An Introduction to Digital Resilience in Smart Cities

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The context of Digital Resilience in Smart Cities

"Smart cities" (SCs) is a multifaceted term and although there is no consensus on its definition [1], as such, SCs are one of the current examples of research on a balanced mix of technological applications, sustainability, competitiveness, and resilience [2;3]. Through these dimensions of SCs [4;5], the European Commission aims to develop program plans that can address the future development of (smart) cities, effectively.

For Washburn [6], using Smart Computing technology is fundamental to make the vital infrastructure additives and offerings of a town - including town administration, education, healthcare, public safety, actual estate, transportation, and utilities – more sensible, interconnected, and efficient. For Barrionuevo [7] following a SC architecture ensures resources utilization in a sensible and coordinated way to expand city facilities which can be rendered integrated and sustainable.

As in any city environment [8], SCs need to assure revolutionary offerings to the citizens with environmental, social, and monetary efficiency. ICT innovation gears the evolution of the SCs into something that meets citizens social necessities and wishes[9]. This explains why software for SCs is increasingly following a people-centric design, in which the citizens' needs, recognition and perceptions are captured by a bottom-up method [10].

Resilience is commonly perceived as a framework for understanding how individuals and organizations respond and adapt to environmental and social change [11]. An individual's resilience depends on a variety of personal factors, including their life course situation, interactions in formal and informal networks, education, sociodemographic status and employment opportunities, and resource availability increase. All these factors affect individual adaptability [12] and can affect digital resilience. Borekci [13] defines organizational resilience as the ability of an organization to respond, adapt and act to internal or external signals or pressures. In this way, organizations structure their activities to anticipate and avoid threats and opportunities to their survival. Consistent with the organization's resilience approach, resilience is tied to the socio-technical environment. It is facilitated and improved by digitization.

Digital resilience (DR) is the ability to manage technology so that work and health outcomes are managed equally, effectively, and sustainably [14]. DR refers to the specific knowledge, skills,

attitudes, and behaviors (individual resources or competencies) that must be acquired, developed, and protected to counter the negative effects of digital stressors [15]. Resource Conservation Theory (COR) [16] provides a useful framework for analyzing and investigating DR in both operational and organizational approaches. COR theory is underpinned by the belief that individuals are motivated to acquire, build, and protect resources to achieve their goals.

Cities have complex systems, and if cities are to be considered intelligent, it is important that they are always resilient [17]. The concept of resilience is therefore one of the key elements of SC planning. Cities must learn how to become more resilient to challenges in this age of unpredictability and uncertainty. Research on resilience in sustainable development focuses primarily on ecological security. However, the concept is acknowledged as an important step in building sustainability [18]. Veglianti et al. (2021) [19] considered the concept of SC planning including resilience elements. Understanding the concept of SC planning by incorporating resilience elements can be reinterpreted to find new definitions or frameworks for approaches from SC to DR. Veglianti et al. (2021) [19] aimed to fill this gap in the literature by investigating, analyzing, and understanding SC-by-DR approaches.

Recent Research Findings

Based on analysis by Veglianti et al. (2021) [19], SC has the goal of addressing both social and individual needs, with the aim of improving whole communities and sustainable development.

Results showed that SCs enable the development of integrated, more sustainable, and more inclusive urban centres. SC is therefore a combination of innovative elements (e.g., efficient structures, higher security) and services (e.g., ease of mobility) that connect individuals with both social and technological capital.

In other words, these results suggest that ICT will play an important role in SC aimed at creating a better life balance and a more sustainable scenario from an economic, social, and environmental perspective. suggesting. Therefore, they pointed out that SC concepts and goals are related to ICT aspects. It also shows that citizens are very important actors in planning SC.

Furthermore, the analysis emphasized that SC DR is also influenced by individual traits and multiple traits arising from contextual resources. Personal characteristics include, for example, ability to change, acceptance of change, adaptation to change, flexibility, and flexible thinking. Contextual resources include government policy, policy planning and strategic projects, ICT investment, active participation, and digital knowledge and thinking. In other words, research has shown that the concepts of SC and DR are not recognized separately but are closely related. DR is combined with the development and implementation of SC initiatives. Therefore, DR adapts to new situations and creatively uses available digital tools to produce a combination of active and

passive functions that help better address SC contexts. Therefore, flexibility and adaptability to change are key dimensions underlying the concepts of DR and SC.

Veglianti et al. (2021) [19] points out that the existence of contextual resources (government policies and plans, increased investment in ICT, development of digital knowledge, etc.) is of strategic importance for combining DR and SC approaches. The authors suggest that the perception of DR in SC is a combination of individual and organizational resilience. As such, it "represents the ability of individuals and organizations to cope with digital change and flexibly adapt to new environments."

Conclusions and Future Developments

The SC concept is gaining popularity among disaster and sustainability management professionals, especially in developed countries. This short article aims to analyze and redefine the SC concept through a resilience approach. The results show that the concept of SC resilience is related to flexibility, acceptability, and adaptability. This flexibility is essential in a highly uncertain and changing environment where everything is relevant in the COVID-19 and post-pandemic contexts.

From the above discussion, one may find it useful to redefine the concept of SC as a city that uses ICT to enhance public awareness, intelligence, well-being, and community participation through a resilience approach. The goal of this organizational resilience is for organizations to structure their activities in ways that anticipate and avoid threats and opportunities to their survival [20]. Approaching SCs through resilience is a way to ensure sustainability while at the same time helping to meet the needs of citizens and fostering community participation [21].

Finally, SC and DR are two built-in, interconnected concepts that lead to the definition of smart and resilient cities. This framework includes both hard and soft aspects of SC. ICT resources and digital knowledge that promote citizen participation and sustainability.

Future research could conduct semi-structured interviews with those who would benefit from SC services to analyze their perceptions of citizen benefits [21]. Technology is helping cities shape city policies and develop smarter approaches to fostering civic engagement. Cities need to involve people in political decisions, and cities moving towards sustainability need to rediscover intelligence and participation.

We are interested to focus future research on SC and their services to marginalized groups, such as refugees, to determine whether these groups experience SC through DR as an opportunity to improve social inclusion.

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