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Innovative Entrepreneurship and Sustainable Development of Smart Cities

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Abstract: The main objective of this scientific article is to analyze the link between innovative entrepreneurship and the development of smart cities in Romania. In order to fulfill this objective, I studied a part of the specialized literature in the field and I determined, based on statistical data, the current stage of development of innovative and R&D activities carried out by enterprises in our country, as well as the hierarchy of smartest local cities. The main results obtained from the study of the scientific literature showed that between innovative entrepreneurship and the sustainable development of smart cities there is a link of mutual influence. This statement is partially confirmed in the case of Romania, because the results showed that the best performing regions of the country in terms of enterprises carrying out innovation and research and development are the Bucharest-Ilfov and North-West regions, while those more developed smart cities are found in the Central (Alba Iulia) and North-West (Cluj Napoca) regions. On the other hand, the research results highlighted the fact that although in our country there is a tendency to increase the share of innovative enterprises, Romania is one of the last among the Member States of the European Union in terms of companies carrying out innovation / research and development activities. The reality is all the more worrying as our country's potential to improve these indicators is quite low compared to other states. Thus, it becomes imperative that decision-makers in Romania greatly stimulate innovative entrepreneurship, so as to support the development of smart cities, increase competitiveness and reduce the gaps with other European Union Member States. The paper contributes to a clearer understanding of this two-way relationship on the concrete case of Romania and is addressed to the academic, social environment and decision makers.

Keywords: *entrepreneurship; innovation; technology; smart cities; R&D.*

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1. Introduction

There is a two-way link between innovative entrepreneurship and the sustainable and inclusive development of smart cities. On the one hand, entrepreneurs who focus on innovation initiate and develop innovative technological solutions that contribute to solving urban problems and help to improve the living standards of the inhabitants, and on the other hand integrated technologies in most aspects of urban life collect important data that help companies to explore new opportunities.

The development of smart cities and innovative entrepreneurship are extremely important topics in the new knowledge-based economy, and as we will see in the next section, scientific studies conducted so far fail to fully cover all aspects of these topics. Thus, it becomes imperative that more and more researchers in the economic field address specific issues related to them so as to improve the level of fundamental knowledge, so that future strategies implemented in various regions to produce the greatest possible positive effects.

2. Problem Statement

Technologies have an extremely important role in the development of smart cities and innovative entrepreneurship. This is also highlighted by [1], who state that most of the technologies needed to transform cities into smart cities are created and promoted by companies in the technology sector as part of their own medium and long-term development strategies.

The same statement is supported by [8] who report that entrepreneurs propose new ideas for the development of innovative technologies necessary for cities, which they subsequently exploit and obtain considerable benefits.

The huge amount of data generated by smart cities cannot be processed by the human mind, which is why companies involved in developing innovative entrepreneurial initiatives must use artificial intelligence and machine learning correctly, so that the results accurately reflect the reality.

According to [2], for the sustainable development of smart cities, it is necessary for enterprises to form collaboration networks through which to transfer information and knowledge between them.

Another important factor that must be included in the equation when we discuss about the process of smart urban development and innovative entrepreneurship is the social and cultural context.

In his paper, [5] states that any economic action is not independent, it is influenced, improved or attenuated by the social sphere.

Thus, it is imperative that enterprises that are part of smart city development projects to understand and take into account the structure and the basic characteristics of the society when developing and implementing certain strategies.

On the other hand, the scientific literature focus on human capital implications in the development of smart cities. For example, [7] shows that universities play a key role in cities because these institutions create smart capital, which can play three key roles in the development of smart cities. The first is that some graduates of in-depth higher education can develop their own companies of innovative technologies. The second function consists in the active collaboration in partnership system with various enterprises by offering specific know-how. The third function is represented by the employment within the enterprises and the support of their innovation activity.

Related to this dependency relationship, [11] believes that intellectual and creative capital offers sustainable competitive advantages for cities of residence, enabling businesses to operate efficiently and [4] point out that an agglomeration of highly skilled human capital in a city leads to increased competition, which makes a smart city even smarter.

On the other hand, [9] state that smart human capital significantly influences the development of smart cities by encouraging lifelong learning, creativity, flexibility and open mind.

All these studies highlight the fact that enterprises, through highly qualified human capital and investments in innovative technologies, contribute in a decisive way to the development of smart cities.

Given these aspects, I believe that this analysis on the concrete case of Romania can contribute to the expansion of knowledge regarding the contribution of innovative entrepreneurship in the development of smart cities.

3. Research Questions/Aims of the research

The main objective of this paper is to evaluate the development stage of innovative entrepreneurship in Romania and how it can support the development of smart cities in this country, and also what is the situation of our country compared to the others European Union Member States.

4. Research Methods

In order to fulfill the main objective of this paper, a diversified research methodology was used, based on descriptive analysis, critical comparative analysis and interpretation of statistical data.

5. Findings

This chapter presents the results, in a structured manner.

5.1. The evolution of innovative entrepreneurship in Romania – driver for smart city development

In the period 2012 - 2018, the number of innovative enterprises in Romania registered an oscillating evolution. According to the data published by [10] – NIS (Chart 1), the share of innovative enterprises in our country decreased in the period 2014 - 2016 compared to the period 2012 - 2014 by 2.6 percentage points (pp), following that in the period 2016 - 2018 to be an increase of 4.4 percentage points.

Chart 1. The evolution of innovative enterprises in Romania in the period 2012 – 2018

* for the period 2014-2016 there are no official data of NIS in the case of successful innovative enterprises

Source: made by the author based on NIS data [10]

At the same time, from the chart above we can see that the share of successful innovative enterprises increased during the analyzed period, which shows that an increasing number of companies have implemented at least one product or business process innovation.

Regarding the type of innovative economic activities, from Table 1 we can see that the companies in the industrial sector were more innovative compared to those in the services sector.

Table 1. The share of innovative enterprises in total enterprises, by economic activities

Economic sector/period	2012-2014	2014-2016	2016-2018
Industry	12.6%	10.3%	16.3%
Services	13.1%	10.0%	12.9%

Source: made by the author based on NIS data [10]

Although in the period 2014-2016 there was a slight decrease, both economic sectors returned to an upward trend in the following period, with an increase of about 60% in industry and about 30% in services. The growth in the industrial sector was supported mainly by the manufacturing industry, which had a share of 94.7%, while the services sector was driven mainly by information and communications, with a share of 39.8%.

An important thing to highlight is that in the period 2016-2018 the most innovative economic activities, calculated according to their share in total enterprises in their sector of activity, were: IT services, services related to information technology and research and development (Table 2).

Table 2. Top 10 innovative activities in the period 2016-2018

Top	Economic activity	%
1	IT service activities	58.5
2	ICT activities	51.3
3	Research and development	45.0
4	Decontamination activities and services	44.6
5	Manufacture of basic pharmaceutical products and pharmaceutical preparations	43.7
6	Manufacture of tobacco products	40.0
7	Printing and reproducing records on media	29.6
8	Insurance, reinsurance and pension funding activities (except those of the public social security system)	27.1
9	Manufacture of furniture	26.1
10	Manufacture of other non - metallic mineral products	25.1

Source: NIS [10]

Comparing the data in Table 2 with those in Table 3, we can see that currently an increasing importance is given to the IT sector.

Table 3. Top 10 innovative activities in the period 2012-2014

Top	Economic activity	%
1	Research and development	54.2
2	Manufacture of basic pharmaceutical products and pharmaceutical preparations	39.7
3	IT service activities	36.6
4	Manufacture of coke oven products and crude oil products	30.8
5	Telecommunications	23.2
6	Decontamination activities and services	22.2
7	Metallurgical industry	22.2
8	Manufacture of other transport vehicles	22.0
9	Manufacture of chemicals	21.8
10	Editing activities	21.3

Source: NIS [10]

Thus, if in the period 2012-2014 the IT services had a share of only 36.6%, in the period 2016-2018 it came to register a share of over 50%, which means that many Romanian companies invest in innovative technologies, as part of their strategies to meet increasingly market demands and gain competitive advantage.

This reality confirms, in the case of Romania, the results of [6], which states that technology-based firms appear more and more in the economic forefront through the development of technological and communication solutions that help to use efficiently, reasonably and sustainable the existing resources, given the growth of the global population and implicitly its consumption needs.

On the other hand, the NIS statistics show that in Romania the most innovative companies are the big ones, with a high number of employees, these being followed by the medium and small enterprises (SMEs).

This is explained by the fact that enterprises with large capitals can sustain considerable investments in the innovation process, which involve high costs (in the period 2016-2018 the cost was the main obstacle to the development of innovative activities) that can hardly be supported by small enterprises.

At the same time, the positioning of large enterprises in the top of the most innovative companies in our country is due to the fact that they could more easily conclude cooperation agreements for innovation, due to the extensive links they have with suppliers of equipment, materials, software, etc.

Awareness of the need for innovation in Romania is clear, and companies in order to be competitive and gain a larger share of the market allocate increasing costs for research and development (Chart 2).

Chart 2. The evolution of research and development expenditures in the period 2012-2014 vs. 2016-2018

Source: made by the author based on NIS data [10]

The results presented in the chart above show an increase in internal research and development expenditures in the period 2016-2018, higher by approximately 78% compared to the period 2012-2014. It is also noteworthy that the outsourced research and development expenditures have been reduced, which demonstrates that Romanian entrepreneurs rely more on national intellectual capital and internal research resources, whose performance is increasing.

If we analyze the degree of innovation of companies at territorial level in Romania, we notice that the most developed region is Bucharest-Ilfov (Chart 3).

Chart 3. The share of innovative companies in total companies depending on the territorial profile, in the period 2012-2014 vs. 2016-2018

Source: made by the author based on NIS data [10]

Comparative analysis of the two periods shows a significant change in terms of the best performing regions regarding the development of innovative entrepreneurial initiatives. The only positive evolutions in the analyzed period were registered by the North-West and Bucharest-Ilfov regions, with increases of 12 and 7.9 percentage points, respectively.

The South-East region, which registered the highest performances in the period 2012-2014, had a decrease of 7.7 percentage points, following the downward trend of the other regions of the country.

The West region is the region with the fewest innovative enterprises throughout the period 2012-2018.

Given the link between innovative entrepreneurship and the development of smart cities, demonstrated in the literature, we can say, based on the results obtained in this section, that currently it is supported the smart development of cities that are located in the Bucharest-Ilfov and North-West regions.

But the real situation is a little different. According to [12], the top 10 smartest cities in our country are led by cities located in the Central and North-West regions (Table 4).

Table 4. Top 10 best performing smart cities in Romania

N City r	Total projects	Smart econo my	Smart Mobili ty	Smart Environm ent	Smart t peop le	Smart Sma rt livin g	Smart governance
	594	84	188	42	29	121	130
1 Alba Iulia	106	24	18	8	8	24	25
2 Cluj Napoca	54	4	20	7	3	12	8
3 Timisoara	26	5	9	1	1	6	4
4 Arad	19	2	5	1	5	1	5
5 Iasi	19	2	5	1	0	7	4
6 Brasov	18	1	6	1	1	3	6
7 Bucharest District 4	18	2	7	0	0	5	4
8 Oradea	17	1	8	1	0	4	3
9 Sibiu	16	5	5	0	0	2	4
10 Piatra Neamt	15	1	6	2	0	3	3

Source: *Vegacomp Consulting – “Smart city scan for Romania” [12]*

As can be seen in the table above, most of the smart cities projects are implemented in the cities of Alba Iulia (106) and Cluj Napoca (54).

Thus, on the one hand, the report prepared by Vegacomp Consulting confirms the results previously obtained in this section, as the largest city in the North-West region (2nd place nationally depending on the share of innovative companies in total companies), Cluj Napoca, occupies the 2nd place in the top of the smartest cities in the country.

On the other hand, Bucharest, the most important city in the Bucharest-Ilfov region (1st place nationally depending on the share of innovative companies in total companies) occupies only the 7th place in the top made by Vegacomp Consulting. Moreover, only one sector of this city is included in the top.

This demonstrates that some of the innovations developed by companies located in the Bucharest-Ilfov region are mainly implemented in other regions. Another explanation is that the innovative enterprises with territorial headquarters in this region develop innovations especially for the improvement of the internal activity and less innovations that contribute significantly to the smart development of the cities in which they are located.

5.2. The current stage of development of innovative entrepreneurship in Romania compared to the European Union

In this section I will try to determine the level of Romania in relation to the European Union in terms of the degree of development of innovative entrepreneurship, and therefore of smart cities.

According to [3], the Community Innovation Survey (CIS) shows that 49.5% of SMEs in the European Union undertook an innovation activity in the period 2014-2016 (Chart 4).

Chart 4. The share of SMEs in the EU-28 that undertook innovative activities in the period 2014-2016

Source: European Commission – “Annual Report on European SME’s 2018/2019” [3]

The data presented in Chart 4 show a worrying situation for Romania. Even if certain regions in our country (Bucharest-Ilfov, North-West) are making significant progress in the development of innovative entrepreneurship, in 2014-2016 Romania ranked last in the European Union according to the share of SMEs that have carried out innovation activities.

Equally worrying is the fact that the research and development performance of SMEs indicates a similar situation in the case of Romania (Chart 5).

Chart 5. Share of small and medium-sized enterprises in the EU-27 that have undertaken R&D activities internally or outsourced in the period 2014-2016

Source: European Commission – “Annual Report on European SME’s 2018/2019” [3]

Compared to the EU-27 average of 47% in terms of SMEs that carry out research and development activities in-house and 28% of those that outsource such activities, Romania registers a share of only 32% in the case of the first category of SMEs and only 9% in the case of the second, being among the poorest performing countries in the European Union in this regard.

The fact that many of the Romanian SMEs do not undertake innovation or research and development activities does not necessarily mean that they do not have the potential and resources to do so.

According to an estimate made by [3] on the research and development potential of enterprises in each European Union Member State, Romania is among the last places in the ranking of these countries (Chart 6).

Chart 6. Index of research and development potential of SMEs in EU Member States, 2018

Source: European Commission – “Annual Report on European SME’s 2018/2019” [3]

The index of research and development potential in our country is 2.41, below the EU-28 average of 2.58 and well below the values recorded by the best performing countries according to this criterion, Slovakia and Slovenia (2.77). Another estimate made by the [3] is related to the innovation potential of the Member States. Chart 7 shows the calculated values of this index for 2018.

Chart 7. Index of innovation potential of SMEs in EU Member States, 2018

Source: European Commission – “Annual Report on European SME’s 2018/2019” [3]

Also in the case of this index, Romania is below the EU-28 average, in the last part of the ranking.

All these results show that Romania is currently one of the poorest performing countries in the European Union in terms of innovation and research and development activities undertaken by domestic companies. On the other hand, the potential for innovation and research and development is also low in our country.

Given these aspects, it is obvious that the low performance of national SMEs related to innovation and research and development makes the sustainable and inclusive development of smart cities in Romania to be much more difficult compared to cities in most other European countries.

At the same time, the low potential for innovation and research and development makes these gaps to increase in the future, if no concrete measures are taken to stimulate innovative entrepreneurship in our country.

6. Discussions

The author, being aware about the complexity of the chosen topic, highlight the need to consider for further research more issues concerning the challenges related to innovative entrepreneurship and smart cities development.

Within this approach I was facing a number of limitations in terms of the availability of official statistical data, but I believe that my research can be a solid foundation for future researches in this area.

7. Conclusions

This empirical research has shown that there is a link of mutual influence between innovative entrepreneurship and the sustainable development of smart cities, and their long-term interaction produces positive effects at the micro, mezzo and macroeconomic level.

Following the analysis of the particular case of Romania, I came to the conclusion that the enterprises in our country are making progress in terms of innovation in entrepreneurial activity, which can contribute essential and decisive to the development of domestic smart cities.

Another important conclusion that can be drawn from this research is that the most significant innovation and research and development activities are carried out by large companies with high financial potential, which more easily create partnerships with other companies to increase the performance of such activities.

Conclusion of such partnerships is also recommended in the literature to ensure sustainable development of innovative entrepreneurial initiatives and smart cities.

On the other hand, the research showed that currently the most developed regions of the country in terms of the two criteria are Bucharest-Ilfov and North-West, but the most developed smart cities are found in the Central (Alba Iulia) and Northwest (Cluj Napoca) regions.

Thus, I demonstrated that the initial statement that smart cities are developing on the basis of innovative entrepreneurship is partially confirmed in the case of Romania.

Currently, in Romania there is a growing emphasis on information technologies and R&D activities, but at the moment the important positive effects are not very visible.

Thus, our country ranks last in the European Union in terms of SMEs carrying out innovation or research and development.

The situation of our country is all the more worrying as the potential to improve the level of innovation and R&D activities is low compared to most of the other European Union Member States.

In these conditions, it is imperative to adopt sustainable measures to support innovative entrepreneurship, so as to develop faster smart cities in Romania and to reduce competitiveness gaps compared to other European Union Member States.

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