

## THE CONCEPT OF A SMART CITY MANAGEMENT IN THE LIGHT OF THE LITERATURE REVIEW

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**Abstract:** The vision of a Smart City is to connect smart models, smart IT, and smart management practices that qualitatively help municipalities advance service delivery in the areas of infrastructure, environment, education, health, and more. Modifying the management skills of local government leaders is a natural response to Smart City policy. Methods used in this paper that helped to achieve the objectives were a review of the current state of knowledge of the issue, search of relevant literature and case studies, summarisation of results, induction, deduction, and others. The studies included the following research questions: 1. What is the general scope of research on Smart City and Eco-Smart City? 2. What are the key challenges for Smart City managers? 3. What is the current state of Smart City development? The Web of Science and Scopus databases were chosen to identify relevant literature. The research focuses on articles published in English (from 2019 to 2023). The aim of the review is to provide a current picture of research in smart cities and to identify gaps and areas for future research. The analysis brought two challenges to the research: research is often fragmented and technology-driven, and many studies are on the perceived benefits of smart city projects.

**Keywords:** innovation, management, Smart City

**JEL Classification:** H79, O32, O40, R11

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## Introduction

In the last years of the 21st century, we can observe a growth of interest in the topics of self-governance theory that concerns participation, innovation, and environmentalism (Frick, 2023; Beveridge & Koch, 2022; Shelley, 2022). Studies, policies, practices, and theories are leading to the transformation of local governments into a new form (Teles, 2023; Volk, 2022). The enormous qualitative change in local government units in terms of development and growth is the result of awareness of the importance of this element of society. What is remarkable is the fact that local governments continue to maintain their status as an important part of the existence of communities, the quality of life development of society, and democracy.

Extreme changes in the external and internal forms of local government are the natural evolution of the needs and means that inevitably affect it. The exhibition of these changes has the results in terms of life quality indicators, economic, social, and business performance, etc. In addition to its representatives and inhabitants, the driving forces are the policies of global urbanization and the digitalization of society. It is the latter that currently presents an opportunity resulting in a quantitative-qualitative change in the nature of local governments (Tura & Ojanen, 2022; de Gaiumaraes et al., 2020; Frank & Fernández-Montesinos, 2020; Singh & Rathi, 2019).

Technological advances in IT, the rate of change and innovation, the new capabilities of local government representatives, citizen participation, the size of resources and means, and the potential of local governments are the driving forces of the renaissance. The selected elements of the mechanism are only a brief selection of the options that fundamentally modify the phenomenon of territorial self-government into the form of a Smart City. As Vagisha (2020) adds, "Thanks to digital technology, all operational tasks related to citizens and government, integrated metropolitan services, database systems, geographic information systems and others are easily automated. The functioning of smart city infrastructure is seamless and free from any hindrance". This places Smart City among the tools for sustainable, smart and quality development of cities and regions (SBA, 2021; Smart City Summit, 2021; Johnson et al., 2020; Yigitcanlar, 2018).

The intention to proactively implement (cutting-edge) technologies and platforms enabling maximum use of IT in the local government environment leads to digital transformation and automation of local governments, which has a major impact on these units compared to the archaic governance model. Equally important are the abilities of their representatives to adapt to new environments and circumstances. Therefore, it is not only the expansion of high-end technology and hard infrastructure, such as buildings, transport, logistics, and the economy, that must be emphasized. Although, as Neirotti et al. (2014) state, "hard infrastructure plays an important role in addressing Smart City issues", Ammara et al. (2022) point out in their work that attention should also be focused on humanistic elements and social capital.

Studies dealing with Smart City issues examine the above-mentioned aspect, thus sidelining soft infrastructure. However, to comprehensively explore this conceptual sophistication of municipalities and cities, including processes, models, and practices, it is necessary to also dismantle the changes related to management, i.e., the

qualitative development of human resources. Kavanagh (2020) points out that smart cities have the potential to change not only the hitherto existing nature of the economic models of running and managing local government units but also the nature of social-community models. The liaison officer for the above is the local government management. Local government management is facing new unknown challenges (Qayyum et al., 2021; Zhang et al., 2017). It must be able to reflect and align the city's strategic development plans with land use planning, citizens' needs, and opportunities. Only through the professional erudite management approach of the leadership and management of the planning units can the goals and objectives of the Smart City concept be achieved. At the same time, this can be considered a natural consequence of the global digital revolution and automation.

The add-on of the Smart City model is the Eco Smart City, which in terms of higher intentions again takes the whole issue of sustainability and resilience of the Smart City forward, thanks to eco-innovations. Here again, the main role is played by the management, which embraces eco-innovation and the eco-dimension of managing the unit. As Bibri (2021) and Caprotti (2020) mention in their studies, in the case of Eco-Smart City, in addition to the economic and social qualities of the city, its environmental qualities must be taken into account. By this, cities declare not only economic autonomy but also a policy that leads to full carbon neutrality and renewable energy production, sophisticated urbanization and transport systems, sustainable lifestyles, reduction of material consumption, and awareness raising about environmental issues, among others. These are five things that cannot be achieved without erudite managers and approaches. However, there are no strict definitions of the term “smart manager” or even of the term “eco-city”. Spath (2023) proposes ecocities and smart cities as “socio-technical experiments” that are potential drivers of local, national, and international environmental socioeconomic change and transition. Many of these projects combine elements of eco-city planning (focusing on visible ‘hardware’ of environmental sustainability: planning, architecture, renewable energy, smart grid technologies, etc.), with ‘Smart City’ planning (focusing on ‘software’: information systems, social capital, knowledge transfer, etc.). We will analyse ‘Smart Eco City’ initiatives that experiment with environmental and economic reforms in both areas that are spatially close (e.g. city regions) and in an international context (through networks of knowledge, technology, and policy transfer and learning).

## Literature review

Analysis of the available literature shows that several researchers work on Smart City issues, each of them having a specific approach to the topic based on their professional focus (Table 1). The Smart City issue is understood as a concept, method, product, philosophy, IT platform, etc. Therefore, a unified framework and a correct definition are still not clear. In addition, researchers and authors of publications focus their research more on hard infrastructure (Rani & Sharma, 2023; Jonek-Kowalska, 2022; Elghaish et al., 2022; Alnahari & Ariaratnam, 2022; Benedict, 2022). The most frequent topics include infrastructure, energy, urban mobility, and waste management. Less intensively, the authors analyse the relationship between the application

of the Smart City concept and the quality of management. However, the authors stress the importance and role of unit managers in the application of the Smart City concept. Thus, our analysis concludes the need to link the qualitative nature of IT and the qualitative development and open approach of local government representatives. Furthermore, as the authors emphasize in their studies, the environmental influence and dimension of Smart City intentions become inevitable. The latter can be described as a new opportunity for communities, which puts Smart City intentions in a diametrically different dimension. The eco-innovative dimension, called Eco Smart City, is currently being addressed by an increasing number of authors. The authors agree that a Smart City without the added eco-characteristic loses its meaning. Working from the very first stages with the environmental and eco-innovative character of the modification of schemes leads to more sustainable development in regional and global schemes.

**Table 1. Meaning of a Smart City**

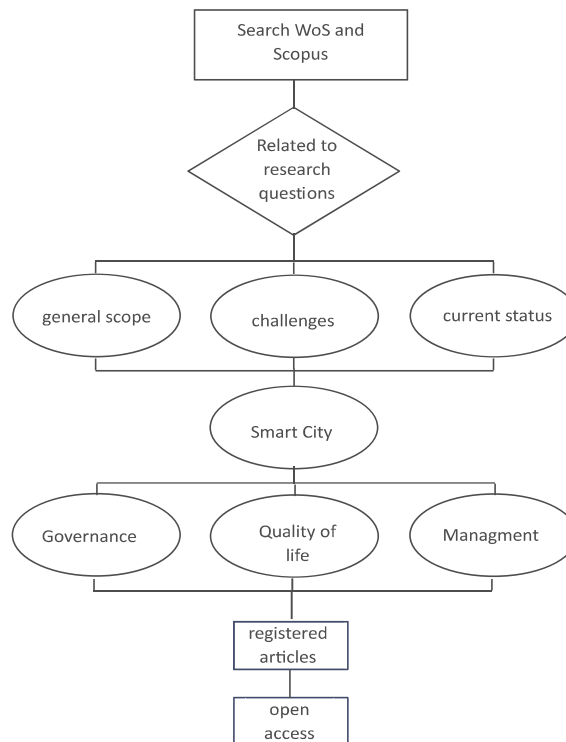
Year	Source	Meaning
2023	Filiou, Kesidou, Wu	an example of a combination of AI and IoT applications to specific geographical contexts and are used here as a way to capture the implementation of digital policies
2022	Ammara, Rasheed, Mansoor, Al-Fuqara, Qadir	the ability of urban inhabitants – whether they are leaders or members of urban communities – to use ingenious solutions to solve lingering problems
	European Union	a place where traditional networks and services are made more efficient with the use of digital solutions for the benefit of its inhabitants and business
2020	DeGuimaraes, Severo, Júnior, Da Costa, Salmoria	a viable solution to aggregate public resources, human capital, social capital, and information and communication technologies to promote sustainable development
2019	Zitzman	hubs that route IoT-produced data through public-private partnerships to solve real problems
2018	Ruhlandt	a multi-dimensional mix of human (e.g., skilled labor), infrastructural (e.g., high-tech [...] facilities), social (e.g., [...] open network linkages), and entrepreneurial capital (e.g., creative [...] business activities) merged, coordinated and integrated into the fabrics of the city using new technologies to address social, economic and environmental problems, involving multi-actor, multi-sector, and multi-level perspectives
2013	Kitchin	places where information technology is deliberately used to improve city operations and management, enable innovation in public services and governance and increasingly improve long-range planning
2007	Giffinger, Fertner, Kramar, Kalasek, Pichler-Milanović, Meijers	a city well performing [...], built on the ‘smart’ combination and activities of self-decisive, independent, and aware citizens

Year	Source	Meaning
2003	Odendaal	[...] Information and Communication Technology (ICT) in promoting prosperity and influence of the city
2000	Hall, Bowerman, Braverman, Taylor, Todosow, Von Wimmersperg,	designed, constructed, and maintained making city use of advanced, integrated materials, sensors, electronics, and networks which are interfaced with computerized systems comprised of databases, tracking, and decision-making algorithms
1999	ICT Strategy of Dubai	[...] where residents and local governments created communities using ICT and sensors to share information

Source: Own processing according

## Research methodology

To understand the issues and the role of local government management within the Smart City concept, it is essential to draw on real studies and knowledge, which will be analysed in the form of studies and scientific output. To achieve this, a bibliometric analysis will be carried out based on 46 publications, largely indexed in Web of Science and Scopus. The search strategy consisted of searching for articles based on selected keywords, availability of abstracts, and open access to the works (Figure 1).



**Figure 1. Literature Review Search Process**

Source: Own processing

On average, more than 10,000 articles are identified per year (Table 2). Some of the publications are indexed in both databases, which means that the total number of publications is lower. The authors cannot quantify this fact exactly.

**Table 2. Articles in Web of Science and Scopus databases by filter**

Year	Database	Status of articles	Keywords		
			“Smart City” and “Governance”	“Smart City” and “Quality of life”	“Smart City” and “Management”
2019	Scopus	registered articles	1074	2741	3061
		open access	190	450	498
	WoS	registered articles	425	361	418
		open access	172	119	152
2020	Scopus	registered articles	1360	3527	3890
		open access	285	659	749
	WoS	registered articles	366	330	410
		open access	198	163	208
2021	Scopus	registered articles	1762	4507	4992
		open access	513	1121	1277
	WoS	registered articles	429	316	415
		open access	233	161	222
2022	Scopus	registered articles	1866	4987	5352
		open access	718	1535	1737
	WoS	registered articles	423	319	380
		open access	261	185	198
2023*	Scopus	registered articles	1234	3197	3399
		open access	468	1044	1154
	WoS	registered articles	131	108	115
		open access	83	68	67

Source: Own processing according to results in the Web of Science and Scopus databases

The research aims to answer the following questions: 1. What is the general scope of research on Smart City and Eco-Smart City? 2. What are the key challenges for Smart City managers? 3. What is the current state of Smart City development?

In answering the last question, we will rely on the global Smart City evaluation indexes. In addition to the secondary literature analysis, the method of summarisation, comparison, deduction, induction, and creativity was used to draw our own general conclusion. Therefore, this article aims to contribute to the understanding of the relationship between innovation and Smart Cities and management, contribute to the Smart City literature, and also formulate questions that will support the potential for further research.

## Results

As the present paper intends to answer the key questions of nature, outcomes and efforts, as well as skills required, we will use secondary study results and findings to approach the specific answers.

### 1. What is the general scope of research on Smart City and Eco Smart City?

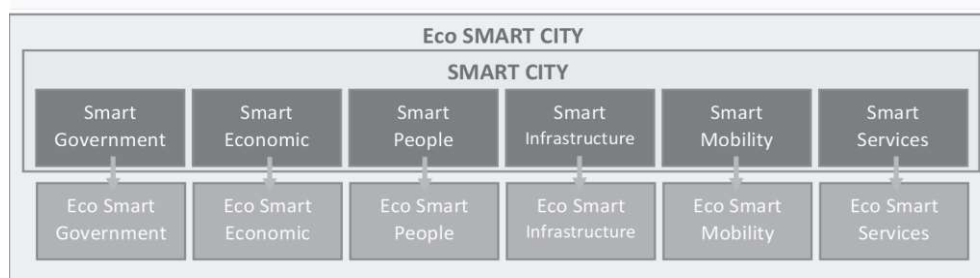
Smart City is not only a discussion topic among experts, but also a matter of running and managing units. Research shows that many cities address Smart City issues not only in terms of new technology trends, such as Internet of Things, Internet of Drones, Internet of Vehicles (Preeti, Sharma, 2023; Akram et al., 2023; Heidari et al., 2022; Quin-Shan et al., 2022) but also in terms of social and environmental impact (DeMarco & Mangano, 2021; Nitoslawski et al., 2019). In their publications, researchers mainly deal with hard infrastructure and management elements of the classic Smart City concept (87% of publications). By the term Smart City, we mean the involvement of IT elements without reflection on environmental burdens, i.e., the possibilities of IT application in the municipal environment, the interconnection of networks, and the technological perspective. The strengthening of the qualitative nature of services and improving regional competitiveness are the main drivers for cities to implement the Smart City strategy. Implementing innovative solutions and targeting key problem-solving is the essence of the representative model ideas. Digital policies embedded in Smart Cities can facilitate long-term sustainable development, as the combination of artificial intelligence and the Internet of Things can provide the starting point for further innovations in the form of process, product, or supply chain eco-innovations, e.g. smart manufacturing (Filiou et al., 2023).

The conventional Smart City model is based on the development and elements of the proportional components integrated on the basis of naturalness. Building this model is based on coherence, reliability, accessibility, and completeness. This is based on a dimensional structure consisting of six domains (Figure 2), which is advocated by Giffinger & Haindl (2009) and Attaran et al. (2022).

Another finding is that the dimension of local government units, management and their transition to new skills and competencies is often absent in the output. While this issue is covered in the themes that have seen a noticeable increase in popularity in the area of life quality assessment, as well as the environmental dimension, it is not solved directly. According to a study by the McKinsey Global Institute (2018),



the application of Smart City elements has an impact on quality of life, which can improve by 10-30%, reduce the number of deaths by 8-10%, speed up the response time of emergency services by 20-35%, reduce the greenhouse effect by 10-15%, and much more.



**Figure 2. The General Six-Dimensional Model of Smart City and Eco Smart City**

Source: Own study

The aforementioned dimension of environment, eco-innovators and eco-visionaries, a group that includes cities, regions, and states that have set as a goal the green development of Smart City or Eco Smart City, is also progressing. This issue is one of the global visions of today, given the unwanted fact that they are emitters of 80% of gas emissions (Mott et al., 2021). Green schemes (Wang, 2023; Bonab et al., 2023; Albalawi et al., 2023) address the value and impact of green technologies on the economy and environment.

## 2. What are the key challenges of Smart City management?

As cities are among the driving engines of socioeconomic development, the modernisation pathway is a natural response and key to achieving this goal (Camboim et al., 2019), as well as the fact that Smart Cities have a higher potential to achieve a healthy and quality life (Demarco & Mangano, 2021; De Guimaraes et al., 2020) by applying holistic eco-green frameworks. It is fundamental to understand the role of policy in supporting eco-innovation, particularly in cities in developing and emerging economies as “growing first and cleaning up later” can increase environmental impact and risk locking in their development trajectory (Pegels & Altenburg, 2020).

For applying and achieving the intentions of Smart City policies, the selection of areas and intentions, planning and choosing the implementation mode, professional management, pro-client mode of goods provision, sustainability, and eco-potential become key challenges. However, of fundamental importance in this area is the value and quality of human resources, which represent the key actors on both the creator and users' side (Gerli et al., 2022; Guenduez & Mergel, 2022). Helfat & Raubitschek (2018) emphasise that decision-makers, as key thinkers, should think primarily in terms of ecosystems, strategic partnerships, and coordination of activities and technology both within and outside the organisation. The issue of openness and access of management to clients, as well as the reciprocity of relationships, is a major advancement, especially for the post-communist EU states. Management learns and builds on examples of good practice. Globalisation, computerisation, digitalisation



and open access, as well as state and EU support mechanisms, are all means of facilitating the transition to a new style of management. Of course, language skills, the ability to think critically and futuristically, to see contexts and to look for deeper socioeconomic connections, to have the prerequisites for dealing with the legislative and legal framework, as well as the ability to be oriented towards the protection and support of the vulnerable are also important.

### 3. What is the current state of Smart City development?

Under the theme of Eco Smart City, we observe reflections on the current age. Strong economically developed cities and countries respond to the need for a change in mindset. However, the positive trend in the application of Smart City elements is not only noticeable in developed countries in the world or the EU.

The leaders in Smart City, according to the report by the results of the World Competitiveness Center (2023), are the countries outside the EU, that is, Switzerland, Norway, or Australia, but even EU countries are not far from reaching the top and approaching the elite (Figure 3). We attribute this to EU initiatives in addition to domestic initiatives. This is because the EU (European Commission, 2022) promotes a paradigm of innovation and urban modernisation through its policies. It sees this phenomenon as the integration of physical, digital, and human systems into traditional networks and services to make better and more efficient use of resources. Within the EU, Amsterdam and Hamburg lead the deployment of Smart City solutions.

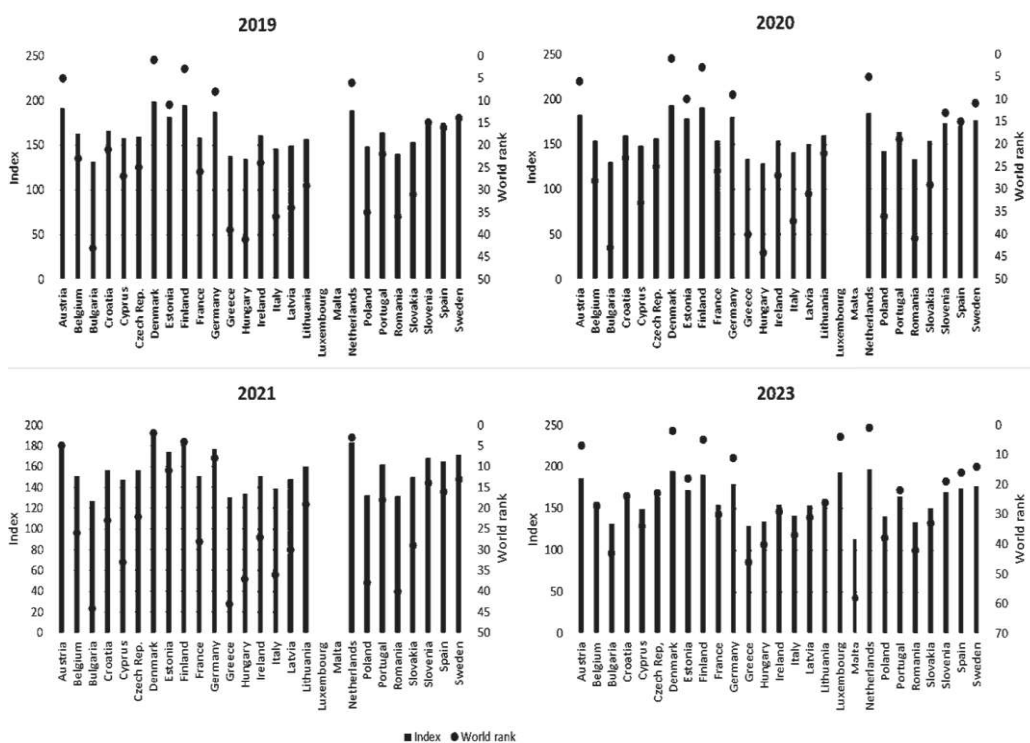


Figure 3. Smart City Index – Member states of the European Union

Source: Own processing according to the results of IMD World Competitiveness center (2019-2023)

Equally pleasing are the results of the newcomers in the application of Smart City strategies, which are also the less developed EU countries. Therefore, it can be said that all countries consider the Smart City issue as an opportunity for development and growth (Malta being an exception). These countries show the most signs of dynamism and appetite for improving the quality of life, through innovation in public services. Thus, the Smart City Index itself is the first global index that covers the assessment of the level of achievement of Smart City intentions (Figure 4). It assesses the approaches of the main cities, based on the perception of services, the pro-client approach, and innovations directed towards the citizens.

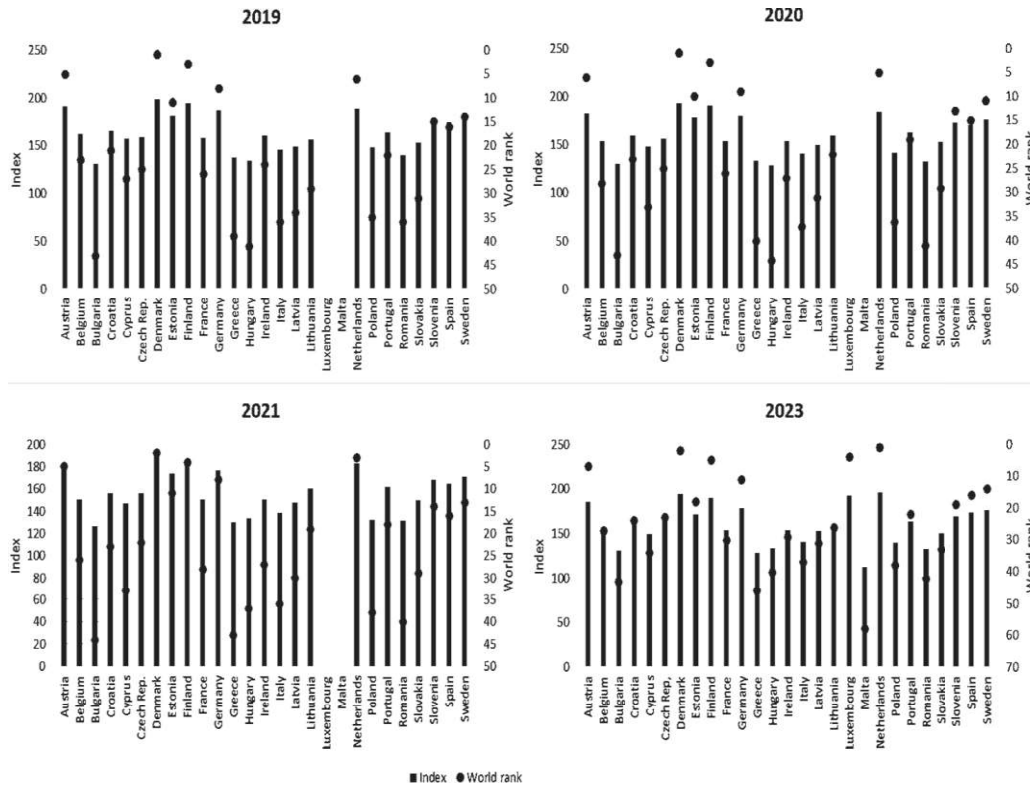


Figure 4. Quality of Life Index by Country

Source: Own processing according to Numbeo results (2019-2023)

We note that cities are interested in innovation and a qualitative shift based on the dynamics of things, but given circumstances such as the COVID-19 pandemic or the economic and energy crisis, there is still plenty of room to fully achieve their plans.

## Discussion

Based on the goal setting, purpose, and constraints we have worked with in the development of the output, we take the opportunity to discuss the changes and opportunities related to the Smart City issue.

Smart City issues have been topical and addressed by many practitioners since the 1990s, as evidenced by the quantum of practical and theoretical outputs. However, there has not been a clear and unambiguous definition of the concept (Filiou et al., 2023; European Commission, 2022; Zitzman, 2019). Smart City is perceived as a process, a means, a goal, an intention, but also a challenge. The first-generation definition of Smart Cities appeals to the use and application of IT technologies (ICT Strategy of Dubai, 1999). The topics of population needs and cyber security are completely absent. Minimum to no attention has been paid to concerns about data misuse or meeting the needs of residents (Odendaal, 2003; Hall et al., 2000). Equally minimal has been the participation of municipalities and citizens in building the Smart City. The effects are felt by the municipality, not by its population. The transition from a traditional form of governance to a digital form of supporting the governance of the municipal environment was the sole intention and goal.

Changes in the external and internal forms of local government have led to innovations in the Smart City idea. In addition to cybersecurity and population needs, the needs of the environment are also reflected (Ammara et al., 2022). Residents are becoming a natural and desired part of Smart City-related processes, not only as users but also as co-creators. This position is significant, especially given the absence of the issue of systematic training and development of management skills of local government representatives. However, we believe that it is important to pay attention to the quality of local government management and to achieve growth and development of its qualitative aspect.

A critical look at the disadvantages of the Smart City concept constitutes a threat and an opportunity at the same time. There is little economic impact and few effects to evaluate. No comprehensive consideration of the needs of society is given. Most studies focus on and present the positive functions that Smart Cities can bring to cities and citizens.

Very few studies describe the disadvantages of smart city projects. We consider this shortcoming as an important element for future possible research. Likewise, the misconduct that has occurred in Smart City advocacy is not addressed or discussed. Good practice only points to outcomes with positive impact. Negative impacts are hidden or not given attention, which we consider a threat. We assume that in certain cases there may be not only economic but also social and societal decline. Revealing the error of understanding citizens' dissatisfaction with the Smart City may lead to the elimination of others. The automatically taken assumption that Smart Cities are a win-win is wrong. We see shortcomings, especially in the case of small and lagging units or underdeveloped units. In addition, specific and unique units may lose their identifying uniqueness. This raises the question of what Smart is and what it is not. Is Smart City about hard infrastructure or soft infrastructure? What is the ratio, the relationship, and the linkage?

If we look at the results, the hard infrastructure is clearly dominant. Here, we can state that it is the soft that lies behind the hard, without which it would be impossible to apply sophisticated technologies and provide sophisticated services. However, little attention is paid to the development and training of qualitative skills for local government representatives. It would be useful to pay attention to this initiative, both theoretically and practically. The ability to think critically and futuristically, to see the

context, and to look for deeper socioeconomic and other contexts should be continuously enhanced. Only in this way can progress be made towards an efficient and intelligent city, which should not only serve but also create space for a full and safe life.

## Conclusions

The article is based on the findings of a review of results published in the field of Smart City. The main limitations include the choice of keywords, registers, and methods used in this article. Based on the results, we can conclude that the European Union promotes the paradigm of ecological modernization and the effectiveness of eco-innovation, both in the private and public sectors and thus also within local governments. Studies also show tangible progress in the Smart City area within the eco dimension and in the search for solutions related to the protection of the whole community. The hard infrastructure is of greater interest than its soft counterpart. The theory of development of classic management skills is taken as an automatic part of running and managing. Attention regarding the application of new trends and smart policy is felt by both states of typical leadership format and their followers. The point of the Smart City and Eco Smart City concepts is the synergistic effect of inputs and outputs, while in green form reflecting the higher goals that cover all circumstances and areas of governance, production, and life in the area of sustainability. Sharing, sustainability-oriented innovations, and promotion of environmentalism are the trends that shape the Smart City. However, as it turned out, without a responsible approach, quality of representatives, vision of units, and a change of mindset, it is a very difficult path. For future studies, it is necessary to dedicate the Smart City area to the management process of Smart City, to conduct surveys and studies dealing with the impact of smart management and smart progress, as well as to make all the healthy impulses available to be adopted by their new subjects.

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## ZARZĄDZANIE INTELIGENTNYM MIASTEM

**Streszczenie:** Smart City to filozofia bezpiecznego, wydajnego i otwartego miasta, które wykorzystuje technologię i wiedzę, aby reprezentować nowy model dla miast przyszłości. Wizją Smart City jest połączenie inteligentnych modeli, inteligentnych IT i inteligentnych praktyk zarządzania, które jakościowo pomagają jednostkom samorządu terytorialnego przyspieszyć świadczenie usług w obszarach infrastruktury, środowiska, edukacji, zdrowia, integracji społecznej i innych. Jednym z kluczowych filarów Smart City jest zarządzanie samorządem lokalnym. Modyfikacja umiejętności menedżerskich liderów samorządowych jest naturalną reakcją na politykę Smart City. Poprzez połączenie najlepszych praktyk, systemów i polityk można osiągnąć wyższe cele Smart City, co stanowi istotę i intencję tej filozofii. Głównym impulsem do napisania tego artykułu była ambicja zidentyfikowania aktualnych trendów w zarządzaniu inteligentnym miastem. Cele szczegółowe dotyczą odpowiedzi na pytania związane z rozwojem zagadnień Smart City, identyfikacją umiejętności Smart menedżerów samorządowych, wdrażaniem praktyk Smart oraz mapowaniem wyzwań Smart City. Metodami stosowanymi w niniejszym opracowaniu są: przegląd aktualnego stanu wiedzy, poszukiwanie odpowiedniej literatury i studiów przypadku, podsumowanie wyników, indukcja, dedukcja i inne, które pomogły osiągnąć założone cele.

**Słowa kluczowe:** innowacje, zarządzanie, inteligentne miasto

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