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Abstract. Over the past two decades, the "Smart City" has risen to global prominence as an urban planning and development strategy. This concept is now widely used as broad of toolkit of technological services and policy interventions aiming at enhancing a balance between competitiveness and sustainability of cities through ICT innovation and Human Capital.
ICT and modern technology are considered the key aspect of the Smart City concept. Meanwhile, other authors emphasize the importance of the people and human capital who adopt and operate the technology. Although very few literatures emphasize the importance of resilience in the Smart City discourse.
This paper aims to analyze and redefine the Smart City concept through resilience approach. For this purpose, it describes and defines what the Smart City concept is, and then the relation and linkage of the importance of using resilience approach in defining the Smart City. The model is based on a qualitative analysis of people's perceptions related to Smart Cities and Digital Resilience. Digital Resilience will lead to a soft infrastructure approach, such as enhancement in social and human capital, knowledge inclusion, citizenship participation and social satisfaction. The results constitute a first step to approach Smart Cities as a soft sustainable infrastructure urban planning. Discussion and analysis are conducted through a deep literature study using systematic literature review methodology.

Keywords: Digital Resilience – Smart Cities – Developed Country

1 Introduction

In light of the emphasis on urbanization and Information Technology, the concept of the Smart City evolved in an attempt to save the earth and human health. It is an idea or concept people had hoped would be able to solve urban problems while considering the environment [1]. Internationally, the Smart City concept is grounded on the sustainability of growth and urban development, which is based on a triple bottom line that can be expressed as the need of a balanced approach to ecological, economic and socio-cultural values. By drawing the concept of Smart Cities, European Commission has been able to show that sustainability, smartness and inclusiveness repre-

sent the basis in order to effectively develop a programmatic plan able to meet the future evolutions of (smart) cities [2,3].

Despite many definitions and approaches of Smart Cities, there is a consensus among social scientists about two fundamental aspects: human capital and ICT innovations. As an urban environment [4], Smart Cities have to guarantee innovative services to the citizens, with a constant research of environmental, social and economic efficiency, whose objective is the fulfilment of individual happiness together with the optimization of social satisfaction [5].

As the role of citizen is emphasized, the new horizons of the approach to the application of Smart Cities is shifting to a people-centric design, where the citizens' needs, awareness and perceptions are structured with a bottom-up method [6].

During the last two decades, Smart Cities are approached as one of the contemporary examples of the research of a balanced mix between sustainability and competitiveness [7], and several methods of benchmarking and indicators are attempted to evaluate and measure impacts. This benchmarking has the purpose of comparing Smart Cities based on various factors and perspectives [8], as its sustainability, global city performance, resilience, local government effectiveness, urban competitiveness, and good urban governance. As Benchmarking Smart City planning now considers the perspective of resilience, have even created an instrument or guideline in benchmarking of resilience based on an evaluation of the city's resilience [9].

We position our research by addressing resilience by sociotechnical as operational resilience, which is the ability to adapt quickly to new outlining requirements, and organizational resilience, conceptualized as the organizational capability to use resources, adapt, and even excel in unexpected change. In this paper, digital resilience is considered both at individual as well as at organizational level.

This paper aims to explore the combination of the definitions of the Smart City concept and Digital Resilience, which would give us some insights to answer the research following question: what is the perception of these two (embedded) concepts, which is expected to establish a new definition that will represent both concepts?

Our objective is to investigate how Digital Resilience could contribute to enhance the perspectives of Smart Cities: competitiveness, sustainability, individual happiness and social satisfaction. In other words, the paper aims at conceptualizing the most relevant feature of resilience that impact smart cities initiatives.

For this purpose, a qualitative study, carried out among experts in the field of Smart Cities. The results will be analyzed in order to identify the main elements that point out from the combination of Smart Cities and Digital Resilience.

The paper is structured as follows. We summarize the theoretical background in Section 2. In Section 3, we explain our methodology and introduce our sampling for the study. After exposing the perception of Smart Cities and Digital Resilience in Italy, we present and discuss our findings in Section 5 with the analysis aimed at finding the definition of a Smart City concept based on Digital Resilience. Finally, in the conclusion, we expose the practical and theoretical implication of our results before presenting our guidelines for future research.

2 Literature review

2.1 Smart cities

A large and growing body of literature has investigated the connections between the emergent information and communication technologies and the smart governance and organization of cities and buildings [10]. The variability of citizens' necessities over space and time is one of the most challenging dares: finding efficient solutions to gain an optimal ranking between Smart Cities is becoming a fundamental leverage to achieve a competitive advantage [11].

Although the concept of a "Smart City" is not clearly defined and interpreted, Smart Cities are therefore one of the contemporary examples of the research of a balanced mix between sustainability and competitiveness [7]. Moreover, United Nations forecast that in 2050 two thirds of the world population will live in the cities, consuming over 70% of world's resources, with considerable and growing negative impact on environment, health and social organization [12]. The sustainability of growth and urban development is based on a triple bottom line that can be expressed as the need of a balanced approach to ecological, economic and socio-cultural values. By drawing the concept of Smart Cities, European Commission has been able to show that sustainability, smartness and inclusiveness represent the basis in order to effectively develop a programmatic plan able to meet the future evolutions of (smart) cities. For Washburn [2], the use of Smart Computing technologies aims to make the critical infrastructure components and services of a city - which include city administration, education, healthcare, public safety, real estate, transportation, and utilities - more intelligent, interconnected, and efficient.

For Barrionuevo [13] being a Smart City means using all available technology and resources in an intelligent and coordinated manner to develop urban centers that are integrated, habitable and sustainable. Giffinger [14] discuss that Smart City is a city well performing in a forward-looking way in these five characteristics - economic, social, governance, transportation and smart living - built on the "smart" combination of endowments and activities of self-decisive, independent and aware citizens.

In fact, the idea of Smart Cities is rooted in the creation and connection of human capital, social capital and Information and Communication Technology (ICT) infrastructure in order to generate greater and more sustainable economic development and a better quality of life. Although different authors emphasize its various aspects [15,16], the concept of Smart City highlights these following common dimensions: sustainability, efficiency and citizen's awareness.

In addition, Dameri [17] analyses the Smart City architecture and suggests four Smart City dimensions: land, - the territory on which the city is built and the geographical area on which the city has its own boundaries - , infrastructures - all the material or technological facilities supporting the urban life, such as public and private buildings, streets, transport systems, production sites, and the ICT - , people, - the citizens living in the city, but also who works or studies in the city, or come to visit the city or to enjoy there some cultural or leisure facilities - and government -

the public powers to govern the city and the public administrative agencies to manage and supply public services.

Despite these definitions and approaches of Smart Cities are quite different, there is a consensus among social scientists about two fundamental aspects: human capital and ICT innovations. As an urban environment [4], Smart Cities have to guarantee innovative services to the citizens, with a constant research of environmental, social and economic efficiency. Almost all papers that have been written on the development of the concept of Smart Cities outlines that this kind of urban environment has to seek the fulfilment of individual happiness together with the optimization of social satisfaction [5]. ICT Innovation aims to drive the evolution of the Smart Cities to something able to meet the individual need and the social necessities [18].

In line with this perspective, a Smart City is supposed to improve the quality of life with the use of technology, and thereby increase the efficiency of services and meet citizens' needs [3]. At a high level of research, a Smart City is one that in the long term shows sustainable economic growth (high economic efficiency) and offers high quality of life, promotes investment in human capital and social capital, introduces and uses the latest ICT techniques as well as technical and technological solutions determining the quality of public services, and based on the principle of co-governance [19].

Consequently, the new horizons of the approach to the concept and the application of Smart Cities is shifting to a people-centric design, where the citizens' needs, awareness and perceptions are structured with a bottom-up method [6].

We choice this latest Smart City approach as the theoretical basis to support the empirical analysis of the Digital Resilience in Smart Cities. The role of citizens is fundamental, and they can be seen as beneficiaries, aware users, and involved actors. In the existing literature, there is a lack of discussions on citizen perception of Digital Resilience in Smart Cities. We need at this point to define the concept of Digital Resilience.

2.2 Digital Resilience

The increasing urban population creates significant challenges for the city, such as urbanization, climate change, terrorism, and the increased risk of natural disasters. To face these situations and unexpected changes, the city must learn to adapt in dealing with these challenges. Developing resilience is a way for these cities to face the problems and deal with these challenges of this era of unpredictability and uncertainty.

Resilience is understood as the capacity of individuals and organizations to bounce back or bounce forward from external shocks and to proactively adapt to constant change through pathways to build capacity and develop resources within and beyond the organization [20,21]. Resilience is applied broadly as a framework to understand how individuals and organizations respond and adapt to environmental and societal changes [22]. For the purpose of our study, we will define the concepts of individual resilience and organizational resilience, before delimiting the notion of Digital Resilience.

Individual resilience has been predominantly studied within psychology and healthcare settings [23]. Personal resilience refers to the capacity for maintaining or regaining psychological wellbeing in the face of challenge [24]. Individual resilience depends on various personal factors including the circumstances of a person's life-course, their interaction in formal and informal networks, education, socio-demographic status and employment opportunities, and the availability of resources. All these factors influence an individual's capacity to adapt [25] and could then have an impact on Digital Resilience.

At the organizational level the term resilience has been used to describe the inherent characteristics of those organizations that are able to respond quicker, recover faster, or develop more unusual ways of doing business under duress than others [26,27]. Borekci [28] define the organizational resilience as the capability of organizations to react, adapt and act according to internal or external signals or pressure. It is how organizations structure their activities in order to anticipate and circumvent threats and opportunities to their continued existence. From this approach, a resilient organization is one that not merely survives over the long term, but also flourishes, passing the test of time [29]. Organizational resilience is a strategic imperative for an organization to prosper in today's dynamic and interconnected world characterized by volatility and uncertainty. Previous research on organizational resilience has distinguished between two approaches of resilience: operational (passive) resilience and strategic (active) resilience [30,31]. According to the first approach, resilience is considered as the ability of organizations to cope with crises and hardiness and to survive despite threats. Conversely, the second approach considers resilience as the capacity of organizations to transform threats into opportunities to prosper and to achieve organizational change.

In line with this approach of organizational resilience, resilience is pinned to sociotechnical environments; it is facilitated and enhanced by digital. Resilience is human attribute, yet it is materialized in novel ways of utilizing sociotechnical environments as well as human ability to adapt to new situations and creatively use the ICT infrastructure and tools available. In this paper, resilience by digital is approached as both individual and socio-organizational attributes.

Digital Resilience is the ability to manage technology so that work and health outcomes are managed equally, effectively et also sustainably [32]. Digital Resilience refers to the specific knowledge, skills, attitudes and behaviors (personal resources or competencies) that need to be acquired, built and protected to counteract the negative effects of digital-stressors [33].

We position our research by addressing resilience at both as operational resilience, which is the ability to adapt quickly to new outlining requirements, and organizational resilience, conceptualized as the organizational capability to use resources, adapt, and even excel in unexpected change. To analyze and explore Digital Resilience at both operational and organizational approach, the Conservation of Resources theory (COR) [34] provides a useful framework. The COR theory is underpinned by a belief that individuals are motivated to acquire, build and protect resources in order to achieve their goals.

COR theory states that stress is neither first nor foremost a product of individuals' appraisal of events, but that it has central environmental, social, and cultural bases in terms of the demands on people to acquire and protect the circumstances that ensure their well-being and distance themselves from threats to well-being [35]. The latter identified two distinct types of resources: contextual and personal. Contextual resources are located outside the individual and set in the broader environment. These resources include social support, autonomy and opportunities for development and feedback, whereas personal resources are inherent to the individual and include physical, psychological, affective, intellectual and capital resources.

The more resources an individual has, the more effective they are at responding to situations. In this instance, the acquisition of contextual and personal resources creates a buffer against digital stressors (i.e. longer working hours, social isolation). Thus, building resources is, therefore, a way to build resilience, enabling individuals to negotiate, adapt to and manage stressors. Emerging studies confirm the importance of knowledge building (personal resource) and the value of social networks, social support and relationships (contextual resources) [36,37]. Studies in this area are limited, with research typically centered on students and high-risk groups, and most of the resilience literature is prescriptive and normative [38,39].

2.3. Digital Resilience approach in Smart City

The concept of resilience was initially introduced by a well-known ecologist, Holling, who in 1973 suggested two general approaches, i.e. first, man and nature are closely linked and evolve together and must thus be conceived as one social ecology system; second, the responses of this system towards changes are unpredictable, but not proven [40].

In urban planning, the concept of resilience is developed by Wildazsky in 1988 [41]. It has evolved from the context of extremely powerful disasters, terrorism, energy crises, and climate change [42,43] to socio ecological resilience in a context of communicative planning [44- 47]; and then to collaborative planning for governance in addressing resilience [41, 48].

A city has a complex system and, when a city is considered smart, it is important to be resilient at any time [9]. Therefore, the concept of resilience is one of the key factors in Smart City planning. The increasing urban population creates significant challenges for the city, such as urbanization, climate change, terrorism, and the increased risk of natural disasters. To face these circumstances, the city must learn to adapt in dealing with these challenges. Cities must learn to develop its resilience in facing the problems of this era of unpredictability and uncertainty. The concept of resilience is a way to deal with these challenges. In the context of urban planning, the strategies that have been implemented mirror the philosophy of sustainable development, which focuses on managing resources to ensure the welfare of future generations. The study of resilience in sustainable development initially focuses on ecological safety. However, the concept is viewed as an important step in building sustainability [49].

Based on previous research, the aim of our study is to understand the Smart City planning concept by incorporating elements of resilience. Understanding the Smart City planning concept by incorporating elements of resilience can be reinterpreted to find a new definition or framework of Smart City through Digital Resilience approach.

From review of previous definitions, it can be concluded that the definition of the Smart City with a hardware orientation is a concept of a city that utilizes modern and advanced ICT in order to realize city planning that offers a better quality of life and better environment quality in the city.

From the analysis of literature, the software focused Smart City concept relates to the utilization of information and communication technology as a means to obtain high quality of life and improve environmental quality. Our study aims to fill this gap in the literature by exploring, analyzing and understanding of Smart City through Digital Resilience approach.

3 Research methodology

The research methodology is the result of a long-term, in-depth qualitative process including both theoretical research and empirical analysis [50]. The analysis considered both at the theoretical and empirical sides of the Smart City phenomenon [51]. In line with the most significant scientific contributions and with the purpose of this article, we adopt a descriptive approach to analyze the phenomenon in a narrative form [52]. The latter provides us the possibility to examine the data within the context under investigation [53].

The approach applies Qualitative Data Analysis (QDA) [54] to understand how economic, political, social, cultural, environmental factors influence the social aspects of Smart Cities and Digital resilience in natural settings. The purpose is to conceptualize the main aspect of resilience that affect smart city initiatives. Our QDA design is based on Grounded theory [55,56].

The QDA uses different types of qualitative data as structured texts (i.e., books and reports) and answers from the interviews. In the analysis of our interviewees, we used the content analysis approach. We follow an inductive approach, using emergent frameworks to group the data and look for relationships [57]. First, qualitative data are collected and organized. The coding and labelling activity permit the identification of the most recurrent themes which are consider investigating the main features related to Digital resilience and Smart City projects. Then, the organization of data collection shows emerging patterns that permits to define the theoretical framework in comment.

In other words, to understand complex issues such as Smart Cities and Digital Resilience, this study uses a qualitative and exploratory approach, that is determined by the potential of highlighting the complexity by its richness and holism [58]. Thus, following the relevant literature in this field, a qualitative methodology is applied to investigate “a contemporary phenomenon within its real-life context; when the

boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used" [53].

3.1. The context of the study

As discussed above, this paper provides an exploratory qualitative research method with a content analysis [58]. In line with this, the choice of Italy is twofold. Firstly, the Italian Smart City Milan appears a pioneer and important case at the European level. Specifically, since the report issued by the European Parliament in 2014, Italy presents a relevant number of Smart Cities in its territory compared to other European countries.

In Italy, the interest on Smart Cities meets the government agenda with a focus on ICT, the citizens' role and the quality-of-life enhancement [59,60]. In addition, several municipalities such a Milan driven by the Associazione Nazionale Comuni Italiani (ANCI) promote the development of Smart Cities initiatives in all the territory with a number of activities. For instance, the platform Italian Smart Cities (http://italiansmartcity.it/) represents a web platform used to monitor Smart City projects and their components.

Furthermore, each city plans its own smart program also with the goal of reaching European funds [1]. Therefore, Italy in the European scenario is a prosperous country in terms of Smart City development and implementation with cities such as Milan as crucial examples in the national and international panorama.

Secondly, the nationality of the authors able them to read original documents which help a better understand of the context under investigation. In fact, the access to original documents not translated into English is a significant element to explore a phenomenon.

Moreover, as the arguments under investigation are also a cultural and social aspect of the daily life of many citizens, the tacit knowledge of the culture of a specific country is important to capture the local implications related to Smart Cities as well as to the Digital Resilience aspects.

3.2. Data collection and interview guide

Following the purpose of the present paper, the data collection was structured through a series of semi-structured interviews conducted, due to the COVID-19 pandemic restrictions, either by phone or email between January 2021 and April 2021. The duration of the interviews was between 45 minutes and one hour. Our sample is composed by fifteen individuals, citizens of the Smart City if Milan.

According to numerous academics, there is no optimal sample size; however, a number between six and twelve informants [61,62] is recommended. In addition, the size of the sample is defined considering the theoretical saturation principle [63].

The interview guide includes 10 questions focusing on the two main themes analyzed: Smart Cities and Digital Resilience. Below (see Table 1) there is the interview guide used.

Table 1. Interview guide

1. What is the objective of a Smart City?
2. What is the role of ICT in Smart City?
3. What is the relation between urban planning of Smart Cities and sustainability?
4. In your opinion, what are the required criteria to define a city as a Smart City?
5. What are the advantages/benefits of a citizen living in a Smart City?
6. What is the role of the citizen in a Smart City?
7. What is your perception about Digital Resilience in Smart City?
8. In your opinion, what are the individual characteristics needed to build Digital Resilience in a Smart City?
9. What are the contextual resources that might influence a Digital Resilience strategy in a Smart City?
10. In your opinion, what is Digital Resilience in Smart City? *- the ability of organizations to cope with crises and hardiness and to survive despite threats (Operational/passive resilience)* *- the capacity of organizations to transform threats into opportunities to prosper and to achieve organizational change (strategic/active resilience)*

4 Emerging results

From our analysis, a Smart City has the object to answer to social as well as to individual needs with the goal of improving the overall community and the sustainability development (as summarized in table 2).

The recurrent themes from the coding show that a Smart City provides the development of urban centers that are more integrated, sustainable, and inclusive. Hence, a Smart City is a combination of innovative elements (i.e. efficient structures, higher safety) and services (i.e. easier mobility) that connect the individuals to the social capital as well as to the technological capital.

In other words, our findings suggest that the ICT has a prominent role in a Smart City with the aim of creating a better life balance and a more sustainable scenario from an economic, social and ecological perspective. Thus, the present analysis points out that the concept and objectives of a Smart City are related to the ICT dimension.

In addition, it emerges that in the planning of a Smart City, the citizens are very important actors.

Furthermore, the analysis underlines that the Digital Resilience in a Smart City is also influenced by a number of features derived by the individual characteristics and by the contextual resources which are presented in the following table.

Table 2. Smart city and Digital Resilience

Community needs	Sustainability development
Social Needs	Economic Development
Individual Needs	Urban development
Improving People life quality	Environmental sustainability
Better life balance	Ecological sustainability
Inclusion	Easier mobility
Citizen needs and citizen participation	More efficient Structures
	Safety
Individual characteristics	**Contextual resources**
Capacity to change	Government policies
Accept change	Political Plans and strategic projects
Adaptation to change	ICT investments
Flexibility	Active participation
Flexible Mindset	Digital Knowledge
	Digital Resources
	Digital Mindset

In other words, our investigation highlights that the concepts of Smart City and Digital Resilience are not perceived as separate, but they are strictly embedded. The Digital Resilience is combined with the development and implementation of a Smart City initiative.

Therefore, Digital Resilience results a mix of active and passive features that help to adapt to a new situation and creatively use the digital tools available to better face a Smart City context. In line with this, flexibility and adaptation to change are important dimensions at the base of Digital Resilience and Smart City concepts.

The analysis indicates that the presence of contextual resources (such as the actions and plans of the government, higher investments in ICT and the development of a digital knowledge) is strategical for the combination of Digital Resilience and Smart City concepts. The present study suggests that the perception regarding Digital Resilience in a Smart City is a mix of individual and organizational resilience. Therefore, it "*represents the capacity of individuals and organizations to deal with the digital change, adapting to a new setting in a flexible manner".*

This results also important in the current COVID-19 situation. In fact, a shock such as the COVID-19 is identified as an unpredictable emergency that pushes a needed change from different sides. On one hand, each single person should accept and adapt to this unique change. On the other hand, each organization have to face this new scenario maintaining or reorganizing its business. Thus, despite the challenges driven by the COVID-19 pandemic, a Smart City, composed both by individuals and organizations, is impacted by the digital transformation and it emerged that this helps to shift threats into opportunities.

5 Conclusion - Implications and Limitation

The concept of Smart City is growing in interest among disaster and sustainable management professionals, specifically in developed countries. In this study, we aim to analyze and redefine the Smart City concept through a resilience approach.

The results showed that the concept of resilience in Smart Cities is bound to flexibility, acceptance and capacity of change. This flexibility is a must in a very uncertain and changing environment, which finds all its relevance in the COVID-19 pandemic context.

From the above discussion, it can be concluded that the Smart City concept through a resilience approach can be redefined as a concept of a city that utilizes ICT to increase citizen's awareness, intelligence, wellbeing as well as community participation in facing pressures and hazard. The objective of this organizational resilience is for organizations to structure their activities in order to anticipate and circumvent threats and opportunities to their continued existence [28].

At this point, it emerges that the community achieve a higher quality of life and environment, which is sustainable in facing the future era of uncertainties. Approaching Smart Cities through resilience is a way to ensure sustainability while promoting the satisfaction of the citizens' needs and enhancing their participation to the community [3].

At this stage, many challenges could be identified related to both personal digital resources and socio-technical and contextual resources and policies.

Specific knowledge, skills, attitudes and behaviors (personal resources or competencies) need to be acquired, built and protected and fostered to for all not only to provide the needed resources to cope with Digital era but also to counteract the negative effects of digital stressors [33]. Contextual resources are also needed and include social support, autonomy and opportunities for development and feedback [35] that should be provided and fostered by governments policies and strategies related to Digital development.

From a theoretical perspective, the study is positioned within the domain of enriching Smart Cities research and Digital Resilience. On practical terms, our findings may help governments and other stakeholders in their efforts towards a more inclusive and sustainable world. The interest on Smart Cities meets the government agenda in Italy with a focus on ICT, the citizens' role and the quality-of-life enhancement [59,60]. The technology inherent in Smart Cities promises efficiencies and options that could allow cities to be more "inclusive, safe, resilient, and sustainable" as required by the U.N. agenda, and at this stage, the challenge of government policies is to invest on digital resources.

The outcome of our research suggests that Smart City and Digital Resilience are two embedded and interrelated concepts that can lead to one definition of a smart resilient city. This framework encompasses both hard and soft dimension of Smart City: the ICT resources as well as the digital knowledge which will foster citizen participation and sustainability.

This study has some limitations that should be mentioned. Firstly, it was conducted only on a small sample size (with 11 interviewees). Further empirical research must be conducted on larger sample in order to build and elaborate on our findings. Secondly, the results are mainly based on the points of view of managers working in a Smart City.

In future research, semi-structured interviews can be carried out with people who benefit of the services provided by the Smart City, in order to analyse their perception as citizen beneficiaries [3]. Technology helps the city to develop a smart approach to designing urban policies and fostering citizen participation. Cities should involve people to be included in policies choices and cities proceeding towards sustainability should rediscover smartness and participation.

Furthermore, related to a larger and broader approach, Smart Cities through a resilience approach could lead to a sustainable and inclusive world, in alignment with the eight Goals of the Millennium Development Goals. A future research could take place with other groups, for example refugees, in order to identify if these groups are experiencing the Smart City through Digital Resilience as a way to enhance their social inclusion.

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