacts of TSC that are technology enabled, more motivational/belief and empowerment-related means such as TSE and TSI are called for to address their impacts on broader performance. Both types of mechanisms are thus required, to address the impacts of TSC on performance. We believe that this finding is theoretically important and introduces richness and nuance in the emerging technostress literature.

Third, we integrate ideas from social cognitive theory, technostress and the sales literatures to theoretically lay out and empirically examine a role for TSE as a factor that increases SP, countering its decrease because of TSC. Considering TSE furthers the understanding of technostress by highlighting that the individual's beliefs about ability to use IS will influence response to stressful situations that she or he encounters because of IS use, a perspective missing in literature. The study thus broadens the theoretical ambit of TSE in the technostress phenomenon. In considering TSI, our study demonstrates that mechanisms such as literacy facilitation and involving sales professionals upfront while introducing new applications can reduce TSC. Although IS-related training is regarded as a typical mechanism for assisting managers with new applications, our results point to the particular importance of increased understanding about applications and the rationale for and expected benefits from their adoption and use, as an additional and effective mechanism for reducing the negative effects of technostress.

Fourth, it is important at this point to discuss the particular context of our study and similar contexts for transferability of our findings. The sales context is distinctive in that requirements for effectively accomplishing critical tasks (such as contact management, for instance) through the use of complex IS (such as ACT!), coexist with expectations of overall performance in a role that is primarily relationship oriented. Although use of IS is becoming increasingly important for the sales professional, the nature of the job still largely and inherently involves person-to-person communication. Our results show that even as the individual tries to cope with the immediate negative impacts of technostress on IS-mediated tasks, he or she is subject to the broader effect of TSC on overall performance. Moreover, while customary TEC building efforts such as increasing ability to use IS can alleviate the former, more empowering mechanisms such as increasing the individual's self-efficacy with IS and mechanisms for supporting informed IS use, are called for, for reducing the latter. These findings, which the context of this study has enabled us to highlight, are theoretically new and can be extended to a broad range of service industries that have similar characteristics and that have been subject to recent and widespread computerization, such as frontline functions in hospitality, healthcare, banking and, increasingly now, higher education. The services domain thus represents a potentially interesting application/extension for the findings of this paper.

Fifth, this paper offers three theoretical contributions to the professional sales literature. One, it highlights the importance of technostress in the context of the sales professional's ongoing

use of IS and shows it to be a possible reason for reduced performance as an (unintended) effect of use of IS, theoretically extending the IS sales/marketing literature that focuses on the sales professional's job stress and turnover during *initial IS implementation/adoption* (Speier & Venkatesh, 2002). We find it important to note that while the professional sales literature has discussed variables such as perceived usefulness as antecedents of IS use, the role of negative cognitions such as technostress in effecting IS use-related outcomes has not been examined. Given existing mixed findings regarding the impact of sales technologies use on the performance of the sales professional (Ahearne & Rapp, 2010), technostress represents a promising domain for further exploration. Two, we highlight the importance of TEI in better understanding how TSC impact TEP. While the importance of TEI has increased, sales professionals have historically preferred to innovate in the area of customer interactions/solutions, rather than in IS use. Our findings caution that TSC can reduce the extent to which the sales professional innovates with technology, in turn negatively impacting his or her performance at technology-enabled tasks. Three, while TSE has been found to positively impact the extent of IS use by sales professionals, in the context of newly implemented sales IS, the current study reveals a more far-reaching impact, namely, increased SP, in the context of ongoing use of existing sales IS.

Implications for practice

A number of customer-facing and service-oriented functions and roles have seen increasing numbers of IS-mediated tasks in recent years. At the same time, rates of failure of such applications because of non-use or insufficient use have been high IS (Erffmeyer & Johnson, 2001). Given the struggles in appropriating benefits from the use of sales force applications (Ahearne *et al*., 2004), and strategically important expectations from their use (Sarin *et al*., 2010), insights into how technology-related stress relates to TEI and performance, and SP, are critical to improving the practical application of these IS. Adding responsibilities for using IS to what is inherently a relationship oriented role can be associated with deterioration in performance, when technostress is considered. While increasing the individual's competence for using IS can partially counter that deterioration, increasing TSE, IS-related understanding and literacy, training and help desk support and involvement in IS decisions that affect their tasks and workflows are also crucial. In particular, it is important to go beyond standard training mechanisms and ensure, through continuing education, involvement, confidence/belief building and technical assistance, that sales professionals, and in general professionals in frontline or customer interfacing careers, understand why specific technologies are implemented, how they can be used and what functionalities they beget. Moreover, given that such professionals typically may not be physically located internally in the organization but remotely housed, it is important for the organization to make them aware of such support mechanisms as might exist.

Limitations

In terms of limitations to our study, first, it was conducted in a limited setting of three firms, all in the institutional/business-to-business product domain. Further research can show the robustness of

findings across different settings such business-to-consumer sales, services sales, other service industries and so forth. Second, subjective, self-report measures of performance were used. Future research that utilizes objective performance measures would be useful. Third, future research also needs to consider longitudinal studies that measure technostress over time and in tandem with interventions in the form of inhibiting factors identified in our study.

CONCLUSION

The phenomenon of technostress is emerging and not yet fully understood. And yet, with pervasiveness of IS in many frontline and customer-facing processes, it is reasonable to expect that it would dampen expected performance benefits from their use in these processes. Focusing on the professional sales context, this paper examines the negative manifestations of stress-creating aspects of IS use, as adverse effects on the individual's TEI, TEP and overall performance. We also highlight potential mechanisms to offset these impacts. The paper theoretically extends the current technostress literature to highlight performance impacts of technostress and contributes more generally to the up-and-coming area that examines negative consequences because of use of IS.

ACKNOWLEDGEMENTS

The authors would like to thank the Senior Editor, Associate Editor and two anonymous reviewers for their comments and suggestions that helped improve the paper.

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APPENDIX

Appendix Table 1: Factor analysis for technostress creators (TSC) – rotated component matrix

	Component			
	TSC_1	TSC_2	TSC_3	TSC_4
TSC_1_1	0.85			
TSC_1_2	0.72			
TSC_1_3	0.84			
TSC_1_4	0.81			
TSC_1_5	0.77			
TSC_2_1		0.84		
TSC_2_2		0.82		
TSC_2_3		0.74		
TSC_2_4		0.78		
TSC_3_1			0.80	
TSC_3_2			0.90	
TSC_3_3			0.83	
TSC_3_4			0.81	
TSC_3_5			0.86	
TSC_4_1				0.78
TSC_4_2				0.79
TSC_4_3				0.74
TSC_4_4				0.82
TSC_4_5				0.79

Varimax rotation, variance explained 76%.
KMO: 0.90, Bartlett's test of sphericity chi-square = 321, df = 171, significance = 0.000.

Appendix Table 2: Factor analysis for technostress inhibitors (TSI) – rotated component matrix

	Component		
	1	2	3
TSI_1_1	0.82		
TSI_1_2	0.78		
TSI_1_3	0.76		
TSI_1_4	0.75		
TSI_1_5	0.77		
TSI_2_1		0.83	
TSI_2_2		0.81	
TSI_2_3		0.82	
TSI_2_4		0.84	
TSI_3_1			0.82
TSI_3_2			0.80
TSI_3_3			0.88
TSI_3_4			0.82

Varimax rotation, variance explained 71%.
KMO: 0.84, Bartlett's test of sphericity chi-square = 1717.7, df = 78, significance = 0.000.

Appendix Table 3: Factor analysis for technology self-efficacy (TSE), technology-enabled performance (TEP), technology competence (TEC), technology-enabled-innovation (TEI) and sales performance (SP)

	Component				
	1	2	3	4	5
TSE_1	0.68				
TSE_2	0.81				
TSE_3	0.84				
TSE_4	0.81				
TSE_5	0.87				
TSE_6	0.75				
TEP_1		0.72			
TEP_2		0.72			
TEP_3		0.79			
TEP_4		0.68			
TEP_5		0.77			
TEC_1			0.82		
TEC_2			0.86		
TEC_3			0.81		
TEC_4			0.81		
TEI_1				0.76	
TEI_2				0.88	
TEI_3				0.83	
SP_1					0.98
SP_2					0.98

Varimax rotation, variance explained 68%.
KMO: 0.923, Bartlett's test of sphericity chi-square = 3378.8, df = 190, significance = 0.000.

Appendix Table 4: Composite reliability, communality and redundancy

	Composite reliability	Communality	Redundancy
Sales performance	0.99	0.98	0.03
Technology self-efficacy	0.91	0.63	0
Technology competence	0.92	0.74	0
Technostress inhibitors	0.81	0.58	0
Technostress creators	0.84	0.57	0.01
Technology-enabled innovation	0.94	0.83	0.17
Technology-enabled performance	0.91	0.62	0.11

Appendix Table 5: Analysis with control variables – education, organizational tenure and professional tenure

Control variable	Sales performance	Technology-enabled performance
Education	Not significant	Positive relationship ($p = 0.013$)
Organizational tenure	Not significant	Not significant
Professional tenure	Positive relationship ($p = 0.002$)	Not significant