3 From Smart City 1.0 to Smart City 3.0:
Deep understanding of the smart cities concept and evolution

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Introduction

The mobilization of people led cities to rapid growth within a short period. This paradigm brought several issues, since many cities were not prepared to face the rapid population growth and the worldwide migration to urban areas. Streets have not grown because of this quick urbanization; green parks have not extended, and city boundaries were kept in the same place. Therefore, cities have a considerable challenge in accommodating the growth experienced. Technology and consequently Smart Cities emerged to answer such challenges. In the 1960s emerged the "informational or cybernetically planned cities". In the 1980s, technologies were sought to promote "computable or networked cities" (Gabrys, 2014). In the 1990s, the Smart City concept was associated with information and communication technologies (ICTs) for the first time, expecting them to be in the center of urban management (Aurigi, 2006; Bastelaer, 1998; Gibson et al., 1992; Graham & Aurigi, 1997; Tan, 1999).

Until 2010, the number of Smart City studies reported in the literature was scarce. Only after the emergence of the Smart City projects supported by the European Commission, was the proliferation of writings and academic publications on the topic noted (Jucevičius et al., 2014). From then onwards, the Smart City expression started to be widely adopted. Figure 3.1 portrays the search results of "Smart City" or "Smart Cities" expressions from Scopus.
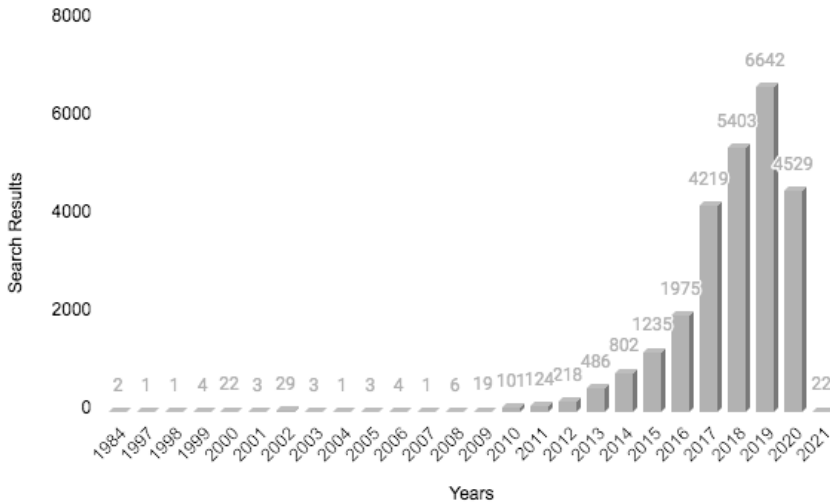
Figure 3.1: - Scopus Search Results for "Smart City" or "Smart Cities"

It is apparent in the literature that the smart city concept has been evolving. It is no longer in the first stage where technology companies led research and cities' transformation. Moreover, the focus changed from technology diffusion to meet corporate and economic interests, to break silos and focus on people, governance, and policies (Robert et al., 2017). Simultaneously, citizens passed from a passive role to urban development and planning co-creators (Mainka et al., 2016). Based on a narrative literature review, this paper details the evolution of the concept, highlights the associated comprehensions and terms, and proposes a common understanding of the Smart City concept.

Theoretical background: Smart City concept evolution

In the beginnings of the Smart City conceptualisation, the term was associated with a futuristic city, where technology would be predominant. It is a fact that technology is ever more present in our daily lives. However, what seemed to be a movement to implement technology without any plan quickly has shifted to a problem-solving ideology. Table 3.1 states and resumes the evolution of the Smart City concept from Smart City 1.0 to the Smart City 3.0.

The first Smart City stage – Smart City 1.0 – was seen as the possibility of providing citizens with information and services via the integration of Information and Communication Technologies (ICT) into the city's infrastructure. It was provided a techno-centric interpretation of cities, where ICTs were the goal and not the means (Ahvenniemi et al., 2017).

Concept	Sources
Smart City 1.0	
A city that uses ICTs to collect data to improve its critical infrastructures and services' efficiency.	(Hall et al. 2000; Harrison et al. 2010)
Smart City 2.0	
A city that starts with the human capital, motivating citizens to create and flourish their lives, using ICT to increase the quality of life and the city's social, economic, and environmental sustainability.	(Ahvenniemi et al. 2017; Angelidou 2014; Barrionuevo, Berrone, and Ricart Costa 2012; Caragliu, del Bo, and Nijkamp 2009; Chen 2010; Hollands 2008; Mohanty, Choppali, and Kougianos 2016; Neirotti et al. 2014; Rios 2008)
Smart City 3.0	
A city that uses ICT to promote citizen engagement and active participation, allowing continuous interactions, where the strategy is collaboratively created with them and relevant stakeholders.	(Albino, Berardi, and Dangelico 2015; Van der Graaf and Veeckman 2014; Trivellato 2017)

Table 3.1: The three Smart City stages

Cities realized that the vision led by technology companies lacked the context. Municipalities' budgets served to test, and develop solutions in laboratories and closed rooms, without relating these to citizens' real needs. The lack of policymakers' knowledge to realize cities as open and interoperable systems and the political wish for quick news led them to become dependent on proprietary technological solutions. Over time it created a dependency on private companies, not allowing cities to integrate other stakeholders and systems into their strategy and infrastructure. After Hollands (2008) criticized cities for not taking into account the people, the concept started to strive for human and social capital (Caragliu et al., 2009). Smart City's understanding was inflicted because of the world's financial crisis and popular acknowledgment of the global warming effects. From these extreme events, emerged concerns regarding sustainability and citizens' quality of life. United Nations' Sustainable Development Goals, and the Green Deal, brought cities a decarbonization mindset, adopting green and sharing-based policies focused on citizens' quality of life (European Commission, 2019; UN, 2018).

The transition period from the Smart City 1.0 to the Smart City 2.0 between 2008 and 2012 was notorious. The focus shift from "What" to "Why", from technology to its purpose, from only hardware and software development to answering people's needs. Thus, it evolved to an understanding of a Smart City as a city that crossed traditional infrastructure with ICTs to collect real-time data and optimize services by integrating and analyzing information.