Public Innovation in Romania: Financing Smart City Initiatives Using European Funds in Small and Medium Sized Cities

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Abstract

In the current paper we identify some of the challenges in implementing innovative projects among local public administration type of organizations, alongside with some examples of best practices in Romania. Main scope of the paper is to show that only some of the local public administrations in Romania are demonstrating characteristics that are beneficial to citizens, that is: openness to innovation, strategic thinking, transparency, agility or collaboration with a wide range of stakeholders. We observe some case studies and extract some conclusions of relevant indicators for promotion of innovation and smart city solutions. Also, we analyse the rate of EU non-reimbursable funds absorption of some local public administrations and conclude that it is consistent to their institutional capacity and performance to embrace innovation and competitivity of their respective territories.

Key words: innovation, smart city, strategy, public sector
J.E.L. classification: H83, O31.

1. Introduction

An improved quality of life, a secure and clean environment, predictable decisions are some of the citizens' expectancies from the public administration. Due to the exponential growth of technology and innovative companies all over the world, there is a growing pressure on meeting citizens' needs. Still, despite the increased attention of innovation and smart city solutions in recent years, their adoption in the public sector has been slow.

Main scope of the current paper is to show that public organizations in Romania are on their way of making a big change in their institutional capacity, but there are in their beginnings, with not so many organizations that are truly implementing innovative solutions. Since great economic and social challenges are still ahead of us, we can only hope that best practices and tangible results and implemented projects are going to inspire other organizations to accept the benefits of this new type of change in public sector.

2. Theoretical considerations

As urbanization grows globally, it is closely linked to a set of quality-of-life issues, such as traffic congestion, waste disposal, energy consumption, environmental disruption, rising energy costs and urban resource management. All of these are concerns and issues that city administrations are trying to address. Smart city technologies are an innovative way to address these concerns and ensure sustainable urban development (Kramers, Höjer, Lövehagen, & Wangel, 2014). The development of smart solutions for information and communication technologies (ICT) is a strategy driven not only by the need to enhance of citizens life and expectancies, but also by the desire to streamline administration and services in a systemic way that addresses complex quality of life and societal challenges (Lee, Phaal, & Lee, 2013; Melo, Macedo, & Baptista, 2017).

It is a known fact that local public administrations that implement smart and innovative projects and initiatives ensure above all an adequate administrative environment. In this regard, rules that promote the sharing of information, data and responsibilities between different departments, agencies and programs are essential to promote collaboration and integration both at the managerial level and in the provision of services (Nam and Pardo, 2011; Alawadhi et al., 2012; Glasmeier and Christopherson, 2015). Such interoperability in public administration also requires leadership and coordination to actively improve the value of shared information.

On the other hand, collaboration and integration processes must also be encouraged outside the public administration, especially between this type of organizations and other stakeholders or citizens. In relation to economic actors, establishing public-private partnerships to involve enterprises in the provision of public services (Deakin, 2014; Hajer, 2014) is seen as a viable approach to optimize the limited resources that local authorities have (Paskaleva, 2011). However, to avoid the risk of social exclusion and / or profit creation, stakeholders such as businesses, citizens and other organizations must be included in decision-making and planning processes (Angelidou, 2014; Marsal-Llacuna, 2015). In this sense, it is essential to create collaborative processes that promote the co-production of public services and goods (Paskaleva, 2011). The creation of new (online) communication channels for citizens, discussion platforms and public and social services are some of the tools for involving individuals and groups belonging to a community (Chourabi et al., 2012). Such involvement processes must be supported by a policy that promotes commitment to data disclosure (open data) so as to promote accessibility and transparency (Nam and Pardo, 2011; Chourabi et al., 2012). These in turn will increase the responsibility of public institutions and, therefore, the levels of trust towards them (Alawadhi et al., 2012; Zygiaris, 2013). Moreover, it is known that the processes of empowerment and participation of citizens alleviate social inequalities, thus resulting in an improvement of social inclusion (Paskaleva, 2011). However, there is a risk of deepening existing inequalities, even more so if these processes are not supported by inclusive strategies and interventions that address the digital divide, i.e. the issue of unequal access and use of ICT (Zygiaris, 2013; Angelidou, 2015). Here, interventions aimed at increasing the accessibility of ICT, especially the Internet, are absolutely necessary to reduce socio-economic disadvantages (Paskaleva, 2011). ICT equipment and broadband network access should be made available to citizens free of charge through public access points or other similar arrangements (Zygiaris, 2013).

But neither access nor data availability seems to be in this case enough. Of course, as Angelidou (2014) pointed out, we also postulate that having access is not equivalent to participation, and the availability of data does not necessarily correspond to knowledge. Investments and programs to promote education in the use of ICT, especially for the persons with fewer skills (e.g. the elderly) and disadvantaged social groups (e.g. the unemployed persons) (Wiig, 2015), these are the main actions that can be taken to support the improvement of human and social capital and the avoidance of social disparities (Glaeser and Berry; 2006; Caragliu et al., 2011; Neirotti et al., 2014). Interventions aimed at reducing possible barriers, such as language, culture and disabilities that prevent certain individuals or groups from fully accessing ICT (Nam and Pardo, 2011). Because information technology and cyberspace are not accessible to everyone, it is necessary to complement online and offline interventions, i.e. with traditional tangible services (Nam and Pardo, 2011; Walters, 2011; Angelidou, 2014). This is also true for interventions that do not specifically target low-skilled and disadvantaged groups, but also in general, in the context where direct relationships and physical proximity are important factors for the development of human and social capital (Nam and Pardo, 2011).

Finally, the role of public administrations in defining and implementing smart city solutions requires a common vision, debated and shared by different stakeholders, and this could materialize in a long-term strategy (Nam and Pardo, 2011; Pultrone, 2014; Goh, 2015). The leader represented by a person or department within the public organization is beneficial in promoting this process (Nam and Pardo, 2011). In addition, this long-term strategy must be based on an in-depth analysis of the context of a city in order to match existing resources and needs and to avoid the application and use of ICT in an inappropriate or totally inappropriate way (Hajer, 2014; Pultrone, 2014). In fact, the analysed literature highlights the fact that the strategy and integrative approach that favours the initiation and implementation of smart city solutions vary depending on the context,

because cities vary depending on local institutions, values, priorities, physical and social conditions (Goodspeed, 2015; Kitchin, 2015). Therefore, there is no single paradigm for smart city and innovative development: cultural, social, political, and economic contexts shape the approach and features of a community (Alawadhi et al., 2012; Neirotti et al., 2014). Then, there is clearly a dependence on the effects of a smart city initiative and it seems that previous initiatives also influence the further development of innovative solutions (Marsal-Llacuna, 2015).

To sum up, the primary role of local public administration in the development of smart innovative solutions refers to the creation of new forms of collaboration through the use of ICT so as to encourage the co-production of services and goods in the urban environment. The purpose of smart city governance is to integrate and enhance urban management processes and improve human and social capital, so as to provide better results which in turn conduct to a higher quality of life. The main components in the development of smart city solutions can be summarized at:

- a common strategy with long-term impact, based on the analysis of the strategic vision of urban metabolism and challenges and opportunities that characterize a particular context;
- openness, accessibility and data sharing, as much inside the organisation as outside it as well, so as to encourage collaboration and integration processes and to increase transparency and accountability;
- creating collaborative and participatory processes for the involvement of stakeholders and private citizens in the initiation process, production and delivery of public services and goods based on smart city solutions;
- combining "new" online interventions with "traditional" offline ones, especially in the educational field, to remedy possible uneven results related to the use of ICT and to increase the acceptability of smart solutions in sustainable urban development.

3. Research methodology

The aim of our analysis is to debate on the role of local public authorities in attracting EU funds for financing smart city initiatives and enhance innovation, especially in small and medium-sized cities. Thus, we have started by assessing the role of public administration and noticing the importance of strategic development, using tools such as collaboration, participation and digitalization. Several documents and statistics have been compared to draw up conclusions regarding the absorption of EU funds in Romania for smart city initiatives. At the end, some conclusions were formulated in order to determine Romania as a potential model for sustainable development using smart city solutions and public innovation.

4. Status quo of smart city projects throughout Romania

Some of the results of the current study are based on the exploratory analysis of smart city initiatives in Romania and the analysis of the areas addressed by these initiatives in Romania.

Smart city projects represent innovative initiatives in many cities that belong to the post-communist bloc (Sikora-Fernandez 2018). In Romania, similar to the other Central and Eastern European states, we observe a lack of maturity in smart projects, that is they are not fully integrated or coordinated, although they are meant to represent short-term solutions to some identified urban problems as opposed to development strategies with a significant long-term impact (Borsekova, Nijkamp 2018). Romania is still at the beginning of a long process, with a timid and relatively underdeveloped start of the smart city concept (Vegacomp, 2018). Moreover, it can be seen that the idea of smart city was introduced for the first time in CEE and Romania only in the business environment and only later it is adopted by the local public administration.
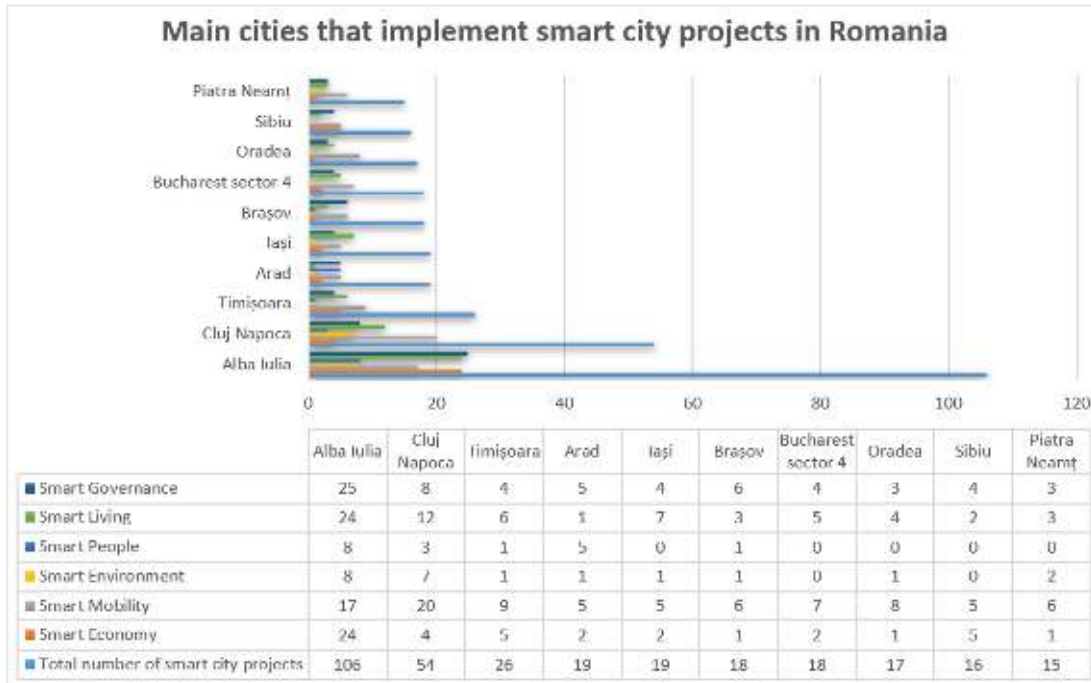
A report by the European Organization for Smart Cities states that some of the biggest Romanian cities are truly implementing smart city projects, but smart city concept is developed at an initial stage (Batagan 2012); even important cities, such as Timișoara, Sibiu or Craiova are below the EU average in terms of smart city development (Rotuna et al. 2017). Between years 1999-2012 there were only a few cities in Romania that had started to initiate and develop smart solutions (Iași, Piatra-Neamț, Hunedoara, Sinaia). Since 2012, big important cities such as

Bucharest, Sibiu, Craiova, Cluj-Napoca, Brașov or Timișoara, due to their demographic data or industrial potential started to implement more and more smart solutions and integrate them in their urban projects for further development (Batagan 2012).

Currently, the city of Alba Iulia represents the ultimate leader in the implementation of smart projects in Romania with as many as 106 projects implemented not only by the city administration, but by private companies as well. The rank of smart cities in Romania includes Cluj-Napoca with 54 smart initiaves, Timisoara with 26 projects, Arad and Iași each with 19 initiatives, Brașov and Sector 4 in Bucharest each with 18 projects, Oradea (17), Sibiu (16) and Piatra Neamț (15 projects).

We observed that in the first edition of the Vegacomp report which appeared in March 2018 a number of 216 projects and initiatives in Smart City areas were identified in Romania and their estimated value exceeded 30 million Euros, whereas in the second edition of the same report which appeared several months later there are included over 300 Smart City projects. The number of identified Smart City initiatives grew every year until in 2020 Vegacomp report there are approximately 600 Smart City projects with a market value of over 120 million Euros from multiple sources. In our opinion these numbers undoubtedly demonstrate an exponential interest in the concept of Smart City projects in Romania.

Figure no. 1. Main cities that implement smart city projects in Romania.

	Alba Iulia	Cluj Napoca	Timișoara	Arad	Iași	Brașov	Bucharest sector 4	Oradea	Sibiu	Piatra Neamț
■ Smart Governance	25	8	4	5	4	6	4	3	4	3
■ Smart Living	24	12	6	1	7	3	5	4	2	3
■ Smart People	8	3	1	5	0	1	0	0	0	0
■ Smart Environment	8	7	1	1	1	1	0	1	0	2
■ Smart Mobility	17	20	9	5	5	6	7	8	5	6
■ Smart Economy	24	4	5	2	2	1	2	1	5	1
■ Total number of smart city projects	106	54	26	19	19	18	18	17	16	15

Source: Vegacomp (2020).

Regarding the type of smart city solutions adopted in Romania, the old leader is confirmed in 2020, respectively solutions for Smart Mobility. This is of utmost importance in our opinion considering the increasing interest on public safety and citizens' health, reflected also in the field of transport. This vertical is represented by a total of 188 projects in Romania, with over 100 more than in the Vegacomp report issued previously. Smart Governance is also deemed important, with 130 projects. Third place for smart projects in Romania is occupied by Smart Living, with 121 projects. Next in line is Smart Economy, with a total of 84 projects. Smart Environment, having 42 projects and Smart People, with 29 smart projects complete this ranking. The consolidated leadership position show a pending need in Romania in finding suitable solutions to the problem consisting in the lack of mobility infrastructure, accentuated by social distancing rules and the effects of the 2020 pandemic. This aspect renders smart transport as a major priority for the safety of residents not only in Romania but all over the world.

5. Role of European funds in promoting innovation and implementing smart city initiatives in Romania

The European funds available for Romania are being used mainly to implement innovative solutions in accordance with EU policies. Thus, the majority of smart cities were initiated in Romania in close connection with programs financed by the European Union. In particular, the Regional Operational Program was initiated in order to play a key role in the projects developed by cities across Romania to boost smart sustainable development. In our opinion, European Union financing programs have created the opportunity for public administration to increase their financial resources, but they also improved their innovative capacity to implement smart and innovative solutions at high-level quality standards.

Regional Operational Programme 2014-2020 is an Operational Programme that is addressed mainly to public administrations in Romania and its consistence and financial allocation is based on a comprehensive view of the economic and social situation of the Romanian regions. Following this analysis, a series main problems have been identified, such as:

- Research, development and innovation: there is a low transfer of market research results and an extremely low level of innovation within private companies;
- SME: underdeveloped SME sector, which in turn has a negative impact on the competitiveness of regional economies. A few main deficiencies of the SME sector were identified in the national strategic programming documents, such as:
    - Absence or low presence of entrepreneurial culture and extremely low business density in all Romanian regions;
    - Few resilience of new companies, that is approx. 2/3 of new private firms disappear from the economic market in the first year;
- Energy efficiency in public infrastructure, including public buildings and residential buildings: big energy consumption;
- Environment: increased level of pollution in urban open spaces;
- Urban development: degraded urban areas, vacant or not properly used areas in Romanian cities;
- Heritage resources: poorly capitalized cultural heritage;
- Tourism: valuable, balanced touristic potential distributed territorially as an alternative for the revitalization of less developed / isolated areas;
- Mobility infrastructure: poor or no accessibility in certain areas of Romania, which results in no competitivity and attractiveness with small level of potential for investments;
- Social and educational infrastructure: undersized educational, health and social services infrastructures impede social inclusion and human capital development;
- Cadastre: cadastral records missing or incomplete, which affects the implementation of socio-economic policies that govern sustainable development;
- Administrative capacity: there is an ongoing need to strengthen the administrative capacity of public authorities and beneficiaries, which would support relevant and successful projects' implementation.

These aspects have been linked to the strategic directions of action mentioned by the European Commission regarding the financing from the European Structural and Investment Funds, through the European Regional Development Fund in the period 2014-2020:

- Innovation and research;
- Digital agenda;
- Support for small and medium enterprises (SMEs);
- Low carbon economy.

During the current programming period, the counties with the largest number of contracted projects are: Cluj (267), Constanța (180), Bihor (154), Timiș (146) and Argeș (142), and those with the highest value of projects (EU funding) are Cluj (1,743,073,821 lei), Bihor (1,036,340,777 lei), Bistrița-Năsăud (951,079,707 lei) and the Municipality of Bucharest (818,318,099 lei).

Regarding the distribution of projects through ROP 2014-2020 by Romanian municipalities and cities, the situation is as follows:

Table no. 1. Distribution of projects contracted by Romanian municipalities and cities at the end of 2020.

Top main municipalities of the county (The average of the contracted projects is 17 projects.)	Top municipalities (The average of the contracted projects is 5 projects.)	Top cities / towns (The average of the contracted projects is 5 projects.)
Oradea – 39 projects	Hunedoara – 15 projects	Petrila – 17 projects
Timișoara – 33 projects	Dej – 15 projects	Pucioasa – 13 projects
Baia Mare – 32 projects	Orăștie – 14 projects	Buftea – 11 projects
Bistrița – 31 projects	Turda – 11 projects	Uricani – 10 projects
Cluj-Napoca – 31 projects	Carei – 10 projects	Oravița – 9 projects
Galați – 31 projects	Odorheiu-Secuiesc – 10 projects	Beclean – 9 projects
Deva – 26 projects	Slobozia – 9 projects	Balș – 9 projects
Reșița – 25 projects	Târgu Jiu – 9 projects	Negrești Oaș – 8 projects
Craiova – 24 projects	Târgu Secuiesc – 9 projects	Sângeorz-Băi – 8 projects
Zalău – 24 projects	Gheorgheni – 9 projects	Siret – 8 projects

Source: ROREG (2020).

With reference to the value of EU funds contracted by local public administration, situation is illustrated in the next table which reveals the champions of applicants among Romanian local public administrations.

Table no. 2. Distribution of EU funds contracted by Romanian cities at the end of 2020.

Top main municipalities of the county (The average of the total non-reimbursable budget contracted per municipality of county residence at national level is 56.16 million Euros.)	Top municipalities (The average total non-reimbursable budget contracted per municipality is 12.385 million Euros.)	Top cities / towns (The average contracted non-reimbursable budget / city is 5.78 million Euros.)
București – 205,65 mil Euro	Dej – 58,652 mil Euro	Pucioasa – 32,679 mil Euro
Cluj-Napoca – 162,99 mil Euro	Turda – 52,668 mil Euro	Beclean – 29,782 mil Euro
Oradea – 137,21 mil Euro	Făgăraș – 37,886 mil Euro	Eforie – 26,93 mil Euro
Craiova – 98,433 mil Euro	Carei – 29,297 mil Euro	Sîngeorz-Băi – 24,746 mil Euro
Timișoara – 88,326 mil Euro	Orăștie – 28,416 mil Euro	Sinaia – 23,717 mil Euro
Galați – 87,876 mil Euro	Mangalia – 25,712 mil Euro	Siret – 20,656 mil Euro
Reșița – 85,987 mil Euro	Odorheiu Secuiesc – 24,184 mil Euro	Isaccea – 18,694 mil Euro
Iași – 84,519 mil Euro	Bârlad – 23,427 mil Euro	Cugir – 18,234 mil Euro
Baia Mare – 73,062 mil Euro	Curtea de Argeș – 21,96 mil Euro	Oravița – 18,061 mil Euro
Bistrița – 70,087 mil Euro	Moinești – 20,094 mil Euro	Gura Humorului – 17,874 mil Euro

Source: ROREG (2020).

Regarding the thematic fields of contracted projects, the total number of 1070 projects contracted by the municipalities were divided between the following areas:
- Business environment: 0.7% - 7 projects;
- Energy efficiency: 42.2% - 452 projects;
- Urban mobility: 20% - 214 projects;
- Green spaces: 5.5% - 59 projects;
- Cultural heritage: 3.6% - 38 projects;
- Tourism: 0.7% - 7 projects;
- Health: 4% - 43 projects;
- Social services: 0.7% - 7 projects;
- Marginalized urban communities: 3.5% - 37 projects;

- Education: 16.8% - 180 projects;
- Urban regeneration: 2.4% - 37 projects.

62.2% of the total of 1070 contracted projects are in the fields of energy efficiency and urban mobility. In our opinion, these are the fields with the most prolific innovations in the smart city sector. By far, the largest total non-reimbursable budget was contracted by municipalities in the field of urban mobility, i.e. 1.992 million Euros.

The 475 projects contracted by cities or towns were divided between the following areas:
- Business environment: 0.21% - 1 project;
- Energy efficiency: 35.79% - 170 projects;
- Urban mobility: 7.58% - 36 projects;
- Green spaces: 10.32% - 49 projects;
- Cultural heritage: 3.16% - 15 projects;
- Tourism: 7.58% - 31 projects;
- Health: 6.53% - 31 projects;
- Social services: 3.16% - 15 projects;
- Education: 12% - 57 projects;
- Urban regeneration: 14.74% - 70 projects.

50.53% of the total of 475 contracted projects are in the fields of energy efficiency and urban regeneration, also the fields with the highest contracted budget by the local administrations, that is approximately 204 million Euros for urban regeneration and 191 million Euros for energy efficiency.

As we have seen, more developed regions such as the Bucharest-Ilfov Region and the North-West Region of Romania have had several projects in the last years and have implemented more mature initiatives, while the other regions have had fewer initiatives. several contextual projects (especially in response to applications requests through European Union funding programs and we noticed a real lack of a long-term vision on the implementation of the idea of "smart city".

In short, smart city or other innovative projects have been developed mainly in several large cities: Bucharest (capital), Brașov, Baia Mare, Cluj-Napoca, Iași or Timisoara mainly with the support of EU funding programmes. Some of the medium-sized cities where such programs have taken place (such as Hunedoara or Alba Iulia) have benefited from contextual programs of the European Union or these cities have been involved in unique initiatives aimed at reviving the tourist potential of historical heritage or cultural. Manika (2020) also found that in the case of smart cities, the European Union's legislative framework on public procurement encourages the implementation of innovation and sets the context for strategic procurement for smart cities.

6. Conclusions

Schipper and Silvius (2018) analysed the characteristics of smart development of sustainable cities and the implications for project management. They said that local public administration could require a centralized system and a comprehensive approach in order to strike the right balance between exploring various services in different areas and intensively exploiting services. As we have seen, smart and innovative projects implemented exclusively by public organizations can help accelerate the adoption of smart solutions from an early stage. In the case of some smart cities, Milenkovic et al. (2017) showed how the role of government in public-private partnership projects is to evaluate and approve detailed execution plans of the concessionaire, while the role of the private partner is to design, build, finance and exploit smart solutions.

The initiatives that were analysed in the Romanian context covered only some dimensions of the concept of "smart city", especially smart transport and ecological mobility, free Wi-Fi and public safety, recycling and lower CO_2 emissions, energy savings, e-government, sustainable development and land use, regeneration of small and medium-sized cities and disadvantaged areas, smart buildings, renewable and sustainable energy and smart tourism. We have not been able to identify too many projects or initiatives aimed at accessing health services, especially for vulnerable people or groups. We believe that this field of medical services could be intensively exploited by initiating projects with smart solutions, especially in the context of the COVID-19

pandemic that has affected the entire world and continues to have an impact on all levels. Therefore, we conclude that the idea of "smart city" in Romania is strongly related to improving the country's infrastructure, saving energy and reducing CO2 emissions, which is a relatively restrictive view on the concept of implementing smart city solutions. Still, there are a considerable number of public administrations which, as we have shown in this research, apply for European funding and are successful in increasing their financial resources with impact on their "smartness" and innovativeness. By implementing European funded projects, some local public administrations are increasing their institutional capacity alongside with reaching some quality standards in their procedures and initiatives that were otherwise difficult to achieve.

Romania's case could be a model for other middle-income countries in the European Union, as infrastructure development, including internet-based technologies, is seen as a sign of progress by local authorities. Consequently, smart cities initiatives would not aim to address people's needs, but to improve local economic development and infrastructure. We believe that such issues need to be further analysed in other Eastern European countries and that similar models should be investigated. Any approach to the smart city in Romania, focusing on Internet-based technologies, as a way to increase people's quality of life could be a first step in connecting smart city development strategies to take over good practices and even implement strategies in partnership to ensure the success of these projects and increase the acceptability of smart solutions in the community. Here, Jiménez's (2015) approach, which identifies new models of collaboration, could be important. Such models include collaboration with citizens, which leads smart city communities to grow beyond addressing public-private partnerships. This could be a Quadruple Helix model defined by the public-private-partnership or PPPP, in which citizens have an important say in designing solutions for their city. In our opinion, promoting innovation throughout public sector represents at the moment not only a desirable outcome, but a tangible effect once more and more smart city solutions are being implemented with the support of European funding.

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8. References

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