# Digitalization – The Key to Smart City Development

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**Abstract**

*By addressing the theme of smart city, we have set out to illustrate some of the challenges that can arise in the intelligent development of cities, in order to adapt the public services provided to the needs of a number of constantly evolving inhabitants and to their increased demands.*

*The aim of the work is to present, through a comparative analysis, Romania's situation with other European countries, concerning the composite index of the digital economy and society, as well as the direct link between the evolution of urban income and activities using digital technology.*

*The challenges of transition processes, for smart city development, stem from the need to identify the optimal mechanisms to be used by city administrations so that the decision-making level supports scientific and practical methods of analyzing existing situations and communities' future needs, and the digitalization of all areas of activity is a key element supporting the strategic goals of a smart city.*

**Key words:** development, smart city, challenges, digitalization
**J.E.L. classification:** H790

## 1. Introduction

Global economic developments have always been accompanied by a complex process of urbanization, with cities acting as drivers of progress, providing the most favorable ground for technological innovation and educational, cultural and social achievements. But it is not always the environmental and social benefits of this development, because we are currently witnessing major problems that cities face, such as population congestion, pollution, congestion, resource use, lack of adequate physical and social infrastructure, the need for sustainable economic growth, as well as strict environmental requirements.

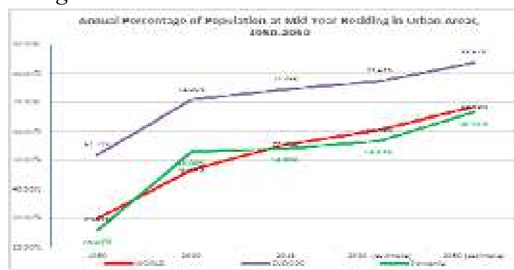
We need to take into account the current societal developments, characterized by the rapid growth of urban settlements, which are an irreversible and constantly changing phenomenon. The population is increasingly migrating to cities for economic and social reasons, and this leads to increased demand for housing, networks and means of transport, social services, and the expansion of education (especially the school system in small and medium-sized towns, as well as universities in large cities), health, culture and leisure facilities.

According to official data, the share of the urban population in the world has increased from 29,61% in 1950 to 55,29% in 2018, with an estimated 68,43% in 2050, followed by the evolution of the urban population in Romania (U.N., Department Economic and Social Affairs, 2018).

*Figure no. 1*

| Annual Percentage of Population at Mid-Year Residing in Urban Areas, 1950-2050 | | | | | |
|---|---|---|---|---|---|
| Region, subregion, country or area | 1950 | 2000 | 2018 | 2030 (estimate) | 2050 (estimate) |
| **WORLD** | **29.61%** | **46.68%** | **55.29%** | **60.43%** | **68.43%** |
| **EUROPE** | **51.71%** | **71.06%** | **74.45%** | **77.47%** | **83.67%** |
| Northern Europe | 69.72% | 77.88% | 82.16% | 85.01% | 89.22% |
| Western Europe | 64.57% | 75.97% | 79.86% | 82.23% | 87.03% |
| Southern Europe | 46.17% | 66.43% | 71.52% | 75.44% | 82.09% |
| Eastern Europe | 39.75% | 68.19% | 69.62% | 72.23% | 79.42% |
| **Romania** | **25.63%** | **53.00%** | **54.00%** | **56.63%** | **66.67%** |

*Figure no. 2*



*Source:* United Nations/population Division + own representation of the data in the table and graph in Excel

In 1950, the share of the urban population in Romania (25,63%) was below the world average (29,61%) and half of the European average (51,71%), but within almost 70 years it had accelerated, with the inhabitants of Romanian cities doubling their share, compared to the 44% growth in european countries, which is in line with global urban development, which is growing by more than 86%. A sharp trend toward global urbanization has put pressure on administrations to identify how best to solve the difficult situations facing large urban agglomerations today and to meet the needs of society by ensuring sustainable development (Nam and Pardo, 2011). Tackling the smart development of cities is therefore not only an opportunity today to make them more attractive to new inhabitants, but is an imperative necessity to address the major current problems of pollution, mobility and obsolete technological infrastructure. elements that can make economic activities less attractive and thus lead to social problems.

The motivation for this study is because in academia, but also in the economic environment, there are several studies that seek to provide an overall understanding of the smart transitions of cities and their development process, but most studies address issues with a focus on technology, in terms of technical facilities, without giving due weight to the human factor and the interaction of administrations with the population. In the context of economic analyzes, the reference to the national economic result indicator (GDP) is also predominant, but in order to better understand the transition processes specific to smart cities, we propose to look at smart city phenomena by combining indicators relating to the use of ICT, with an economic result specific to the urban environment, characterized by average income in urban settings.

The aim of this research was to highlight the quantitative development of average urban income in close connection with the evolution of the urban population share and its qualitative evolution in close relation to that category of population using modern technology, both in personal activities, as well as in professional activities.

This analysis can be useful for administrations across all categories of cities, since this section of the population is mainly the category of providers of income to the budgets of cities, compared with the population with limited digital skills and training, which is mainly part of the category of beneficiaries of social assistance, so the consumers of resources from budgets.

## 2. Literature review

The future of the regions relies on exploiting the opportunities of innovative technologies to develop optimally. Interest has been expressed since the 1990s, initially addressing the area of "competitive regions" and "Smart Communities", and the main drivers of regional competitiveness have been presented.

For example, the success of Silicon Valley is attributed to the creation of a decentralized industrial "network system", where production is organized by specialized firms which compete intensively with each other, but also formal and informal collaboration with each other, as well as with certain local institutions such as universities. In the Silicon Valley, intense social, technical and productive relations have fostered the development of entrepreneurship, experimentation and collective learning by interconnecting public, private and academic organizations. It has thus been proven that both technological and social infrastructure are critical to the success of local firms' own activities and, consequently, to the social development of the region (Saxenian, 1994, quoted in Paquet et al, 2001).

Improving the socio-economic situation and the development of regions depends on the use of an innovative environment resulting from the interaction between the various participants in the active life of municipalities, i.e. administration, businesses, universities and residents. Thus, the success of a locality in order to become a smart community depends largely on its effectiveness in collecting, processing and using knowledge and technology, in order to fulfill its administrative role and to provide public services in an efficient way (Paquet et al, 2001). With the transition to the new digital era, the expectations and demands of taxpayers have become increasingly greater toward city leaders and how they manage the interests of local communities. Therefore, as Eger said (2001), cities all over the world are now struggling to reinvent themselves for a new period, where society is no longer based solely on the industrial economy, but on the development of data infrastructure, the updating of real-time information and their efficient use, they are recognized as a valuable resource (Eger, 2001).

In the Digital City Kyoto paper, Ishida addressed the concept of "*digital cities*", relying on collaboration and interaction between people in regional communities who share knowledge, experiences and experiences with each other, depending on common interests. Thus, through the platforms set up, urban information is integrated into the digital city and a public internet space is created for the inhabitants of cities or their visitors (Ishida, 2002).

Moving to the next stage, in 2007 the smart city was defined as "a well-performing and visionary city in terms of economy, citizens, governance, mobility, environment and housing. Based on the smart mix of endowments and activities of citizens who are determined, independent and aware" (Giffinger et al, 2007).

Most definitions have highlighted common characteristics, building on the remarkable advances in communications and information technology (ICT) and the use of these technologies, not only in the private economic environment where competition is fierce, but also in the field of public administration and services, so as to develop (so far as is possible). and intensive) urban areas.

A *Smart City* is intended to be *„an urban environment heavily supported by information and communication systems (ICT), which is capable of providing advanced and innovative services to its citizens in order to improve the overall quality of their lives"* (Piro et al, 2014).

In the academic world, there are several studies that seek to provide an overall understanding of cities' smart transitions and their development process.

So in the "*Smart cities : Strategic Sustanaible Development for an urban World*" a group of researchers (Colldahl et al, 2013) addressed the issue from the perspective of sustainable strategic development, carrying out qualitative research, through structured interviews with practitioners of cities where actions and investments were made to implement specific elements of Smart City and concluded that the performance of a smart city can be defined in the light of six main features: *Smart economy* (competitiveness), based on innovation, productivity and labor market flexibility*; intelligent people* (social/human capital) characterized by a desire to learn throughout life, public involvement/participation, creativity and flexibility*; Smart governance* (participation) based on participation in decision-making and transparent governance*; Smart mobility* (transport and information-ICT technology) characterized by local accessibility, a developed information and communication technology infrastructure, sustainable, innovative and secure transport systems*; a smart environment (*natural resources) characterized by attractive natural conditions, environmental protection and sustainable resource management*; Smart life* (quality of life) characterized by social cohesion, housing quality, health conditions, cultural facilities and tourist attractions (Giffinger, 2007, Berger, 2017).

In many work on the analysis and development of the *Smart City* concept, the focus has been on the technology side, investments and performance facilities, but the socio-human aspects, i.e. the users of these technologies (city administrations as public service providers) and the inhabitants of these cities (as taxpayers and recipients of public services) should not be overlooked either. Why? Because "*human performance today depends not only on the provision of a city with hard infrastructure (physical capital), but also increasingly on the availability and quality of knowledge* *of communication and of social infrastructure (human and social capital). Human and social capital is crucial for urban competitiveness*", (Caragliu and Nijkamp, 2011).

A more extensive study was presented in the "*Category planning for the Development of Smart cities*" (Angelidou, 2015), analyzing fifteen development strategies of cities around the world, which are at a more advanced stage in implementing specific *Smart City* goals.

After 2000, large it companies began adopting *Smart City* terminology (e.g. Siemens, Cisco, IBM) to drive the integration of complex it systems into urban infrastructure and services. IBM proposes reinventing and reconfiguring public services by applying new cloud technologies, *AI* (artificial intelligence), and by automating the range of repetitive tasks to create more flexible systems to optimize and streamline all administrative processes (IBM).

In this respect, a new global company of Romanian origin software, UiPath, has developed and implemented, since 2017, a platform for automation of robotic processes (RPA or RPAAI) for repetitive activities. For example, Copenhagen, in order to cope with the pressure generated by population growth of around 20% over the last decade and with the aim of providing high-quality public services to the population, has automated the vast majority of administrative procedures, saving thousands of individual hours of work (Bratu, 2020).

## 3. Research methodology

The question behind this research is whether: *Is the evolution of revenues in urban areas significantly influenced by digital technology-based activities?*

The hypothesis we make and verify is: Digitalisation is the key factor in the intelligent development of cities, that is, today, most economic and social processes in urban areas are based on the use of information technology, aiming to eliminate the ways in which information is collected, processed, transmitted and physically archived.

In this paper, by consulting the various sources (literature, case studies, official reports and rankings by consultancy firms, official city hall platforms), we have sought to present the need and timeliness of the study on Smart City, creating the conceptual framework and marking the stages of development in addressing the specific challenges of smart cities over the last three decades (1990-2020). We also sought to highlight the basic features of a smart city, and from these features, what challenges can be faced by cities in Romania.

The research methods addressed were:

- *A first method of research* used shall be based on the application of linear regression in excel ($y = x\ \alpha + \varepsilon$), which aims to present a direct link between: the evolution of urban income with certain factors, which are based on the use of information technology, and the factor which illustrates the evolution of the share of the urban population in the country's total population.

- *The second method of research* used was to present the rankings and carry out the comparative analysis of *The composite index of the Digital Economy and Society for Romania* compared to the other member states of the European Union (EU-DESI, 2020).

To illustrate the evolution of the share of the urban population, worldwide, European and Romania have been selected for the years 1950 and 2000, with the aim of synthesizing the picture over the half-century period, with the latest updated data available being those of 2018.

The estimated data on urban population growth in the years 2030 and 2050 have been selected to illustrate the evolution of urbanization for the next generation.

By consulting *primary data sources* (databases: Eurostat, United Nations-Department Economic and Social Affairs, INSSE, Official website of Romanian cities) and *secondary data sources* (specialist works, case studies, rankings by consultancy firms, press articles), we have presented a table and a graphic on the state of play of a basic element of *integrating innovative technologies into the development strategies of cities*.

The data used to present the link between the variables, analyzed using the statistical method of linear regression on a unified basis, were available for the period 2011-2020 on the Eurostat website, illustrating the evolution of Romania's post-accession to the EU.

## 4. Findings

### 4.1. Data analysis by applying linear regression

*Table no.1*

| Year | Mean income by degree of urbanisation =Y | Individuals - frequency of internet use = $X_1$ | Use of computers and the internet by employees= $X_2$ | Annual Percentage of Population at Mid-Year Residing in Urban Areas by Country = $X_3$ | Gross domestic expenditure on R&D = $X_4$ |
|---|---|---|---|---|---|
| 2011 | 3,187.00 | 37.00 | 28 | 54 | 0.50 |
| 2012 | 3,174.00 | 43.00 | 26 | 54 | 0.49 |
| 2013 | 2,936.00 | 45.00 | 28 | 53.9 | 0.39 |
| 2014 | 3,224.00 | 48.00 | 29 | 53.9 | 0.38 |
| 2015 | 3,295.00 | 52.00 | 30 | 53.9 | 0.49 |
| 2016 | 3,659.00 | 56.00 | 28 | 53.9 | 0.48 |
| 2017 | 4,105.00 | 61.00 | 32 | 53.9 | 0.50 |
| 2018 | 5,301.00 | 68.00 | 34 | 54 | 0.50 |
| 2019 | 6,196.00 | 72.00 | 31 | 54.1 | 0.48 |
| 2020 | 6,507.00 | 76.00 | 35 | 54.20 | 0.48 |

*Source:* Eurostat, United Nations/population Division/ + own representation in Excel table

#### 4.1.1. Analysis of the correlation between variables Y (*Mean income by degree of urbanisation*) and $X_1$ (*Individuals - frequency of internet use*)

We make the following assumptions:

$H_0$: *the regression slope of the time series has no statistical significance and there is no direct link between the evolution of the variable $X_1$- Individuals - frequency of internet use* and variable changes *Y- Mean income by degree of urbanisation.*

$H_1$ : *the regression slope of the time series has statistical significance and there is a direct link between the evolution of the variable $X_1$- Individuals - frequency of internet use* and variable changes *Y- Mean income by degree of urbanisation*.

Analysis of the data resulting from simple regression for the variable gives the following results:

*Correlation coefficient* (Multiple R) = 0.93490; *The confidence interval* has no different signs (Lower=65.9814, Upper=125.1304), therefore, the coefficient of variable $X_1$ cannot take the value of 0, both values being positive; Calculated *Student Test* value for 5% and 8 degrees of freedom error (df=n-1=8) is $t\text{-Student}_{calculat/0,05/8} = 7.4507 > 2.3060 = t\text{-Student}_{teoretic}$; the calculated value of the *Fisher coefficient* is $F_{calculat}=55.5138 > 5.3176 = F_{teoretic\ 0,05/1/8df}$ ; *Sig* (Significance F) = 7.25926E-05 < 0,05;

In conclusion, the $H_1$ hypothesis is accepted: *the regression slope has statistical significance*, that is, we can guarantee with a 87,40% probability that the model of the time series has statistical significance, so there is a strong and direct link between the evolution of the variable *$X_1$- Individuals - frequency of internet use* and variable changes *Y- Mean income by degree of urbanisation.*

#### 4.1.2. Analysis of the correlation between variables Y *(Mean income by degree of urbanisation)* and $X_2$ *(Use of computers and the internet by employees)*

We make the following assumptions:

$H_0$: *the regression slope of the time series has no statistical significance and there is no direct link between the evolution of the variable $X_2$- Use of computers and the internet by employees* and variable changes *Y- Mean income by degree of urbanisation.*

$H_1$: *the regression slope of the time series has statistical significance and there is a direct link between the evolution of the variable $X_2$- Use of computers and the internet by employees* and variable changes *Y- Mean income by degree of urbanisation*.

Analysis of the data resulting from simple regression for the variable gives the following results: *Correlation coefficient* (Multiple R) = 0.8169; *The confidence interval has no different signs* (Lower=161.5366, Upper=599.5474), therefore, the coefficient of variable $X_2$ cannot take the value of 0, both values being positive; Calculated Student Test value for 5% and 8 degrees of freedom error (df=n-1=8) is $t\text{-Student}_{calculat/0,05/8} = 4.0068 > 2.3060 = t\text{-Student}_{teoretic}$; the calculated value of the *Fisher coefficient* is $F_{calculat}=16.0552 > 5.3176 = \mathbf{F}_{teoretic\ 0,05/1/8df}$; *Sig* (Significance F) = 0.00391196 < 0,05;

In conclusion, the $H_1$ hypothesis is accepted: *the regression slope has statistical significance*, that is, we can guarantee with a 66,74% probability that the model of the time series has statistical significance, so there is a strong and direct link between the evolution of the variable $X_2$- *Use of computers and the internet by employees* and variable changes *Y- Mean income by degree of urbanisation.*

#### 4.1.3. Analysis of the correlation between variables Y (*Mean income by degree of urbanisation*) and $X_3$ *(Annual Percentage of Population at Mid-Year Residing in Urban Areas by Country)*

We make the following assumptions:

$H_0$: *the regression slope of the time series has no statistical significance and there is no direct link between the evolution of the variable $X_3$- Annual Percentage of Population at Mid-Year Residing in Urban Areas by Country 2011-2020* and variable changes *Y- Mean income by degree of urbanisation*.

$H_1$: *the regression slope of the time series has statistical significance and there is a direct link between the evolution of the variable $X_3$- Annual Percentage of Population at Mid-Year Residing in Urban Areas by Country 2011-2020* and variable changes *Y- Mean income by degree of urbanisation*.

Analysis of the data resulting from simple regression for the variable gives the following results: *Correlation coefficient* (Multiple R) = 0.8252; *The confidence interval has no different signs* (Lower=4746.5662, Upper=16728.0170), therefore, the coefficient of variable $X_3$ cannot take the value of 0, both values being positive; Calculated Student Test value for 5% and 8 degrees of freedom error (df=n-1=8) is $t\text{-Student}_{calculat/0,05/8} = 4.1330 > 2.3060 = t\text{-Student}_{teoretic}$; the calculated value of the *Fisher coefficient* is $F_{calculat} =17.0824 > 5.3176 = \mathbf{F}_{teoretic\ 0,05/1/8df}$ ; *Sig* (Significance F) = 0.00328443 < 0,05;

In conclusion, the $H_1$ hypothesis is accepted: *the regression slope has statistical significance*, that is, we can guarantee with a 68,10% probability that the model of the time series has statistical significance, so there is a strong and direct link between the evolution of the variable $X_3$- *Annual Percentage of Population at Mid-Year Residing in Urban Areas by Country 2011-2020* and variable changes *Y- Mean income by degree of urbanisation.*

#### 4.1.4. Analysis of the correlation between variables Y (*Mean income by degree of urbanisation*) and *X4 (Gross domestic expenditure on R&D)*

We make the following assumptions:

$H_0$: *the regression slope of the time series has no statistical significance and there is no direct link between the evolution of the variable $X_4$- Gross domestic expenditure on R&D* and variable changes *Y- Mean income by degree of urbanisation*.

$H_1$: *the regression slope of the time series has statistical significance and there is a direct link between the evolution of the variable $X_4$- Gross domestic expenditure on R&D* and variable changes *Y- Mean income by degree of urbanisation*.

Analysis of the data resulting from simple regression for the variable gives the following results: *Correlation coefficient* (Multiple R) = 0.1180; *The confidence interval has no different signs* (Lower= -12580.191, Upper=33065.0463), therefore, the coefficient of variable $X_4$ can take the value of 0, *lower value* being negative and *upper value* being positive; Calculated Student Test value for 5% and 8 degrees of freedom error (df=n-1=8) is $t\text{-Student}_{calculat/0,05/8} = 1.0348 < 2.3060 = t\text{-Student}_{teoretic}$; the calculated value of the *Fisher coefficient* is $F_{calculat}=1.0710 < 5.31765= \mathbf{F}_{teoretic\ 0,05/1/8df}$; *Sig* (Significance F) = 0.33098388 > 0,05.

In conclusion, the $H_0$ assumption is accepted: *the regression slope has no statistical significance*, i.e. we cannot guarantee that the model of the time series has statistical significance, so there is a very poor link between the evolution of the variable $X_4$- *Gross domestic expenditure on R&D* and variable changes *Y- Mean income by degree of urbanisation.*

From the analysis of the four independent variables presented above, the assumption has been confirmed, with the result that economic and social processes conducted in urban settings are based to a very large extent on the use of information and communication technology (given the strong links between variable developments $X_1$, $X_2$ *și* $X_3$ and variable changes *Y*) however, unfortunately, no real effort has been made in the development and implementation of these technologies, which is the result of adverse development of the parameter $X_4$ *- Gross domestic expenditure on R&D*, in relation to the change in the parameter *Y- Mean income by degree of urbanisation.*

### 4.2. Comparative analysis of data on the composite index of the digital economy and society

Smart and sustainable urban development issues were addressed and updated in June 2015 at the meeting of ministers responsible for territorial cohesion and urban issues of the EU Member States, when the "*Campaign eSkills for jobs 2015-2016*" was launched, a particular initiative to raise awareness of the problems related to the digital skills gap between the different countries and regions of the European Union.

The proposed measures have sought to mobilize EU States, academia and the information and Communication Technology (ICT) industry to identify viable solutions to reduce the digital divide between Member States by 2020, By stimulating investment in education and creating new jobs, with a view to boosting growth in Europe and smart city development.

Against this background, the Riga Declaration proposed that Europe should realize its potential in the field of digital technologies, following ten key principles: "*make as much investment as possible in digital technologies and skills; create new jobs for unemployed young people by developing their digital skills; adopt the Digital skills for the 21st century policy as a priority and its rapid implementation; support the work of the Grand Coalition for Digital jobs in implementing national coalitions; promote the concept of European e-leadership; stimulate technology take-up and digital entrepreneurship; commitments for lifelong education and training; european leadership in global standards; developing the expertise of ICT professionals and maturing ICT professions across the EU; commitments to collaborate, share experiences and integrate efforts* (AssociationIT, 2015).

In Romania, some of the first smart development projects were carried out in large cities, resulting from a combination of demographic concentration, diversified economic production and services, accessibility to large and important markets (such as the European one), attractive universities, what has supported their continuous development and encouraged economic growth, and therefore also greater possibilities for allocating the resources needed to start specific *smart city* projects. The situation has evolved and in the vast majority of large and medium-sized cities the number of Smart City strategies has increased from 330 projects started in 45 cities in 2019 to 594 projects started in 87 cities in 2020, that is, 860 projects started in 124 cities in 2021, with the top 35 cities ranked as follows: Alba-Iulia (106 projects), Cluj-Napoca (58 projects), Iasi (56 projects), Bucharest-sector 3 (39 projects), Bucharest-sector 4 (35 projects), Arad (29 projects), Sibiu (27 projects), Oradea and Timisoara (26 projects each), Brasov (18 projects),etc. (Vegacomp, 2021).

For smart city development, we need to focus on the use of innovative technologies, which calls for support for R&D, but reality shows that Romania is at the forefront of the effort made to support R&D in the EU. Less than 1% of GDP (0,48%) was spent on this (Eurostat, 2018 și INSSE, 2019).

At the top of the European rankings, achieved in 2019, are the Nordic countries and those with a developed economy, with the highest share of over 3% of GDP, used to support R&D, for example: Sweden-3,39%, Austria-3,19%, and Germany-3,17%. Denmark-2,96%, Belgium-2,89% and Finland-2,79% are close to this threshold.

However, the end of the ranking groups eight countries that allocated less than 1% of GDP to R&D expenditure, with Lithuania-0,99%, Bulgaria-0,84%, Slovakia-0,83%, Ireland-0,78%, Latvia-0,64%, Cyprus-0,63%, Malta-0,61% and far away Romania-0,48% (of which 0,28% for the private sector and 0,20% for the public sector) (Dicu, 2020).

*Figure no. 3*

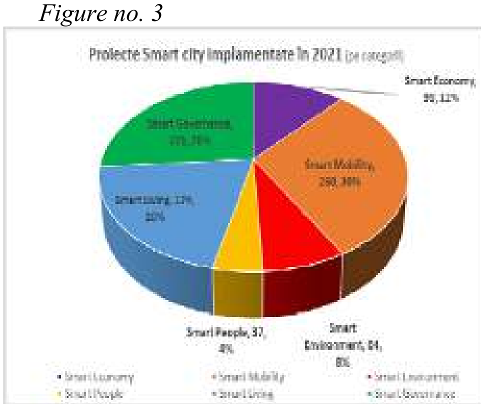
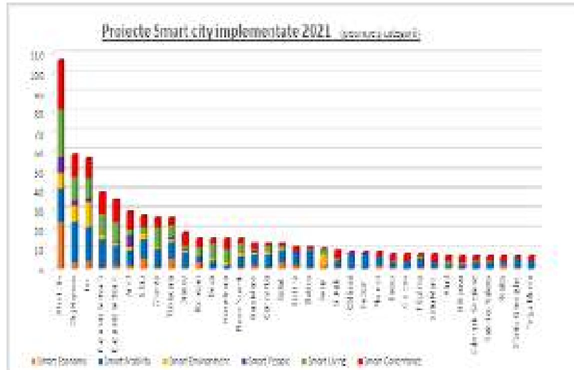



*Figure no. 4*



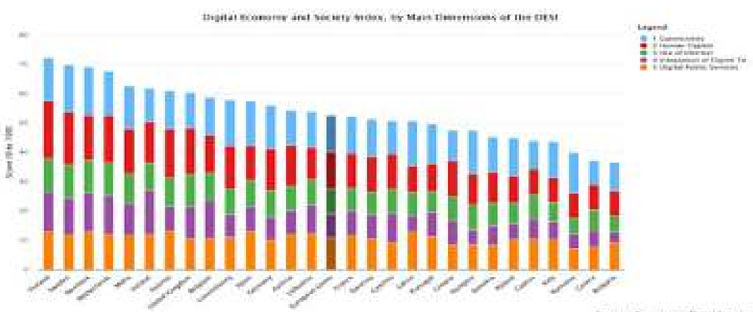

*Source:* Vegacomp, June 2021+ own representation of the graph in Excel

Raising the quality of public/urban services is based on a very important tool: Digitalization, i.e. the tool of the future that provides efficiency and predictability, and is one of the development pillars of any intelligent Community. It is therefore important to present a comparative picture of the situation in Romania, in the European context, in the light of a relevant indicator.

*The Digital Economy and Society Index - DESI* is the composite index summarizing the relevant indicators on digital performance in the European Union, reflecting the evolution of member states in five main areas: connectivity, internet use, integration of digital technologies, human capital (digital skills) and digital public services (DESI, Digital Scoreboard Data & Indicators, 2020).

Data on *The Composite Index of the Digital Economy and Society* – DESI since 2020 it ranks Romania as the 26 in the 28 Member States of the European Union.

*Figure no. 5*



*Source:* DESI by components-Digital Scoreboard - Data & Indicators

Looking at each component, the situation of our country is as follows:

***1 – connectivity***: Romania is in a very good position - 11 (out of the 28 EU countries), with a score of 14,05 point, compared to the average European score of 12,51 point.

Unfortunately, the good news stops here, because for the next four indicators Romania is at the end of the ranking, like:

***2 – human capital***: Romania ranks only 27 (out of the 28 EU component countries), with very low level of basic digital skills and basic software skills (with 8,29 point), well below the European average level (12,3 point).

***3 – internet use:*** Romania has a very modest score (5,38 point), which puts it at the end of the European ranking, which has an average of 8,70 point (28 of the 28 EU Member States). In Romania the Internet is used mainly for social media communication and less for economic operations or financial transactions, possibly because of very low trust in digital technology and transaction security.

***4 - integration of digital technology***: with a score of 4,99 point (well below the european average, which is 8,27 point) Romania is in an unfavorable position (27) and sustained efforts are needed to integrate digital technology into the economic environment;

***5 – digital public services***: although Romania ranks 8 – for citizens who have used eGovernment services (with over 80% of internet users, compared to the EU average of 67%), digital public services only scored 7,26, Smaller than the European average (10.80 point), which puts Romania in the last position (28).

The public service has mainly been used by the public to submit forms, and the interaction with public authorities has only been confined to this.

Very low scores for the provision of pre-filled digital forms and fully online services place Romania at the bottom, this shows that there is a large gap in the quality of the digital services offered and their ability to be used by the population. This is due to the lack of interoperability of it systems and public administration databases, which is an older problem that has not been solved so far.

By summarizing the analysis of the 5 components of the Digital Economy and Society Index (DESI), we can say that this is an area where our country needs to accelerate the pace of digital transformation, because it is an essential component that underpins the development and implementation of smart city strategies.

The digitalization of all areas of activity is the solution to achieve policy objectives in other areas (economic, mobility, social, educational, health, health, etc.). An additional argument, which supports the need to step up actions for the digitalization of activities (by developing physical information and communication technology infrastructure and by appropriately specializing human resources in this area), It follows from the fact that the appropriate framework needs to be created for the effective implementation of the Directives of EU Regulation No 910 of 2014 on electronic identification and secure services for electronic transactions in the internal marke.

## 5. Conclusions

By creating a well-functioning administrative system, by means of process digitalization, efficient tools are available to city decision makers and public service users, which can be used in various areas of interest such as urban planning and urban development, urban planning regulations, land registers, utilities, extension of projects or maintenance, taxes and fees. Of course, to reap the benefits of innovative technologies, appropriate funding is needed, and depending on the strategies of cities and the scale of the projects, these financial needs may be very high.

Every step must therefore be taken very carefully, *raising awareness and defining problems* (such as population congestion, pollution, congestion, resource use, lack of adequate physical and social infrastructure, the need for sustainable economic growth and increasing energy and environmental requirements, etc.), *the setting of strategic objectives* and *standards associated with these objectives*, and each city *will set its specific objectives and actions to achieve the corresponding standards* (according to the result indicators associated with these standards), *within real time limits.*

A great opportunity to provide quality and affordable public services for citizens is represented by the national Investment Program "*Anghel Saligny*", which is to be carried out between 2021 and 2028, by allocating lei 50 billion to development programs. This program can achieve investment objectives which are necessary to equip territorial administrative units with technical and publishing facilities and access to communication channels, thereby contributing to the objective of convergence with the economies of the more advanced countries of the European Union (Project of the Government Emergency Ordinance for the approval of the National Investment Program "*Anghel Saligny*", 2021).

The use of new EU financing instruments such AS ITI (Integrated territorial investments) is also likely to be the best instrument used to tap the growth potential of smart cities (Cristea and Ionescu-Heroiu, 2017), but to prioritize investment needs within a realistic operational budget, it must be the basis for decisions taken by urban stakeholders. Economic solutions to meet the current challenges are within the reach of decision makers by taking advantage of all funding opportunities, both internal and external, but only on the basis of viable projects.

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