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DEVELOPING TECHNO-RESILIENT CITIES: BALANCING TECHNOSTRESS AND TECHNORELIEF

TREO Paper

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1 Motivation

Cities are becoming increasingly densely populated, which creates economic, social, and environmental tensions. The prevalence of mental illness is higher in urban compared to rural areas, and this pattern has been observed across different countries. The risk of developing depression or generalized anxiety disorder is approximately 20% higher in urban dwellers than those who live outside the city, and the risk of developing psychosis is 77% higher in urban than rural dwellers (Sundquist et al., 2004). At the core of these mental health issues lie significant environmental stressors in urban areas – with noise pollution, lack of green spaces, poor air quality, and inadequate sanitation facilities being some examples of these stressors.

Smart cities leverage a combination of sensors, communication networks, applications, and usage by various actors to collect, analyze, and act on real-time information. They aim to address various challenges such as safety, mobility, health, environmental sustainability, social connectedness, and economic development (Lazányi, 2023). In this context, digital technologies have become integral to enhancing the quality of urban life, offering innovative solutions to everyday challenges. Smart-city technologies have the potential to improve some key quality-of-life indicators by 10 to 30 percent, translating into lives saved, fewer crime incidents, shorter commutes, reduced health burden, and carbon emissions averted (Remes et al., 2018). For instance, applications that provide real-time public transit updates or parking availability alleviate daily stress for commuters and reduce urban pollution by minimizing unnecessary vehicle emissions. These technologies do not only solve pragmatic problems, but they also have the potential to unlock new levels of well-being for local dwellers.

However, the integration of technology in urban settings is not without challenges. Urban environments that are increasingly data-intensive and real-time focused foster fast-paced environments. Indeed, IoT (Internet of Thing) sensors generate continuous and rapid flows of data, innovation runs on ever-shorter iterative cycles due to the use of digital field experiments, and digital transformation is reaching an unprecedented pace, especially since the COVID-19 pandemic (Rydén & El Sawy, 2019). As a result, individuals and communities must adapt to this speedy multi-platform reality enabled by digital communication, reducing distance and increasing parallelism without compromising immediacy.

Fast-paced processes and elevated levels of complexity in digital ecosystems often result in dissatisfaction, technostress, and burnout (La Torre et al., 2019). Technostress refers to the negative psychological impact of new technologies (Riedl, 2012; Tarafdar et al., 2007). It can manifest in various forms such as techno-anxiety, techno-addiction and dependency, techno-overload, techno-complexity, and techno-invasion (Salanova et al., 2013; Tarafdar et al., 2019). These stressors can lead to physical, emotional, and psychological symptoms, including feelings of anxiety, mental fatigue, despair, and apathy (Califf et al., 2020; Riedl, 2012). In the context of smart cities, technostress can emerge in unique ways. The rapid pace of technological change in smart cities can lead to techno-overload and techno-complexity, as residents are constantly exposed to time-related information, forcing them into a stress

mindset. Techno-invasion can also be a concern, as smart city technologies often collect data continuously, potentially leading to feelings of surveillance and privacy invasion. The reliance on technology for essential services could also lead to techno-anxiety, particularly among those who are not tech-savvy. Therefore, while smart cities offer many benefits, it's important to consider and address the potential sources of technostress to ensure the well-being of all residents.

2 Conceptual Framework

Since retreating from digital technologies is neither feasible nor desirable, cities must find a balance that mitigates the risks of over-exposure and information overload. The key lies in leveraging technology to counterbalance these effects, ensuring that its benefits do not inadvertently contribute to increased stress levels among city dwellers. While technology can significantly improve urban life, there is a delicate tipping point between its advantages and the potential for added stress. As cities strive to become smarter, they must navigate the complexities of integrating technology in a manner that enhances, rather than detracts from, the quality of urban living.

Preliminary findings suggest that users subject to sensory and social challenges can leverage digital media capabilities to act as sensory and temporal buffers (Saigot, 2024). These sensory buffers filter out harmful stimuli, which helps them focus their attention on relevant objects in a noise-free environment. Temporal buffers enable them to “stretch” time and match it to their own pace. As they leverage temporal and sensory buffers, individuals can experience “technorelief,” understood as a psychological relief from environmental stressors that is achieved through digital technologies (Saigot, 2024). While sensory, temporal, and social challenges may be particularly intense in autistic populations, some of them are experienced universally, as exemplified by concepts such as techno-overload or Zoom fatigue. Technology, therefore, can be a broader catalyst for societal well-being. In previous works (see Saigot, 2024; Saigot et al., 2023), technorelief was discussed within digitalized workplaces. We now wish to explore the potential of technorelief in a new context – that of smart cities.

The concept of resilience can help us better understand the dynamic relationship between stress and relief. Resilience research is fragmented across several areas providing a variety of insights, but the opportunities of the current body of knowledge have not yet been fully explored (Fletcher & Sarkar, 2013). According to Trim & Lee (2008, p. 731), resilience refers to “the maintenance of positive adjustment under challenging conditions” and is a proactive approach to risk assessment. Resilience develops through positive adjustment under challenging conditions. We, therefore, suggest that when positive adjustment is achieved by a steady increase in their use of digital technology without reaching over-exposure, it can help individuals and communities adjust to this fast pace in a way that fosters their well-being, their ability to engage in meaningful interaction, and their virtuous behavior.

We propose techno-resilience as the balance between technostress and technorelief, providing a dynamic framework for navigating technological evolution in dynamic environments. This new perspective calls for an adaptive approach to city planning, emphasizing the dual role of technology adoption as both a challenge and an opportunity to foster resilient and people-centric urban environments. Smart cities must therefore navigate the fine line between technology providing relief and causing added stress, ensuring that the digital transformation leads to sustainable urban development and improved well-being for all city dwellers.

3 Proposed Research

We present a novel theoretical framework and research plan to explore how technorelief and techno-resilience can create socially sustainable societies. We propose a multiple-case study that explores the management of residents’ well-being in the smart cities of Copenhagen, Los Angeles, Brisbane, and Singapore. The focus is on how these cities balance the challenges of technological overload (technostress) and the potential for relief offered by technological solutions (technorelief). These cities were ranked in the top 50 of resident-reported quality of life (Helliwell et al., 2020) and their nations

are characterized by above-average attitudes toward the urban use of technology (Bris et al., 2023). These cities handled the balance between technological overload and technorelief particularly well, making for interesting cases to delve into. Moreover, from a cultural and demographic standpoint, each city provides a unique context to explore the balance between technostress and technorelief.

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