Technostress: Implications for Adults in the Workforce

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The use of technology can enhance workplace efficiency, productivity, and flexibility; yet, technological tools can have negative effects on individuals’ cognitive, psychological, and physical health, as well as on organizations (e.g., lowered employee satisfaction, decreased employee commitment). The use of information and communications technologies (ICT) adds to existing work stress. The authors reviewed recent literature to identify ICT trends, define key terms, and gain insights to improve awareness of ICT issues related to career development, health and wellness, and job security. The potential for inquiry as it relates to career exploration, development, and advancement is relevant to counselors and clients in today’s workplace. Research is needed to examine the effects of technostress across different industries, to identify workers at greatest risk of adverse effects, to explore the impact on career decision making, to help clients develop personal coping resources, and to determine strategies for career professionals to collaborate with workplace managers.

Keywords: technostress, technology, job skills, occupational health, technological literacy

Although some workplace technologies create efficiency, productivity, and flexibility (Society for Human Resource Management, 2014), recent literature reflects an increasing interest in the effect of technostress on employee health and productivity (Laspinas, 2015). Brod (1984) defined technostress as ineffective coping with technology that results in distress. Use of information and communications technologies (ICT), such as cell phones, voice mail, e-mail, and instant messaging, can challenge employees by creating a range of stressors, including overload, role ambiguity, and job insecurity (Fenner & Renn, 2010; Grant, Wallace, & Spurgeon, 2013; Knani, 2013). ICT can create somatic stress responses (e.g., Riedl, 2013; Riedl, Kindermann, Auinger, & Javor, 2012) and is associated with job strain, poor self-rated health, and workplace effort–reward imbalance (Stadin, Nordin, Broström, Magnusson Hanson, Westerlund, & Fransson, 2016).

ICT-related stress, which is distinct from general work stress, adds to overall work stress even when job demands, demographics, and job variables are controlled (e.g., Ayyagari, Grover, & Purvis, 2011). Use of ICT changes not only the way people complete their work but also the work environment and culture (e.g., Ragu-Nathan, Tarafdar, Ragu-Nathan, & Tu, 2008). As technology alters the nature and tempo of work, researchers are only now starting to investigate its effect on individuals and organizations (Tarafdar, Tu, Ragu-Nathan, & Ragu-Nathan, 2011). Psychosocial hazards such as work stress are globally recognized health risks (Leka & Jain, 2010). With 24/7 access to work enabled by ICT, telecommuting, and tech-based automation, it is prudent to explore the impact that work “anytime and anywhere” has on workers.

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Regardless of occupation, employees across industries manage and use technologies in their jobs. They must meet expectations for timely responses from multiple directions and are asked to complete tasks simultaneously from different channels. Many workers cope with technostress on an individual level, despite attention to organizational environments and resources that contribute to technostress (e.g., Tarafdar et al., 2011; Wang, Shu, & Tu, 2008). Furthermore, some literature suggests that technostress impacts family life and recovery from work (Diaz, Chiaburu, Zimmerman, & Boswell, 2012). This impact is more than psychosocial, with research linking technostress to measurable changes in physiology (e.g., Riedl, 2013).

Despite the work implications, the career development literature contains little information about the effects of ICT use on workers. Some information exists on the use of social media and the Internet for career planning and career service delivery (e.g., Kettunen, Vuorinen, & Sampson, 2015; Osborn & LoFrisco, 2012; Sampson & Osborn, 2014). Other research addresses ways to incorporate ICT into career practices (Bimrose, Kettunen, & Goddard, 2014) and workforce development (Bimrose, Hughes, & Barnes, 2011). Researchers also have examined career professionals’ use of ICT for career information and client decision making (Osborn, Kronholz, & Finklea, 2014) and associated ethics (e.g., Sampson & Makela, 2014). There is literature on use of ICT as a flexible tool consistent with career self-construction (Bernaud & Di Fabio, 2011). Diaz et al. (2012) studied attitudes about communication technologies flexibility and work outcomes. They found that although flexible attitudes increased use of communication technologies and work satisfaction, work–life conflict also increased.

Given the expanding use of ICT across industries, career professionals must understand how technostress could impact their clients. For this review, we examined how technostress may affect career planning and decision making as well as individual and organizational functioning.

Technostress

Brod (1984) defined technostress as a “modern disease of adaptation caused by an inability to cope with the new computer technologies in a healthy manner” (p. 16). Technostress is mental stress from technology (Weil & Rosen, 1997) and includes physiological and emotional arousal (Arnetz & Wiholm, 1997). Existing definitions generally refer to physical, behavioral, and psychological strain (Salanova, Llorens, & Cifre, 2013) in response to ICT dependence, increasing computer complexity, and ICT-driven work changes (Ragu-Nathan et al., 2008). Technostress models and definitions are composed of three main categories: (a) transactional and perceived stress, (b) biology, and (c) occupational health. These categories provide a framework for discussing the potential impact of technostress on individual career choice, transitions, and decision making, as well as on organizational outcomes.

Transactional and Perceived Stress

Researchers studying organizational behavior describe technostress as a collection of interrelated psychosocial constructs that negatively impact employees. Managerial interventions are designed to reduce the impact of these stressors on ICT users (Day, Paquet, Scott, & Hambley, 2012c; Ragu-Nathan et al., 2008). This line of research focuses on employee transactions at work in an imbalanced work situation that affects organizational outcomes.
For example, person–environment fit theory assumes that attitudes, behavior, and outcomes are a result of an interaction between the individual and the environment (Edwards, 1996). The Job Demands–Resources model (Demerouti, Bakker, Nachreiner, & Schaufeli, 2001) explains workplace conditions that influence employee health impairment and motivation. Job demands have a negative impact on health and motivation that results in burnout and the intent to leave; job resources have a positive impact on health and motivation that results in employee engagement and organizational commitment (e.g., Llorens, Bakker, Schaufeli, & Salanova, 2006).

Ragu-Nathan et al. (2008) used a transactional approach to describe a combination of tasks and roles that create stress (e.g., increased information-processing requirements, role ambiguity) and situational factors, such as organizational mechanisms, that buffer the impact of ICT (e.g., perceived control). Technostress affects job satisfaction, organizational commitment, and employee outcomes (e.g., absenteeism, turnover). It is defined using two dimensions: technostress creators and technostress inhibitors (Tarafdar et al., 2011). Technostress creators include techno-invasions (constant connectivity that invades life), techno-overload (simultaneous, different streams of information that increase the pace and volume of work), techno-uncertainty (from a change or upgrade to hardware, software, or applications; ambiguity around expectations related to changes), techno-insecurity (employees feel threatened by job loss to technology or other people with more ICT understanding), and techno-complexity (inherent complexity of ICT that users find difficult to understand, which leads to feelings of incompetence). Technostress inhibitors include literacy facilitators (knowledge sharing, teamwork, end-user training, user guides), technical support provision (assistance provided to employees to reduce techno-complexity and techno-uncertainty), and involvement facilitation (mechanisms to engage employees in adopting systems). Ragu-Nathan et al. (2008) created and validated measures of technostress creators and inhibitors consistent with their definitions.

Day et al. (2012c) identified perceived ICT demands and supports. Demands include external events with the potential for a negative outcome that depends on individual perception of a psychological threat. Extended perceived stress results in strain or burnout and its concomitant effects of cynicism, emotional exhaustion, and reduced work self-efficacy. ICT demands include (a) the extent to which employees experience hassles (i.e., regular demands on employees, such as reacting to malfunctions), (b) the amount of information ICT provides (e.g., overload, disruptions from a barrage of information), (c) the extent to which ICT increases employees’ work outside of business hours (e.g., demands beyond regular hours, flexibility), (d) the extent to which ICT increases workloads (i.e., enables excessive work or efficiency), (e) the lack of control employees have over ICT (e.g., strain, increased anxiety/frustration), (f) the requirement of learning and mastering new ICT knowledge and skills (e.g., implementing upgrades/changes, meeting expectations for mastering ICT), (g) the extent to which ICT influences communication among employees (e.g., increased access, amplified miscommunications), and (h) the extent to which ICT is used to monitor employees (e.g., keystroke information, supervised phone conversations). These interactions with the environment also include ICT policies about work–life balance. Day et al. (2012c) outlined organizational supports that alleviate demands (personal assistance, upgrade support, IT staff) and also validated the ICT Support Scale (Day, Paquets, Scott, & Hambley, 2012b) and the ICT Demands Scale (Day, Paquets, Scott, & Hambley, 2012a).
For career professionals, the existing research helps increase understanding of contemporary workplace stress from an organizational vantage. It extends career professionals’ understanding of job demands and workers’ wellness to include ICT technostress and includes constructs familiar to career professionals (e.g., work role ambiguity, role conflict, job insecurity) and shares theory represented in career literature (e.g., Webster, Beehr, & Christiansen, 2010; Webster, Beehr, & Love, 2011). Collectively, the researchers have identified multiple sources of technostress and discussed employers’ interventions (Day et al., 2012c). There are validated instruments that career professionals or researchers could use to explore the role of technostress on work factors (e.g., commitment, performance). Conversely, although the definitions of technostress seem similar, there is no agreed-upon definition in this literature.

**Biology**

Some researchers have defined technostress as a psychosomatic problem (e.g., Arnetz & Wiholm, 1997; Riedl, 2013). This psychophysiological approach incorporates theory on physiological systems, or feedback loops, that regulate the body (e.g., temperature, blood sugar) to stay at set points. When there is a discrepancy, the systems work to return to a set point, much like a thermostat responds to room temperature changes. When stressful situations remain unresolved, with chronic activations of regulating systems, the result is a cumulative “wear and tear” effect, much like the effect of an open window in winter making a thermostat work overtime. Repeated unresolved states lead to damage or fatigue that compromises health (e.g., Goldstein, 2010). ICT use can increase heart rate, blood pressure, and stress-hormone production (e.g., Riedl et al., 2012; Riedl, Kindermann, Auinger, & Javor, 2013), or change immune system, sleep, and gastrointestinal activity (Riedl, 2013). There is evidence that people respond physiologically to ICT before they perceive a situation as stressful (e.g., Hjortskov et al., 2004; Riedl, 2013). Moderators such as gender can change physical responses elicited by ICT malfunctions (Riedl et al., 2013). Using evolutionary theory, Riedl et al. (2013) found that stress levels related to ICT accomplishment failures were higher for men than for women, which was consistent with research on the experiences that are stresses for men (achievement or accomplishments) versus women (interpersonal conflict). Riedl et al. (2013) found that men’s physiological stress was higher than women’s for ICT breakdowns that led to task failures, particularly those with added time pressure. In contrast, increased physiological activity is not always distressing by nature (Szabo, Tache, & Somogyi, 2012). Keller, Bless, Blomann, and Kleinböhling (2011) found that a positive subjective experience can simultaneously be recorded as changes in heart rate and stress hormones when using ICT. Additionally, technostress countermeasures can reduce biological measures. For instance, variations in break times, implementation of relaxation techniques, and choice of music can change biological stress measures positively (e.g., Riedl, 2013).

Adapting a biological model offers potential areas for career development research. The literature on psychosomatic technostress underscores how humans respond physiologically to ICT in negative ways (Riedl, 2013). Research does not define the degree of physical detriment technostress has at work. Although occupational stressors, such as role ambiguity or job control, impact physical health (Nixon, Mazzola, Bauer, Krueger, & Spector, 2011), the extent to which technostress affects employee health is not clear from this research. Additionally, the biological instruments used in these studies
required a knowledge of physiological markers of stress and of instruments that are unfamiliar to most career professionals. Nonetheless, biological information about cardiovascular or endocrine system functioning is an objective source of information and indicator of health (Riedl, 2013). The countermeasures or moderators (e.g., gender, age) that mitigate technostress are unclear. Finally, this research uses monitoring atypical of work. Competitive athletes use wearable technologies (e.g., clothing embedded with components that collect data) to self-monitor their physical and biological activities and use this to reduce stress or prevent injury (Page, 2015). Some jobs, however, may not allow for use of wearable monitors for research.

**Occupational Health**

ICT technostress is explained by occupational health resource theories that consider multiple resources (e.g., socioeconomic status; environmental, economic, personal, and social support) that interact with demands. Individual and contextual resources can be gained or lost, spiraling positively or negatively such that negative events beget or accelerate further resource loss cycles (Hobfoll, 2001). The Resources–Experiences–Demands (RED) model (Salanova, Cifre, Llorens, Martinez, & Lorente, 2011; Salanova, Llorens, & Cifre, 2013; Salanova, Llorens, & Ventura, 2014) includes theoretical grounding in a spiral model of occupational health that explains the process of technostress as a negative spiral resulting in deterioration (Salanova et al., 2014). The RED model includes antecedents and consequences of technostress at individual, organizational, and social levels. Psychosocial health is concerned with distress and well-being.

According to Salanova et al. (2014), technostress is a negative psychological state related to current or future use (or abuse) of technology. This overarching concept encompasses two experiences: technoaddiction and technostrain. **Technoaddiction** is based on workaholism research with compulsive use and excess devotion of time associated with it. It has an uncontrollable “have to” pressure paired with anxiety when not using ICT. **Technostress** includes four interrelated constructs—anxiety, fatigue, skepticism, and inefficacy—that occur in a chain-reaction relationship. **Anxiety** is an overactivated emotional response of fear, apprehension, or agitation characterized by high physiological activity and tension. **Fatigue** is an affective response typified by low activation from information overload. **Skepticism** is attitudinal and characterized by cynicism mirroring burnout. Users feel exhausted or discouraged and display distant, detached, and indifferent attitudes toward technology. **Inefficacy**, a cognitive dimension, involves perceived levels of ICT efficacy. With chronic anxiety, fatigue, and skepticism, users’ ICT self-efficacy lowers (Salanova et al., 2013, 2014). There is empirical support for the factor structures from multigroup confirmatory factor analysis and for the predictors of technostress using multiple regression analyses (e.g., Salanova et al., 2013). ICT technostress has three predictors: technology demands, lack of technological resources, and lack of personal resources.

**Demands.** The technology demands predictor refers to the psychological or physiological cost of the sustained effort required of employees related to ICT use in the organization. Such demands can include work overload (e.g., excess work, attentional demands), ergonomic stresses, the pace of work (i.e., time to perform tasks is less than available time), role ambiguity (tasks associated with ICT are poorly defined), and monotonous and unchallenging ICT tasks. At the societal level, formation of human relationships around use of ICT can create social isolation, emotional overload, or role
conflict (e.g., multiple virtual teams operate differently, old and new systems operate concurrently). Organizationally, demands may relate to competitive advantage in the labor market. This can take the form of job insecurity (i.e., jobs at risk because of ICT), organizational culture (e.g., limited ICT choices), or work–life conflicts.

**Lack of technological resources.** This predictor refers to aspects of working with technology that allow employees to reduce ICT demands, achieve work goals, or increase personal/professional growth. At the individual level, this takes the form of autonomy (e.g., communication technology control, responsibilities), participation in using ICT, task variety (e.g., changes in job/environment from ICT), and clarity of tasks (i.e., role and tasks well defined). At the societal level, this comprises social networks or trust (i.e., how workers relate to one another), transformational leadership (e.g., negative predictor of technostress), social support climate, and feedback (e.g., user has clear information). Organizationally, this refers to healthy human resource practices that facilitate users’ acceptance of ICT or positive psychosocial outcomes. It includes ICT implementing policies (e.g., work controlled by users vs. ICT-directed activity), quality training, and work–life balance. Finally, outside resources can buffer technostress (e.g., family or friend support).

**Lack of personal resources.** This predictor refers to personal resources for coping with ICT demands and low ICT resources. The antecedent includes coping strategies, past ICT use, and self-efficacy. Coping includes efforts to control perceived ICT demands that exceed individual resources. These are workers’ behaviors to modify their situations or behaviors to change their emotions. There is a negative impact of past ICT use (e.g., prior negative experiences). Self-efficacy is the belief in one’s ability to use ICT. High ICT self-efficacy increases effort to engage, but low ICT self-efficacy leads to burnout.

The consequences of technostress are physiological, psychosocial, organizational, and societal. Physically, workers can develop problems or health can deteriorate. Psychosocial problems (e.g., anxiety, job dissatisfaction, decreased work engagement) can lead to mental exhaustion or user belief of incompetence. Employers can observe low performance and absenteeism, excess personal use of ICT, or low commitment and retention. At the societal level, ICT abuse can deteriorate social contact and networks or can create financial problems.

The RED model reflects a holistic approach to technostress that considers personal and contextual resources that either cause deterioration or build upon existing strengths, which is consistent with a whole-person approach to career development. There is empirical support for the RED model, constructs, and questionnaire (e.g., Salanova et al., 2013). Although the model is promising for research and career practitioner use, some intervention guidelines and studies are in Spanish (e.g., Llorens, Salanova, & Ventura, 2011). Studies in English do provide evidence for scale validity and demonstrate that job demands (e.g., overload, role ambiguity) and lack of personal resources (e.g., autonomy) predict technostrain and addiction (Salanova et al., 2013). Moreover, the model is broader in focus than transactional and biological models, recognizing biological, cognitive, and psychosocial resources/lack of resources in the individual, the workplace, and society. It offers a basis for understanding client performance at work and potential points of intervention (e.g., assist clients to decrease technostress by increasing personal resources). Similarly, career professionals routinely support individuals with work skills development, employability, work adjustment, and job stress, among other areas (e.g., self-efficacy) included in this model. Counseling for deterioration could be within the scope of career counseling with appropriate training.
Discussion

Implications for Career Development Professionals

Are career professionals discussing technostress when intervening with clients, consulting with a company, or managing employees? Today’s career professionals work in a range of contexts with individuals and organizations. The impact of technostress can affect individuals and organizations in a variety of ways. Therefore, it is important to increase career professionals’ awareness of technostress issues and interventions related to career development, health and wellness, and job security at individual and organizational levels. Herein, we review key issues in this regard and identify areas for future research.

Individual interventions. When working with individual clients, it becomes important for career professionals to attend to their unique technostress experiences. As the RED model proposes, technostress issues can originate from many sources beyond the individual (Salanova et al., 2014). As practitioners who help clients working in tech-heavy workplaces, how do career professionals broaden their understanding of the potential influence of technostress? For example, when career professionals talk about the work environment, it is common to consider social relationships and work–task productivity. Technostress research suggests that professionals attend to additional workplace mediators and sources of workplace satisfaction. If a career professional suspects that a client is experiencing technostress, it might be helpful to incorporate some existing tools for obtaining information needed to evaluate the problem. For example, there is an RED technostress questionnaire (Llorens et al., 2011; Salanova et al., 2013). Day et al. (2012a, 2012b) developed measures of ICT demands (e.g., hassles, response expectations, workload) and employer ICT supports (e.g., extent of organizations’ support). These measures can identify ICT demands, organizational norms, and ICT resources.

As a construct, technostress can be incorporated when conceptualizing the nature of an individual’s career problem. For instance, if a client’s sleep patterns impact work performance because of late-night e-mail checks, it might be tempting to attend only to workplace performance issues. It also makes sense, however, to explore some technostress factors, such as work expectations related to response time. Likewise, it might be useful to explore if this is a technological form of workaholism, in which case it might be fruitful to address a client’s compulsive feeling to stay connected. Perhaps anxiety regarding work is from electronic performance monitoring, which warrants asking clients what effect the monitoring of keystrokes or calls has on them.

Interventions can address not only technostress management issues while at work and job satisfaction in general, but also skill development and career management topics. As an example, a client might feel threatened because in a recent restructuring memo his or her employer announced planned changes to individual roles and responsibilities as new ICT solutions are adopted. This scenario could prompt a variety of career discussions, such as whether the client feels uncertain about the unknown impact of ICT changes. It could create insecurity over job loss or personal competencies. In addition, the work environment restructuring could prompt a skill gap analysis. The problem can be reframed as an opportunity for self-evaluation, including what knowledge, skills, and abilities the client wants to develop for future work. It is an opportunity to reevaluate general career direction.

Organizational interventions. If one works primarily with organizations, there are reasons to attend to technostress to limit its impact on company
outcomes. As with an individual, organizational technostress can be assessed. The relationship of technostress to organizational outcomes is undesirable when technostress leads to turnover or absenteeism (e.g., Fuglseth & Sorebo, 2014; Ragu-Nathan et al., 2008). This has implications for how managers handle ICT.

Career professionals can work with leaders in organizations to consider overall group needs when managing the ICT dimension at work (Ragu-Nathan et al., 2008). There can be instances when ICT use is more stressful for workers based on gender or age. For example, Ragu-Nathan et al. (2008) examined relationships between gender, age, education, and computer confidence. Men experienced more technostress than women; as age, computer confidence, and education increased, technostress decreased (e.g., Ragu-Nathan et al., 2008). Although, overall, technostress creators lead to poor work outcomes, employees’ personalities can mediate technostress creators and work outcomes (Srivastava, Chandra, & Shirish, 2015). For instance, a proactive personality that is disposed to confront a situation and transform it can lessen the impact of communication overload on productivity (Hung, Chen, & Lin, 2015). Technostress can differ depending on job type and user socioeconomic status (e.g., Stadin et al., 2016). Technostress is perceived differently in large and small organizations and can be mitigated with organizational-level interventions (Salanova et al., 2014; Tarafdar, Bolman-Pullins, & Ragu-Nathan, 2015), such as providing training in advance of ICT changes to increase self-efficacy, implementing strategies to balance work/personal life (e.g., flexible work schedules), and addressing organizational culture and expectations.

ICT changes require planning and sensitivity to how ICT is introduced, chosen, and implemented (Ragu-Nathan et al., 2008). When appropriate, career consultants could use existing tools to determine organizational outcomes related to technostress, especially for fields experiencing rapid changes (e.g., Ragu-Nathan et al., 2008; Tarafdar et al., 2011). Ragu-Nathan et al. (2008) identified that their scale can assist in determining the absence and presence of factors that result in technostress. Career professionals, human resource personnel, and managers can use such research to identify mechanisms to increase satisfaction and employee retention. Likewise, scales by Day et al. (2012a, 2012b) can help in evaluating corporate expectations and norms within a company to identify prevalent ICT demands and employee outcomes. It could help managers identify employee support efforts for ICT (Day et al., 2012b, 2012c).

New technologies and skills implications. Lists of 21st century workplace skills include topics related to inventive thinking, high productivity, the adapting and managing of complexity, self-direction, prioritizing and planning, sense making, and knowledge management (National Institute for Professional Practice, n.d.). Career professionals should be aware of these topics and how they may affect aptitude for a career choice, as well as decisions about career development. These skills are not unique to ICT, but the way in which they are applied now involves multiple technological tools. As employees learn to use individual tools, there is an expectation that ICT will be integrated into their workflow effectively and efficiently on a larger scale than has been experienced in the past. Discussions with clients might address employer “upskill” opportunities.

Furthermore, ICT literacy is now listed as a basic skill among core work-related skill sets (World Economic Forum, 2016). Although the ICT industry helped drive a “third industrial revolution,” the global workforce can expect that the technological disruptions to industry and business structure will continue with new technologies on the horizon (e.g., artificial intelligence,
robotics, 3-D printing). The digital transformation within most industries and regions is predicted to continue at a fast pace (World Economic Forum, 2016). Workers have ongoing changes to job functions that require continual skill acquisition and decisions related to career development. By extension, the phenomenon of technostress can be expected to continue, albeit it will likely apply to a broader array of technologies than ICT.

**Health implications.** Salanova et al. (2014) pointed out that wellness is not just the absence of illness. It raises the question, what do career professionals know about the impact of technostress on well-being? There is evidence that technology and the changes that result from infusing it into work can lead to general kinds of stress, like role ambiguity and lack of feedback. There are health implications for excessive stress, but what impact does routine technostress have on worker psychosocial or physical health? It is easy to understand how a jackhammer impacts physical health, but it is difficult to see how ICT equipment affects workers physically or psychosocially. If an organization structures its personnel and workflow to telecommute, it is hard to predict which employees will find it useful and which will be challenged. Vartiainen and Hyrkkänen (2010) found multilocational work affects manager and employee mental workload. This work space can contribute to well-being (e.g., managers empower employees) or to stress (e.g., managers have less interaction with employees, are unable to locate an employee). It is equally unclear what physiological changes caused by ICT influence individuals and organizations in productivity or health care costs. Similarly, there is a need for career professionals and managers to understand technostress prevention and intervention as well as the application of change management principles to technostress (i.e., change in work roles and business structure from technology).

**Job security/workplace stability implications.** The impact of technology on different work environments may vary, but changing skill sets and employment qualifications include those related to technology. It is important for career professionals to understand the impact technology has on required skills when working with clients who are entering a new career path, changing their workplace setting, or advancing with their employer. Technostress could be an indicator that a client is no longer effective at a job or that there are changes to occupational requirements.

Although technology is not the sole source of industry change, there are yet-to-be-realized technologies that could change the employment landscape dramatically. It is reasonable to expect that convergence of new technologies (e.g., machine learning, autonomous transport, processing power) will influence employment trends. For example, the World Economic Forum (2016) has termed the next wave of technologies as a fourth industrial revolution, which includes the impact of technology-based disruptors. This has implications for skills stability, industrial changes, and new business models (World Economic Forum, 2016).

New structures and technologies hold great promise for economic growth; however, changes to industry and individual job functions can create instability for workers. Clients involved in career counseling may express a feeling of incompetence, for example, or feel threatened by an employer who hires new workers with advanced ICT skills rather than train existing employees to perform jobs. This issue transcends a white-collar versus blue-collar issue.

**Implications for Future Research**

Our primary intent in this article was to provide an initial overview of the early research in organizational management, psychology, occupational health, and
human–computer psychophysiology for career development professionals. We attempted to incorporate this fragmented work into an interdisciplinary view to improve career professionals’ awareness of the issues and to expand research conducted on these topics by career counseling professionals. The potential for inquiry as it relates to career exploration, development, and advancement is relevant to counselors and clients who interact with today’s workplace.

There are potential areas of exploration within the career development field, including the prevalence of technostress among individuals or organizations. Likewise, research is needed to examine technostress differences across industries and identify who is most at risk for any detrimental impacts from technostress and how much technostress workers can tolerate before experiencing problems. Day et al. (2012c) noted that they detected strain and stress using a cross-sectional design. Longer term effects of technostress burnout suggest a study design that captures repeated exposure to ICT demands resulting in burnout. By contrast, research is also needed to identify when ICT demands can promote work performance.

Research can also bring awareness to how technostress might influence career decision making and what career professionals can do to help clients develop personal resources to cope by improving, for example, the client’s ICT self-efficacy, resilience, and work-stress management. Research could address ways for career professionals to work with management. Managers and other organizational leaders are in positions not only to help identify technostress problems in the workplace, but also to implement solutions and preventions. ICT infrastructure changes could be accompanied by specialized training, for example, to reduce use-related stress (Ayyagari et al., 2011; Ragu-Nathan et al., 2008). Collaborative planning between career counselors and human resources professionals may also have the potential to identify policy changes (e.g., work–home boundaries) that would reduce instances of technostress (Ayyagari et al., 2011).

Because we aimed to introduce the concept of technostress, we did not include research on ICT boundary management or restoration from work (e.g., having downtime after work hours) topics. For example, Diaz et al. (2012) found results regarding the mixed impact of ICT. Although the flexibility of ICT predicted an increased use of ICT and work satisfaction, an increased use of ICT also increased work–life conflict. Such conflict reduced work satisfaction. Nonetheless, an important area for career development research is intervention when technostress interferes with work performance or family functioning. There is research on work–life balance, such as research by Kossek, Ruderman, Braddy, and Hannum (2012), who studied work and family cross-role interruption. Ohly and Latour (2014) explored work use of smartphones after the scheduled workday. They addressed autonomy and motivation factors and found positive (e.g., flexibility) and negative (e.g., lack of boundaries) effects. Nam (2014) studied work–life infiltration in ICT work-at-home arrangements, pointing out that ICT permeability and flexibility impact each other in complex ways. These studies exemplify work from other fields that could inform career development research in this area.

Finally, there is emerging literature from a field of study, termed NeuroIS, that combines cognitive science and information technology. Tams, Hill, Ortiz de Guinea, Thatcher, and Grover (2014) examined whether physiological and psychological measures assess the same construct or dissimilar dimensions of technostress. They found that physical and psychological measures are complementary, not alternative, measures of the same construct, which suggests that both should be measured to predict technostress outcomes. Tams et al. was the first study on this important measurement topic. Sellberg and Susi (2014)
proposed that distributed cognition, a branch of cognitive science, provides the best framework in which to understand cognitions as humans engage in a sociotechnical system while interacting with technology. Although a comprehensive body of research is lacking, this novel approach to understanding technostress offers an area for career researchers interested in exploring technostress, for example, with regard to the effects of ICT cognitive workload.

Conclusion

Several models and studies of technostress based in different fields of study have identified multiple ICT stressors. Combined, these models and studies identify a source of unique anxiety and strain in the workplace. Technostress phenomena influence work enough to spur research in organizational management and health. Career professionals must appreciate the relatively new influence that technostress exerts on employers and employees, given the transformative nature of ICT on industry and organizational structure. There are identified antecedents and consequences and insight into what creates or inhibits workplace technostress. To identify career interventions, professionals should account for technostress and use appropriate tools to assess the problems. Consideration should be given to how the role of career professionals might increase with their awareness of technology’s potential technostress effects on individual job decisions and organizational performance.

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