

Impacts of Smart Governance on Urban Development

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Abstract. The present paper focuses on the identification of the smart governance impacts on the urban development verified by the empirical research carried out in the cities of the Slovak Republic in 2021. The literature review refers to the various positive and negative effects of smart governance that can be applied at the level of cities. In the paper, the effects mapped in the already published research works were tested by the questionnaire survey, where the respondents were representatives of the cities. The unique contribution of the paper is a verification of these effects in practice, subsequently, by factorial analysis also a specification of the factors (positive effects and barriers) that are key to implementation of smart governance in an integrated and systematic way.

Keywords: Smart Governance · Slovakia · Cities · Factors · Impact

1 Introduction

Over the past decades, urban development has undergone various economic, political, demographic, social, cultural and technological changes that have significantly impacted the current state of cities, both positive and negative. Cities have been the areas in which innovations, new technologies, and efficient and smart solutions are created for a better quality of life for people.

These changes are also reflected in the new approaches in city management. From the new public management, the shift towards public governance and network governance focusing on collaboration can be identified [1–5]. It strongly supports the involvement of stakeholders to carry out a public purpose that could not be achieved due to the boundaries of public administration [6] and digital transformation that focusses on adapting organizational structures and fundamental public service delivery processes [7].

The challenges of urban and local development therefore require appropriate policy responses. In addition to an integrated approach to urban development, the issue of 'multi-level governance' and the participation of relevant actors in city governance is coming to the fore. Both of these approaches require openness, transparency, efficiency, effectiveness, exploration of needs and promotion of active participation of relevant actors in public decision-making while involving them in local community life. For this

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task, it is necessary to introduce new management tools, measures and processes that will create procedures for seeking consensus among representatives of the public, private and non-profit sectors [8, 9]. It is part of smart governance concept.

The aim of the paper is to identify the impacts of smart governance on urban development verified by the empirical research carried out in the cities of Slovak Republic in 2021. It explains, based on the factorial analysis, the pros and cons of smart governance and identify the key factors influencing its implementation.

The paper is divided into three chapters. The first part presents the theoretical review of the research topic, including the main theoretical presumptions used in the primary research. Subsequently, the data and methodology are described and the research results are presented. In the processing of research data, we used descriptive statistics and a software - IBM SPSS Statistics for factorial analysis (KMO and Bartlett's tests).

The added value of the paper lies in the identification of the crucial factors that influence the implementation of the smart governance concept in cities and should be reflected by policy makers and transformed into monitoring and evaluation criteria.

2 From Traditional to Smart Governance in Cities

The concept of governance is generally associated with theories and problems of social coordination and the establishment of its rules. These theories abandon the previous emphasis on the importance of the hierarchical role of the state and highlight the role of the market and networks [10]. Regarding the public sector, the term public governance is used as an alternative approach to public sector management [11–17]. It is a new process of governance in which society, comprising the public, private and not-for-profit sectors, actively participates while accepting the state's authority [13, 18].

Due to rapid technological rapid progress, the governance has to face new challenges and transform to a digital one. This creates new opportunities for improving the participation and interaction of municipalities with relevant stakeholders through conventional and multi-channel communication, including virtual space [19, 20].

Many organizations view digital transformation primarily as the implementation of IT systems [21–23]. It is important to note that an essential prerequisite for the success of digital transformation is, first and foremost, a change in the way of working, organising and managing. At the local level, cities with established technological infrastructure, resources, vision and political leadership see digital technologies as key enablers and infrastructure enablers capable of addressing the growing challenges of urbanisation, population growth, and environmental and fiscal pressures. The use of information and communication technologies (from now on ICTs) enables 'smart' city transformation [24].

Smart governance can be seen as a starting point for the development of smart administration through the use of new ICTs in the management of municipalities [25–30, 56]. Smart governance through ICTs allows improved decision-making through better collaboration between stakeholders. However, even in this approach, innovative technologies should be seen only as a medium or channel that helps cities to streamline management and administrative processes and thus achieve better results for municipalities [25–28, 31].

Moreover, Gil-Garcia, Zhang and Puron-Cid [32]. State that smart local governance is based on integration, innovation, evidence-based decisions, citizen-centricity, sustainability, creativity, efficiency, effectiveness, equity, entrepreneurship, citizen engagement, openness, resilience, technological capabilities.

To the key elements in building a smart governance system in cities belong the efforts of politicians and city leadership to seek new opportunities for the collaboration and empowerment of residents, entrepreneurs and different communities in the city, the efforts to implement these opportunities through relevant tools and methods in decision-making and local policy formulation (Vaňová 2021; Lee, Lee 2014; Lombardi et al. 2011). The next preconditions are an appropriate legislative and organisational framework, financial support and technological infrastructure. A significant challenge for cities is not only to educate and train end-users of smart governance tools but it is also essential to support activities that aim to improve the digital skills of employees [33–37].

Building a smart governance system is a long-term transformation process based on the shared understanding of the concept of smart governance, vision, strategy and shared responsibility. The level of smart governance can then be assessed based on the transparency of urban governance, the involvement of social partners, the level of public services and the implementation of development strategies [38–40, 57].

Based on the scope of the transformation of municipal management, four forms of smart governance can be identified in cities [41]. The least invasive form of smart governance in cities is the preservation of the original government structure in the city with an attempt to adapt it to a smart one. As a rule, the smart attribute is used as a marketing item and becomes part of the city's brand. Externally, this approach is manifested in innovative city websites or the sophisticated use of social networks. The second variant of smart governance is based on decision-making processes that use actual data over time to make decisions that should be the right solution to society's challenges. The third variant of smart governance is smart public administration. Its essence is the reconstruction and integration of the internal processing system through electronic government tools using advanced digital technologies. The fourth form of smart governance is identified as collaborative governance. It is a large-scale transformation of the organisation of city governance, linked to the integration of internal structures and building partnerships with relevant stakeholder, especially within the decision-making processes.

Based on studies by authors working on smart governance [28, 42–47] it is possible to identify three groups of benefits. The first group includes impacts on urban quality of life (improved social and economic conditions, value creation, social equity, urban performance, sustainability, resilience, improved services, economic development based on knowledge and innovation, maximization of socio-economic and environmental development indicators, and the like). The second group relates to local municipalities and the benefits concerning governance processes (e.g. greater administrative efficiency, interoperability, the effectiveness of public policies, strengthening openness and accountability, changes in the structure of municipal organisation, strengthening citizen orientation, and the like). The last group is more stakeholder-oriented and empowering their standing in local politics (e.g. stakeholder participation in public life, equity of their role in local politics, promoting their awareness to build trust in municipalities and social inclusion).

The concept of smart governance in cities also has its critics, who focus on defining the pitfalls [45–47] associated with implementing this concept. The success of implementing the concept depends on the will and capacity of the local municipality to learn. The concept of smart governance requires the continuous development of the skills and capabilities of municipal staff, managers, and stakeholders; otherwise, it cannot be systematically developed.

Several authors [among others, 48–51] often point out that it is not yet possible to realistically assess the long-term benefits of smart governance in practice. At the same time, these authors question the value digital co-production brings concerning the political and social impact in the context of the potential for some marginalisation of parts of the population. Some doubts are associated with the meaning and, in particular, the effect of participatory processes as part of smart governance. The evaluation of the effectiveness and efficiency of participatory processes and identifying their actual contribution to sustainable urban development needs to be addressed [52, 53]. Royo and Yetano [50], for example, point out that the use of new technologies, sensors, and chips can lead to the perception that the citizen as an active public policymaker taking a back seat. According to these authors, the citizen can only be perceived as a unit of information gathering or a particular statistic. Prioritisation of technological innovations can exacerbate the situation without considering the real needs and expectations of users. Thus, unnecessary innovations may represent an unnecessary financial investment.

The benefits and pitfalls of smart governance in the context of smart city governance we researched in the next text in the context of the Slovak Republic.

3 Data and Methodology

To identify the potential positive and negative impacts of smart governance on the local development we used following research studies [28, 42–47, 52–54]. The list of identified impacts was verified in the practice of Slovak cities.

In this paper, we present the partial results of the empirical research realized in a form of questionnaire survey. The research was conducted in the first half of 2021 using a questionnaire survey method, with which we addressed all 141 Slovak cities, with a return rate of 67 responses (47.52%).

The questionnaire was filled out either independently by a city representative or in a guided interview with a city representative. The questionnaire contained 17 questions. For the paper we selected the results that are oriented on the definition of pros and cons of the smart governance in cities.

Four questions were of an identifying nature (city name, position, gender, age). By the size of the cities, 32.84% of respondents were from cities with 5000–9999 inhabitants; 22.39% of the respondents from cities with 10,000–19 999, 20.90% of respondents from cities with 20,000–49 999 inhabitants, 14.93% respondents from cities with inhabitants up to 5000, 7.46% respondents were from cities with 50 000–99 9999 inhabitants, and 1.49% of the respondents were from cities with more than 100 000 inhabitants. Based on the Chi-square test, the research sample is representative of the size categories of the cities.

$$G = \sum_{k=1}^{K} \frac{(n_k - n\prod_k)^2}{n\prod_k}$$

$\chi^2 = 9.49$ ($\alpha = 0{,}05$)
$G = 0.52682$
Degrees of freedom $= 4$

The respondents of the represented cities were mayors (35.8%), deputy mayors (31.3%), and heads of municipal authorities (32.8%). As many as 64 respondents (95.5%) were university educated, while three had a secondary school education. Regarding age, 3% of the respondents were in the 18–30 age category; 22.4% in the 31–40 age category; 31.3% in the 41–50 and 51–60 age categories; and 11.9% in the 61 + age category.

In the research results processing we use descriptive statistic methods, statistical induction and factorial analysis. To order the benefits and pitfalls by the priority given by respondents, we used Friedman's tests. The research data was tested by KMO and Bertlet test to check if the data are suitable for factorial analysis. In both cases, they passed, so we could use the factorial analysis based on the rotated matrix of factor saturations.

4 Research Results and Discussion

Based on in-depth literature review we identified relatively broad scope of potential positive impacts of digitalization and introduction of innovative methods of governance at the local level. By their summarization, they include:

1. increasing administrative efficiency and operational capability;
2. strengthening openness and accountability;
3. improving services;
4. increasing the effectiveness of public programmes and policies;
5. changes in the structure of the organization of local municipality and its bodies, as well as in its position in relation to stakeholders;
6. strengthening the orientation towards the interests of the citizen (transparency and trust);
7. increasing the involvement of citizens in public life;
8. increasing the participation of other stakeholders in public life;
9. enabling stakeholders to become more informed, qualified and skilled in engaging in public affairs, which increases mutual understanding and trust;
10. sustainability and resilience;
11. economic development based on knowledge and innovation;
12. combined creation of social and economic values;
13. social inclusion;
14. promoting social justice;
15. improving the quality of life in cities;
16. maximizing indicators of socioeconomic and ecological development.

Within the questionnaire survey, we asked the respondents to evaluate each statement as a possible positive impact of smart governance in the city on the scale-fully disagree (1), disagree (2), neither agree, nor disagree (3), agree (4), fully agree (5). Figure 1

presents the share of respondents' answers of the respondents, as well as the average evaluation of each item. The numbers in legends 1–16 identify the evaluated potential benefit below.

As Fig. 1 shows that the most important advantage of a modern municipality is increasing administrative efficiency and operational capability and improving service. Respondents consider the third and fourth advantages to be the strengthening of the orientation towards the interests of the citizen and the strengthening of openness and responsibility. Increasing the efficiency of public programmes and policies is in fifth place, and economic development based on knowledge and innovation is in sixth. Increasing the participation of citizens on the seventh and increasing the participation of other actors on the eighth. The respondents consider changes in public administration organizations and their position in relation to other actors to be the least significant advantage. Changes are followed by social inclusion and social justice.

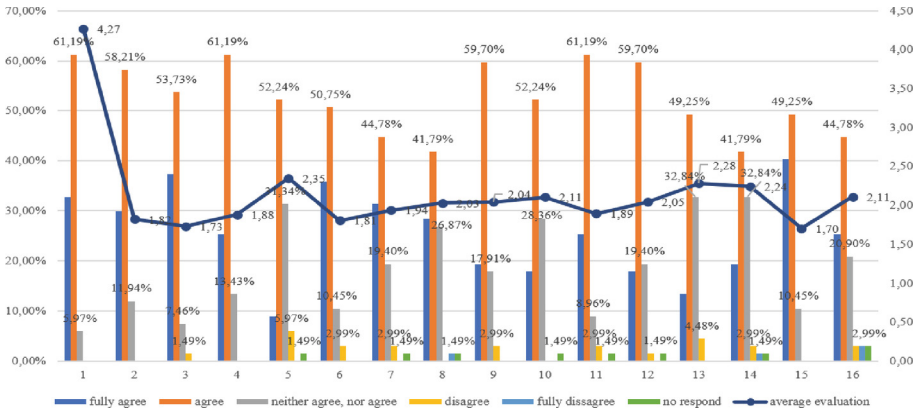

Fig. 1. Potential benefits of smart governance in cities. Legend: 1. Increasing administrative efficiency and operational capability; 2. strengthening openness and accountability; 3. improving services; 4. increasing the effectiveness of public programs and policies; 5. changes in the structure of the organization of local municipality and its bodies, as well as in its position in relation to stakeholders; 6.strengthening the orientation towards the interests of the citizen (transparency and trust); 7. increasing the involvement of citizens in public life; 8. increasing the participation of other stakeholders in public life; 9. enabling stakeholders to become more informed, qualified and skilled in engaging in public affairs, which increases mutual understanding and trust; 10. sustainability and resilience; 11. economic development based on knowledge and innovation; 12 combined creation of social and economic values; 13. social inclusion; 14. promoting social justice; 15. improving the quality of life in cities; 16. maximizing indicators of socioeconomic and ecological development

The research results confirm the priority of cities to improve their quality of life and the services they provide through a smart governance approach. This priority is only possible if, at the same time, the local municipality is transparent and prioritises the citizen, has built an excellent organisational structure and set processes that contribute to administrative efficiency and interoperability. All these aspects also influence the implementation of public policies and programmes.

This assessment was tested with the Friedman test (significance level 0.01), which determined the following order of significance of the individual benefits of smart governance in the cities of the Slovak Republic (Table 1).

Table 1. Order of potential benefits of smart governance by Friedman's test

Improving the quality of life in cities	10.45
Improving services	10.01
Strengthening citizen-orientation (transparency and trust)	9.91
Increasing administrative efficiency and operational capacity	9.68
Strengthening openness and accountability	9.33
Economic development based on knowledge and innovation	9.14
Increasing citizen participation in public life	8.94
Increasing the effectiveness of public programmes and policies	8.93
Increase participation of other stakeholders in public life	8.40
Enabling stakeholders to become more informed, skilled and knowledgeable in engaging in public affairs, increasing mutual understanding and trust	8.20
Combined social and economic value creation	8.12
Maximising socio-economic and environmental development indicators	7.92
Sustainability and resilience	7.54
Promoting social justice	6.82
Social inclusion	6.48
Changes in the structure of the organisation of local municipalities and their bodies, as well as in their position in relation to stakeholders	6.13

Because the results of KMO and the Bertlet test of sphericity showed that the data are suitable for factorial analysis, we try to identify the factors that can be seen as crucial in the perception of benefits of smart governance in cities. We used the principal method analysis and the Varimax method of rotation (Table 2).

Table 2. Eigenvalues and the proportion of explained variability with the original number of variables – positive effects of smart governance

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
increasing administrative efficiency and operational capability	6,447	40,294	40,294	3,631	22,692	22,692

(*continued*)

Table 2. (*continued*)

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
strengthening openness and accountability	1,878	11,741	52,035	2,926	18,285	40,977
improving services	1,225	7,654	59,689	2,490	15,565	56,542
increasing the effectiveness of public programs and policies	1,095	6,844	66,533	1,599	9,991	66,533
changes in the structure of the organization of local municipality and its bodies, as well as in its position in relation to stakeholders	0,920	5,749	72,282			
strengthening the orientation towards the interests of the citizen (transparency and trust)	0,763	4,768	77,050			
increasing the involvement of citizens in public life	0,755	4,717	81,767			
increasing the participation of other stakeholders in public life	0,576	3,599	85,367			

(*continued*)

Table 2. (*continued*)

Component	Initial Eigenvalues			Rotation Sums of Squared Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
enabling stakeholders to become more informed, qualified and skilled in engaging in public affairs, which increases mutual understanding and trust	0,544	3,398	88,764			
sustainability and resilience	0,426	2,665	91,430			
economic development based on knowledge and innovation	0,366	2,288	93,717			
combined creation of social and economic values	0,359	2,244	95,962			
social inclusion	0,221	1,382	97,344			
promoting social justice	0,168	1,050	98,394			
improving the quality of life in cities	0,138	0,863	99,257			
maximizing indicators of socioeconomic and ecological development	0,119	0,743	100,000			

Based on the Eigenvalues, the software recommended four factors that together explain 66% of the variability from the original sixteen variables. Thus, the data also meet the percentage of explained variability criterion, which is required in the social sciences to be at least 60%. Their influence is illustrated in Table 3 the rotated matrix of factor saturations (Table 3).

Table 3. Rotated matrix of factor saturations – positive effects of smart governance

Rotated Component Matrix				
	Component			
	1	2	3	4
increasing administrative efficiency and operational capability	,008	-,057	,603	,573
strengthening openness and accountability	,662	,134	,180	,417
improving services	,272	,128	,712	,053
increasing the effectiveness of public programs and policies	,236	,326	,536	,183
changes in the structure of the organization of local municipality and its bodies, as well as in its position in relation to stakeholders	,491	,210	,416	-,504
strengthening the orientation towards the interests of the citizen (transparency and trust)	,766	,128	,298	-,056
increasing the involvement of citizens in public life	,848	,098	,051	,081
increasing the participation of other stakeholders in public life	,772	,233	,264	,016
enabling stakeholders to become more informed, qualified and skilled in engaging in public affairs, which increases mutual understanding and trust	,745	,186	,077	,021
sustainability and resilience	,129	,382	,096	,689
economic development based on knowledge and innovation	,162	,454	,251	,453
combined creation of social and economic values	,123	,836	,211	-,026
social inclusion	,240	,825	,192	,170
promoting social justice	,235	,838	,181	,184
improving the quality of life in cities	,431	,250	,521	,227
maximizing indicators of socioeconomic and ecological development	,096	,357	,709	-,026
Extraction Method: Principal Component Analysis Rotation Method: Varimax with Kaiser Normalization				

From the rotated matrix in Table 4, we see that for the first factor the significant variables are the strengthening of openness and responsibility; strengthening orientation to the interests of the citizen; increasing the involvement of citizens in public life; increasing the participation of other stakeholders in public life and supporting and developing the

skills and abilities of other actors. We could interpret the mentioned variables as factor 1 - participation and interested groups. Combined creation of social and economic values; social security and social care support are significant for the second factor, are important for the second factor - social welfare. Variables - increasing administrative efficiency and operational capability; improvement of services; increasing the efficiency of public programs and policies; changes in public administration organizations and their positions in relation to other actors; improving the quality of life in cities and maximizing socioeconomic and ecological development can be summed up in a factor called more efficient services and public policies. Sustainability and resilience and economic development based on knowledge and innovation can be interpreted as factor 4 - sustainability and resilience.

As the second part of the impact analysis, we asked the respondents evaluate on the same scale the potential pitfalls of smart governance in cities. Again, they were identified by the literature review as follows:

- insufficient capacity of local government to learn;
- exclusion of certain population groups;
- higher rate of non-participation of selected population groups (e.g. pensioners), especially in e-participation;
- residents are perceived only as a unit of information collection;
- prioritization of technological innovations instead of user needs and expectations;
- negative impact of technology on ecology.

The share of respondents´ answers and the average assessment of each pitfall are presented in Fig. 2.

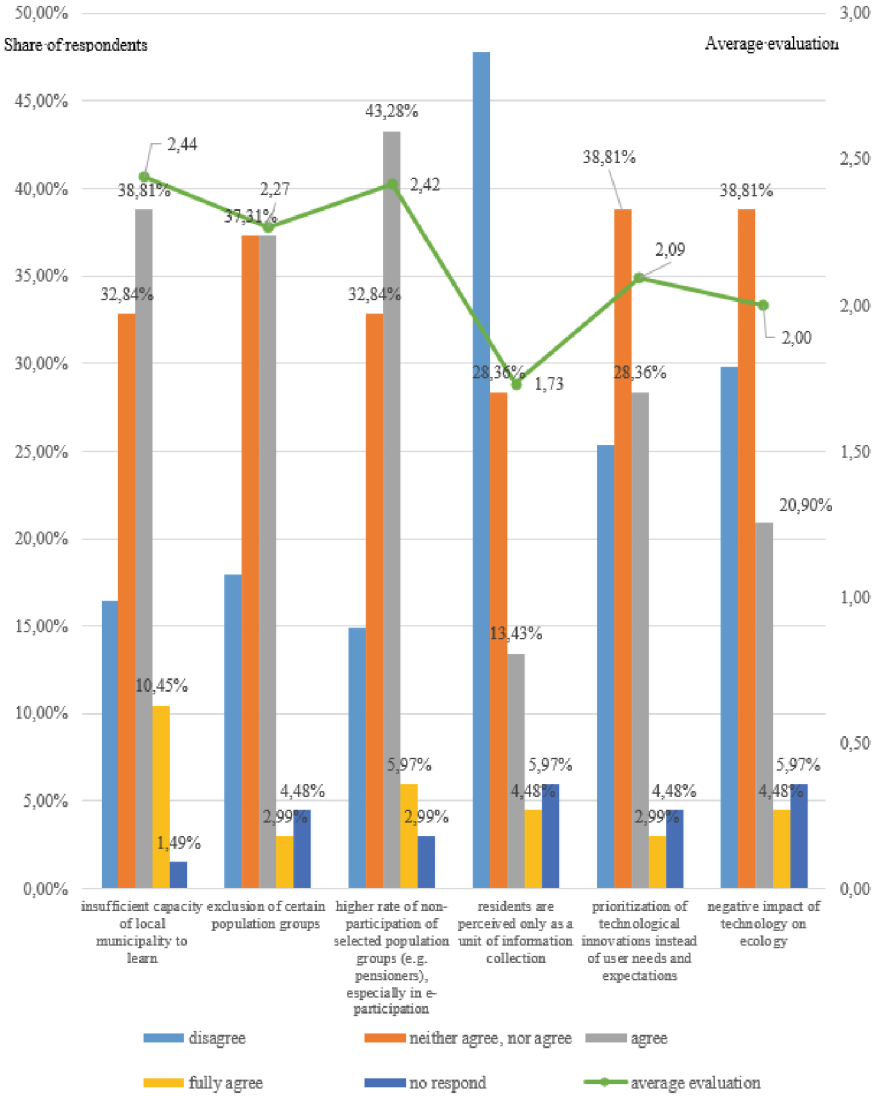

Fig. 2. Potential pitfalls of smart governance in cities

By the Friedman's test (significance level 0.01) of the respondent's answers, the statement with which respondents agree the most is the lack of capacity of local municipalities to learn. Other pitfalls follow this in the following order - a higher level of non-participation of selected population groups (e.g. senior citizens), especially in e-participation; the exclusion of specific population groups; the prioritization of technological innovations instead of users' needs and expectations; the negative impact of technology on ecology; residents are perceived only as a unit of information gathering.

By the results of KMO and Bertlet test of sphericity the research data are suitable for the factorial analysis. We again used the principal method analysis and the Varimax method of rotation (Table 4).

Table 4. Eigenvalues and the proportion of explained variability with the original number of variables – potential pitfalls

Component	Initial Eigenvalues			Loadings			Loadings		
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %
insufficient capacity of local municipality to learn	2,427	40,443	40,443	2,427	40,443	40,443	1,874	31,228	31,228
exclusion of certain population groups	1,24	20,675	61,118	1,24	20,675	61,118	1,793	29,889	61,118
higher rate of non-participation of selected population groups (e.g. pensioners), especially in e-participation	0,883	14,718	75,836						
residents are perceived only as a unit of information collection	0,626	10,426	86,261						
prioritization of technological innovations instead of user needs and expectations	0,466	7,77	94,031						
negative impact of technology on ecology	0,358	5,969	100,00						

Based on the Eigenvalues, the software recommended 2 factors that can explain 61,118% of variability from all original variables. The relationship of these factors with all variables presents Table 5 Rotated component matrix.

Table 5. Rotated component matrix – potential pitfalls of smart governance in cities

Rotated Component Matrix		
	Component	
	1	2
insufficient capacity of local municipality to learn	0,416	0,379
exclusion of certain population groups	0,202	0,788
higher rate of non-participation of selected population groups (e.g. pensioners), especially in e-participation	-0,077	0,877
residents are perceived only as a unit of information collection	0,515	0,503
prioritization of technological innovations instead of user needs and expectations	0,816	0,056
negative impact of technology on ecology	0,851	0,043

Extraction Method: Principal Component Analysis. Rotation converged in 3.

Our research results show that for the first factors are significant that variables 1, 4, 5 and 6, it means insufficient capacity of local government to learn, residents are seen only as a unit of information collection, prioritization of technological innovations instead of the needs and expectations of users, and the negative impact of technology on ecology. Resulting from these obstacles and negative effects, we can name the first factor technology. For the second factor are significant variables 2 and 3, i. e. the exclusion of certain population groups and a higher rate of non-participation of selected population groups (e.g. pensioners), especially in e-participation. Because they are closely associated with stakeholder engagement, the factor can be called barriers of participation.

Our research results verified all identified impacts of smart governance in the cities as relevant. In the field of potential benefits of smart governance, they can be clustered into four main areas. The factorial analysis confirms the importance of the participation and their collaboration. Stakeholder participation can be used at different stages of the public policy cycle and implemented at different levels of involvement in different forms and ways. To achieve the desired effect, it is necessary to develop a participatory process design with a definition of the objective of the participatory process; the target group of stakeholders; the outputs of the participatory process; the forms of stakeholders' participation and engagement; the sequence/logic of the phases of the participation process the timeframe, the staffing and the financial support.

As the second factor, a social welfare was identified. By the in-depth literature review we found out that the smart governance approach should contribute to maximizing the possibilities of economic and social development which is reflected in better quality of life for citizens. This is evident also in the metrics dealing with the smart governance, and verified by our research results. It should be noted here that the assessment of the level of smart governance should not only be based on quantitative assessment but also on qualitative assessment, which often helps to understand better the interrelationships, processes or problems of smart governance.

The third factor in the positive effects of smart governance in cities is more efficient services and public policies. However, it is possible only in case of systematic and integrated implementation of smart governance with the political, organizational and financial support. It creates an opportunity to increase efficiency and strengthen the links between the local municipality and stakeholders to achieve synergies, stimulate coordination on the territory, and thus make governance more effective through the participation of the actors [55]. All previous factors help achieve sustainability and resilience of the city, which were identified as the last factor of positive impacts of smart governance. The sustainability and resilience are supported by the tools of smart governance that are manifested in local municipal functioning, namely transparency, participatory democracy, co-production, and communication that contribute to absorbing economic, environmental, or social changes/shocks, to adapt to them, to mitigate their impacts while at the same time maintaining the ability to perform basic functions of the territory without delegating it to other entities.

In case of potential pitfalls of the smart governance, two factors were identified. The problems in smart governance implementation can be caused by technology. If the priority became technology, the approach to smart governance is only technocratic, without respecting the added value of networks and the development of social capital. The technology is closely associated with the barriers in participation, which is the second identified factor. Due to higher claims (especially computer skills) on forms of stakeholder's engagement it can decrease the rate of participation in the public policy process. The concept of smart governance works with a wide range of tools that can be used in the different phases of participation. To eliminate the possibility of excluding a particular group of the local municipality's population, the solution is a combination of traditional (offline) smart governance tools with new ones in electronic form (online).

We are aware of the limitations in our research, mainly the orientation only on the research sample from one country as well as specifics of questionnaire research results based on the subjective opinion of respondents. On the other hand, the research was original and collected new primary data and the system of local governance in the central European countries is very similar, so the research results can be a starting point for the international comparison or spatial cluster analysis of government behavior of cities in different size.

5 Conclusion

In the present paper, based on our research results and their critical discussion, we identified the impacts of smart governance on urban development. Although, the research was realized in the cities of the Slovak Republic, the principles of municipal self-governance are generally accepted everywhere. Therefore, if cities implement the smart governance approach systematically and in an integrated way, they can expect a relatively wide portfolio of benefits. Moreover, they have to be prepared to face the barriers that can be caused by the progressive technological development. Equally important is the ability of cities to deal with both the opportunities and threats that smart governance brings.

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