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Original Article

Understanding smart cities: a systematic review

Entendendo cidades inteligentes: uma revisão sistemática

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ABSTRACT

Purpose: Smart cities are emerging as a fast-growing scientific research topic; much of the knowledge generated is particularly of a technological nature. The objective of this research was to identify how the articles approach the theme of smart cities from the perspective of innovation and technology.
Design/methodology/approach: The methodological procedure consisted of a systematic review of the literature; the process was carried out in three main stages: planning, reviewing, and reporting/disclosure. The period established for searches was from 2006 to 2021, using the databases: Emerald Insight, Scielo, Scopus, and Web of Science, and the Mendeley tool was used to filter articles within the theme.
Findings: After careful selection, 349 studies were found, based on the objective and relevance of this research. Regarding the databases, Emerald Insight presents 91 articles, Web of Science 83 articles, Scopus 101 articles, and Scielo 74 articles. About publications per country, Italy presents 12 articles, the United Kingdom 11 articles, and Spain and the United States 8 articles each. Information and Communication Technology (ICT) has great potential to improve the quality of life of the population living in smart cities, innovation has always been significant to competitiveness and is vital to smart cities and tourist destinations. The sustainable and smart development of cities should be developed based on specific principles: synergy, creativity, and circularization.
Originality/value: The research is considered relevant since the theme of Smart cities in innovation and management is relatively new in the scientific area. It is opportune that governments and citizens discuss what they want for the future of their cities, understanding how technology can be an exceptional issue among nations around the world. A unique model of a smart nation can emerge and boost cities over the next 50 years.

Keywords: Smart cities; Information and Communication Technologies; Systematic review; Sustainable cities

RESUMO

Objetivo: As cidades inteligentes estão emergindo como um tópico de pesquisa científica em rápido crescimento; grande parte do conhecimento gerado é principalmente de natureza tecnológica O objetivo desta pesquisa foi identificar como os artigos científicos que abordam o tema cidades inteligentes sob a ótica da inovação e tecnologia.

Desenho/metodologia/abordagem: O procedimento metodológico consistiu em uma revisão sistemática da literatura; o processo foi realizado em três etapas principais: planejamento, revisão e relatório/divulgação. O período temporal estabelecido para as buscas foi de 2006 a 2021, utilizando as bases de dados: Emerald Insight, Scielo, Scopus e Web of Science, sendo utilizada a ferramenta Mendeley para filtrar os artigos dentro do tema.

Resultados: Após criteriosa seleção, foram encontrados 349 estudos, com base no objetivo e relevância desta pesquisa. Em relação às bases de dados Emerald Insight apresentam 91 artigos, Web of Science 83 artigos, Scopus 101 artigos e Scielo 74 artigos. Em relação às publicações por país, a Itália apresenta 12 artigos, o Reino Unido 11 artigos, a Espanha e os Estados Unidos 8 artigos cada. A Tecnologia da Informação e Comunicação (TIC) tem grande potencial para melhorar a qualidade de vida da população que vive em cidades inteligentes, a inovação sempre foi significativa para a competitividade, sendo vital para cidades inteligentes e destinos turísticos. O desenvolvimento sustentável e inteligente das cidades deve ser desenvolvido com base em princípios específicos: sinergia, criatividade e circularização.

Originalidade/valor: A pesquisa é considerada relevante uma vez que o tema Cidades Inteligentes em inovação e gestão é relativamente novo na área científica. É oportuno que governo e cidadãos discutam o que desejam para o futuro de suas cidades, entendendo como a tecnologia pode ser um assunto excepcional entre nações de todo o mundo. Um modelo único de nação inteligente pode surgir e impulsionar as cidades nos próximos 50 anos.

Palavras-chave: Cidades inteligentes; Tecnologias de Informação e Comunicação; Revisão sistemática; Cidades sustentáveis

1 INTRODUCTION

It is estimated that more than 50% of the population is concentrated in cities. This phenomenon of congestion, together with many other social, political, and economic factors, makes it urgent to rationalize urban processes to improve the quality of life, energy savings, and, in general, the sustainability of the planet. In this scenario, ICT (Information and Communication Technologies) infrastructures play a key role since they are often based on the levers that allow the application of management control to the urban context in its broadest sense (Calderoni et al., 2014).

In 1950, five years after the creation of the United Nations, the world population

had an estimated of 2.6 billion people, according to current estimates, the world population will reach approximately 9 billion by 2030, being more than 65% concentrated in cities (Un, 2015). These perspectives on urban population growth present major challenges for public management.

Facing the challenges, opportunities, conceptions, and solutions of the growing urbanization, the concept of a "smart city", which is still a bit diffuse, heterogeneous, and vague, has been increasingly studied in academia. It is considered smart due to the transforming processes, being an urban development path based on technology and characterized by a governmental, economic, and political aspect, involving several layers: public, private, individual, collective, infrastructure, and intangible (Matos et al., 2017).

The debate over smart cities has gained momentum over the years through key players such as the United Nations, Economic Cooperation and Development (OECD), and the European Union (EU) highlighting how technological progress can contribute to the development of urban systems (Visvizi et al., 2017).

The discourse of smart cities is grounded on sustainable development ideals on issues such as income, basic sanitation, education, mobility, health, and safety, with the idea of democratization of access and good use of information, since it is a challenge to implement smart cities in Brazil, a fact that should be viewed and evaluated with caution (Weiss et al., 2015; Viana Ribeiro et al., 2019; Ferreira Quilice et al., 2019; Müller & Silva 2022; Santos Silva et al., 2023; Golçalves et al., 2023).

The concept of a smart city has evolved, and depending on which location it is inserted, it has diverse characteristics and qualities, contributing to the growth and urban development through the daily actions of its population and local government (Visvizi et al., 2017; Santos Silva et al., 2017).

Hall et al. (2000) define a smart city hose that monitors and integrates the conditions of operations of all critical infrastructure of the city, acting as a preventive way to continue their fundamental activities.

According to Carvalho & Maia (2016), civic entrepreneurs have a strong potential to contribute to building cities more inclusive, innovative, democratic, and responsive

to the challenges of the future.

In this way, this article aims to identify how the articles approach the theme of smart cities from the perspective of innovation and technology, the methodology used was based on a systematic literature review.

2 METHODOLOGICAL PROCEDURES

Evidence-based management research is a relatively new field for academia with constant development because the studies depend on evidence in diverse contexts, and regarding this area, there is still no consensus on key issues, so systematic review becomes a fundamental tool (Tranfield, Denyer & Smart, 2003).

The systematic review process proposed by Tranfield, Denyer & Smart (2003) can be divided into three main stages: planning, carrying out the review, and report/dissemination. In this way, the process phases are: understanding the question formulation or identifying the problem, determining the objective (establishing the review basis), selecting studies that will serve as base references, the definition search mechanisms (strings), inclusion and qualification criteria, and finally the methods and tools.

3 ANALYSIS OF RESULTS

For the present review study, the first step concerns the formulation of the problem questions, expressed below:

a) Which studies approach the concepts of smart cities from the point of view of innovation and technology?

b) What are the main characteristics (authors, year, periodicals, country, and database, among others) of the existing studies?

c) What are the topics addressed among smart cities, innovation, and technology?

The purpose of this research is to survey published articles regarding smart cities, from the point of view of innovation and technology, seeking to answer the

questions defined in the research problem.

The searches were performed in several databases: Emerald Insight, Scielo, Scopus, and Web of Science, from the year 2006 until 2021. The strings used were: smart city, innovation, technological, and ecosystems, searching the fields: title, abstract, keyword, and topic.

As a strategy to present the data, the inclusion and exclusion criteria of the selected articles chosen for this study, are shown in Chart 1 in the Filter 1 column.

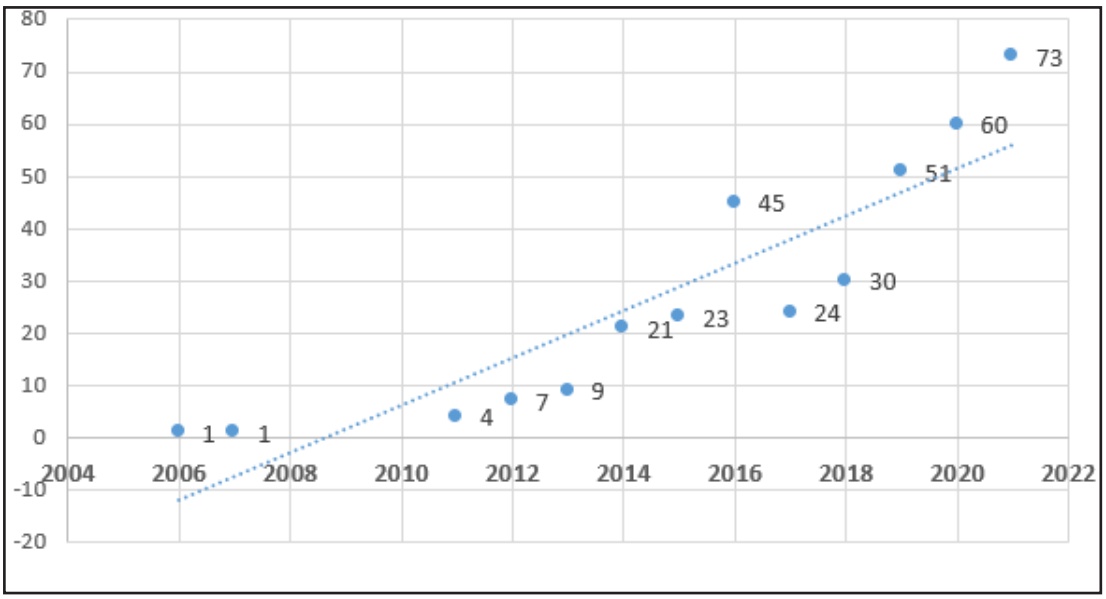
For the systematic review, since the peer review process in this type of publication represents quality, besides presenting more complete studies, to avoid repeated articles searched in more than one database, the Mendeley software was applied. Then the title and abstract of selected articles were read to verify if they addressed the research topic.

After presenting the inclusion and exclusion criteria, the “Result” column represents the selected articles from a systematic review, considering all the articles published from 2006 until 2017. In the final step (report/dissemination) a systematic classification of the selected articles was presented (Chart 2) using the following criteria: authors; year of publication; country of authors; journal; and database.

For final selection, the abstracts of all articles found were read, being 349 studies selected for analysis due to their potential information pertinent to the research objective.

From the results, it was found in the publication history that the term “smart city” only started in 2006; the studies on this subject are few in their majority recent, thereby receiving the attention and interest of worldwide researchers over the last four years, as shown in Figure 1.

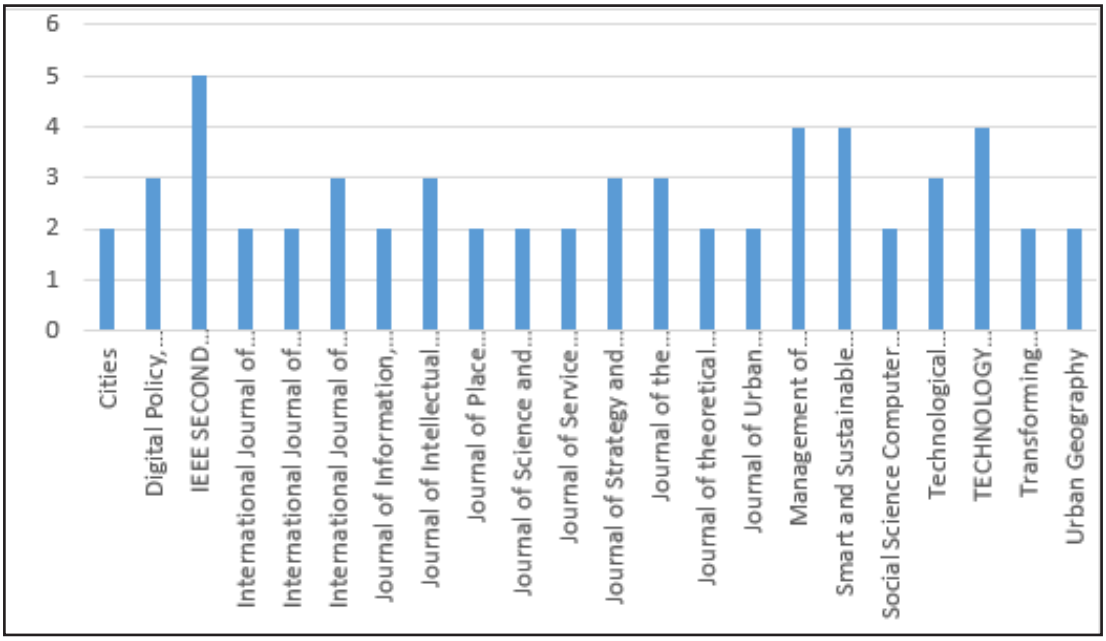
Figure 1– Number of articles published per year (2006-2021)



Source: Elaborated by the authors

Concerning published journals there was heterogeneity, but only a few journals stood out with more than one published article, as shown in Figure 2. Regarding the databases, Emerald Insight stood out (51 articles), followed by Web of Science (43 articles), Scopus (36 articles), and Scielo (5 articles).

Figure 2 – Main journals found



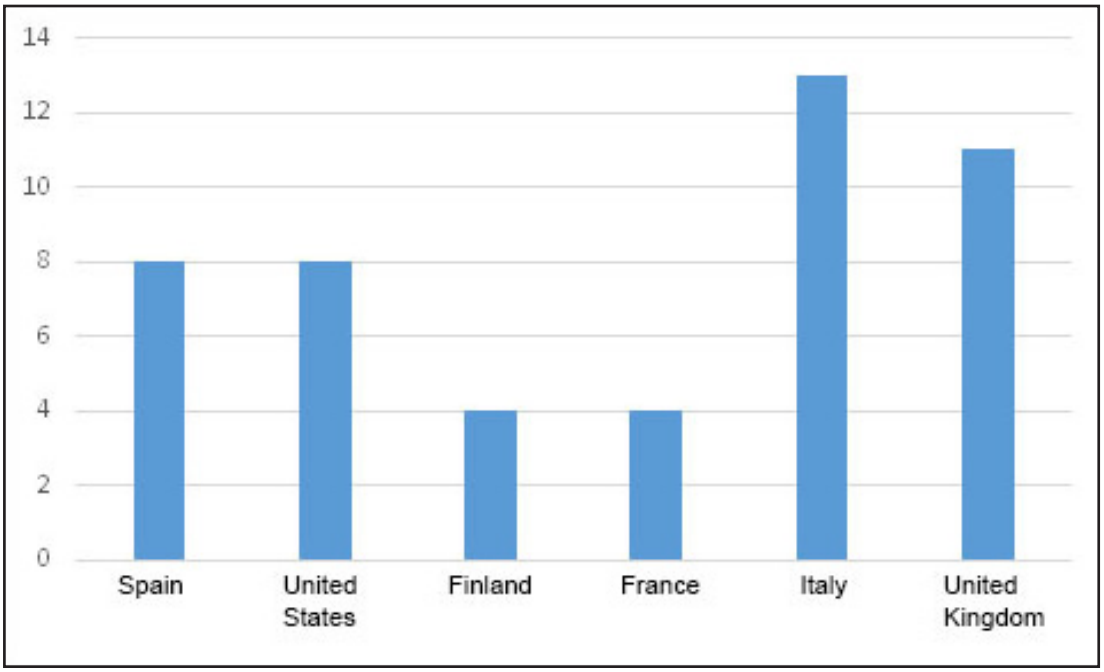
Source: Elaborated by the authors

Regarding the publications by countries, in the same way, we can note certain heterogeneity, from the results a total of 71 countries was found (Figure 3). Some articles have authors from more than one country, for those cases, it was considered the country of the first author, as can be seen in the concentration of articles in Italy (12 articles), followed by the United Kingdom (11 articles), Spain and the United States (8 articles each), Finland and Spain (4 articles each). Europe stands out (91) when grouping the number of publications per continent.

This fact can be justified due Europe has several smart city initiatives, such as Barcelona which was elected in 2014 as the European Capital of Innovation, the initiative of the Spanish Network of Smart Cities, French universities as promoters in the generation of smart cities through public and private initiatives, among other successful initiatives (Capdevila & Zarlenga, 2015; Dupont, Morel & Guidat, 2015).

The countries leading the publications on the subject are massively represented by developed countries, that is it is a subject of current interest for those societies, except Brazil (a developing country), with only one record found.

Figure 3 – Publications by countries



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In this way, it is pointed out that even though the number of articles on smart cities, from the point of view of innovation and technology, is considered reasonable, however, there is a need for publications on this topic in the American continent, where the number of surveys on this current and relevant issue for the management of innovation in cities is still low.

In the fourth step, based on the research guiding question, the selected records were analyzed about the contributions and knowledge provided to meet the study objectives. Thus, it is a presentation of the proposals of the subjects discussed in the articles analyzed.

3.1 Smart City Definitions

Currently, there is no standardized definition of a “smart city”, although many authors propose a definition that matches their meaning (Rochet et al., 2016).

Despite the ongoing discussion over the last few years, while strategic planning in this field is still not widely explored. Inspired to understand the purpose of this work, the proposal of the systematic survey consists of identifying the forces that shaped the conception of the smart city and, in so doing, begin to replace the currently abstract image of what it means (Belkin, Oddy & Brooks, 1966; Angelidou, 2015).

Although many "smart city" definitions have been proposed, corporate developers define it by the use of information technology in the search for efficient systems through real-time monitoring and control, they know that this definition is not new and is equivalent to the idea of debated urban cybernetics in the 1970s, when urban contexts adopted a digital configuration that focused on technologies and non-material structures incorporated into the physical space of the city (Bifulco et al., 2016; Bork et al., 2016; Ramaswami et al., 2016; Battarra et al., 2016; Benfares et al., 2017; Bibri & Krogstie, 2017; Branchi et al., 2017; Cantino et al., 2017; Zhuhadar et al., 2017; Kamel, 2013; Matos et al., 2017).

In contrast to the Rio de Janeiro Operations Center discussion, which considers urban problems as perverse problems, allowing more fundamental solutions than urban cybernetics, but requires local innovation and stakeholder participation (Goodspeed, 2015).

It is argued that the concept of a smart city is an evolution more centered on the user of the other city - concepts that seem to be more technological of a deterministic nature (Brent & Labuschagne, 2007; Branchi, Fernández-Valdivielso & Matías, 2015; Tazilan, 2012; Schuurman et al., 2012; Egger, 2013; Paroutis, Bennett & Heracleous, 2013; Galindo, 2014; Williams & Currid-Halkett, 2014; Lee, Hancock & Hu, 2014).

Cities form the heart of a dynamic society. In an open economy, they need to mobilize all their resources to remain attractive and competitive (Modderman et al., 2007).

Given this scenario, the term "smart city" attracted a lot of attention from policymakers, business leaders, and citizens in general. While there is no single definition of a "smart city," it is generally accepted that "smart" urban policies refer to initiatives

by local governments that use information and communication technologies to increase the quality of life of their inhabitants, contributing to sustainable development (Capdevila et al., 2015; Gianni & Divitini, 2015).

Accepting the idea that those who directly experience a problem are stronger to develop more innovative solutions, local governments have begun to engage smart communities in the innovative delivery of public services. Even though the meaning of "smart community" often refers to community participation in the innovation of public services for urban life, local governments have predominantly encouraged the participation of their citizens (Orłowski, 2014; Kramers et al., 2014; Girtelschmid et al., 2014; Dameri & Ricciardi, 2015; Silva et al., 2015; Tachizawa et al., 2015; Michelucci & De Marco, 2017).

Across the world, municipalities have made substantial investments to accelerate the construction of an urban phenomenon that has become known as a smart or connected city (Tucker et al., 2017). Throughout the twentieth century, knowledge participation has worked in total employment in high-income countries, increasing from zero to nearly twenty percent. Almost all of this knowledge work is located in cities (Krozer, 2017).

Solutions should start with "city" not "smart" from a technology-driven planning approach, combining different types of intelligence (technologies, tools, and applications) with different types of functions and urban contexts (Stratigea, Papadopoulou, & Panagiotopoulou, 2015).

The idea is to use the latest advances in telecommunications, hardware, and robotics to create a completely new hi-tech urban environment that minimizes the consumption of natural resources, optimizes road traffic, and studies work on how technologies affect the urban environment (Chesov et al., 2016).

There is a lack of empirical case studies based on smart city strategies and their results. As well as a lack of insight into how exactly it is implemented in practice, what current and emerging policies and strategies are used to exploit broadband infrastructure opportunities and Internet-based applications how these policies work, and what bottlenecks impede

the successful development and implementation of smart city strategies (Komninos et al., 2013; Lynggaard & Skouby, 2015; Cavada, Hunt & Rogers, 2016; Jokinen, Latvala & Lastra, 2016; Chinh et al., 2016; White, 2016).

The development of business ecosystems is currently hampered by the absence of established approaches that facilitate long-term value and sustainability (Artto et al., 2016).

The involvement of open and user-driven sustainable innovation ecosystems to improve business innovation and improve quality of life, to transform rural and urban areas into places of democratic innovation, where innovation ecosystems enable collective intelligence and capacities creation of communities of users and citizens to design life scenarios and innovative work (Scuotto et al., 2016).

Smart city concepts follow this approach and involve all stakeholders in the decision-making process. Becoming "collaborative innovation platforms" (Mainka et al., 2016).

Most definitions of a "smart city" make a direct or indirect reference to improving performance as one of the main objectives of initiatives to make cities smarter (Castelnovo et al., 2015).

Mobile applications try to access resources made available by city authorities through the use of Application Programming Interfaces (APIs). There is a growing awareness of the benefits of using APIs to promote civic engagement through a more efficient and personalized administration of government services and as a facilitator of a new wave of innovation that contributes to a more automated and sustainable functioning of cities (Sciarretta et al., 2016).

Smart city is a term that has gained strength in academia, business, and government to describe cities that, on the one hand, are increasingly composed and monitored by generalized and ubiquitous computing and whose economy and governance are being driven by innovation, creativity and entrepreneurship, enacted by smart people (Kitchin, 2014; De Wijs, Witte & Geertman, 2016; Degbelo et al., 2016; Ojasalo & Kauppinen, 2016).

The orientation of innovation could address the steps towards greater sustainability aiming at human well-being (Hung & Peng, 2017). The initiative of smart cities encourages the improvement of their performance in the three pillars of sustainability: environmental, economic, and social.

3.2 Sustainable Cities

Sustainability has become increasingly important in research and environmental policy since the 1980s. This concept was officially defined for the first time by the Brundtland Commission as follows: "development that meets the needs of the present without compromising the ability of future generations to meet the needs of the world".

The concept is comprehensive, involving several key domains: energy and resources, water, economic development, health, lifestyle, etc. The emphasis is on the balance between the economy, society, and the environment. Today, many activities in different sectors and countries around the world are pursuing sustainability and the corresponding research programs have been launched (Bao & Toivonen, 2014).

The movement of smart cities is distinguished from sustainable cities by the use of smart technologies to achieve sustainability. The world-class initiative is the first and only urban movement to generate interest from citizens, governments, and even industry, most interested because of its opportunities to sell technology solutions and services to governments to better serve citizens (Cimmino, 2014; Marsal-Llacuna, 2016).

EcoCloud's concept of helping industrial facilities to use water sustainably, especially in recycled form for refrigeration, and its long-term goal is to support all aspects of sustainability, including energy use of the soil (Rosenblum et al., 2011).

Freedom of access to information is a critical component of smart cities and open government initiatives, as it is seen as an improvement in aspects of public life, such as citizen participation in the democratic process, trust in government, and prevention of corruption based on access to public information (Hivon & Titah, 2017).

There are innovation platforms and intermediaries for open and collaborative improvement of cities. An innovation platform is defined as an approach that systematically facilitates external actors to develop solutions to the problems and needs of the platform owners. In the context of citations, the platform owner is typically a city and therefore the innovation platform works between a city and external actors and facilitates its collaborative innovation (Ojasalo & Tähtinen, 2016).

The technological vision of smart urbanism was promoted as a silver bullet for urban problems and a great market opportunity. The quest is for companies and governments to find effective and transferable demonstrations of advanced urban technology (Taylor Buck & While, 2015).

The integration of well-known brands and value-based experience rooms helps create an innovative ecosystem of services that can grow and make a strong profit. Well-known brands linked to partners that signal quality and confidence can reduce risk and contribute to innovation (Aal et al., 2016).

New companies, able to take full advantage of new market channels and change the mobile application business environment, create a new industry around open data (Hielkema & Hongisto, 2013).

The political agenda of the smart city must be informed and address the structure of transnational urban networks, as this may affect the effectiveness of these local policies. The meaning of this global network structure is essential because cities do not exist in a vacuum. On the contrary, urban development relies heavily on the urban interdependencies found on a global scale (Tranos & Gertner, 2012).

3.3 Tourism

Improving the competitiveness of tourism is the main purpose of building the city of smart tourism. According to the index system to find the gap and improve, while the dynamic assessment of assessment indicators, smart tourism, competitive, contributes to the direction of development (Huang et al., 2017).

As a growing competition between cities in Asia, the effective tourism marketing of cultural tourism products becomes increasingly important. Cultural exposure to a particular foreign city through the media affects people's preference for that destination and ultimately can be a function of the behavior of that city's cultural product (Koo et al., 2016).

Having established what is meant by unhealthy lifestyles, he went on to analyze the technologies of existing smart cities being developed to tackle diseases. This drew particular attention to the high-density challenges that the application of such technologies places on cities seeking to be smart in managing the condition and proceeded to explore the possibility that smart city districts approach the spread as part of sustainable urban development (Sidawi & Deakin, 2013).

In light of the urgent threats posed by climate change and rapid urbanization, interest in "smart city systems" is increasing. In contrast to erudition that represents "smart" as something that needs to be added to cities, recent developments in spatial morphology research pursue a view of the fabric constructed from cities as an extension of the cognitive human apparatus, as well as a material formulation of social, cultural and economic relations and processes (Marcus & Koch, 2017).

The possibility of so-called smart technologies to improve the life of the city generated several questions. While the corporations driving these developments emphasized how smart technologies can improve efficiency, critics have warned against the risks associated with the proliferation of smart surveillance (Galdon-Clavell, 2013).

The world is experiencing an evolution of smart cities. These emerge from innovations in information technology that, while creating new economic and social opportunities, represent challenges to our security and privacy expectations (Elmaghraby & Losavio, 2014).

The sustainable and smart development of cities must be developed based on specific principles: the principle of synergy, the principle of creativity, and the principle of circularization (Girard, 2013).

Framing new systems as public investments rather than a "free ride" for taxpayers would be a more accurate and potentially effective way of promoting their development in the context of the current push for a sustainable transport policy in cities around the world (Béland, 2014).

3.4 Smart Cities in Different Countries

Even taking into account that the population living in European cities and around the world is increasing, we must be able to respond to the level of its multiple services with an adequate response to provide residents with a good quality of life, based on sustainable systems (Brent & Labuschagne, 2007).

Technology is a way to enable people to contribute to common goals in smart city projects and leverage a combination of knowledge (Bifulco et al., 2016). To establish an evaluating tool for different technologies in terms of usefulness and consequences, and to consider the impact of their applications. So, policymakers and influencers can assess the advantages of each initiative, and the virtues of the technologies and systems available for their application in smart cities (Branchi Borrell et al., 2014; Viitanen & Kingston, 2014).

In the case of Amsterdam, the strategy was called "Amsterdam Smart City" and the idea of initiating this initiative was developed in 2007, thanks to the collaboration between the Amsterdam Innovation Motor (AIM), based on the conviction that information technologies and communication improve the functioning of cities, organizations have proposed to take the initiative of a strategy currently underway and the main driving force behind all the activities carried out in the progressive implementation guarantee (Mora, Bolici & Deakin, 2017).

Cities, as the closest management structure for citizens, should play a key role in the implementation of Europe 2020 and its flagship initiatives, as well as addressing climate and energy challenges (Androulaki, Doukas, Marinakis, Madrazo, & Legaki, 2016). Innovation has always been significant and is vital to the competitiveness of smart cities and tourist destinations.

In Barcelona, Amsterdam, and Helsinki, innovation is the result of all practices undertaken and is highly promoted and strongly empowered by the capacity of information and communication technologies (Boes, Buhalis & Inversini, 2016; Vitaliev, 2016).

In May 2016, a Dutch environmental group reported that poor air quality in parts of Amsterdam was exposing citizens to dangerous levels of pollution. A month later, newspapers presented an article on a new example of smart technology, the "TreeWiFi": a birdhouse that responds to air pollution and has a green glow, giving travelers free Wi-Fi signal, but only when the air quality is high. The Dutch inventor has reported a desire to find a simple way to make air pollution visible to citizens in a simple and easy-to-understand way on the emotional level rather than having to dig for data and maps (Kaika, 2017).

Japan is advancing and bringing quality of life for citizens through public services, using resources with less impact on the environment. However, this project requires huge financial and long-term investment for profitability and with many uncertainties (Ha & Fujiwara, 2015).

A case study based on a Kitakyushu smart community project was developed in Japan to examine the validity and usefulness of the antecedent framework conditions: resource-dependent leadership network, intersectoral collaboration based on social ties, and governance (Chatfield & Reddick, 2016).

With the development of smart cities in Japan, it was possible to provide an alternative theory to the predominant socio-cognitive explanations of how organizational fields emerge. In the empirical case, the drivers for the initial development of an organizational field are concrete organizational actions to bring together the tangible objects of the new field (Nyberg & Yarime, 2017).

In 2014, Barcelona received the European Capital of Innovation Award. Four years earlier, the city council of Barcelona launched a project using new technologies to promote economic growth and the well-being of its inhabitants, was structured around five axes: open data initiatives; sustainable city growth initiatives (smart

lighting, mobility of electric vehicles, and waste energy); social innovation; promotion of alliances between research centers, universities, private and public partners; and providing "smart services" based on ICT.

The sustainable innovation ecosystem of Barcelona, called "iCapital", is supported by public institutions (including public services, universities, and research centers), private sector (start-ups), and citizenship based on the infrastructures of the city. Recognized as capable of successfully developing an ecosystem where urban development, business opportunities, and quality of life have improved in the last decades (Capdevila & Zarlenga, 2015).

For years, various strategies have been implemented to create smart cities, supported by national public policies, coordinated by the Secretariat of State for Telecommunications and the Information Society (SETSI). The Spanish Network of Smart Cities, created in June 2012, with 41 members signed an agreement with the Spanish Federation of Municipalities and Provinces to work on incentives and proposed the participation of more cities in the project. These cities are not necessarily the largest, and many of them have a population of about 150,000 (Alejandro et al., 2014).

Another initiative that came into effect was possible through the French Universities, through an innovative public-private partnership dedicated to urban transformation; it was possible even being public, an analogy with the notion of market strategy was possible. Universities are competitors for research, teaching, and resources. French public funds and the reduction of subsidies imply the diversification of the origin of resources, especially with private funds.

Thus, social change and sustainable urban transformation create opportunities for new types of collaboration. Empirical evidence and the state of the art show that isolated stakeholders cannot find sustainable answers. In addition, collaboration between universities and municipalities needs to be highly diversified and expanded for urban sustainability (Dupont, Morel, & Guidat, 2015).

Security is one of the challenges for contemporary integrated urban development.

In Hungary, each strategic document highlights this goal, seeking social solutions and smart cities for the problem. However, behind the general theory and internationally known practical knowledge about this component of the urban renaissance, each place has its history. The transformation of public space depends on local, physical, and abstract peculiarities; cultural, financial, and legislative backgrounds; and especially the actors involved in the process: politicians, designers, users, etc. (Benkõ & Germán, 2016).

The smart city has become a political technology that serves as a tool for policy-making in the context of austerity urbanism in Italy (Pollio, 2016). Familiarity with ICT in Italy is somewhat less dramatic in statistics on e-government (individuals invoked or interacting with public authorities and private internet services in the last 12 months, year 2013) because the European average is lower by 40 percent).

A project to illuminate an old city in Italy is based on a holistic approach that aims to fulfill several objectives: Reduce energy consumption using efficient light bulbs and advanced control systems; make the network viable and useful for many purposes, integrating ICT devices; provide a new identity to the oldest part of the city using new technologies and design concepts; and ensure the safety of streets and pedestrians according to the codes and standards (Beccali et al., 2017).

But the pace with the Nordic countries remains (not including the UK), reaching more than 80% in Denmark, compared to approximately 20% in Italy. It is important to emphasize the occurrence of “digital divisions” in Europe, the use of ICT differs considerably according to age (the largest internet users are between 16 and 24 years old, more than double between 55 to 74 years) and level of formal education (individuals with a high level of education are almost twice as likely to use the internet) (Chiodi, 2011).

It is important to highlight the growing attention given to cultural networks, often envisaged as a means of promoting the competitive advantage of the territory and overcoming the major challenges facing the cultural sector today. This means

implementing the logic of cooperation between different public institutions, private affairs, and various stakeholders in the area that progressively evolve towards the creation of cultural ecosystems (Borin et al., 2015).

Singapore has been extremely successful economically over the past 50 years through the concept of the smart nation; a new area and paradigm for digital technology and the data are applied to address strategic issues through a government-wide approach and in collaboration with citizens (Hoe, 2016).

In response to the recent wave of urbanization and liberalization, there has been a drastic increase in the size of cities, especially in countries with a mixed economy like India. Population has doubled over the past five decades and will continue to grow exponentially. Hindu, one of India's leading newspapers, said housing millions of people with a young demographic is challenging - with 250 million young Indian tributaries, real estate is already exploiting the growth of the Indian working population (Ghosh et al., 2016).

It was adopted as a key question why India became the city of producing 100 smart cities as proposed. We convey a notion of "technocratic nationalism" to suggest that the young urban population in India has largely bought the dream of the smart city (Datta, 2015).

The state of Pennsylvania has different types of cities, broad water resources, and water quality problems that are all connected by aging, and existing rainwater management infrastructure (Nielsen, 2014).

As older cities begin to invest in new infrastructures, they have two relatively new technology options: the "green infrastructure" and the "smart infrastructure", which adds sensors, controls, and communications (Meng et al., 2017).

In Brazil it was also possible to identify actions of smart cities, in Natal capital of Rio Grande do Norte state started to offer faster Internet connection to attract businesses, public and private companies, universities, and other organizations, proposed to achieve three main objectives: build world-class broadband infrastructure

for the city; extending broadband services to underserved areas; and offering free Wi-Fi in selected public spaces (Cacho et al., 2016).

In another example, in Porto Alegre the capital of Rio Grande do Sul state, the implementation of innovations in information and communication technologies (ICTs) for the provision of public services provided greater efficiency in the activities involving the management of the city, with important results in favor of the actors involved (Cesar Weiss et al., 2015).

4 CONCLUSION

This systematic literature review was developed in search of a better understanding of how smart cities contribute to identifying how the articles address the theme of smart cities from the perspective of innovation and technology. From the article's analysis, it was possible to perceive the existence of different technological solutions that are integrated into the urban context, and, according to some authors, the use of technology is substantially interconnected to the characteristics of innovation characteristics. The effectiveness of the technology can be witnessed, for example, in the automation of functionalities in convenience environments and high-impact environmental technologies.

Although the importance of technology strategy has received more attention in recent years, few research studies have examined how road processes are used to explore the potential convergence of products and services that can be developed in the future (Lee, Phaal & Lee, 2013).

Civic entrepreneurs have a strong potential to contribute to the construction of smart cities that are more inclusive, innovative, democratic, and adapted to the challenges of the cities of the future, the contours of which we can only imagine today (Carvalho & Maia, 2016). Most of the world's population lives in urban areas and energy-inefficient buildings. Based on these assumptions, there is a need to identify methodologies and innovations capable of improving social development and the quality of life of people

living in cities. Smart cities can be a viable solution (Battista et al., 2014).

In the context of smart cities, concepts, dimensions, and models have been created that allow, for the most part, the transversal and sustainable aspect. In this article, it was possible to find the technology supporting the instances of government, university, and business.

The success of performing smart services depends on innumerable technical interactions between community, city, and contextual factors (Ramanathan & Calyam, 2016).

The development and dissemination of technologies, policies, and practices of the "smart city" is now an important element of contemporary urban governance given the role of powerful global companies (Mcneill, 2015).

Local government needs to establish appropriate conditions for people to engage, and it is a market empowerment change to empower local communities. It means that, in many if not all cases, local governments should look closely at institutional design and move towards open, inclusive transparent, more reliable, and accessible governance. That is, a people-centered approach based on participatory facilitation and, hopefully, empowerment (Van der Graaf & Veeckman, 2014).

Divided along these paths, the future development of this new and promising field of research runs the risk of being harmed. Although bibliometric analysis indicates that smart cities are emerging as a topic of fast-growing scientific research, much of the knowledge generated about them is singularly technological. In this sense, the social intelligence, the cultural artifacts, and the environmental attributes that are necessary for urban innovation related to ICT that these researchers defend (Mora et al., 2017).

The innovative character of ecosystems did not necessarily fit into the smart economy until they came on the stage to develop new business models in the layer when they capitalize on the resources of the layers, city structures, public services, and urban planning game, where the readiness for changes in the smart city is exercised. Conclusively, the planning agenda for urban innovation ecosystems starts from the

city's readiness to implement smart policies (Leavy, 2012; Zygiaris, 2013)

We conclude that complex processes of smart community implementation require a shared vision of multi-stakeholder social innovation with conflicting values and adaptive use of informal mechanisms of social governance for the effective implementation of the smart city (Chatfield & Reddick, 2016).

So it is opportune that government and citizens discuss and discuss what they want the future of the city-state to be and how technology can make it truly exceptional among nations around the world. A unique model of a smart nation can emerge and propel the city-state not only into the immediate future but over the next 50 years (Hoe, 2016).

In light of these new perspectives, the contributions of other studies and conceptions about smart cities are interesting.

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1. Definition of research problem	√	√			
2. Development of hypotheses or research questions (empirical studies	√				
3. Development of theoretical propositions (theoretical work)	√		√		
4. Theoretical foundation / Literature review	√	√			
5. Definition of methodological procedures	v		√		
6. Data collection				√	√
7. Statistical analysis	√	√		√	
8. Analysis and interpretation of data			√		
9. Critical revision of the manuscript	√	√	√	√	√
10. Manuscript writing	√	√	√	√	

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The authors have stated that there is no conflict of interest.

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