Smart City Strategies in Slovak Cities

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Abstract
The concept of Smart City represents a resonating theme in the world, which is based on the efforts of the creators of this concept to increase the quality of life in cities. In recent years, it has gradually become a phenomenon that cities around the world are trying to apply. The reason for its introduction is the added value in the form of more efficient functioning of human society, as according to the data available so far, it increases safety in the city, enables more efficient transport of goods, services, human capital, reduces the negative impact on the environment, speeds up administrative processes, increases economic development and brings financial savings. All this is happening against the background of the increased interest of city dwellers in public administration. With these facts in mind, our ambition is to identify the degree of application of the implementation of the Smart City concept in Slovakia and, based on relevant data, create a realistic picture of the possibilities and limits of the concept in our domestic environment. In order to achieve the research objective, we rely on a set of quantitative (questionnaire survey) and qualitative methods (critical analysis) that are also used in social sciences. Based on our research intention, we must draw attention to the obviously negative state of development of this strategic concept at the level of Slovak cities. Because the Smart City concept represents a challenge for the future development of self-government in our environment, it is necessary to reflect on the current starting point and proceed with the implementation of steps aimed at correctly grasping and understanding the importance of the issue by the professional public, municipal politicians and residents of self-governing units. Due to the fact that it is a relatively new topic, there are only a few works dealing with the issue of the Smart City concept or its application in our domestic conditions. Nevertheless, our research intention is open to new knowledge and interpretations by current and future authors who find strength and interest in this issue.

Keywords: Smart City; city innovation; Slovak Republic; urban development

JEL Classification: H83; H76; J18

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1. Introduction

Cities are centres of human activity and can be defined as large densely populated areas in which different social groups live. They are a complex of buildings, spaces and infrastructure, while supporting economic, social, environmental and cultural processes. At the same time,

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they represent an environment that helps the learning and development of humanity (Kovács et al., 2021). They ensure this by simplifying communication between people and creating communication channels (Petrolo et al., 2015). At the same time, they have a visible and tangible impact on the lives of their residents (Persaud et al., 2020).

The topic of the contribution is the implementation of the Smart city concept in the conditions of Slovak cities. For several years in Slovakia, we have been witnessing depopulation tendencies of some regions. The young generation of people focus their activities to cities, where they find relatively sufficient space for self-realization in all areas of social life. The constant influx of residents and mass migration from rural areas to cities forces cities to reconsider the concept of service provision, reduce expenses, the burden on the environment and the introduction of new elements digitization (Lukáčová & Sovičová, 2013). With this trend, they are consciously moving towards the concept of smart cities, whose primary task is to increase the quality of life of residents through modern technologies (Gassman et al., 2019).Considering these facts, we examine cities from the point of view of introducing this concept, or how the cities themselves perceive this issue and what problems they have to face in connection with the introduction of the Smart City concept.

The motive for our interest in this issue is based on the following research questions:

RQ1: *What is the current status of the implementation of the concept of smart cities in the Slovak Republic from the point of view of the existence of strategies*? RQ2: *What are the problems that limit the introduction of this agenda in Slovak cities*? RQ3: *Are Slovak cities planning to introduce innovations and the smart city concept in the future*? RQ4: *What has been the focus of innovative projects in Slovak cities so far?*

The topic of Smart city is a relatively new and insufficiently addressed research topic in our environment, as evidenced by the focus of such contributions in the Scopus scientific database. From a theoretical level, the contribution contributes to the expansion of the scientific portfolio of articles focused on the area of smart cities in Slovakia. In addition, it also fills a gap in the practical research of the Smart city concept, as it is the first survey of its kind that examines this topic in the conditions of the Slovak Republic on a research sample of 137 cities. This fact underlines its practical benefit and relevance.

The structure of the contribution consists of a review of the literature, which provides a brief overview of the background and definitions Smart city, its strategies in general and in the conditions of the Slovak Republic. Subsequently, the contribution describes research methodology from the point of view of the research sample and quantitative research through a questionnaire with four questions. In the main part of the paper, the conducted research is shown, which is then evaluated in the discussion.

2. Literature Review

The background of the idea of creating a Smart city can already be found in the beginnings of urban architecture or urban planning. One of the most famous visions of a healthy and functional city was created by Ebenezer Howard in 1898, entitled "The Garden Cities of Tomorrow" (Clark, 2003; Glaeser, 2019). In addition to him, this idea was dealt with, for example, by Georges-Eugene Haussmann (Christiansen, 2019; Glaeser, 2019) or Charles-Edouard Jeanneret, known as Le Corbusier (Dzwierzynska & Prokopska, 2017; Neirotti et al. 2014). Since the 70s of the 20th century, the efforts of the cities themselves to change the

usual ways of functioning and thinking in relation to society and public space can be observed. Examples can be cluster analysis in Los Angeles (Mosco, 2019; Cugurullo, 2018, Vallianatos, 2015), "Intelligent Island" in Singapore (Choo, 1997; Soh et al., 1993; Vanolo, 2014; Teo & Lim, 1999), or "De Digitale Stad" in Amsterdam (Alberts et al., 2017). However, the foundations of the Smart city concept were laid only in the 90s of the 20th century, when sustainability began to be enforced in urban planning, an example can be the Kyoto Protocol in 1997, which was signed by 192 parties, including the European Union. At the same time, the development of this concept was helped by the development of the Internet in 2000 (Bibri & Krogstie, 2017). Even though the term Smart city was first used in the 90s of the 20th century, its overall boom only took place after 2008. In that period, the International Business Machines Corporation (IBM) realized the potential and idea of this term, used it in its initiative "Smarter Planet" and patented it in 2011 (Kumar & Ratan, 2019; Paroutis et al., 2014). In addition, the concept of Smart city has expanded and gained awareness thanks to the European Union's Europe 2020 strategy (Bibri & Krogstie, 2017).

Unambiguously defining the term Smart city is a complicated process. Its difficulty is conditioned by the lack of a uniform definition or legal framework for this term. From a definition point of view, there is a large number of definitions of the content of the term Smart city. However, all definitions agree that the Smart city is characterized by ubiquitous ICTs that help the city use resources more wisely (Neirotti et al., 2014; Cocchia, 2014; Popescu, 2020). A Smart City is usually defined as a place where existing networks and services are made more efficient by implementing digital and telecommunication technologies into their operation (Scupola & Zanfei, 2016; Nilssen, 2019; Cardno, 2016; Rani et al., 2022). These technologies are usually classified as "Internet of Things", "Big Data" or "Cloud Computing" (Mosco, 2019).

There are several obstacles that prevent a uniform definition of this term. The explanation offers the opinion that it is a concept that was created based on the bottom-up principle, that is, it developed with the use of the Internet (Dameri, 2013; Cocchia, 2014). Another point of view brings the possibility of identifying the term Smart city with the term Digital city. Despite the fact that both concepts were created in the 90s of the 20th century, Digital city is based on ICT, while in Smart city ICT is only one of the components that help to create it (Dameri & Cocchia, 2013; Cocchia, 2014). The British government also gives a meaningful argument that Smart city is too dynamic and a constantly developing concept.

Despite the fact that there was and still is a constant debate about the exact definition, scientists agreed on the basic elements of every Smart city, namely Smart Economy, Smart Environment, Smart Governance, Smart Living, Smart Mobility, Smart People (Vanolo, 2014; Bibri & Krogstie, 2017; Myeong et al., 2018; Albino et al., 2015; Barlow & Lévy-Bencheton, 2019; Fernandez & Stawasz, 2016).

Examining the applied practice, the Smart City concept brings a wide range of benefits for the city and its residents. Examples include safety (Tariq et al., 2021; Zhao & Zhang, 2020), higher efficiency and safety of transport (Šemanjski et al., 2018; Nagy & Csiszár, 2020; Butler et al., 2022), higher participation in public administration (Kóňa et al., 2020; Fletcher, 2020; Guo & Zhong, 2022; Korachi & Bounabat, 2021; Toh, 2022), environmental protection (Cardno, 2016; Offenhuber & Ratti, 2017; Monzon, 2015; Olokesusi et al., 2017), economic development (Tan & Taeihagh, 2020; Campisi et al., 2021; Mura et al., 2021), better and more efficient infrastructure (Abdeljebbar et.al., 2019; Shahanas & Sivakumur, 2016; Leccese et al., 2014; Kim et al., 2014) or lower costs (Mboup, 2019).

Due to the huge benefits of the Smart city concept, it is being implemented by cities all over the world. However, the strategies for introducing this concept are very different, which naturally results from the universality and specificity of each area. Differences are already noticeable at the level of the continents. While cities in Asia focus on transport and infrastructure, Korea, for example, relied on technological innovation when implementing the smart city concept and, thanks to the "Giga Korea" project, gained a leadership position in the field of ICT (Popescu, 2020; Kim, 2020). European cities focus their attention more on human capital, namely areas such as education, public administration, or social inclusion. On the contrary, a low interest in smart initiatives can be observed in North and South America (Popescu, 2020).

Strategies also depend on the size of the city, population density, economic and technological development or environmental policies. Larger cities have more financial capital for investments and thus know how to implement the smart city concept more comprehensively, while smaller cities focus more on pilot projects and solving partial problems (Neirotti et al., 2014). This is the reason why cities are increasingly using cooperation with the private sector and concluding public-private partnerships, examples being the cities of Turin, Naples, Genoa, Kochi and Songdo (Vanolo, 2014; Popescu, 2020).

The variety of strategies can be seen by looking at cities from different parts of the world. For example, the city of Yokoama in Japan focused its attention on creating a meeting space for artists and creative personalities called "Creative City Yokoama Office", while the city of Chicago, through the program "Empowerment Zone Program", increased the quality of the provision of health services in the poorest zones (Neirotti et al., 2014). Singapore's “Smart Nation” city strategy is focused on promoting digital innovation and sustainability, with strong universities and government agencies at the core (Chang & Das, 2020). London presented a plan called "Smarter London Together", focused on air quality, water and ecology, mobility, and education of unemployed people over the age of 50 (Contreras & Platania, 2019). Barcelona has a "Decidim" platform created as part of electronic democracy, which involves residents in the creation of new legislation, and in terms of mobility, the city has designated so-called Superblocks, to which access for cars is limited (Aragón et al., 2017). Every year, New York organizes the innovation competition "BigApps NYC" with the aim of gaining an overview of smart solutions that could be used to improve the city. And at the same time, it has implemented sensors that provide information about the state of the air, and thanks to them, the city has reduced sulphur dioxide emissions by more than 70% since 2008 (Shah et al., 2019). Warsaw has a "Million Trees" application that allows residents to advise the city where new trees should be planted, and thanks to it, more than 8,500 trees have been planted so far (Lewandowska et al., 2020). The capital of Hungary, Budapest, has a Brownfield Register that collects data on underutilized areas of the city, and this database mediates to potential investors, thereby increasing the efficient use of urban resources (Horkai et al., 2019).

At this point, we consider it important to remind that the set of benefits mentioned above is not final, as today we can only assume which areas of public administration will be affected by the Smart City concept. Therefore, it is natural that the success of the Smart City concept did not leave the public administration in Slovakia cold either. The specialization of the Slovak economy is on a higher level compared to the European Union average (Pauhofova et al., 2018). In 2017, the document Supporting Innovative Solutions in Slovak Cities, published by the Ministry of Economy of the Slovak Republic, became the starting point for Smart City

support in Slovakia. The document was the first material dealing with this concept in a domestic environment. He defined the Smart City, the typology of relevant parties connected to this concept as well as the principles that are necessary to support innovative solutions in Slovak cities (Ministry of the Economy of the Slovak Republic, 2017). In the same year, the Ministry of Transport and Construction of the Slovak Republic issued a document entitled *Concept of Urban Development of the Slovak Republic until 2030*. The document was the output of discussions and knowledge of representatives of cities and regions, representatives of the academic community, representatives of civil society and the business sector. The basic purpose of the document was to propose a set of measures that will strengthen the role of cities in terms of overall development of the state (Ministry of Transport and Construction of the Slovak Republic, 2018). In the second half of 2017, the first two major calls to support experimental development for Smart cities were announced in the form of a public-private partnership. The calls were intended for small and medium-sized entrepreneurs, focused on transport management and digitization of public administration of cities (TASR, 2017). Nevertheless, it should be remembered that the concept of Smart City began to appear in some Slovak cities before the first official documents from the state were created. The first cities that started to gradually implement innovative projects to achieve the Smart City concept were cities such as Prešov (in 2015) and Nitra (in 2016). Both cities introduced innovations in various areas of administration that helped them not only save time and money, but also improve the quality of life of residents. Gradually, along with the increase in strategic documents from the state, other Slovak cities also began to show interest in this concept.

3. Research Methodology

Considering the basic characteristics of the goal of the contribution – to identify the degree of application of the Smart City concept in the conditions of the Slovak Republic, it is necessary to define the basic theoretical – research intention. In this context, the interpreted survey results are therefore based on a set of several scientific methods and procedures. In addition to the traditional analysis of secondary sources of literature available so far (professional scientific articles as part of internationally recognized interdisciplinary database journals, official documents of state bodies), we focus on obtaining relevant data based on targeted research. We carried out quantitative research through a questionnaire with four questions. The purpose of the questions was to find out whether the cities have developed a smart strategy, what problems they solve in the implementation of smart projects, what plans they have in the area of Smart city for the next 5 years and what projects they implemented in the area of Smart city for the period 2014-2020. Data collection was carried out through the legislative institute (requests for information on the basis of Act No. 211/2000 Coll. on free access to information and on amendments to certain laws). The indisputable advantage of this method of data collection is the fact that the subjects questioned are obliged by law to answer or provide relevant answers. The lack and limit of data collection can be considered to be the fact that the requested subjects will do so only if they have this information. The limit of the survey is undoubtedly the human factor, as it is not clear who prepares the answers for individual cities, in what scope and quality. This is especially true in cases of difficult topics, which include the issue of the Smart City concept in all its breadth and essence.

Despite the above-mentioned essential starting points and the possible limits of the survey, the research sample consists of the cities of the Slovak Republic. According to § 22 of Act no. 369/1990 Coll. on the municipal establishment, a city is a municipality that is an important economic, cultural and administrative center, provides services for surrounding municipalities, has transport connections with surrounding municipalities, has an urban development and has at least 5,000 inhabitants. These conditions in the context of the Slovak Republic are met by 141 local governments, respectively cities. Our research sample consisted of 137 cities. These cities are located in 12 size categories according to the number of inhabitants. The size structure of these cities in terms of population ranges from 1,380 (Dudince) to 475,500 (Bratislava) inhabitants. From a geographical point of view, 55 cities from the research sample are located in Western Slovakia, 42 cities in central Slovakia and 40 cities in Eastern Slovakia. With regard to the primary goal of the contribution, the research intention also monitors measurable indicators aimed at the implementation of the Smart City concept into practice directly by Slovak cities. For better orientation and classification of the obtained data, the contribution looks at the issue of the implementation of the Smart City concept through the lens of selected areas such as transport, education, culture, healthcare, environment, spatial planning, tourism and social area.

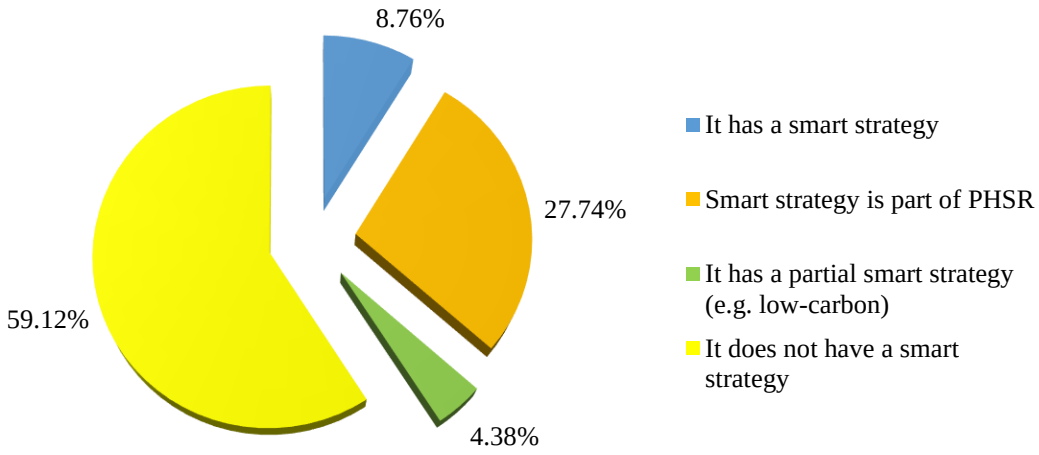
4. Results and Discussion

The success of a questionnaire survey depends on the quantity and quality of information and data obtained. In this context, it is important to note that the cities responded positively to our request for data disclosure. Out of the total number of 141 Slovak cities, a total of 137 municipalities responded to the invitation sent by us. The municipalities of Svidník, Tvrdošín, Krásnonad Kysucou and Gabčíkovo did not respond to the call, despite the fact that the law requires at least a formal response.

The survey itself shows that only 8.76% of Slovak cities have developed an independent smart strategy, which the city prepared voluntarily based on its own efforts for development. It is obvious that this situation is alarming from the point of view of the future development of Slovak cities and requires solutions on the part of competent actors of public policy at the municipal level. This negative situation is partially alleviated by the fact that 28% of towns in Slovakia have a smart strategy within the Municipal Economic and Social Development Program (PHSR). In this context, we consider it important to remind that the PHSR is a strategic document of a medium-term nature, the preparation of which is mandated by the Act on the Support of Regional Development. It contains the intentions of the development policy, management and direction of the municipality, respectively it provides a comprehensive view of the state of the municipality, including development goals and strategic priorities (Babiak, 2021). In contrast, the independent concept of smart strategy provides a broad-spectrum focus and has a significantly greater potential for identifying goals, threats, problems and solutions in achieving the set strategic goals of the territory's development.

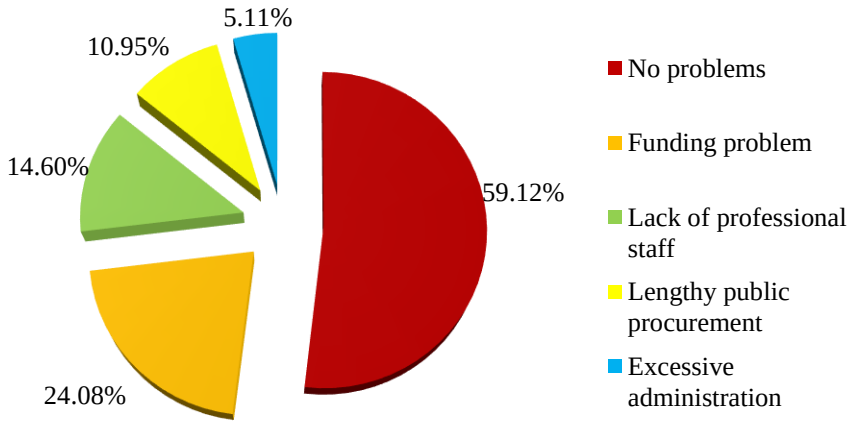
More than 59% of Slovak cities do not have a smart strategy, which is important for the implementation of innovative projects (***Figure 1***). This is the reason why we were also interested in the problems that cities face when implementing such projects. We assume that implementation problems may be the reason for the low interest of Slovak cities in the smart city concept and in developing a strategy for this concept.

Figure 1.Types of smart strategies in Slovakia in percentages (N=137)



Source: Authors' contribution

Figure 2. Types of problems with innovative projects in percentage (N =137)



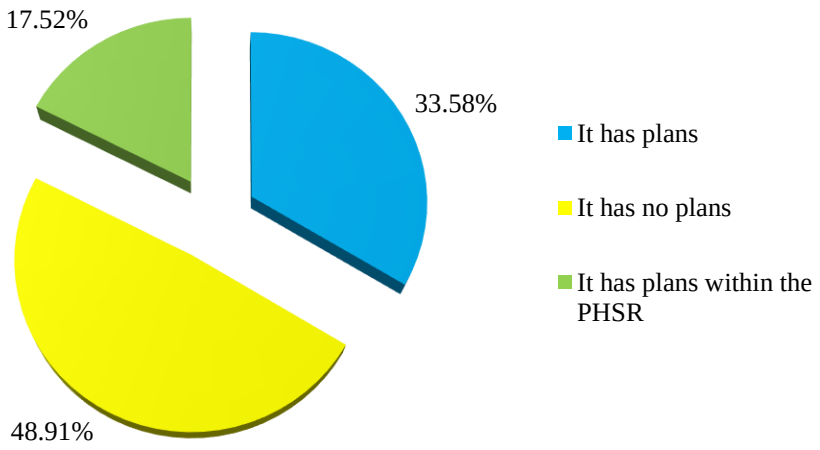
Source: Authors' contribution

The survey also brings findings about the problems that are often the reason for the failure of implementing smart solutions (***Figure 2***). The conducted survey indicates that the problems that are difficult to overcome are the insufficient financing of these activities, either from local government budgets or the state itself (24.08%), the lack of professional staff (14.60%), or persistent problems resulting from the difficulty of public procurement (10.95%). It is the last of these points that is considered the biggest problem even in municipalities that have sufficient financial background and personnel resources. As a result of the long-time intervals of public procurement, the partners cannot guarantee the prices of goods and services, which causes a discrepancy between the competitive prices and the prices on the market. In addition, the very focus of the challenges often does not reflect the real needs of local governments. However, cities also struggle with an excessive administrative burden. According to the survey, the bureaucratic burden on employees is a problem that is being solved by almost all local governments in Slovakia, regardless of the size. This problem

reduces work efficiency and costs municipalities not only time but also money. The issue of bureaucratic burden is also highlighted by the bureaucratic index, according to which a model company in Slovakia spends 224 hours dealing with bureaucratic duties (Galvánková, 2021). It is worth mentioning the fact that in the survey, 59.12% of Slovak cities have no problems with the implementation of innovative projects. At this point, however, we consider it important to take into account the possible error rate of the result, as interpretation of an innovative project in the case of individual cities is different based on the data obtained.

The survey also brings results in connection with the plans of Slovak cities in the area of the Smart City concept on the horizon of the next five years (***Figure 3***). About 33% of Slovak cities plan to introduce smart elements and innovations in their environment. At the same time, 17.52% have such plans included in their Municipal Economic and Social Development Program (PHSR). However, a negative aspect of Smart City development in Slovakia is the fact that almost 50% of cities do not plan to introduce smart projects and strategies.

Figure 3. City plans in the smart area for the next 5 years in percentage (N=137)



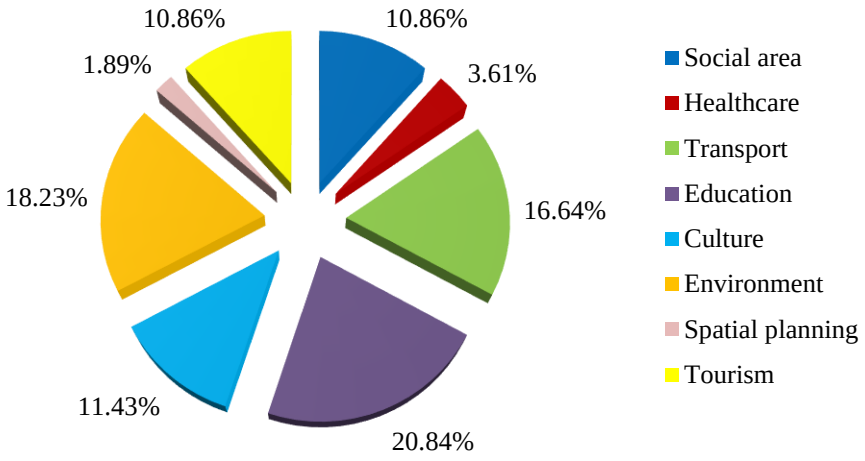
Source: Authors' contribution

An important indicator of the implementation of the Smart City concept is also the number of innovative projects in various areas (***Figure 4***). We examined the number of smart projects in selected areas that were implemented in 137 cities during the 2014-2020 program period. In Slovak cities, most projects in the period 2014-2020 were implemented in the field of education. Furthermore, Slovak cities implemented projects primarily focused on the environment, transport, social and cultural areas. It should be mentioned that the projects were also implemented by cities that have not developed any smart strategy.

However, regarding the questions about innovative projects, there is a constant problem of insufficient information exchange among local government employees about the concept of an innovative project. At the same time, there is a parallel that points to the discrepancy between the smooth process of submitting innovative projects (based on the answers of some municipalities) and the total number of submitted projects. At the same time, there was an parallel here: municipalities that had no problems with innovative projects, as a rule, did not even submit any innovative projects. A survey by Kravčáková (2019) also points to this issue, according to which the respondents mentioned a lack of knowledge or the provision of incomplete, misleading and inaccurate information as a problem in the regular agenda of officials (Kravčáková, 2019). Therefore, if the lack of knowledge occurs in the regular

agenda of officials, with such a complicated concept as Smart City, the lack of information and knowledge is an expected matter.

Figure 4. Distribution of projects by domain of implementation (N=137)



Source: Authors' contribution

Despite the fact that many cities apply elements of the concept, only 9% of Slovak cities have developed a strategy for the implementation of Smart City. Most of such cities are located in Western Slovakia, which is closest to the capital and thus the economic center. From this point of view, we considered it necessary to include in the discussion a summary table of the smart strategy of Slovak cities. ***Table 1*** provides a more comprehensive view of the issue and contains 12 cities that are the only ones in Slovakia that have an independent smart strategy.

Table 1. Smart strategies in Slovak cities

City	Localization	The name of strategy	Year of publication	Areas of focus
Bratislava	Western Slovakia	Bratislava A smart city 2030	2018	City administration, Mobility, Energy, Environment, Circular economy, Business, Public space, Social inclusion, Education, Culture, Tourism, Sport
Dunajská Streda	Western Slovakia	Smart plan of the city of Dunajská Streda	2020	Technical infrastructure, Social infrastructure, Environmental infrastructure
Sládkovičovo	Western Slovakia	Smart plan of the city of Sládkovičovo	2020	Technical infrastructure, Social infrastructure, Environmental infrastructure
Šaľa	Western Slovakia	Involvement of the city of Šaľa in the Smart program	2021	Information systems and servers – Computer platforms, Security cameras, Information panels, Weather stations, Video recorders, Sensors
Galanta	Western Slovakia	Galanta smart city concept	2021	Intelligent management of dynamic traffic, Waste management, Public lighting, Static transport, Smart public transport stops, Support for electro mobility, Bike-sharing, City camera system, City information application and city website, Collection, processing and analysis of energy data, Planning and development of the city using of augmented reality, Integration platform for city data collection and analysis, Smart city dashboard
Senica	Western Slovakia	The strategy of introducing intelligent technologies	2020	Technical infrastructure, Social infrastructure, Environmental infrastructure

City	Localization	The name of strategy	Year of publication	Areas of focus
Lučenec	Central Slovakia	SMART CITIES elements in the city of Lučenec	2021	Electronic services for citizens, Education, social services, security and crime Condition of roads, parking, waste, public lighting Culture, tourism, security
Liptovský Mikuláš	Central Slovakia	Smart city development concept of Liptovský Mikuláš	2020	Transport, Environment, City life, Public administration, People, Business environment
Kežmarok	Eastern Slovakia	Smart Green City Kežmarok	2019	City information, Mobility and green transport, Education and training, Active life and health, Energy and environment
Spišská Nová Ves	Eastern Slovakia	Strategy for Smart city solutions in Spišská Nová Ves	2021	Energy, Transport, Waste management, Adaptation measures to change the challenge, Other areas
Snina	Eastern Slovakia	Strategy of smart region Snina 2030	2021	Planting tree avenues, Installation of green roofs and thermal insulation of buildings, Rain gardens Reconstruction of public lighting, Electric cars, Electric bicycle
Bardejov	Eastern Slovakia	Smart city Bardejov	2020	Smart Mobility, Smart Living, Smart Government, Smart People, Smart Economy, Smart Environment

Source: Authors' contribution

The strategy, concept and other planning documents present an important picture and plans for the future. Their goal is not only to set intentions but also the course of their fulfilment. Strategic planning represents an important element on the basis of which certain future conditions are expected. These ratios can be associated with different areas, processes or resources. Such a strategy usually describes procedures for realizing goals and plans (Kovács et al., 2021; Šimo & Mura, 2015; Szeiner et al., 2022). Municipalities can not only better understand their past and current position, but also think more specifically about their future position. Its meaning and importance lie in the creation of goals, tasks, the distribution of competences and responsibilities as well as in the evaluation of whether the given intention was successful or not (Garaj & Butoracová-Šindleryová, 2022). A comprehensive strategy is therefore an important prerequisite for the success of the introduction of various elements at the level of municipalities. A similar survey was carried out in Poland, where 57 cities were asked. The survey showed that more than 53% of the surveyed cities do not have a smart strategy developed, and only 6% of the cities had a general smart action plan developed (Roman, 2018). The Smart City concept therefore faces several problems not only in Slovakia, but also in neighbouring countries.

According to the results of the conducted survey, one of the frequent problems of Slovak cities is the financing of innovative projects. From the perspective of spending on research and innovation, the Slovak Republic is characterized by long-term underfunding (Cifranič & Valach, 2020). Slovak municipalities have been struggling with the problem of insufficient funding for a long time, i.e. in 2019 (before the outbreak of the COVID-19 pandemic), the share of local government expenditures was 16.2% of public sector expenditures. Just for comparison in OECD countries, this average is at the level of 28%. In addition, local self-government expenses are around 6% of the GDP (Nižňanský, 2020). The problem of financing is also encountered by cities in neighbouring countries, such as Poland (Jonek-Kowalska & Wolniak, 2021), Hungary (Varró & Szalai, 2021), and financing is a barrier to implementation even for cities in the Czech Republic (Ševčík et al., 2023). A fundamental problem is the absence of financial planning (Morvai et al., 2022). This fact is aggravated by

the consequences of the Covid-19 pandemic and the military conflict at our eastern neighbour, thanks to which inflation, the price of materials and the price of labor are constantly growing (Klimovský & Nemec, 2021; RTVS, 2022). These issues have been also experienced by businesses during Covid-19 pandemic (Dvorský et al., 2021). Financial sustainability can be a solution to overcome this funding problem since it also enables to reduce government expenditures (Halaskova et al., 2021).

However, funding is not the only problem. In many cases, cities do not have a sufficient number of professional staff. It is generally known that the level of education significantly determines the quality of human resources, and thus also shapes the prerequisites for potential development (Frank, 2014). The survey shows that this fact concerns more than 14% of Slovak cities (Prešov, Žilina, Nitra, Humenné, Komárno, Šaľa, Senec, Senica, Novémestonad Váhom, Rožňava, Nová Dubnica, Vrútky, Šahy, Medzilaborce, Rajec, Vrbové, Nesvady, Bojnice, Tlmače, Spišská Stará Ves).From this it follows that this problem is most sensitive in western Slovakia. In this regard, educational courses can be provided by governments to increase financial management capabilities, and financial literacy of human resources (Civelek et al., 2023).

The lack of qualified professional capacities is also a problem in other countries of the Visegrad Group. Regarding the Smart City concept, cities in Hungary also face problems with professional staff (Szalai & Fabula, 2021; Varró & Szalai, 2021). In addition to the lack of project management capacities, cities in Poland also face the problem of insufficient IT training among municipal employees, complicated organizational structures and low interoperability of systems (Brzeziński & Wyrwicka, 2022). At the same time, the low interest of mayors in this concept can also be a limiting factor, which manifests itself as a problem, for example, in the Czech Republic (Ševčík et al., 2023).

The fact is that 48.91% of Slovak cities have no plans for the next five years in the area of the Smart City concept, which is very difficult to understand in the 21st century. It should be noted that most such cities are located in central Slovakia. Despite the fact that only about 33% of Slovak cities have plans in the smart area for the next 5 years, it should be noted that 17.52% of cities have such plans included in the PHSR.

We think that the relatively low interest in project activity of Slovak cities due to the above reasons will continue. Where the projects are planned to be implemented, they will continue to affect only certain areas. The results of the survey indicate that most projects within Slovakia for the rest of the period were submitted in the field of education (the most in Eastern Slovakia), followed by the field of environment and transport. Compared to other countries, for example, cities in the Czech Republic invest in innovative projects primarily in transport, ICT and sustainable energy (Zlámal, 2019). In Poland, there are projects implemented in the field of transport, renewable resources and infrastructure (Sikora-Fernandez, 2018), while in Hungarian cities, there are projects in the field of transport and infrastructure (Varró & Szalai, 2021).

5. Conclusion

The Smart City concept is becoming popular all over the world, and the Slovak Republic is no exception. As we have already mentioned above, the motive for writing the contribution is a relatively weak scientific and research portfolio, which would address the issue of Smart

City in the Slovak Republic. The concept of a smart city can bring benefits to cities in the form of increased security, economic development, infrastructure improvement, increasing the efficiency of waste and water management, reducing the burden on the environment, and thereby increasing the quality of life in the city. These are all reasons why Slovak cities should also introduce this concept and create their own strategies adapted to their specific conditions. The striking fact is that only 9% of Slovak cities have an independent smart strategy, which is a key document for the high-quality implementation of the concept. This points to poor documentation preparation in this area. The lack of documentation makes it impossible to take strategic measures and motivate personnel resources to think in terms of the intentions of a modern and intelligent city. This is the reason why we think it is important to motivate Slovak cities to develop Smart strategies and create prerequisites for their effective implementation. The main actor in this area could be the state, which would reduce the bureaucratic burden of smart projects through a homogeneous state policy and documents and create an environment as well as an informational basis for the introduction of the concept. Intensification and increased promotion of the smart concept could also provide motivation for local governments. At the same time, the survey pointed to the fact that 28% of Slovak cities have a strategy or intentions in the field of Smart City included in their Municipal Economic and Social Development Program (PHSR). Another option to support the implementation of smart strategies in Slovak cities is therefore the incorporation of smart elements and plans into the Municipal Economic and Social Development Program. The Municipal Economic and Social Development Program meets the requirements for the development of high-quality proposals for the implementation of smart elements, primarily thanks to the SWOT analysis. Introducing this aspect as a mandatory part of the Municipal Economic and Social Development Program could force municipalities to think critically about the all-round development of the given territory. Another important finding is the confirmation of the relatively often discussed fact, not only among municipal politicians, but also among the wider professional public, that Slovak local governments have an insufficient amount of financial resources at their disposal for a long time. This was clearly manifested in the issue of innovative projects, where more than 24% of cities had problems with financing, which were followed by other problems such as a lack of professional staff, long public procurement processes or excessive administrative burden on city employees. The level of implementation could also be supported by information sharing and cooperation. Currently, cooperation between cities is at a relatively low level. By sharing information and examples from practice, cities would be able to simplify as well as increase the implementation of the Smart city concept. Through cooperation, they could achieve better results and implement more financially demanding innovative projects. The business sector could also help through public-private partnerships, which could provide know-how, data, new resources and, with state intervention, better prices for municipalities. However, it is also important to increase education in the field of Smart city. To improve this aspect, it would be appropriate to introduce courses and educational programs for city employees, or to create cooperation between municipalities and universities. Thanks to such cooperation, students could gain experience and have a better overview of what is happening in public administration, and municipalities could attract the necessary professional capacities to their circles. The question about future development also brought statistically significant data, where almost 50% of Slovak cities do not have plans in the smart area for the next 5 years. The reason for this situation may be precisely the problems in the implementation of innovative projects, the solutions for which we described above. At this point, it should be noted that even our assumed survey limits played a non-negligible role in the results themselves. In contrary to this, we are convinced that research in the area of Smart cities hides considerable potential,

which we can develop effectively in the future with the help of cooperation between municipalities and the academic environment. This is how we will get closer to the quality of life to the extent that many smaller or larger cities in Western Europe offer.

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