SMARTER ROMANIA BY SMART CITIES PROJECTS: EVIDENCES FROM 2018

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ABSTRACT
Smart Cities is more than a group of creative gadgets from which governments choose what they like and can afford to buy. Its implementation calls for sustainable development, integrative vision, overall strategy and an intelligent dream about the facilities offered to the inhabitants of the cities in the near future. Globally, Smart City projects have the most significant development in transforming the digital public sector. Brilliant success cases (Barcelona, Hong Kong, London, Sydney, Vienna, Chicago, Tel-Aviv, etc.) are models to follow, good practices that can be pursued by many cities in the world. The researchers analyzed the existing successful projects and developed support frameworks for smart development analysis of a city. In Romania there is a huge hiatus between the theories and ideas proposed by various specialists, speakers or promoters of the smart cities concept and real implementations. Usually, the road from idea to implementation falls somewhere. In this paper we aim to examine the state of the art in Romania with the analysis of all the existing projects on the sub dimensions of the six main dimensions of an intelligent city: Smart Governance Smart Economy, Smart Mobility, Smart Environment, Smart People, Smart Living. Research is based on the frameworks (The Smart City Framework SCTF) and the taxonomy published in the specialized literature while the research is conducted mainly at empirical level. By analyzing some empirical evidences of smart cities projects, it is possible to affirm that there is no real smart city yet in Romania. It is an undergoing process, in which some elements are present in different space-time perspective. To turn a city into a smart city, the five main components of the six features outlined above are important for sustainable development and growth: government planning & policy design; economic restructuring & business activities; ICT infrastructure; environment protection & City cleanliness. The analysis in this article will highlight areas that are underdeveloped or neglected by the existing projects and the projects announced by local governments.

Keywords: Smart City, Digital transformation, Green Economy, sustainable development
JEL classification: M10, M15, M19

1. Introduction

Urbanization has become the goal of our economic and social progress. In an attempt of improve their way of living, people see the cities as a new opportunity. Because of the migration of the world's population to urban areas, demographic expansion that is forecasted to reach 70% by 2050 [1], the cities need to use the new information technologies to cope with the situation. It has to be taken into consideration the way of living and the use of resources, aspects based on the concept of green economy, which takes into account sustainable development and environmental protection, by optimizing the use of limited resources, but also by transforming the systems. Trying to define a smart city is not a simple matter because multiple factors and dimensions have to be taking into account. The perspectives from which defining the concept has been attempted have some similarities, from technological, humanistic and institutional point of view. Therefore, a smart city uses the new information technologies to improve the quality and performance of urban services, to reduce costs and resource consumption and to involve its inhabitants more effectively and actively in the cities activities. We cannot talk about a concept like this without talking about technology, which is all around us and makes its presence felt more and more every day. Even if we talk about an educational environment or in the office, at the show or in shopping, it is part of our lives. Now that the amounts of information seem infinite, we must let the trends dictate for the sustainable development of cities. The present article aims to provide a clearer picture of the Romanian cities in this context, through an analysis of the existing researches and projects at national level. The first part deals with the general notions of the topic and literature review, focusing on specific dimensions and smart technologies that are associated with smart city. The presentation of the distributed projects is made for each dimension, taking into account their strengths and weaknesses. As a conclusion, we have reached a set of general practices valid for the cities that want to be called intelligent and a synthesis of the most important trends in the field.

2. Literature review and theoretical foundation

Many researchers agree that smart city can be defined as a developed urban area with a sustainable economic development and high quality of life by excelling in multiple key areas: economy, mobility, environment, people, living and government with the use of digital technologies (Business Dictionary). Another definition comes from Gartner, Inc. as an urban area in which

component sectors collaborate to deliver sustainable results by using a community-driven, bottom-up approach where citizens are an integral part of designing and developing smart cities [2]. In order to analyze smart cities initiatives, it is necessary to synthesize the smart city ecosystem used in the classification and evaluation of smart cities projects which consist of eight smart components [3]: economy, people, governance, transportation, environment and living. These components are interconnected and require data collection and ICT infrastructure, to be embedded within city hard infrastructure to deliver smart services to city actors, while governance is necessary for the subsystems to be orchestrated and succeed in smart city mission [4]. The key to turn a city into a smart city which is well connected, sustainable and resilient, where information is not just available but also findable is technological literacy. Some of the technologies without which smartness of a city can never be enhanced are [5]: Internet of things, Sensors, Artificial Intelligence.
Based on the exploration of a wide and extensive array of literature from various disciplinary areas, table 1 presents a short list of the most important integrative and specialised frameworks.

Table 1: Frameworks for Smart Cities Development

Integrated Frameworks	**Reference**
SMELTS framework (Social, Management, Economy, legal, technology and Sustainability.	[6] Sujata, J., Saxenab, S., Godboleb, T., Shreyab, (2016)
Integrative Framework Smart City	[7] Chourabi, H., Nam, T., Walker, S., et all. (2012)
Smart City Reference Model	[8] Zygiaris, S (2012)
Smart City framework	[9] Theodoridis, E., Theodoridis, G., Mylonas, G., Chatzigiannakis, I., (2013)
Smart City Framework – Guide to establishing strategies for Smart Cities and communities	[10] British Standards Institute 2014b
Smart Cities – Guide to establishing a decision-making framework for sharing data and information services	[11] British Standards Institute 2017a
Integrative Framework	[12] Chourabi, H. et al (2012)
Specialized Frameworks	**Reference**
Framework for collaboration within a city based upon Experimentation as a Service	[13] Pye L., Schaaf K. (2018)
Smart community infrastructures - Common framework for development and operation	ISO (2016a). ISO/TR 37152
Framework for integrated health and care services in aged societies	ISO (2016b). PD ISO IWA 18

Regarding the implementation of Smart Projects, Romania is trying to keep up with developed countries in terms of technology and innovation within this market. Because the budgets of the big Romanian cities are under pressure, a solution is to use the technology in order to improve the public services, such as transportation, lighting, or water distribution. The paper presents an analysis of the most important projects implemented in the major cities of Romania, along with the strengths and weaknesses that they have. This research gathered the online available information about the smart city implementation with the main goal of analyzing the data to conclude which are the cities that implemented successfully this kind of projects, which are the best good practices. Using the most known framework's dimensions together with the new dimensions for the Smart living category, the research tries to identify a strategy/pattern to smart cities implementation, strong points and weaknesses as well as the establishment of a set of future development directions.

3. Main Romanian smart cities and associated projects

The theme of smart cities has not been present for a long time in the concerns of the Romanian administrations. Research and projects targeting this area have been launched in the last few years, quite shy, by multinational companies or through European funding, which has raised the interest of public authorities in the development of smart city initiatives.
There are few successful stories and access to information about indicators, budgets, strategies is limited, because the government is not citizen-centered, nor is it characterized by transparency. Regarding intelligent cities, there are a number of profit and nonprofit organizations that seek to promote the concept, but also to determine companies and citizens to get involved with ideas, projects, sponsorship and consultancy such as: "Carta verde digitală[1]", "Convenția primarilor[2]", "Platforma părților interesate de orașe inteligente[3]", CIVITAS, Smart City Pro, Smart City of Romania, My Smart City etc.
The first part of the Romanian smart cities analysis gathered information related to the existing projects. The general analysis started with the projects for each county, as long as the region. For each county analysis followed the type of dimension for which the project was developed, as well as if it was developed by public or private institutions. The flow and the main objectives of the research could be seen in figure 1.

[1] In translation: Digital green book
[2] In translation: Covenant of Mayors
[3] In translation: Stakeholder platform for smart cities

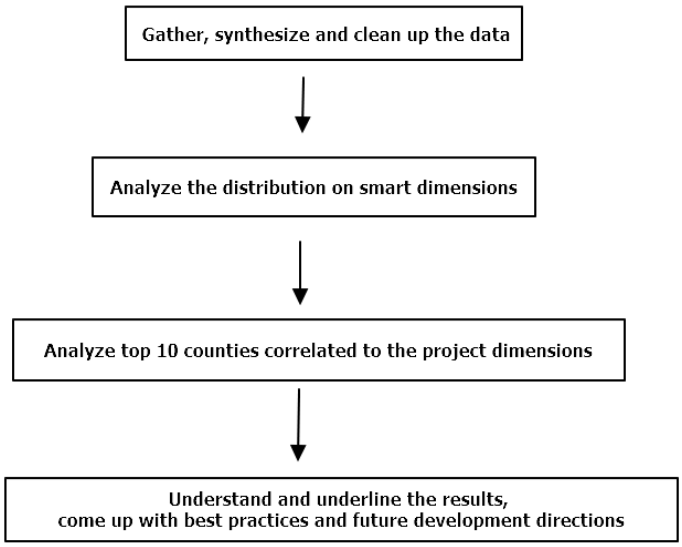

Figure 1 Research steps and objectives

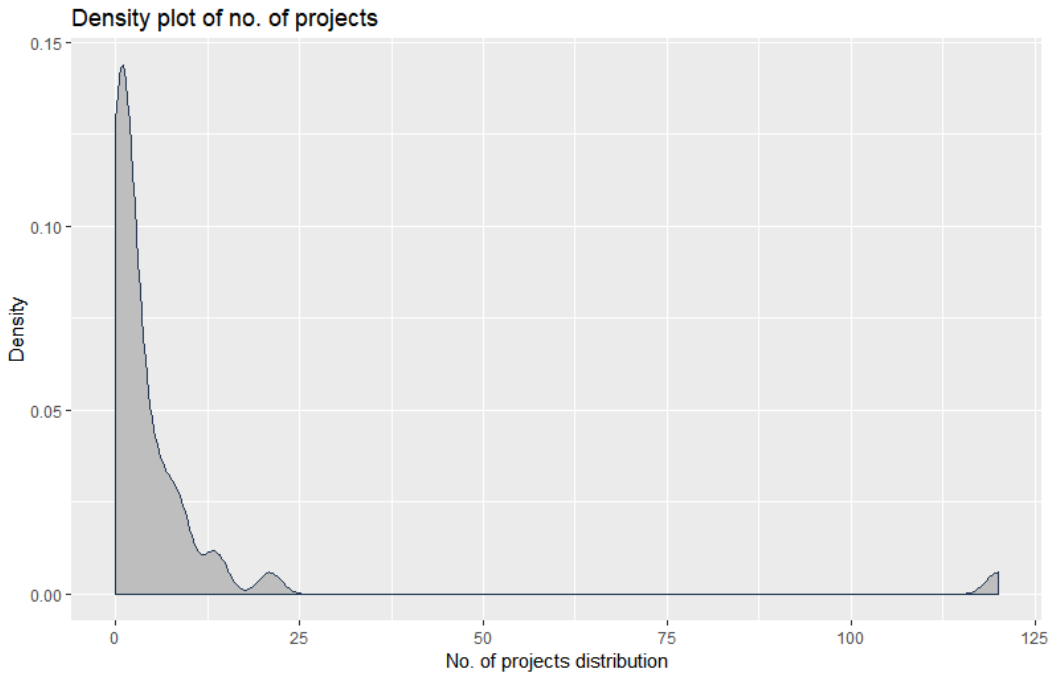

Figure 2 Projects number distribution graph

From the summary of the general data and the project distribution graph (Figure 2) we can observe that we have a minimum of 0 projects. Out of 42 counties, 12 of them don't have any smart city initiatives: Salaj, Vaslui, Vrancea, Calarasi, Ilfov, Buzau, Ialomita, Teleorman, Gorj, Valcea, Covasna and Harghita.

The maximum variable value is 120 projects for the Alba County. It seems that the governance of this county created a successful partnership with the private sector and developed various initiatives. As expected (Figure 3), the main focus was on Smart governance dimension: 19% of them, followed by projects focused on Smart economy (14%), Smart mobility dimension (13%) and Smart environment dimension (13%). The most neglected dimensions are Smart education (8%) and Smart people (5%). These results show that the smart city implementations started from the need of the county governance to communicate better and easier with the population. The focus was mainly to solve issues related to the infrastructure (transportation, mobility) and environmental issues, as well as developing the economy.

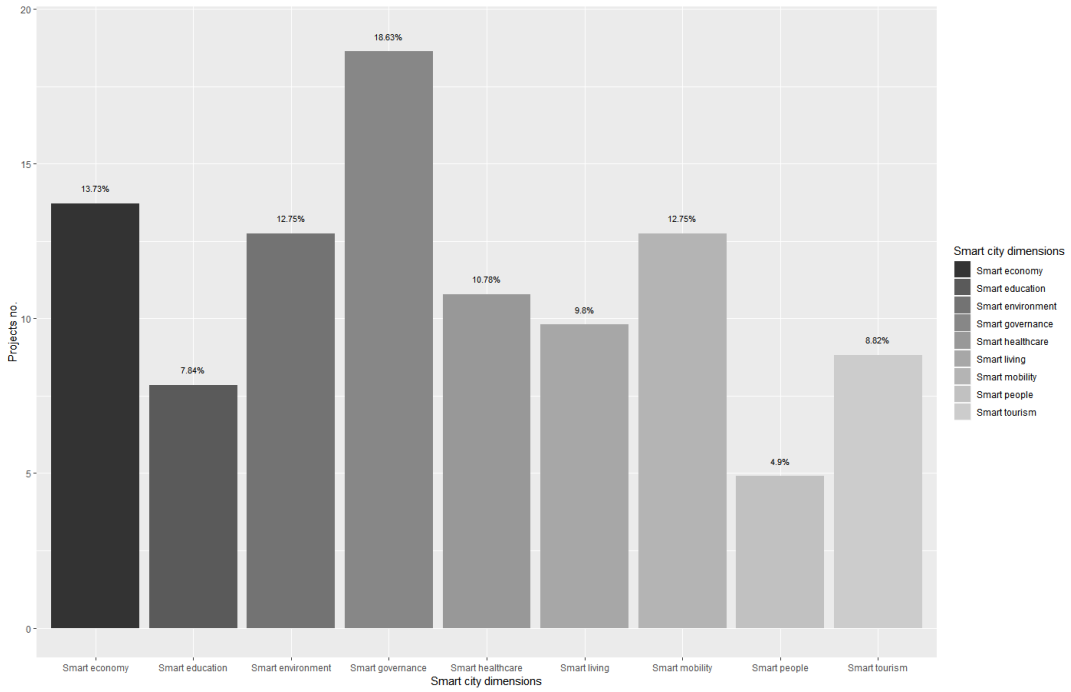

Figure 3 Alba County projects dimensions

On the national level, as it can be depicted from Figure 4 the situation is similar: 23% from the total number of the projects (259) aimed to solve issues related to the dimension Smart governance and the initiative was taken by the public sector. The second dimension is Smart mobility with 20%, followed by Smart living with 18%. The last 3 most underdeveloped dimensions are: Smart utility with 0.5% (only one project), Smart people (2.5%), Smart healthcare and Smart education with 5.6%.

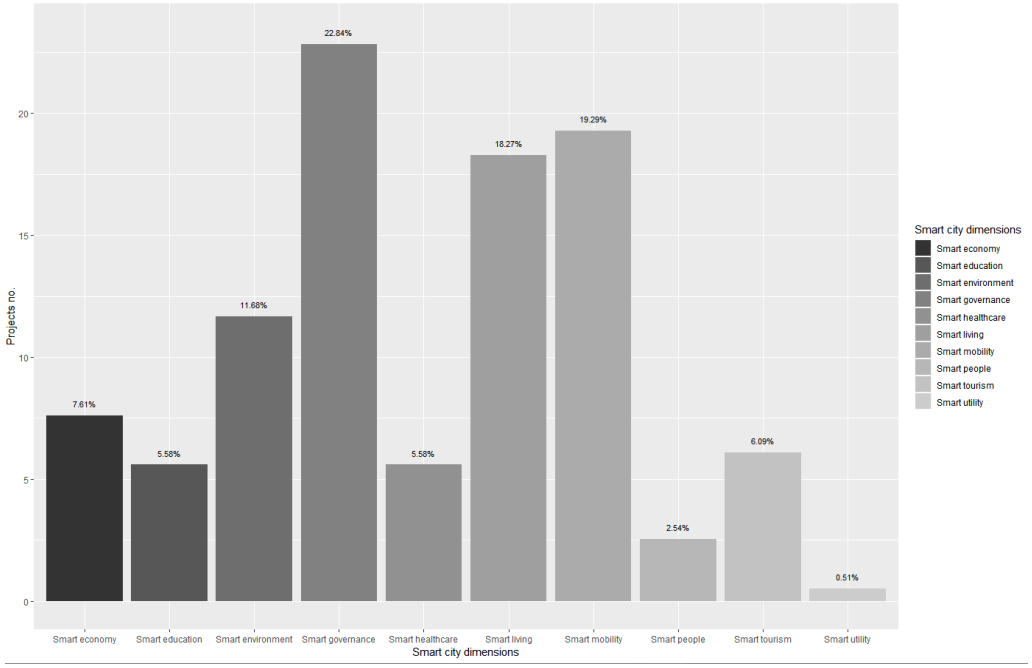

Figure 4 The most developed dimensions in Romania

Alba, Timiș, Cluj, Hunedoara, Bucharest, Sibiu are top 5 counties (figure 5) that implemented smart city initiatives and for each county it can be observed that the needs and priorities were different. Mainly, the projects followed Smart governance, Smart living and Smart mobility dimensions. Transylvania and Banat are the most developed regions from Romania by smart cities project implementations as it could be observed in figure 6.

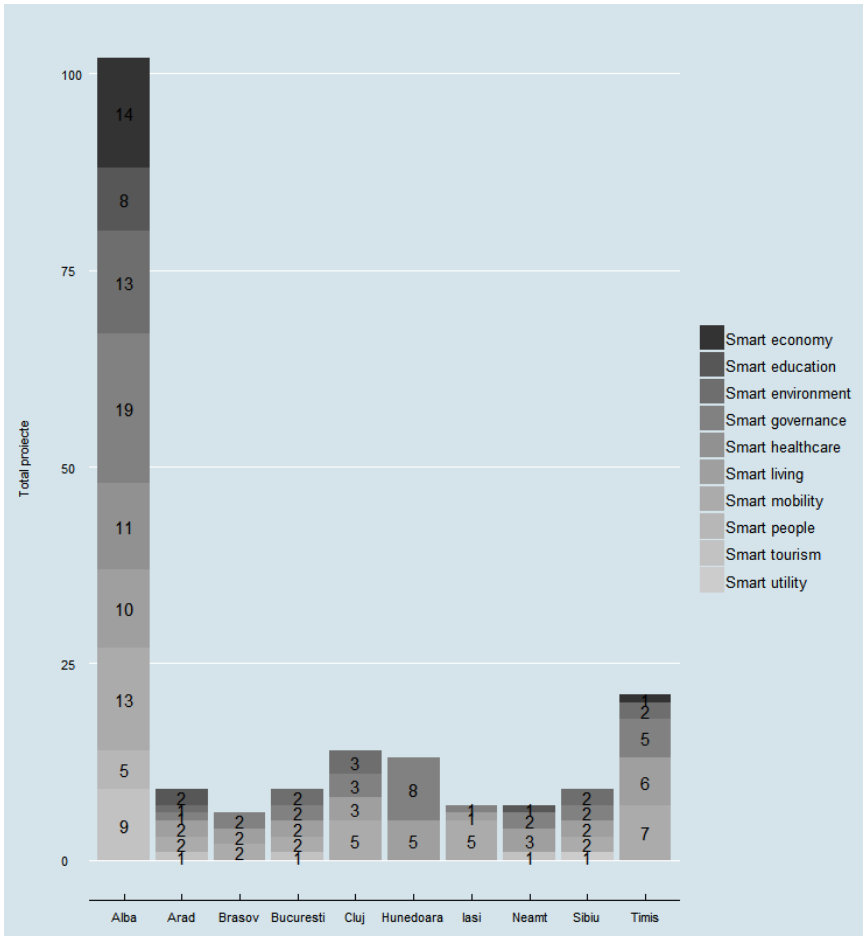

Figure 5 The most developed counties by smart cities projects in Romania

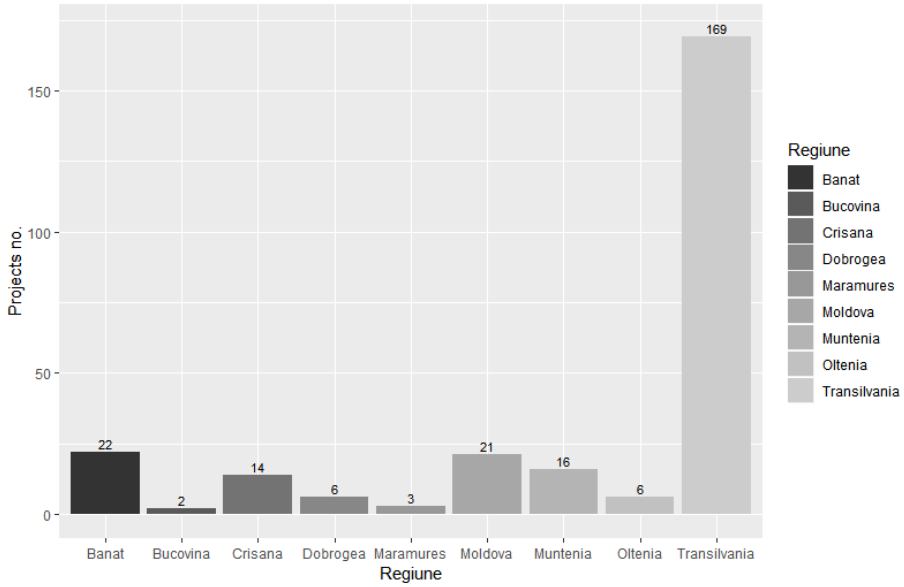

Figure 6 The most developed regions of Romania

Each county started to implement some projects which are not integrated overall. The analysis reveals that the initiatives are mainly conducted by the public sector, with some partnerships with private companies.

This results concludes the fact that even if we have some bold projects and the involvement of some known private companies like Orange, Telekom, Vichy, Delphi, Philips, Intel and also some start-ups and small local private companies, Romania doesn't have a general strategy to evolve and develop by smart city projects. Initiatives are focused mainly on the first two steps and we still have a long way to come to smart performance. Being in the third step means to focus more on the dimensions that we lack initiatives like: Smart education, Smart people, Smart healthcare and Smart tourism.

Romania could integrate and evolve using the following framework for smart city development [14]:
Step 1: smart initiatives from the governance focused mainly on smart governance dimension;
Step 2: develop the infrastructure and solve the local issues related to the basic public services – transportation – mobility, environmental issues and living conditions;
Step 3: smart performance – sustainable socioeconomic development.

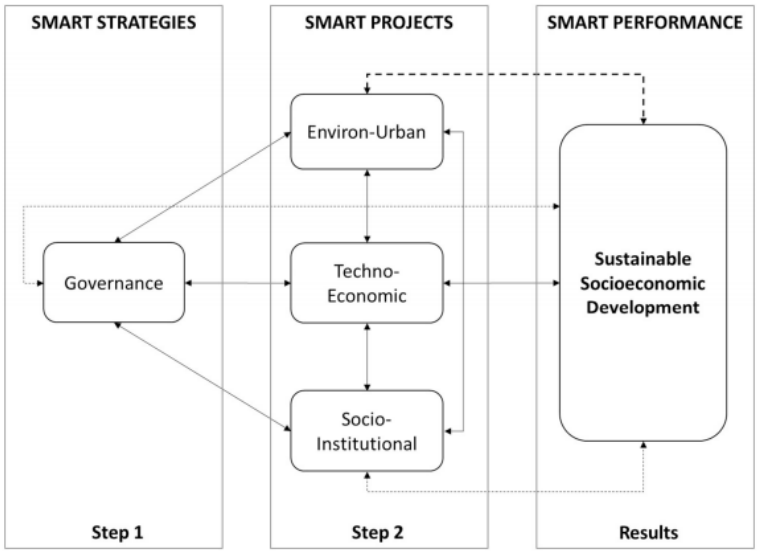

Figure 8 Integrated framework for making a city smarter

The mix between the dimensions reveals the fact that most of the projects skip the planning phase and that we lack the basic infrastructure needed for the development of a smart city [15].

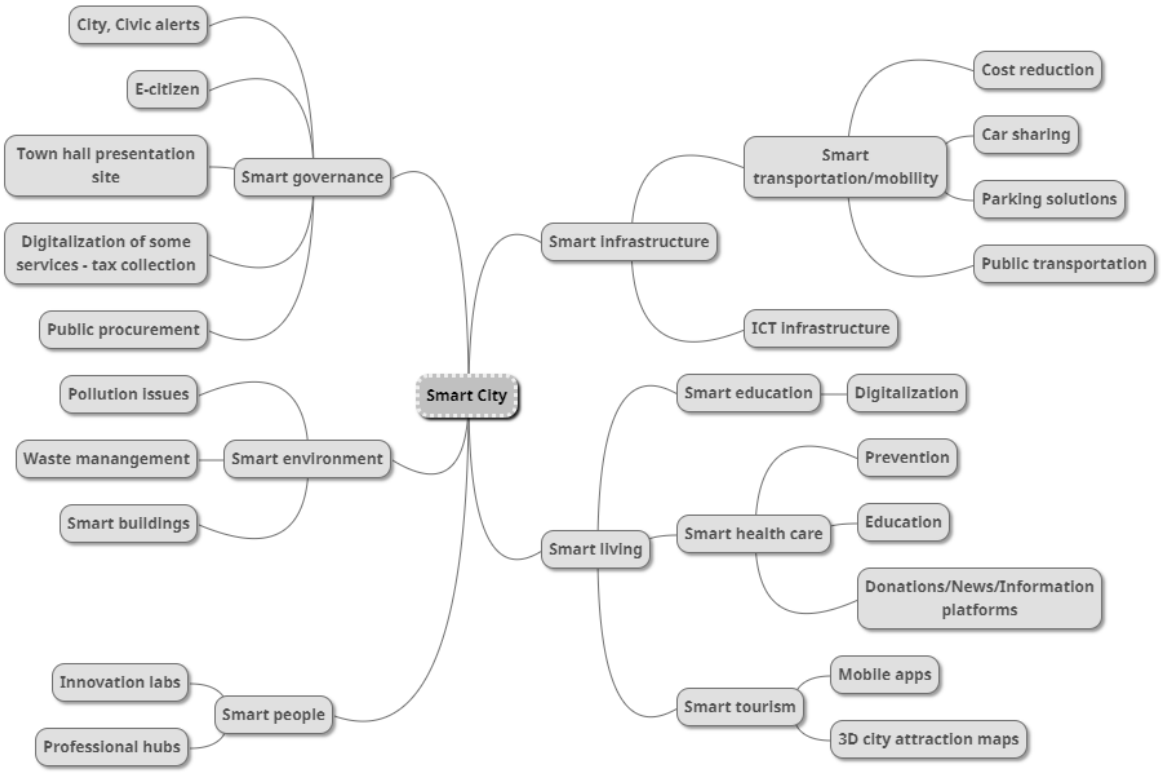

Figure 9 Mind map visualization for Romanian smart cities implementation

The second part of the research presented in the table 2 (Analysis of Smart Cities in Romania), illustrates the most important projects developed in Romania in an objective analysis of their strengths and weaknesses.

Table 2 The analysis of Smart Cities in Romania

	City	Project	Strengths	Weaknesses
Smart Environment	Bucharest	Smart Campus: Energy management system	• The purpose is to develop the cities towards efficiency and sustainability; • Designed for the benefit of the citizen, especially to facilitate communication with the public authorities; • Provides brand awareness for city halls and companies that develop such initiatives; • New jobs are being created for IT specialists; • Contributes to streamlining the processes within the city; • Solves problems with minimal resource consumption; • Provides transparency by providing real-time information; • Enhance the active role of the citizen; • Involves and develops the business environment; new opportunities are created;	•Smart city initiatives developed by city hubs are negatively influenced by political factors; • Projects carried out with European funding with non-reimbursable funds often do not follow the project plan and pursue other meager goals (theft, own interests of city halls, etc.); • The concept is not very familiar in the country and for most citizens it sounds holistic and unrealistic; • Involvement of citizens is very low; • Quality is often not pursued, but only the realization of the projects; • Project evaluation does not pursue clear and objective performance indicators; • At a national level, there are not any uniform and correlated strategies for smart city projects; • Cities develop initiatives without integrating them into a global plan; • Lack of specialists for a sustainable development;
	Sibiu	Smart City Sibiu: Power and heat consumption management (n.d.)		
	Galati	Waste composting plant, modernization of treatment plants		
Smart Mobility	Bucharest	Telekom and Cisco smart city: Smart parking, free Wi-Fi, Smart lighting, city safety solutions [2]		
	Constanta	Smart parking, car charging stations, the acquisition of eco buses, traffic control, video surveillance, green pedestrian demand		
Smart Living	Iasi	Virtual tours 3D: An audio guide in Romanian and English that provides information about the places the user is visiting virtually		
	Sibiu	Intelligent counters and intelligent metering, Smart Grid applications		
	Timisoara	City Alerts: Platform that collects information from public institutions and notifies citizens via website, mail, or SMS about unforeseen emergencies occurring in city life.		
	Piatra Neamt	Smart street benches (with electrical outlets), Smart Public Services QR Guide, Bike sharing		
Smart Governance	Cluj-Napoca	Virtual public servant, e-government, MyCluj mobile app for notifications		
	Oradea	Parking payment through SMS and online payment system for taxes and fees		
	Arad	E-government, mobile app MyArad for mobile devices where notifications can be made.		
Smart Economy	Cluj-Napoca	Online Market for Organic Farming: An integrated e-business platform that provides the urban ecosystem with resources close to the urban community.		
Smart People	Alba Iulia	Digital school: Digital library, tablets for teachers and Wi-Fi secured by user category		
	Alba Iulia	Donez450.ro: The blood donor platform in Romania that offers the possibility to keep a personal history according to which the person will be notified when he can go to donate again.		

It can be concluded from the table 2 that the Romanian cities have no strategies to integrate smart city initiatives, but have developed pillar projects of interest for specific industries and areas, depending on the needs of citizens and funding's that were obtained.
As it could be observed in Figure 9, most of the counties have the following interests:
• e-Government: online public services such as tax payments, taxes etc.,
• Road transport and traffic: Integrated Traffic Management Systems,
• Health and education,
• Tourism,
• Efficiency of energy, water, gas,
• Ensuring public safety,
• Solving incidents in the city (alerts posted by citizens).
Larger cities that were interested in digitization and automation of the processes from the public services that their offered, have developed information and promotion sites of smart city initiatives, some of which also have online platforms that facilitate collaboration and stakeholder communication.

4. Trends and Best Practices

Smart city is not only a buzzword, but also a concept that will be here for a long time, that has emerged because of the development of other trends in both urban and global evolution.
The concept is of great interest especially to numerous research and consultancy firms, to universities and smart IT developers who are studying the evolution of intelligent cities in order to prepare for the next few years and to develop viable solutions for the community and also to bring profit.
Research in the literature facilitates the development of strategies based on a set of structured and realistic predictions, so a synthesis of the most important trends was made, according to the table 3.

Table 3 Trends of Smart cities

Trend	Description
Smart cities will become Cloud cities	More and more cities offer unlimited Wi-Fi connection, mobile travel applications, and connectivity to various devices via IoT technologies. The trend leads the cities to be hyperlinked [16].
Cities will use more sensors	Sensors are used in most devices, whether we talk about smartphones, tablets, machines, etc. Cities have started to use these technologies to improve traffic management, district heating and water distribution. With the help of data analytics, data is transformed into information and transmitted to systems that learn adaptively to function without human intervention [17].
Internet of Things (IoT) Integration	The development of future smart cities dependents directly on the development of IoT technologies and how they will be integrated into urban development strategies. Gartner predicts that video surveillance cameras, webcams and LEDs will account for 24% of the IoT market for smart cities.
"Green Buildings"	The European Union has announced that, starting from 2018, the new offices, houses and buildings will be designed so it will not consume energy. The standard that it will have to fulfill is called LEED Gold [18].
Using Social Media information, crowdsourcing for service optimization offered by smart cities	Citizens' involvement and development of services are part of a smart city strategy. In this way, the data and the citizen online reviews will contribute to the improvement of the smart city systems [19].
The economy of attention	As content has become more consistent, attention is one of the major concerns of the 21st century, being the basis of many business models. Along with the growth of awareness, people are becoming more and more exclusive with such a valuable resource.
Faster and more accessible services to everyone	The terms M-voting, M-fees, M-consultations, E-government refer to the movement of classical public services from the physical environment in the online environment. This is a growing global trend has been successfully developed by some local governments through web applications [20].
Expanding Smart Cities Deployment Strategies	It is expected that the world's countries will develop implementation plans for smart cities, along with financing policies and plans business orientation [21].
Cities will become interoperable, integrated and inclusive	Smart cities are a system of systems that needs to be integrated, which have to communicate and work efficiently together. Inclusion means to involve all stakeholders in the development of the projects.

The expected trends for the upcoming years are in favor of developing intelligent cities, being identified an increase in the interest in these initiatives. As we can see, evolution is moving towards more connectivity, the use of new information technologies to increase the quality of services offered to citizens, the structuring and use of social media data, along with the transformation of jobs and businesses.
Although cities choose different options to solve public problems and there is no unique way of adopting or implementing intelligent city systems, a set of good practices have been created to help cities with similar projects. They highlight the importance of quality management and has to consider the following: prioritizing needs, choosing the best collaborations with the private sector, non-profits or universities, making citizens aware of the benefits of smart initiatives, building relationships with IT suppliers, but also exploit the capacity of smart technologies to bust local economies.
Under these circumstances, successful implementation of projects that will give the name "Smart" to a city is closely linked to the collaboration between public and private institutions to reach a common goal and to achieve the most pleasant and welcoming environment for citizens, which can only be accomplished through technological developments and the adoption of environmentally friendly solutions.

5. Conclusions

The most important urban centers choose to develop synergies between the public and private environments to build smart cities that change lifestyle and business development perceptions. The development of industries and the human desire to evolve permanently without taking into account other disturbing factors make natural ecosystems affected by its activities.
In Romania, we have begun to implement and design initiatives to develop intelligent cities, but we are still far from having intelligent cities in the true sense of the word. The concept of smart city is not fully understood, nor is it known to the whole population, but only to those involved and directly interested. In addition, the impact of policy makes this type of projects attractive to public administrations due to the European Commission's non-reimbursable funding, the main purpose being omitted. Thus, projects do not follow clear and objective performance indicators and end up not having the expected results. The Romanian smart city initiatives aim mainly to strengthen the infrastructure and improve the public services offered by traffic efficiency projects, alerting public institutions to the problems of the city, paying for online services (taxes, taxes, fines, parking, etc.) and monitoring energy consumption, water, gas.
According to the studies carried out during this research paper, we have noticed that the cities in Romania have the potential to adopt smart projects and in the last years pay more attention to them, the governance of the largest cities meet periodically at conferences and organize debates in which they share their experience and plan collaborations in order to create conditions for citizens.
The most important success factors in implementing strategies for the development of smart cities are effective collaboration between city stakeholders, active involvement of citizens, the integration of all small projects into a sustained unitary strategy, and especially the choice of the right technologies for each city and tracking results by analyzing clearly defined performance indicators from the start of project development.
The paper highlights the successful projects that were implemented in a certain region of the country, which were occasioned by the Centenary of the Great Union of Romanian provinces' celebration. As such, major governmental investments were made and they brought added value to the region as many private investments were made. As such, the authors emphasize on such a model as a best practice strategy that could be applied nationwide. Therefore, based on the current paper's results, a strategic plan containing yearly massive investments by regions should be developed. One by one, the regions would receive important investments from the government and the private sector will be encouraged to bring their efforts to investing in smart projects.
In the context of the digitized world, intelligent cities are no longer just on the trend map but have become reality, with many projects being successfully developed.

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