

Analysis of the Concept and Solutions for Transforming Timisoara into a Smart City

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Abstract – Of utmost importance for assuring humanity’s sustainability is the cities and smart regions development, a problem that involves a multitude of factors and is extremely complex. Even though this fact is known by the international communities, the local and public administrations of Romania use the concepts and intelligent solutions modestly. In the present work an analysis of some theoretical aspects is presented regarding the necessity of transforming cities into smart cities, like a study that illustrates the actual state of things at Timisoara’s City Hall in parallel with the transition towards the city’s transformation into a smart city. The successful testing and validation of a smart city’s strategy at Timisoara’s City Hall ensures that it is appropriate for its usage by the country’s other public administrations.

Keywords: Smart cities, smart regions, smart systems, smart interconnection, smart processes, collaborative governing, integrated public management.

I. INTRODUCTION

Worldwide, the community policy creates the premises that more cities will become smart cities. In this regard, strategies, action plans, programs, initiatives and declarations were adopted for which more and more funding is allocated. For cities to become smart, public systems need to be implemented, structured and coordinated in a way that can easily be managed and sustained.

In Romania, the need to recover the development deficit compared to western countries of the European Union can be ensured through conception, adoption and implementation of a cities and smart regions development model funded through the scientific research and adapted to the local’s specific characteristics.

A complete strategy for bringing Timisoara in the digital era „Smart City and Digital Transformation strategy Timisoara” [1] was developed by Timisoara’s City Hall, together with international experts and the actor’s local ecosystem, which includes IT companies, the university environment, NGO’s and many interested civilians. Many projects proposed through this strategy are in the present implementation phase, while other projects are in the preparation phase. The strategy will be implemented in the 2022-2027 period.

1.1 General aspects at a global level

Worldwide, the community policy creates the premises that more cities will become smart cities. In this regard, strategies, action plans, programs, initiatives and declarations were adopted for which more and more funding is allocated.

„Smart cities as a new industrial policies engine in Europe” [2] was a title for an approved document by the Economic and Social European Committee in 2015. This laid the foundations for a new strategy for supporting and developing Smart City’s projects. The European Union and its member states consider that cities are „laboratories for a more dynamic and digital Europe” [3], where measures meant for generating growth accompanied by social development and the employment rate can be experimented. This happens in the context of urbanization that intensifies.

Within the framework of strategic development of cities worldwide, the concept of a “smart city” was one of the most vast, popular and dynamic concepts of the last 10 years. Furthermore, in essence, it is a multidisciplinary concept, which combines method elements and impact measurements from fields such as innovation, sustainability, entrepreneurship,

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technological prototyping, urbanism and civic implication.

To define precisely the meaning of a smart city, we must refer to Boyd Cohen’s work [4], an American researcher, which deals with entrepreneurship, sustainability, urban strategies and climate changes. His motivation and professional progress were defining factors for releasing the concept of smart city in the global professional community in the year 2012.

Boyd Cohen noticed three evolution stages of the cities that adopted and implemented the model, namely:

- Smart cities 1.0 - This includes the cities in Romania;
- Smart cities 2.0 – This category includes the smartest cities worldwide: Singapore, Hong Kong, Boston, Barcelona, London;
- Smart cities 3.0 – This includes Oslo and Amsterdam.

Boyd Cohen highlights the fact that, from the city’s practice, the ideal approach seems to be a combination of options 2.0 and 3.0, because public administrations need to continue offering new opportunities. However, citizens need to be viewed not just as beneficiaries of

solutions, but as active creators, capable of identifying developmental needs quicker than municipal officials.

The Smart City wheel was developed by Boyd Cohen and Rob Adams in 2012 and exemplifies the way that innovation and technology can help cities in becoming more intelligent [4].

In the present, Institute for Management Development (IMD) from Switzerland produces the most thorough annual report on the smart cities from around the world. It uses technological and economic data for ranking the cities, in addition to evaluating citizens’ opinions regarding the city’s intelligence. There is a wide range of different cities, such as, in descending order, Cairo (106), Mumbai (93), Bucharest (87), Lisbon (75), Paris (61), Warsaw (55), Chicago (41), Hong Kong (32), Vienna (25), Sidney (18), Oslo (5) and Singapore (1). As a first example, Singapore is known as the “intelligent nation” [4]. Its strategy was released in 2014 and follows a revolution of the way people use technology for accomplishing their highest ideals and for living a better life together. Vienna wishes to become the city with the highest life quality worldwide before 2050 and Europe’s capital of digitization [5].



Fig. 1. The Smart City wheel [4]

Barcelona – the most innovative project of open data in Europe, proposes a Catalan recipe for a urban creative community, built on participatory democracy and policies that value citizens collective intelligence [6]. Lund is considered as the Swedish emblem of open innovation and invests permanently in the animation of a vibrant entrepreneurial culture.

1.2. General aspects at the national level

At Romania’s level, the need to recover the development deficit compared to western countries of the European Union can be ensured through conception, adoption and implementation of a cities and smart regions development model funded through the scientific research and adapted to the local’s specific characteristics. In Romania, intelligent solutions are very rarely used by the local public administrations. Romania’s development based on some intelligent models for cities and regions development is necessary.

In Romania, projects of city smart transformation have existed and still do exist. In June of 2022, the sixth edition of the radiography of the smart city projects from Romania included 1001 initiatives in 144 big, medium and small cities in the country that are in the present in the project stage or are already finished, in comparison to the 860 projects in 124 cities in June 2021. Thus, a total of 470 finished smart city projects in Romania to date. With 115 projects, sector town halls and the general capital’s city hall occupies the detached first place on national level. With just 49 projects, Alba Iulia, which has occupied first place in the last years, falls on the fourth place in 2022. In the ranking, Sibiu and the fourth sector of Bucharest have 35 projects each. Oradea and Timisoara occupied the sixth place in 2022, each with 26 projects, whilst Arad and Slanic Moldova occupy the second spot, with 25 projects. Bistrita occupies 20th place (20 points), Harsova (19 points), and Brasov occupies 10th place equal to Botosani (18 points).

1.3. General aspects at the local level

A complete strategy for bringing Timisoara into the digital era was developed by Timisoara’s City Hall in 2022. The strategy policy is concentrated on 7 major strategic fields which affect citizens everyday lives: the quality of public services, decisional transparency and participatory governance, innovation and the economic environment, the attraction and retention of the qualified work force, environment and sanitation, culture and recreation, public transport and mobility.

In total, 165 strategic projects are included, 27 of which are in implementation process in the present. For

assuring that the projects are finished and monitored, 62 performance indicators will be annually updated. A partner will be responsible for each project.

The strategy of a smart city illustrates the fact that Timisoara is expressing its commitment to enter the international community of smart cities, with an approach centered on citizens, which activate at the same time the structural and innovation capital of the city:

- “The innovation accessible to all!” is the strategy’s Smart City and Digital Transformation motto 2022-2027.
- “Timisoara 2027: European location favorite for human resources involved in product development and innovative resources” is the vision for the Smart City strategy and Digital Transformation 2022-2027.
- The mission of the Smart City and Digital Transformation Strategy 2022-2027 is to boost the evolution of the municipality of Timisoara by capitalizing on the collective intelligence of citizens.

The smart city of Timisoara is based on the following objectives:

1. “City for all” [7], “Sustainable city” [8] and “Smart and impactful public investments” [9]. These goals include favorable environmental conditions, easy interactions between citizens and the city, and positive public interventions in everyday life.
2. The objectives “Every citizen has a voice” [10] and “Smart City is Fun City Timisoara” [11] illustrate the efforts of the smart city of Timisoara to “create closeness” with its citizens. Citizens will make public decisions, and the city becomes a “favorite” place for work, play and above all the feeling of “home”.
3. The ambitions “Vibrant ecosystem of innovation” [12] and “Timisoara - Attractive city for talents from the international environment” [13] represent the higher level of the intelligent city of Timisoara, the genuine ability to generate value and innovation, which creates the unique framework of smart city development.

II. THE UNDERSTANDING AND IMPLEMENTATION OF THE SMART CITY CONCEPT BY THE TIMISOARA MUNICIPALITY

This paper presents the current situation regarding sustainable development at Timisoara City Hall in parallel with the transition to the transformation of the city into a smart city. In the smart city strategy, there are three distinct objectives: “City for All”,

“Sustainable City” and “Smart and Impactful Public Investments”, which aim to create favorable environmental conditions, facilitate easy interactions between the city and citizens, and achieve public interventions that have a positive impact on everyday life.

Ambition number five within the Smart City Strategy, named Timisoara – The Sustainable City, aims to implement a balanced way of managing the city's essential resources by implementing interventions that reduce expenses, increase the supply of renewable energy and optimize the use of energy.

Digital technologies and processes will be implemented to improve the city's quality of life and environmental factors. Integrated approaches of (re)building biodiversity corridors, energy efficiency and sustainable waste management at city level are crucial to this goal.

A. Timisoara - The city for all

This aims at the accessibility of public services through modern technological means. With 17.7% of the population over 65, this could be a challenge. Payment of fees and submission of various applications are done in writing or physically, because the technology of interaction with citizens is incomplete, incomplete and difficult to understand. The aim is to develop an integrated way of delivering public services, which is supported by optimized digital administrative processes and makes it easy for citizens and companies to interact with public institutions. The “City for all” ambition was ranked first in the first stakeholder consultation, which shows how urgent the intervention is. In addition, this pillar of the strategy's vision focuses on providing digital solutions to make public infrastructure and services accessible to vulnerable groups such as the elderly, disabled and non-digital. The smart city concept is related to the ability to produce human capital through education and creativity, as well as digital and civic inclusion.

Table 1: Implemented feeds

Categories	Flux name
HR	Delegation flow during leave
HR	Flux of onboarding/dis-boarding of HR system of the new employees and past employees
HR	Onboarding/dis-boarding flow from HR systems of new and former employees
Room 12/24	Processing flow of the child's allowance application
Room 12/24	Flow of registration/registration of entry documents in the PMT
Room 12/24	Flow of adding and processing complaints submitted by citizens
Room 12/24	Notification category configuration flow
Room 12/24	Notification category configuration flow
Urbanism	Street nomenclature creation and management flow

Town planning	Processing flow of the urban planning certificate issuance request
Town planning	Flow of approval and issuance of building or demolition permit
Economic	Flow of receipt of invoice and order to pay
IT	AD account management flow
IT	Helpdesk&Ticketing flow for IT management problems
IT	IT HW inventory management flow
IT	Onboarding/unboarding flow from IT systems (HW allocation, IT systems access) of new and former employees
Management	Electronic signature document management flow (documents, user, and position in the document)
Management	Bulk electronic signature management flow in standard format documents
Management	Signature flow stream with electronic seal application and issue number/date
Management	Internal task distribution flow
Management	Management flow of list of signatories with digital certificate (electronic signature)
Communication	Posting flow of announcements (press releases) on the new PMT information portal
Secretariat	Flow of proposal and approval of HCL projects
Room 12/24	Natural persons nomenclature flow
Room 12/24	Nomenclature flow of legal entities
Room 12/24	Nomenclature of problems with their grouping on the structure and summary
Room 12/24	Nomenclature of localities grouped by locality, county, country
Room 12/24	Flow of problematic types in the registry
HR	Employee nomenclature flow
HR	Employee account creation flow

The sustainable development target is decent work and economic growth. This is achieved by separating economic growth from environmentally damaging elements, sectoral diversification and emphasis on social aspects.

In 2023, Timisoara City Hall began the process of implementing the institution's computerization strategy. This started by analyzing, proposing and implementing better technical and organizational solutions, as well as developing and guaranteeing the integrability, compatibility and interoperability of the systems and modules that were implemented. Thus, 30 feeds were implemented using Webcon technology on a Microsoft M365/Exchange platform is presented in Table 1.

B. Timisoara - intelligent and impactful public investments

Even if the traffic data in Timisoara show a decrease in congestion indicators, the problems with the accessibility and communication of the city center with the periphery continue to be a further concern

within this objective. Mobility is the dimension that is addressed in the smart city project, which includes efficient transport in the city, an integrated multimodal transport system and access to real-time information through technology. Inclusive, safe, resilient and sustainable cities are the goals of sustainable development.

The public administration of the municipality of Timisoara has as priorities in the European programming period 2021-2027 the promotion and prioritization of European investment projects that help reduce carbon emissions using clean energy sources, green-blue investments and compliance with the principle of “do no harm in significantly” (DNSH) [14]. These are included in the recovery and resilience plan for the post-COVID-19 phase. The total value of the projects is over 991 million lei, of which the eligible value is over 830 million lei.

During the 2014-2020 programming period, the municipality of Timisoara was a project partner or project leader and implemented 61 projects in accordance with financing contracts and partnership agreements totaling 1,012.21 million lei. The municipality's absorption rate was 0% in 2017-2018, 0.14% in 2019, 1.87% in 2020, 13.68% in 2021 and about 30% in 2022.

Therefore, on December 31, 2022, financing contracts were concluded for eight projects and nine financing applications were evaluated for a total of 1,611.32 million lei. In accordance with the area of influence of the municipality of Timisoara, in 2023 an extensive participatory process was implemented to create an integrated urban development strategy (SIDU). The process was based on the consultation and involvement of local actors and the community, so that a complete picture of the dynamics of territorial development can be obtained and identify relevant and current local challenges that will affect the development of the municipality in the coming years.

Through this strategy, the municipality of Timisoara aims to become a reference European metropolis in 2030, promoting innovation, sustainability and multiculturalism, emphasizing the development of the local community and quality of life. In addition to defining the mission of the municipality, SIDU will have a particularly important role in financing the urban development projects of the municipality and the functional urban area. These projects will be established in accordance with the strategic objectives and policies established at European and national level during the 2021–2027 programming period.

The development idea includes six strategic objectives and four main directions for the city. SIDU is based on four pillars: sustainable development that focuses on the needs of the local community; investments that are based on smart specialization and knowledge; capitalizing on the touristic and cultural capital offered by the title of European Capital of Culture; and the creation of green-blue corridors to transform Timisoara into a climate-neutral metropolis.

The six strategic objectives focus on the following elements:

Strategic objective 1 is to improve the quality of people's lives and the opportunities for social development at the level of the municipality of Timisoara and the towns in the Functional Urban Area by improving the public services dedicated to citizens and by increasing the quality of urban public spaces.

Strategic objective 2 is to develop the economy of the municipality of Timisoara according to the new trends in innovation, technology and knowledge, fields that generate high added value and offer attractive jobs with competitive salaries.

Strategic objective 3 is to develop urban mobility in the municipality of Timisoara and ZUF based on clear and firm principles regarding changing travel behavior and the use of alternative means of travel.

Strategic objective 4 is the sustainable development of the city and functional urban area, with clear commitments to climate neutrality, with a focus on reducing greenhouse gas emissions and promoting investments that help adapt to and mitigate climate change.

Strategic objective 5 is to define the identity and position of the city of Timisoara as a national leader in the cultural-tourism field and as a pole of attraction on European cultural and tourist routes.

Strategic objective 6 is about strengthening the process by which it establishes itself as a model of local public administration that bases its public policies on open dialogue with all its citizens and emphasizes innovation, sustainability and quality of life.

In 2023, new sources of non-reimbursable financing were found and grants worth over 410 million lei were accepted for investment projects from the Development Program of the Municipality of Timisoara. Five funding applications were submitted. In the same period, seven new financing contracts were signed based on the applications submitted in the previous year.

Projects with a non-refundable value of 929.45 million lei were contracted for the European period 2021-2027, including the Recovery and Resilience Plan 2020-2026, starting in 2022.

Table 2: Grant funds solicited and accessed in 2023
(source www.primariatm.ro)

Projects submitted and contracted in 2023	Millions of lei/amounts contracted	Amounts requested
Waste management	55,45	0
Energy efficiency	44	0
Urban mobility	163	157
Energy	0	32
Education	221	221

Table 3: Projects under implementation
(source www.primariatm.ro)

POIM 2014-2020	9%
POR 2014-2020	40%
PNRR 2020-2026	40%
POCA 2014-2020	0%
POAT 2014-2020	1%
PRV 2021-2027	10%

The implementation of projects financed by non-reimbursable funds focuses on the following areas of intervention:

The objective of waste management is to accelerate the expansion and modernization of waste management systems, emphasizing separate collection, prevention, reduction, reuse and recovery. This will be done to comply with the applicable directives and to move to the circular economy.

The objective of the green transition is to increase the built stock by implementing an integrated approach to energy efficiency and the transition to green and smart buildings. This will provide respect for the aesthetics and architectural quality of the fund, as well as the creation of appropriate mechanisms to monitor the performance of the built fund and ensure the technical capacity to implement the investments.

The objective of sustainable urban mobility is to ensure sustainable development of Timisoara by investing in the local public transport infrastructure. This will support resilience and green circulation in the city, while reducing disparities in neighboring suburban areas.

The objective of energy and the environment is to deal with climate change by increasing energy efficiency through the development of intelligent energy production and transport systems, as well as by promoting the use of renewable resources. This will contribute to a modern, competitive and efficient economy that is decoupled from the use of resources in line with the objectives of the European Green Deal (EGP) and the EU Zero Pollution Action Plan.

The objective of tourism and culture is to create a memorial dedicated to the recognition of the dramas caused by people and society during the totalitarian regime, to educate future generations in an interactive and participatory way, so that past mistakes are not

repeated and to build a society based on European values.

The objective of education is to increase the resilience of the education system by modernizing infrastructure and related equipment to match current and future labor market needs, so that everyone can participate in a high-quality, contemporary and inclusive educational process.

The health objective is to increase the resilience of the Romanian health system by increasing the accessibility, safety, quality and functionality of medical services and health infrastructure.

The objective of administrative capacity is to create a modern public administration that has competent and well-managed human resources, efficient and transparent management of the use of resources and an appropriate institutional-administrative structure that can help achieve the goals of the Europe 2020 Strategy.

Social inclusion objective: The aim is to support the poverty reduction process and help vulnerable groups overcome the situation of social exclusion. This is done in accordance with the principles of the European Pillar of Social Rights, which include community-led local development and the protection of the right to social dignity.

In addition, on the C12 – Health component of PNRR 2020–2026, projects worth 42.83 million lei were submitted in collaboration with the Timișoara Municipal Emergency Hospital and the "Louis Turcanu" Children's Hospital in Timișoara. The municipality is the main orderer of credits, and the hospitals are project leaders.

Between January 1 and December 31, 2023, actions were carried out with the aim of initiating or continuing the development and implementation of nineteen investment objectives in the design phase, which will be implemented in different fields of intervention: urban regeneration - public spaces and block of housing blocks; historical monuments - public spaces and buildings; urban mobility; road infrastructure; energy efficiency.

Table 4: Funding AREAS
(source www.primariatm.ro)

waste management	55.450.785,75
the green transition	188.799.758,42
urban mobility	1.171.235.501,57
tourism and culture	22.353.298,72
education	581.336.364,64
health	70.887.273,58
capacity	11.775.521,72
energy and environmental protection	164.101.696,23
social inclusion	22.861.948,87

Table 5: The SWOT diagram (1)

INTERNAL FACTORS	<p>STRENGTHS</p> <p>Optimizing the traffic congestion average Increase in the total number of passengers in public transport Increasing appetite for bicycle transportation in the warm season The existence of foreign investments in the domain of 5G communications</p>	<p>WEAKNESSES</p> <p>Lack of connection between the city and the outskirts by means of multimodal transport The growing pressure of peripheral real estate expansion on transport and parking infrastructure Lack of use of traffic data in the prevention of traffic violations Still small number of charging stations for electric vehicles</p>
EXTERNAL FACTORS	<p>OPPORTUNITIES</p> <p>The use of public transport data to expand it on the segments where there is a need Developing smart city applications by testing fast connectivity</p>	<p>THREATS</p> <p>The overcrowding of the city is proportional to the desire to buy cars Lack of possibilities to expand the road infrastructure without affecting pedestrians Traffic maintenance correlated with air quality degradation and PM2.5 particulate matter</p>

Regarding the awareness of social responsibility, there has been a decrease in the process of citizen involvement in public life due to lack of civic education, digital skills or local history. Citizens cannot report irregularities in real time because the platform does not have traceability in the IT system and a predetermined response time.

Timisoara is among the 80 cities in the world that use the participatory governance method. This method involves collaboration between civil society and local government to develop a local action plan. An essential characteristic of a democratic state is open government, which plays an important role in modernizing public activity. Since October 2020, Timisoara has been included in the Local Partnership Program for Open Government (Open Government Partnership or OGP Local). In these circumstances, the participatory budget was implemented for the first time at the level of the municipality of Timișoara in 2022, through a public consultation and a "Timișoara Decide!"[15] campaign. As can be seen, <https://covid19.primariatm.ro/> and <https://oxigen.primariatm.ro/#/> are two applications that served as examples of good practice during the pandemic and were rewarded by the government. Both platforms provided support to the people of Timisoara and encouraged the community to solve common problems.

In November 2021, the launch of the public participatory platform "DECIDEM" represented a landmark moment. The platform is seen as a primary tool for citizen involvement in city programs and their participation in decision-making.

It was built on the Barcelona model, which is considered the most inventive open data project in

Europe. It was made entirely by volunteers and was inspired by the voice and needs of the local community.

The Timisoara Decide 2024 campaign invites citizens to be actively involved in the governance of the city and to set priorities for spending 4 million lei from the local budget. From May 10 to June 30, projects can be submitted, and from August 23 to September 23, people can vote on projects that others have proposed through questions, suggestions or additions.

As an example, in 2023 the campaign "Timisoara Decide!" invited citizens to be actively involved in the management of the city and to set priorities for spending 4.2 million lei from the local budget. They could do this by submitting projects (March 31–May 15), asking questions, offering suggestions or additions, and voting on projects (June 1–July 2).

During the voting period that started on June 1 and continued July 2, 8,228 voters were registered, which is an increase of 1,513 voters, which is a 23% increase from the previous year. 18,693 votes were registered, 565 less than in 2022, when there were 19,258 votes, which means a decrease of 3%. Of those who voted, 47% supported 5 projects, which is the maximum number of projects possible. The number of these projects has doubled compared to the previous edition.

The Timisoara Municipality Infocenter offered Romanian and foreign visitors useful information about the city, such as accommodation, local and national transport, tourist attractions, monuments, attractions and cultural programs. These include cultural programs such as concerts, festivals, theater performances, opera, fairs, exhibitions and more. There are also leisure options, offers from local tour operators, and guided tours.

Table 6: Top 10 neighborhoods by number of voters, for the years 2022-2023

2022	2023
1. Soarelui	1. Dâmbovița
2. Calea Girocului	2. Calea Șagului
3. Circumvalațiunii	3. Ciarda Roșie
4. Calea Șagului	4. Plopi
5. Dâmbovița	5. Lunei
6. I.I. de la Brad	6. Campus Universitar
7. Ciarda Roșie	7. Calea Girocului
8. Elisabetin	8. Soarelui
9. Aradului Vest	9. Fabric
10. Fabric	10. I. I. de la Brad

Table 7 Comparative situation of the number of tourists

YEAR	2020	2021	2022	2023
January	311	23	51	177
February	984	59	91	695
March	375	23	146	157
April	10	60	288	360
May	16	120	401	681
June	31	133	331	550
July	69	323	679	695
August	143	741	814	1.159
September	168	651	493	1.060
October	64	222	407	965
November	49	142	557	598
December	35	101	151	367
TOTAL	2.245	2.598	4.409	7.464

Table 8: Analysis of the number of tourists

Years	Total arrivals
2020	122.182
2021	153.794
2022	212.785
2023	261.705

In 2023, 7,464 tourists received advice from the Tourist Information Centre. About 25% of them were Romanian tourists, and 75% were foreign tourists. Table 7 presents the comparative situation, per month, of the last four years of the number of tourists who visited the Tourist Information Center. Except for the first quarter of 2020, the number of beneficiaries of the info center services in each month of 2023 is

significantly higher than in previous months. The months of August, September and October were the months with the most visitors.

The analysis of the number of tourists who visited Timisoara in the period 2020-2023 was carried out based on the statistical data provided by the National Institute of Statistics (INSSE). The data is updated until November 2023.

Through the objectives "Every citizen has a voice" and "Smart City is Fun City Timisoara", the municipality of Timisoara should become the favorite place of its inhabitants for work, fun and especially for the feeling of "home".

The ability of the intelligent city of Timisoara to "create closeness" with citizens is illustrated by the slogan "Every citizen has a voice".

Citizens will make public decisions, and the city becomes a "favorite" place for work, play and above all the feeling of "home". Timisoara has the prerequisites of a cohesive urban community with over 325 thousand people and over 440 thousand in the metropolitan area. The revitalization of the civic and participatory spirit can be achieved through the automation, transparency and traceability of the consultative process through digital technologies.

The objective is to create a participatory culture at city level by creating digital tools created by the public administration to involve the private environment and citizens in public debates and decisions. On the other hand, this encourages proactive attitudes and encourages citizens to be more interested in participating in consultations on the future of the city.

The sustainable development target mentioned is the reduction of inequalities. This goal emphasizes the meritocratic nature of society and ensures that everyone has access to resources.

The ambition "Vibrant ecosystem of innovation" and the ambition "Timisoara - Attractive city for talents from the international environment" were established to define the smart city of Timisoara. The Sustainable Development Target focuses on industry, innovation and infrastructure, as sustainable industry requires sustainable infrastructure and innovation is essential for efficient industry. The focus is also on decent work and economic growth: guaranteeing decent jobs for all, for sustained, open and sustainable economic growth, for full and productive employment of the workforce. Universities provide highly skilled human capital that is essential for a smart city, but not sufficient for industry demand.

Table 9: The SWOT diagram (2)

	STRENGTHS	WEAKNESSES
INTERNAL FACTORS	<p>There are several organized forms of public debate and consultation: 20 neighborhood councils, the National Minority Council</p> <p>Timisoara is recognized as a city of cultural activity</p> <p>Identification of current trends through the Quality-of-Life barometer in Timisoara Municipality</p> <p>The town hall monitor, distributed free of charge, allows citizens to be officially informed without access to technology</p> <p>The launch of the Decidem Platform based on the best international practices that assumes the role of a technological vehicle in participatory democracy</p>	<p>The exercise of participating in public debates has been restricted in recent years to simple actions through social media</p> <p>Large-scale participatory culture (participatory democracy) was not supported by specific activities based on a smart policy or goal</p> <p>Collapse of event attendance</p> <p>Lack of a city app to facilitate participation in cultural or sporting events or activities</p> <p>An important segment of citizens who live in the peri urban and interact daily with Timisoara, are not represented in the consultative processes</p> <p>The lack of citizen involvement translates into a decrease in voter turnout</p>
EXTERNAL FACTORS	<p>Facilitating online consultative interaction with Advisory Councils</p> <p>Development of a procedure for recruitment, selection and implementation of smart city project ideas for Timisoara</p> <p>Attracting young people in the process of debating or co-creating some projects</p> <p>Facilitating participation in events through dedicated applications</p> <p>Continued investment in cultural infrastructure (cinema halls, Multiplexity)</p>	<p>Amplification of the feeling of detachment \distance from the city due to the frustration created by the lack of dialogue between the main actors of the city to solve the problems</p> <p>Creating discrepancies between different groups of citizens or decreasing the legitimacy of public projects</p>

The municipality of Timisoara will be able to counterbalance the trend by implementing a smart city strategy and by maintaining an active presence in international networks. This will allow the involvement of diaspora talents in the development projects of the municipality.

As for smart cities, the focus is on the economy: entrepreneurship and innovation, labor productivity and international economic connectivity.

The segment of the population engaged in higher and high school education is essential for the smart city strategy. In 2020, there were 43,582 students, many of them with master's or doctoral degrees. In the past, the university campus in Timisoara was able to grow, but in the long term, the demographic phenomenon and the high school graduation rate have affected it and will continue to do so.

In 2019, there were 9,133 graduates from all universities and postgraduate cyclists, an increase from 2015. However, this number is still insufficient to meet the demands of industry, at least in the technology segment. When we consider high school graduates as well as vocational and technical education graduates, their number has remained above 4,000 over the past five years. Local graduates are not enough to support an increasing number of higher education graduates in

the future. It is constantly necessary to attract regional, cross-border or even international talent.

In the past, Timisoara did not have many unemployed people, which makes it difficult to attract future investments that are looking for a large amount of available or potential labor. Considering the pandemic, the share of unemployed at the end of the year rose to 0.9 percent, doubling from the previous year. According to the share of employees in relation to the population, the economic parts that do nothing indicate the weight they bear. Compared to previous years, this was an increase of 38.4% in 2019. However, this trend should be approached with caution, as it may be affected by the decline of the young population and the migration of the local population to the suburbs. The data collected by the Intercommunity Development Association "Polul de Crestrere Timișoara" (ADI-PCT) must be regularly correlated with those from the growth pole.

Also, domestic and international flight passengers are other factors that are considered in how attractive a city or region is. Their volume decreased by over 70% in 2020, from 470,631. Passengers were over 1.5 million between 2017 and 2019.

Currently, Timisoara has 16 "twins" and 6 European cooperation networks to connect to other European cities. They allow the exchange of

experience, as well as the connection to sources of information or the creation of projects that are related to those that are common.

Universities provide highly skilled human capital that is essential for a smart city, but not sufficient for industry demand. The municipality of Timisoara will

be able to counterbalance the trend by implementing a smart city strategy and by maintaining an active presence in international networks. This will allow the involvement of diaspora talents in the development projects of the municipality.

Table 10: The SWOT diagram (3)

INTERNAL FACTORS	STRENGTHS	WEAKNESSES
	<p>The high school system, along with vocational and technical education, constantly provides around 4000 graduates</p> <p>The university system continues to attract talents from outside Timisoara</p> <p>The university system offers around 9000 graduates annually</p> <p>Timisoara City Hall is internationally connected and a partner in substantial projects, including Urban-Act type</p> <p>The university system has specific research infrastructures, including in the field of ICT</p>	<p>Timisoara's participation in international networks has not yet been exploited to its full potential</p> <p>There is still no public policy (strategy, projects, initiatives) to attract international talent in the interest of the local business environment or the administration</p> <p>The relationship between ICT infrastructures and companies is not dynamic enough to allow the development of solutions for smart city initiatives for now</p>
EXTERNAL FACTORS	OPPORTUNITIES	THREATS
	<p>The positioning of Timisoara as a city offers opportunities and support for smart city projects</p> <p>Specialists can be attracted to solve challenges related to smart city initiatives, on existing partnership platforms.</p> <p>European funding opportunities for the development of entrepreneurship that can be better adapted to real needs through specific smart city promotion and debate mechanisms</p>	<p>The needs of talent companies are growing and cannot be met only with the internal resources of Timisoara</p> <p>The presence of multinationals discourages the local entrepreneurial spirit that cannot compete on salary levels</p>

V. CONCLUSIONS AND FINAL REMARKS

All over the world, community policy is creating the conditions for more and more cities to become smart cities. In this sense, strategies, action plans, programs, initiatives and declarations have been adopted for which more and more funding is being allocated. For cities to become smart, public systems must be implemented, structured and coordinated in such a way that they become manageable and sustainable.

At the level of Romania, the need to recover the development deficit compared to the western countries of the European Union can be ensured by designing, adopting and implementing a model for the development of smart cities and regions, based on scientific research and adapted to specific local characteristics.

For Timisoara to become a smart city, a complete strategy is needed to bring Timisoara into the digital age. The strategy developed by Timisoara City Hall in 2022 aims at seven major areas that focus on the lives of citizens: the quality of public services, participatory governance and decision-making transparency, the economic environment, the attraction of qualified labor, the environment and sanitation, culture, public

transport and mobility. There are, in total, 165 strategic projects, of which 27 are currently in the implementation process. Many projects proposed by this strategy are currently in the implementation phase, while other projects are in the preparation phase.

In accordance with the smart city strategy, Timisoara demonstrates its commitment to join the global community by establishing a culture that involves all citizens of the city by the creation of a complete way of delivering public services, supported by optimized digital administrative processes, which facilitate the easy interaction of citizens and companies in the relationship with public institutions.

Vulnerable groups can gain access to infrastructure and public services using digital solutions:

- Creating an innovative environment that is cohesive, interconnected and transparent, which will stimulate the number of startups, increase the share of enterprises that launch their products and services on international markets, and stimulate the overall research-development-innovation capacity at the level of Town.
- Developing a repeatable process of attracting human resources, especially from the diaspora, to involve them in concrete projects and initiatives for the development of the city.

In addition, creating a city brand will make Timisoara attract startup founders and technology-based enterprises from other countries. Digitization also aims to make the city more accessible for tourists, managing the city's essential resources in a balanced way through interventions that reduce losses, improve consumption and increase the supply of renewable energy. Thus, the following measures could be taken:

- Creating an attractive environment in the city by implementing measures that will improve Timisoara's current offer in terms of entertainment, culture and sports, social interaction and cultural events.
- Creating the best smart city digital infrastructure and the necessary digital tools to help public institutions ensure that public investments are sustainable and maximize their use for the benefit of the community.

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