Technostress in Organizations: A Cybernetic Approach

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Technostress is defined as "*any negative impact on attitudes, thoughts, behaviors, or body physiology that is caused either directly or indirectly by technology*" (Weil and Rosen 1997, p. 5). Due to ever increasing pervasiveness of information and communication technologies (ICT) in human society, along with a trend towards intensified use of mobile technology (e.g. Forbes 2012; Gartner 2013) technostress has become a serious problem in human society worldwide (Riedl 2013). Specifically with one third of the world population having access to the internet (Internetworldstats), and more than one billion shipments of smartphones per year (IDC 2013), it is obvious that ICT has become a significant factor in human society (Coovert et al. 2005).

The benefits of higher technological penetration are well established, ranging from increases in productivity and convenience (Wang et al. 2008) to the reduction of stress by reducing the overall workload (Wastell and Newman 1996). These benefits are potent drivers for the organizational adoption of ICT, though, as research into technostress has shown, technology can also have detrimental side-effects. Examples include effects on the physiological, emotional, cognitive, and behavioral level (Kahn 1970; Kahn and Byosiere 1990). Specifically, among others, higher risk of cardiovascular disease (Vrijkotte et al. 2000), increased mental strain (Johansson and Aronsson 1984), as well as decreases in job satisfaction and productivity (Tarafdar et al. 2010) are reported in the literature. These effects of ICT usage indicate that technology is a double-edged sword, leading to significant benefits on the one hand, but also to technostress and its detrimental effects on the other hand (e.g. employee's poor health).

Accordingly, there is a need for more technostress research on an organizational level, which in the past has often been abandoned in favor of laboratory studies that have an explicit focus on the specific aspects of technostress on the individual level of analysis (Riedl 2013). However, while laboratory experiments are necessary to establish specific cause-effect-relationships (e.g. Does computer breakdown lead to stress hormone elevations?), such studies cannot comprehensively capture the phenomenon. Rather, only very specific aspects can be studied, neglecting that technostress is a multidimensional and context-dependent phenomenon. Consequently, technostress cannot be conceptualized as a phenomenon originating exclusively in the individual or the environment, but arising from interplay of both factors.

This change of understanding in stress research has seen a long development since Selye's first publication on stress in 1936 (Selye 1936) which is also the first response-based approach to stress. *Response-based* means that stress is understood as the outcome of certain stressors in the environment disrupting the individual, and hence stress is conceptualized as the dependent variable (Edwards 1992; Cooper et al. 2001; Sonnentag and Frese 2013). In contrast, *stimulus-based* models present the opposite, defining stress as some force in the environment leading to certain reactions in the individual (Edwards 1992; Cooper et al. 2001). More modern approaches abandoned this thought of stress being located in either the individual or the environment.

The *Transactional Theory* by Lazarus (Lazarus 1966), a popular representative for this type of understanding in technostress research (e.g. Ragu-Nathan et al. 2008; Tarafdar et al. 2010; Tarafdar et al. 2011), introduced the definition of stress as "*a particular relationship between the person and the environment that is appraised by the person as taxing or exceeding his or her resources and endangering his or her well-being*" (Lazarus and Folkman 1984, p. 19). Thus, stress emerges through the dynamic process of resource transactions between the individual and environment which can lead to the exhaustion of an individual's capacities. Transactional Theory includes far more elaborate mechanisms; nonetheless its essential concepts are based on developments in another field of study which has seen wide, but often implicit (Edwards 1992), adoption in stress research, namely *Cybernetics*.

Cybernetics refers to the "*study of methods of feedback control*" (Miller 1965, p. 227) which, per definition, already partially introduces one of its major concepts, the negative feedback loop. Used in Lazarus' Transactional Theory and other theories of organizational stress (Edwards 1992), the negative feedback loop essentially entails the effect of information fed back to the individual leading to a process of self-regulation. This concept of feedback as an essential element in self-regulating systems experienced major influence by Norbert Wiener (1961), an early pioneer in Cybernetics.

With the negative feedback in the center of their focus, cybernetic approaches to organizational stress adopted an understanding of stress as a relationship between the individual and environment, with the individual seeking to maintain a kind of equilibrium (LeFevre et al. 2003).

In contrast to Transactional Theory though, cybernetic approaches to organizational stress more explicitly focus on the subjective occurrence of stress by involving the discrepancy between desires and perceptions (e.g. Cummings and Cooper 1979; Edwards 1992) instead of demands and resources/abilities (Lazarus and Folkman 1984). Edwards (1992) explicitly cited this difference in orientation as strength of cybernetic approaches, as an individual's desires determine whether an outside demand is perceived as important (therefore having higher impact) or not. Following these remarks, cybernetic approaches to organizational stress promise to offer some benefits from a theoretical point of view, and could thus be seen as a viable alternative to theories used so far in technostress research. Amazingly, after analyzing previous research on technostress on an organizational level (N = 17), we could not find any papers using a cybernetic approach. This finding indicates a significant gap in technostress research, because the cybernetic approach has been identified as useful in organizational stress research in general (e.g. Cummings and Cooper 1979; Edwards 1992).

Technostress is a multi-dimensional construct (Ragu-Nathan et al. 2008), involving both psychological as well as biological processes in the individual (Riedl 2013). Moreover, when using models of stress based on cybernetic principles to conduct research on technostress, subjective perceptions and especially individual's desires play a major role in the occurrence of stress (e.g. Cummings and Cooper 1979; Edwards 1992). Yet, not only individual aspects are involved in the stress development, but also aspects of the environment which are perceived by the individual. Consequently, creating a comprehensive understanding of technostress is hardly possible by one type of data set alone, but requires a mixed method approach, focusing on all major components of the individual and the environment involved. After analyzing previous research we found that such a cybernetic approach, presumably due to its high level of complexity, has rarely been used so far.

Thus, technostress would greatly benefit from the application of a cybernetic framework, based on a mixed method approach that comprises physiological, perceptual, and behavioral data sets.

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