Exploring Antecedents of Technology Usage and Stress

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Abstract

The ubiquitous and pervasive use of ICT (Information communication technology) has transformed the contemporary workplace. ICT has enabled blurring of geographical boundaries leading to freedom from being restricted to the physical workplace and has dramatically increased the pace of information flow. While these affordances have enhanced the potential of an employee to be more flexible in meeting the work demands, the above properties have also resulted in continuous engagement of the employee with the workplace and an enhanced expectation of the employers to be prompt in attending the workplace related issues. Thus, potentially, ICT use can increase the work stress significantly. While 'technostress', the stress related to the use of ICT in workplace, as a phenomenon is underexplored, the processual aspects of technostress, particularly, the mechanisms by which ICT use can cause stress is especially understudied. The present study contributes to the literature on ICT use by employees by examining the conflicting aspects of the use of ICT in work place. Specifically, we investigate the processual aspects of technostress by exploring the effect of ICT usage on perception of autonomy, time pressure, work-life balance and work stress.

Introduction

ICT (Information communication technology) has become a ubiquitous part of life in 21st century, pervasive in both work and personal domains. It is posited that ICT has enabled blurring of geographical boundaries, resulting in freedom from being restricted to the physical workplace and has dramatically increased the pace of information flow. These affordances have altered the means of interaction between individuals and between the organizations and their members, thus significantly affecting the work flow processes. Organizations are encouraging the use of ICT to take advantage of the enhanced pace and scope of information flow and hence to enhance the operational savings through increased process efficiencies and, to design new strategic alternatives and look for possibilities of innovations (Brynjolfsson and Hitt, 1996; Kudyba and Diwan, 2002). Further, it has been posited that ICT use can potentially enhance the autonomy of an individual by enabling greater personal freedom to take up and pace workload and performing the task without being bound to the physical work place (Middleton, 2007; Mazmanian et al., 2013). Therefore, a large number of organizations are increasing their investments in ICT and are encouraging employees to use ICT.

However, potentially, ICT can lead to major re-organization of work and information flow and studies have shown that at an individual level, the pervasiveness of ICT and its effect on the communication processes can lead to anxiety and tension (Hienssen et al., 1987), higher work pressures (Hislop and Axtell, 2011) and job dissatisfaction (Smith et al., 1981). Scholars have referred to a phenomenon called 'technostress' (Clark and Kalin, 1996), which refers to the stress experienced by the end users as a result of their engagement with ICT. The World Health Organization (WHO) argues that the work patterns in the organizations have changed due to the increased use of ICT and that the organizations need to address the effect of ICT on the psychosocial and mental health of the employees (WHO, 2005).

Thus, ICT can potentially act as a double edged sword. On one hand, it can enhance effectiveness and efficiency in organizations, it can also lead to increased work pressure and stress on the other. In this paper, we attempt to investigate whether ICT use relates to work stress and if so how?

Though the phenomenon of stress has been a subject of analysis in the management and psychology literatures for a while, the phenomenon of technostress has not been explored in detail (Ayyagari et al., 2011). Here technostress refers to a 'state of arousal observed in certain employees who are heavily dependent on computers in their work' (Arnetz and Wiholm, (1997). Further, the mechanism of technostress- 'understanding how the technology use causes stress' is not fully understood. Scholars have assumed the presence of technostress and examined the impact of technostress on productivity and role stress (Tarafdar et al, 2007). and on job satisfaction, intention to quit and commitment (Raghunathan et al, 2008). Thus scholars have largely focussed on the effect of technostress rather than attempting to understand the mechanism of technostress. Ayyagari et al (2011) attempted to analyze the black box of technostress phenomenon by relating different aspects of technology to the phenomenon of stress. However, the intermediate variables that connect ICT use to technostress have not been examined in detail. Therefore scholars have called for a detailed investigation of the phenomenon of stress due to the new work arrangements facilitated by ICT (Weber, 2004). In our study we attempt to address the above gap by examining the intermediate variables in the phenomenon of technostress, that is, understanding 'how' the technology use can lead to stress.

Rest of the paper is structured as follows. In the next section we draw upon existing literature and derive hypotheses for explicating the process of technostress. Then we present the methodology used and report the findings. The discussion section analyzes the findings with respect to the existing literature and we conclude by highlighting the key contributions.

Theoretical framework and hypotheses development

Stress is defined as an "environmental situation that is perceived as presenting a demand which threatens to exceed the person's capacity and resources for meeting it, under conditions where he or she expects a substantial differential in rewards and costs from meeting the demand versus not meeting it" (McGrath, 1976: 1351). In other words, stress occurs when an individual experiences that the demands placed by environment are beyond one's available resources, thereby threatening one's well being (Cooper et al., 2001). Technostress is a 'modern disease of adaptation caused by an inability to cope with new computer technologies in a healthy manner' (Brod, 1984). ICT can lead to stress in various ways. First, the person may feel intimidated by the technology itself for example, the

individual might feel that the skills required to cope up with the technology use are beyond one's capacity. This may lead to perception of a gap between the environmental demand (use of technology) and one's capacity or resources (acquisition of skills). Second, the use of ICT by the end user may affect the individual's work life and personal life causing stress. The very fact that technology alters the process of information flow and makes the time and physical space irrelevant can lead to perceived gap between environmental demands (such as work overload) and resources available (time). In this research, we attempt to address the second aspect, namely the stress caused by the use of ICT.

Studies have shown that the ICT use can cause stress in multiple ways Barley et al., 2011), such as by increasing the work overload (Hislop and Axtell, 2011), disturbing the work life balance (Murray and Rostis 2007) and by affecting the perception of autonomy of the individual (Mazmanian et al., 2013). All these factors are related to job stress.

Work overload and technostress

It is posited that an important aspect of technology which can lead to stress is by causing work overload, that is, increase in the total amount of work that an individual should be undertaking. In other words, the use of ICT can result in increase in the time spent on working and time being a finite resource, the increased work overload can lead to stress. Work overload is one of the important determinants of job stress (Cooper et al., 2001). Work overload is defined as the perception that amount of work to be accomplished exceeds the individual's capabilities and resources (Cooper et al., 2001).   ICT can lead to additional work burden in several ways (c.f Barley et al., 2011): (1) It is easy and virtually costless to communicate using ICT than written letters and memos making people obligated to handle more communication and spend time in managing the information. Further, the use of ICT has pushed the tasks of administrative aides and secretaries onto the employees themselves (Bellotti et al. 2005); (2) ICT enables people to be connected to the workplace virtually continuously, thus enabling the organizations to give additional work to the individual. Further, the virtual teams working across time zones worsen the situations as the employees need to respond to tasks from co-workers and superiors whose day had already begun; (3) The connectedness afforded by ICT also obligates the employees respond to the queries and demands even when the employee is 'off work'. Therefore, scholars have posited that though ICT offers greater flexibility and control over work in terms of being able to accomplish the

work beyond the constraints of time and space (Valcour and Hunter 2005), these very features can potentially lead to work overload (e.g., Richtel 2003, Alvarez 2005, Stross 2008, Chesley 2005, Boswell and Olson-Buchanan 2007). The ICT induced work overload, in turn, can lead to stress. On the basis of above arguments, we can hypothesize that

      1a. Higher ICT use leads to work overload.
      1b. Work overload leads to job stress.

Work-life (im) balance and technostress

The public-private division is hailed to be the a distinctive feature of modernity, where the importance of private life highlighted the importance of individual's sovereignty (Giddens, 1991). The pervasive connectedness to workplace afforded by the mobility of ICT, however, allows work to invade times and spaces that were traditionally protected from workplace's intrusion (Middleton and Cukier 2006). Indeed, sociologists claim that the distinction between public and private domains should be dispensed with since nothing much of contemporary social life remains on one side or the other of the divide' (Sheller and Urry, 2003: 122). Scholars in the work–life literature posit that ICT can lead to stress as they allow work to spill into space reserved for family and self (Murray and Rostis 2007). Chesley (2005) and Chesley et al. (2003) found that respondents who reported higher use of ICT complained of more negative "work-to-family spill over." Based on self-report data, researchers (Duxbury et al. 2006, Towers et al. 2006) found that the more people relied on communication technologies, the more they worked from home and locations other than their office. Furthermore, the more they used these technologies, the more likely they were to report feeling burned out. These studies rest on variants of the argument that e-mail and other communication technologies produce stress by enabling work to spill into other domains of life, particularly, encroaching upon the time reserved for self and family, thereby making it more difficult to disengage from work and fulfil family obligations (Major et al. 2002, Boswell and Olson-Buchanan 2007).

Therefore we hypothesize that
      2a. Higher ICT use leads to work-life conflicts.
      2b. The work life conflicts leads to job stress.

Individual autonomy and technostress

As MCDs offer connectivity across geographical boundaries, ensure rapid and seamless access to information, and also enable effective data storage and transfer, increasingly professionals are using MCDs to remain connected to workplace (Davis, 2002; Jarvenpaa, 2005). The use of MCDs by professionals has been posited to enhance personal autonomy by enabling the professional to be free of temporal and spatial boundaries of workplace. Middleton (2007) observed that employees using Black-Berry devices in considered that their devices enabled them to have a better control over their environment and thus resulted in empowerment and autonomy. Similarly, Franssila (2013) highlighted how mobile-email acted as an important performance driver for managers, especially those who travelled a lot and those who had to deal with extensive communication volumes. Franssila furthered that the intensive users of mobile-email reported more personal benefits than the non-intensive users.

However, potentially, MCDs can also result in employees being 'on-call' for extended hours and can create the pressure of obligation to respond to the queries and problems raised by superiors and fellow team members even during their time-off. Indeed, various researchers have found that the use of MCDs can lead to increase in working hours and indeed restrict the autonomy of the professional (Gant and Kiesler, 2001).

On the basis of above arguments, we hypothesize that
>   3a. Higher ICT use leads to perception of decreased autonomy.
>   3b. The decreased autonomy, in turn, leads to job stress.


Job support and technostress

The expanded job strain model conceptualizes three major aspects related to job stress, namely, job demands, job control and support (Karasek & Theorell, 1990). Job support, defined as the support provided by the supervisors and colleagues at the work place, has been known to be one of the most important job resource that buffers the employee from job stress (Karasek and Theorell, 1990). In other words, a positive relationship between the employee and superiors/ co-workers provides social support to the individual which in turn buffers the individual from job stress. Job support provides a feeling of being '*appreciated and loved….and being a part of the network'* (Cobb, 1976). Job support has been known to

enhance employee's job satisfaction and sense of well being (Eisenberger et al. 1986, and Beehr et al., 2000). Extrapolating the role of job support as a stress inhibitor to the context of technostress, job support can attenuate job stress in several ways. For example, the supporting supervisors and colleagues may decide not to disturb the employee after office hours or may share the increased work load. Further, the social support received from colleagues and supervisors can enable the individual to balance the pressures of work and family more effectively and can enhance the perception of autonomy.

In the above discussion on stress caused by ICT use, we have posited that ICT use can cause stress by causing increased workload, work life conflict and decreased autonomy. However, as highlighted above, job support can buffer the relationship between (1) ICT use and stressors such as work overload, work life conflict and perception of decreased autonomy and (2) the above three stressors and job stress. Therefore, we posit that

5a. Higher the job support, weaker is the relationship between ICT use and work overload, work life conflict and decreased autonomy

5b. Higher the job support, it is less likely that work overload, work life conflict and decreased autonomy will lead to job stress.
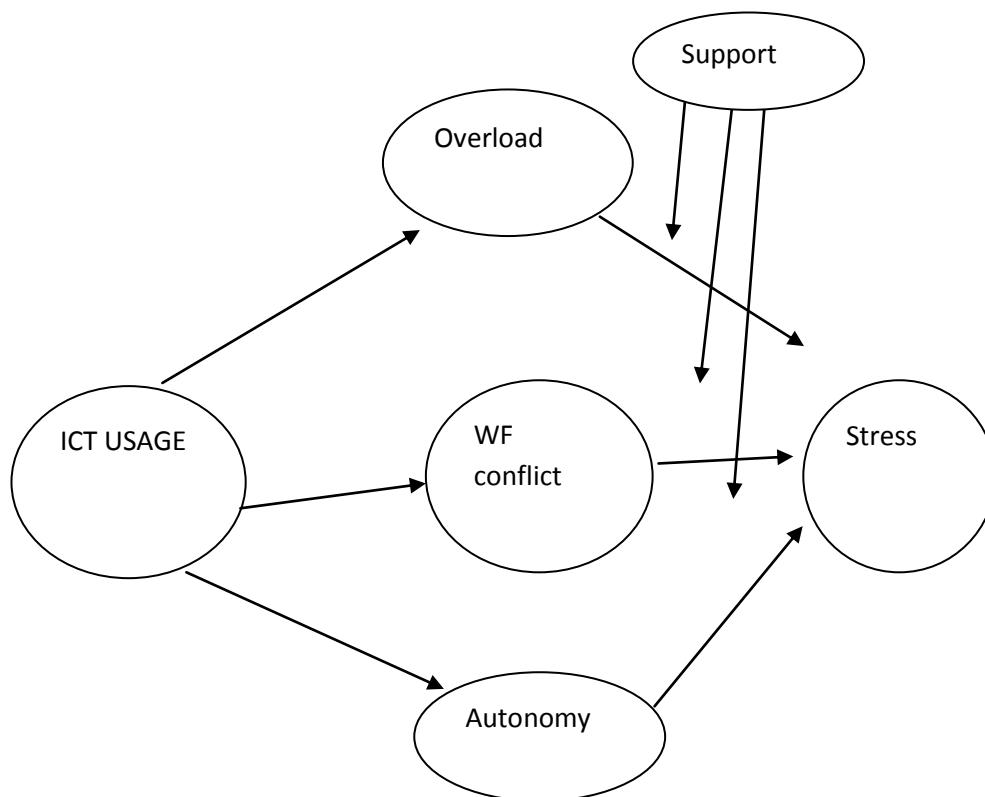
Method

We collected the data for this study from a large supply chain management company based in the Midwestern United States. A survey instrument was sent to 1100 telecommuter of which 417 (37.9 per cent) completed responses were received. There were 296 male (71 per cent) and 121 female (29 per cent) respondents. On average, respondents had spent at least 1 year telecommuting, suggesting they had sufficient telecommuting experience to respond to our survey. The organisation's norms for employees to work during weekdays between 8 am to 5 pm. Teleworkers spent no more than 4 days per week telecommuting. All employees in this sample were full-time employees. Respondents had an average income above $42,000, and were generally well educated with over 75 per cent holding a bachelor's degree or higher. Respondents had a mean age of 26–35 (10 per cent, 18–25; 52 per cent, 26–35 years; 29 per cent, 36–45 years; 5 per cent, 46–55 years; 5 per cent, above 56).

Autonomy was measured by a 9-item scale by Breaugh (1989). A sample item was 'I have the freedom to schedule my work as per my desire' ($\alpha = 0.92$). Social support was measured by two subscales developed by Karasek (1998). This scale measured the social support from the supervisor. A sample item was "My manager is willing to listen to my personal problems' ($\alpha = 0.85$ for managerial). Work overload was measured using 3-item scale developed by Spector et al.(1988) measuring quantitative overload. A sample item is 'How often is there a great deal to be done?' ($\alpha = 0.74$)

ICT was measured using single self-report item. The item asks respondents to indicate the number of hours (per day) spent using ICT. On average, respondents teleworked 3.5 hours per day, ranging from 2 to 7 hours per week.

We used 3 item sub-scale developed by Stephens and Sommer (1996) to measure work family conflict based on time constraints. A sample item is 'My work keeps me from my family more than I would like'). ($\alpha = 0.82$)

Job stress was measured using a four-item scale developed by Motowidlo et al. (1986) A sample item was "My job is extremely stressful." ($\alpha = 0.68$)

Findings

ICT was positively related to overload (t=2.081, p=0.019) supporting H1a. Overload was positively related to stress (t=2.281, p=0.011) supporting H1b. ICT, however, was not related to WFC (t=-0.944, p=0.173), thus Hypothesis 2a was not supported. WFC was significantly related to stress (t=-1.895, p=0.049) and in a negative direction which is consistent to H2b. H2b, therefore, is supported. Consistent with H3a, ICT was negatively related to autonomy (t=-1.907, p=0.046). As per H3b, autonomy was negatively related to stress (t=-3.181, p=0.000).

The mediating roles of overload, WFC, and autonomy on the relationships between ICT and job stress (H1c, H2c, and H3c) were supported. The model (Model 1) with overload as the full mediator achieved a good fit: X^2= 378.618, df=199, GFI=0.938, AGFI=0.921, CFI=0.967, IFI= 0.968, NFI=0.934, RMSEA=0.042. Further, two alternative model were estimated. Second model (Model 2) had overload as partial mediator and third model (Model 3) had overload as another outcome along with stress. We then compared the Model 1 with alternative models (one with overload as a partial mediator and the alternative with overload as an outcome) using bootstrap with 1,000 samples. The mean discrepancy between implied and population moments, AIC, BCC, and CAIC were used for model comparison. The overload as the full mediator model had the lowest values (mean discrepancy=479.453, s.e.=0.974; AIC=486.618; BCC=491.718; and CAIC=769.382) for all these indicators compared to that of the alternative model 2 (mean discrepancy=534.118, s.e.=0.969; AIC=499.545; BCC=502.323; and CAIC=798.124) and alternative model 3 (mean discrepancy=555.719, s.e.=0.964; AIC=560.557; BCC=565.375; and CAIC=827.612). Thus overload fully mediated the influences of ICT on stress. Finally, the total effects, direct effects and indirect effects on stress as an outcome variable were estimated. The break downs of the effects of ICT on stress is total effect=0.033, direct effect=0.042, indirect effect=0.009. Therefore, overload fully mediated the influences of ICT on stress. Similarly, the mediating effect of autonomy and WFC on the relationship between ICT and stress was estimated. The results of analysis indicated that autonomy and WFC fully mediated the relationship between ICT and stress.

For testing the moderating role of job support (H4, H5, and H6), we utilized a multi-group analysis. A multi-group analysis is a technique based on the dichotomization (median split) of the moderator variable. Job support (JS) was split at the median to create two samples: a high JS sample and a low JS sample. We used a two-step approach (Byrne 2001), first analyzing a model with parameters set equal across sub-samples. In the second model, all paths were constrained to be equal across sub-samples, except for the links potentially affected by the moderator variable. Further, we tested for chi-square difference between the two models. A significant decrease in chi-square from the first model to the second model implies that the moderator plays a significant role in the relationship between the independent and dependent variable (Brockman and Morgan 2003). Although the median split of the moderator variable may result in the reduction of power, the robustness of the procedure allows for statistically examining whether a construct's influence on the outcome variable is a result of the moderator variable (Irwin and McClelland 2001; Homburg, Grozdanovic, and Klarmann 2007). Consequently, median split based multi-group analysis has been widely used as a statistical technique for testing moderating effects in recent studies (See Homburg, Grozdanovic, and Klarmann 2007; Palmatier, Scheer, and Steenkamp 2007; Ganesan, Malter, and Rindfleisch 2005)

The chi-square difference between the unconstraint and constraint models was 111.248 and the difference of df was 2. Thus the chi-square difference was significant (critical value of chi-square at 0.05 level for 2 df=5.991) supporting H4 The same procedure was followed for the other two moderating effects. The chi-square difference (337.871) for the moderating effect on the WFC-stress relationship was significant. Thus H5 was supported. The chi-square difference (143.522) related to the moderating influence on autonomy-stress linkage was significant, supporting H6.

Discussion

Our study explores the mechanism of technostress by quantitatively assessing the relationship between ICT use and stress. Specifically, the study examines the mediating role of perceived autonomy, work overload and work family conflict. The findings indicate that increasing ICT use leads to perception of work overload and lack of autonomy in work role. Thus the findings reiterate the earlier research which proffered that increased ICT use can lead to work overload and lack of autonomy (Ahuja et al., 2007; Mazmanian et al., 2013). Further, the

study highlights that it is the perception of work overload and lack of autonomy that lead to higher stress amongst ICT users (Ayyagari et al., 2011).

Though ICT was designed to enable the individual to manoeuvre the pace of work and hence manage the work load according to his/her individual needs, scholars have reported that ICT, in fact, can cause work overload (Hislop and Axtell, 2011). Studies have shown that ICT affordances along with organizational expectations and individual personality traits create a social expectation and obligation of constant connectivity, which in turn can lead to ICT induced work overload (Manzmanian and Erickson, 2014). As explained earlier, ICT can lead to work overload in multiple ways, (1) handling work related issues beyond stipulated office hours, (2) time zone difference between office and home can lead to accumulated work and (3) imperative to respond to the work related issues immediately. Work overload, in turn, is known to be a potent stressor (Cavanaugh et al., 2000). ICT use can result in long hours and frenzy of the pace of information flow, which can potentially lead to work stress. Our study reiterates the above findings by establishing that ICT use can result in perception of work overload, which in turn can cause work stress.

According to the extant literature, the relationship between ICT use and autonomy is ambiguous (Mazmanian et al., 2013).. While on one hand ICT enables the employee to schedule the work according to his/her constraints, technology can also potentially create an obligation for an employee to remain connected to the work place. Thus, technology per se is 'autonomy neutral', and it is the 'perception of the employee' about technology that determines whether ICT use enhances or diminishes autonomy (Mazmanian et al., 2013). As highlighted earlier, studies have found equivocal support for both positive (See for example, Kunda, 2006) and negative (See for example Ahuja et al., 2007) relationship between ICT use and perception of autonomy. In our study, consistent with the latter, we found that ICT use was negatively related to the perception of autonomy and further that lack of autonomy was directly related to work stress. This is in line with previous studies that have shown that ICT can lead to undermining of an employee's autonomy due to increased expectations of availability and responsiveness (Mazmanian et al., 2013; Ayyagari, 2011, Barley et al., 2011). The finding has important implications as organizations which promote ICT usage should ensure that associated systems and processes are designed so as to enhance the perception of autonomy. The findings also point to the exploration of processual aspect of relationship between ICT use and autonomy as a potential research area. Specifically

incorporating the contextual dimensions of work would enable the scholarship to extend the understanding of the relationship.

However, contrary to other studies (such as Ahuja et al., 2007; Chesley, 2005; Murray and Rostis 2007), the relationship between ICT use and work family conflict was not significant, though the direction of the relationship was as hypothesized. There can be many reasons for this. As some studies have shown, employees might feel that though ICT engages them in work related tasks during their 'off time', ICT allows them to remain with their families and hence ICT use may not give rise to perception of work family conflict, though causing spilling over of work into family space (Mazmanian et al., 2013). In other words, at a perceptual level, the employee might feel that though ICT causes increased work load and decreased autonomy, it nevertheless, allows the employee to be with the family. Second, the employees also get used to the ICT facilitated encroachment of work related issues into the family domain and they, hence, may not perceive it as work family 'conflict'. Further, the family members of the employees who use ICT might get accustomed to the employee's tendency to engage in office work through ICT beyond the stipulated office timings. Thus, in spite of work related encroachment of family space, ICT may not lead to work family conflict as ICT enables the employee to negotiate competing demands of work and family spaces. However, further research, including in depth qualitative methods, may be required to understand the relationship between ICT use and work life conflict.

The work stress literature highlight the role of job support or social support in job as an important variable in the process of work stress. Buffer hypothesis of the Karasek's JDCS model posits that social support moderates the negative impact of job circumstances related to high strain (a combination of high demands and low control), that is higher job support enables the employee to cope with the strain due to high demands and low control (Hausser et al., 2010). For example, Johnson and Hall (1988) proffered that high job control buffers strain due to high demands most effectively under high social support. Job support enhances the individual's coping ability and therefore, act as buffer against stress (Cooper et al., 2001). In line with the studies on job stress, the above study demonstrates that job support moderates the relationship between the ICT use and stress, so that more the job support lesser is the chance that work overload, loss of autonomy and work family conflict will lead to work stress.

Our study extends the understanding of the phenomenon of technostress in multiple ways. In comparison to a multitude of earlier studies that have studied the phenomenon of technostress, our study analyzes the processual aspect of the phenomenon- examining *how* ICT use causes work stress. Further, most studies have analyzed one particular aspect of ICT usage in technology stress such as Black Berry (Mazmanian, 2006), email (Barley et al., 2011), mobile e mail (Franssila, 2013) and so on. With the advancement in the specifications and functionalities of the mobile phone devices, a single hand held device enables individuals to connect through emails, text messages and phone calls. In this study, therefore we refrain from focusing on specific aspects of technology. Rather we focus on understanding the mechanisms of technostress. In this study we address the above gaps by proposing and then quantitatively analysing a model explicating the process of technostress.

Conclusion

ICT use has had a significant influence on communication processes thus impacting the organizational and personal life. While organizations are attempting to embrace the benefits of ICTs, including information pace and connectivity, which have largely increased efficiencies in information storage, processing, and retrieval, ICTs can lead to work stress and can potentially affect employee productivity. The above study has implications for the organizations as it explicates the process of technostress, highlighting that ICT can lead to perceptions of work overload and loss of autonomy, which in turn, can lead to work stress. Further, job support moderates the relationship between stressors and stress. The organizations can take cognisance of the and incorporate the design the ICT systems in such

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