

Can Be Small Municipalities Smart?

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Abstract. Open governance, the involvement of stakeholders in addressing local policy challenges, and local and municipal tools supporting the application of democratic principles in local self-government remain consistently relevant topics of research. With the influence of advancements in science and new information and communication technologies, public administration management tools are taking on new forms, posing a challenge at all levels of public administration, including local, regional, and national levels. The aim of this paper is to examine the potential for their use and systematic development within the small local governments of the Slovak Republic, as well as to investigate the factors influencing the adoption of modern tools in the practices of Slovak municipalities, which is based on an analysis of smart governance implementation. With regard to this, our research fills the gap, since most smart city studies are predominantly conducted on a sample of large cities. The paper presents findings of secondary research conducted on a sample of 253 municipalities in Slovakia with populations of up to 4,999. It discusses the factors that influence the concept of smart governance and define the challenges of smart governance development within the framework of small local municipalities.

Keywords: Toolkit · Smart Governance · Municipalities

1 Introduction

Involvement of citizens and other stakeholders into the administration of public affairs has been a challenge in many countries. The Covid-19 pandemics had shown that the previous system of public governance needs improvements and implementation of new features and elements in order to be effective in new conditions. Development of new information and communication technologies is an opportunity for public administration bodies to include stakeholders in the democratic management of public affairs.

It is necessary to explain that the term governance is identified with all forms of democratic management of public affairs, including the involvement of a diversified portfolio of stakeholders in these processes. We understand it as a form of governance where, in addition to paid managers, other actors are also involved in governance and have taken advantage of the opportunity to participate in governance provided by the principles

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of democracy with the common social, economic and environmental objectives (Pierre, Guy Peters 2020). In this sense, smart governance is a new approach to management of public affairs based on the use of modern information and communication technologies with the involvement of relevant actors based on the evaluation of available information and data.

The smart city concept (as well as smart governance) is more associated with the large cities by a great share of research papers and case studies. However, our research (Borseková et al. 2018; Lopez et al. 2017) showed that there is no disadvantage in building smart cities for medium-sized cities in comparison to bigger cities. Some studies confirm that the smart city intervention can help small and rural municipalities to curb the problems of managing the limited resources available as well as in service delivery (Mashau, Kroeze, Howard 2021). That is why the presented research results in next section focus on mapping the situation that concerns implementation of smart governance in small local municipalities, which also covers the research gap with regard to this issue.

The paper presents the research results of survey conducted in the Slovak Republic, which is characterized by the large number of municipalities with small number of citizens. Regarding the Slovak municipalities, this concept is still relatively new. There is not paid adequate attention to this issue and that is why we focused on the potential for the use and systematic development of smart governance within the small local municipalities (villages), as well as on investigation the factors influencing the adoption of modern tools in the practices of Slovak municipalities. This approach also brings new view on the application of smart governance in small municipalities.

The paper is organized as follows. Section 2 is theoretically oriented on definition of smart governance and its tools in local municipalities. Section 3 details the methodology of realized researches and characterizes the data used. The third section is devoted to presentation of the research results and their critical analysis. To conclude the paper, we summarize the challenges of smart governance implementation within the framework of small local municipalities.

2 Smart Governance and Its Tools in Local Municipalities

The concept of smart city governed by smart government is intensively researched during last 20 years. The research shifted from the focus on the techno-economically driven approach to more decentralised, anthropocentric approach fostering the collaboration and community involvement (Zhao, Fashohla, Olarewaju, Onwumere 2021). It also became a part of public policy agenda at the national and international level that strongly influence the progress in local governance and implementation of innovative participative and cooperative tools.

Smart governance in local municipality presents a procedural interplay among diverse stakeholders, managed with technology and data, based on relevant legislation and policies, to achieve benefits or procedural changes (Ruhland 2018). It should contribute to more efficient resource management reflected (Hajek, Youssef, Hajkova 2022) in the sustainable development and increased quality of life (Caragliu et al. 2011; Bakici et al. 2013).

Essential in building a smart governance system are political and city leadership efforts to foster collaboration and empower residents, entrepreneurs, and communities, implementing these opportunities through relevant tools and methods (Vaňová 2021; Lee, Lee 2014; Lombardi et al. 2011). This necessitates establishing appropriate legislative, organizational, financial, and technological frameworks. Nam, Pardo (2011), Mellouli et al. (2014), Maheshwari, Janssen (2014), Nam, Pardo (2014). Smart city governance involves managing urban infrastructure, resources, and intangible capital, aligned with shared visions and strategies (Nam, Pardo 2011; Mellouli et al. 2014; Lee, Lee 2014; Lombardi et al. 2011; Lopez, Oliveira, 2017). Smart governance requires long-term commitment and shared understanding, vision, strategy, and responsibility. Kumar (2017), Zanella et al. (2014), Caragliu et al. (2011). The importance of these factors is confirmed also by research in small municipalities, where also the environmental factor is distinguished (Mashau, Kroeze, Howard 2021; Ibrahim, M., El-Zaart, A. and Adams, C. 2018; Chichernea, V. 2015). Also the authors (Bokun, Nazarko 2023; Kumavat et al. 2021; de Viron and Mudri 2019) researching the concept of smart villages supported their definitions and stress the importance of integrated and interdisciplinary approach in their management.

The core of smart governance is a collaborative governance that brings together multiple stakeholders (e.g. citizens, municipalities, entrepreneurs, parliamentarians, employees, financial institutions, NGOs, government offices, media, universities, and others) together in common forums with public agencies to engage in consensus-oriented decision-making and active co-creation that lead to the sheared learning (Vitálišová 2015; Ansell, Gash 2008; Ruohomaa, Mäntyneva and Salminen 2018; Allahar 2020). Citizen or other stakeholder is an active partner that contribute to co-create the solutions for complex problems of urban policies and projects based on self-regulations and mutual trust (Przeybilovicz, Cunha 2022). The strategic asset that modifies the traditional interactions between government and stakeholders to the dynamic and smart collaboration are ICTs (Albino et al. 2015; Misuraca et al. 2011; Baccarne et al. 2014; Scholl, Scholl 2017; Osella et al. 2016; Guenduez et al. 2018). ICT induces co-creation and catalyses social actors in smart urban governance, eventually challenging existing governance modes (Przeybilovicz, Cunha 2022). However, the importance of ICTs is equal to the right leadership of the city and deep collaboration among participation in an appropriate helix-style collaborative arrangement (Allahar 2020).

Smart governance uses innovative tools to involve stakeholders in delivering public services, addressing policy issues, and making government more transparent. This includes traditional and new participation and co-creation methods (as described in research by Castelnovo et al. 2015; Castelnovo 2016; Vitálišová et al. 2021). They contribute to increasing stakeholder participation through openness and transparency, thus creating an image of municipal accountability, thereby improving the quality of stakeholder-government relations.

There's no one-size-fits-all approach to smart governance tools. These tools are used in different combinations depending on the stage of stakeholder engagement (Vitálišová et al., 2022). The right mix of tools (informing, negotiating, coordinating, etc.) is crucial for building relationships with stakeholders (Peters 2003; Cresbo & Cabral 2010; Schaap et al. 2014). Thus, smart governance becomes a process of continuous improvement based on mutual communication, which requires time, flexibility and reputation (Franzke, Roeder 2014; Pianzola, Ladner 2014; Michels, Montfort, & Pianzola 2014).

The OECD (2020) categorizes smart governance tools based on their application in stakeholder engagement. These categories include communication, consultation, participation in policy-making, representation, partnership, and co-production/co-decision. Simonofski et al. (2019) offer another perspective with three main categories: tools for participatory democracy (citizen involvement), tools for co-producing public services, and tools that leverage ICT to make citizens active participants in smart city infrastructure and data collection. The first group consists of tools to promote participatory democracy represented by citizen involvement in governance. The second group consists of tools promoting the co-production of public services. The third group of tools considers the impact of the development of ICTs, where the citizen is an active part of the infrastructure of smart cities, a source of information that facilitates the management of public affairs.

The set of tools in our research were identified based on the literature review oriented on the definition of the smart governance tools (inter alia Bolívar 2015; López-Quiles, Bolívar 2018; OECD 2020; Simonofski et al. 2019; OECD 2020; Castelnovo et al. 2015; Estevez, Janowski 2013; Chourabi et al. 2012; Wijnhoven et al. 2015; Gil-Garcia et al. 2015; Johannessen, Berntzen 2018; De Guimarães 2020; Vaňová 2021). Subsequently, their composition was verified by the Dephi methods among international experts (see also Vitálišová et al. 2023). Because the research studies indicate that the existing models of smart governance and their tools are too complex and too extensive for smaller municipalities (Iammarino et al. 2019; Weck & Beißwenger 2014; Anschütz, Ebner, Smolnik 2024), we are primarily trying to identify the composition of the used tools in the small municipalities of the Slovak Republic and the level of their implementation in this paper.

3 Material and Methodology

The research focused on mapping the utilization of smart governance tools in Slovak local municipalities with a current population of up to 4,999 inhabitants. The smart governance tools were defined in compliance with foreign and domestic scientific and professional literature sources. In total, 32 tools of modern self-government were examined, and categorized into four groups: tools supporting transparency, tools of democracy (participation), tools of communication, and tools of education and co-creation of public services. Data collection was carried out between February and August 2021. In case municipalities engaged these tools, data were gathered through observation that was based on the study of websites, strategic municipality documents, or other relevant reports (national, regional).

The total number of the municipalities of the Slovak Republic is 2890 including villages and cities. Their composition is fragmented. Generally, we consider Slovakia to be a rural country, due to the fact that out of 141 cities only 2 cities have more than 100 000 inhabitants. In the research, we focused only on the villages with up to 4999 inhabitants, which we consider as small villages, and we excluded the cities. In this case, the number of municipalities is 2752, what is 95,23% of the total number of Slovak municipalities. All municipalities regardless the size or localization have to operate within the same institutional and legislative framework. The research samples consist of

253 municipalities in the Slovak Republic across five size categories, with populations of up to 4,999 inhabitants (Table 1). According to the Chi-square test result, the research sample is representative in terms of the size category and location of the municipalities relative to the spatial division of the Slovak Republic into Western, Central, and Eastern Slovakia. Hence, the research findings can be extrapolated to all small Slovak villages.

Table 1. Composition of the research sample by size category and area

Area	Region	Local municipality size category					Total
		to 199	200–499	500–999	1 000–1999	2 000–4 999	
Western Slovakia	Bratislava	0	1	1	1	2	80
	Trnava	0	2	3	4	6	
	Trenčín	2	7	13	9	2	
	Nitra	1	4	12	8	2	
Central Slovakia	Banská Bystrica	9	13	15	6	5	90
	Žilina	4	9	10	9	10	
Eastern Slovakia	Prešov	9	16	10	7	5	83
	Košice	3	9	15	7	2	
Slovak Republic		28	61	79	51	34	253

To analyze the secondary data, we employed various mathematical and statistical methods, with a particular focus on descriptive statistics and correlation analysis. Based on the results of the analysis, we have categorized the municipalities using the "smart governance traffic light" system. This system enables to assess the level of smart governance development in individual municipalities. The methodology behind the smart governance traffic light involves classifying municipalities into three categories based on the percentage of defined tools they utilize in each category. Municipalities marked in red indicate a lack of smart governance activities. These municipalities utilize 0%–30% of smart governance tools. Those marked in yellow are in the developmental stage of smart governance adoption, utilizing 31%–60% of the defined tools. Finally, municipalities marked in green demonstrate active engagement in smart governance initiatives, utilizing 61%–100% of the defined tools. The final section of the paper discusses and summarizes the most significant research findings, along with the primary challenges in the development of smart governance within Slovakian municipalities.

The research can be considered as a pilot one, because there is no evidence about the similar studies conducted in the conditions of the Slovak Republic, which means that we do not consider the spatial distribution and proximity to cities within presented research results.

4 Research Findings and Discussion

The transformation and development of municipalities are strongly influenced by technological advancements, digitalization, and the concept of "smartness" across various areas, spanning from decision-making to the delivery of public services. This relatively recent phenomenon has led to the adoption of smart governance tools in the practices of Slovak municipalities.

Regarding the specific smart governance tools analyzed, the utilization levels within the transparency tools category (Fig. 1) are relatively low. Among these tools, the 3D mapping system is the most commonly used, implemented in 41.50% of municipalities. Databases for sharing information within the municipal authority and organizations established by the local municipality are implemented in 26.88% of municipalities.

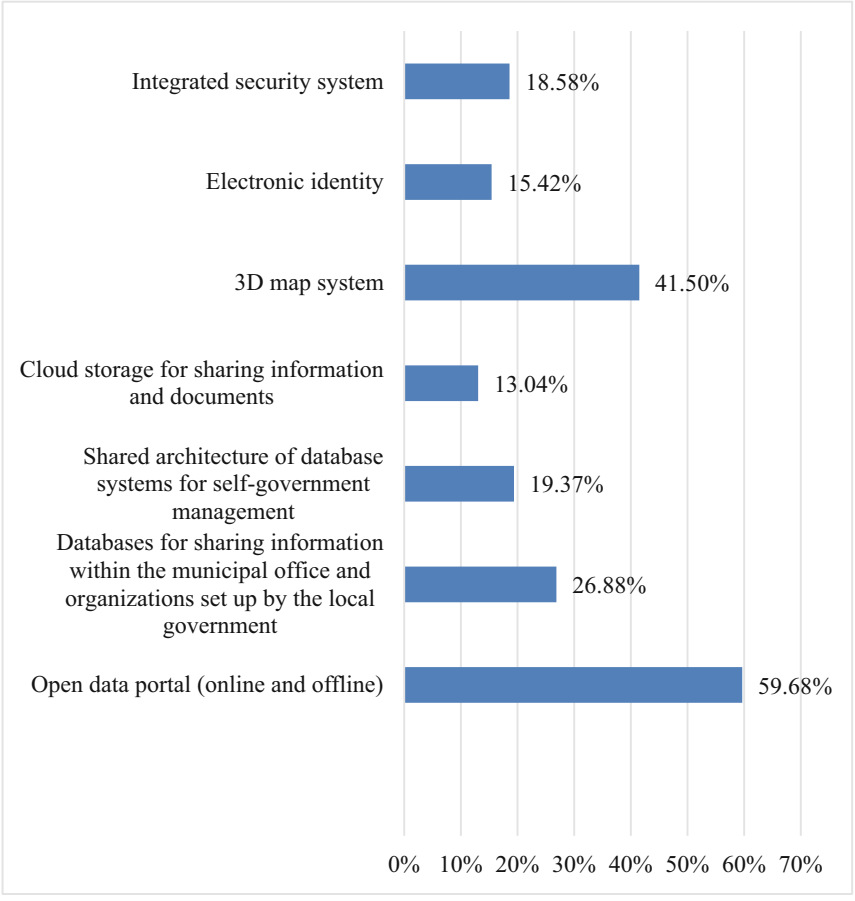


Fig. 1. Transparency tools.

However, integrated security systems, electronic identity systems, cloud storage, and shared database architectures for local municipal management systems – all of which are essential prerequisites for implementing digital forms of smart governance tools – are present in less than a quarter of municipalities. Additionally, none of the small Slovak municipalities utilize open data through an open data portal concerning local municipality affairs, either online or offline.

Similar to the transparency tools, the utilization of individual tools for promoting participatory democracy (Fig. 2) is relatively low in small municipalities in the Slovak Republic. Less than a quarter of municipalities employ all tools to promote participatory democracy. The least widespread tools are electronic e-democracy tools, primarily represented in Slovakia by electronic petitions and electronic voting forms. This is also due to the absence of electronic public elections in the Slovak Republic. The representation of each tool varies across size categories, and their implementation is not correlated with the municipality's size category.

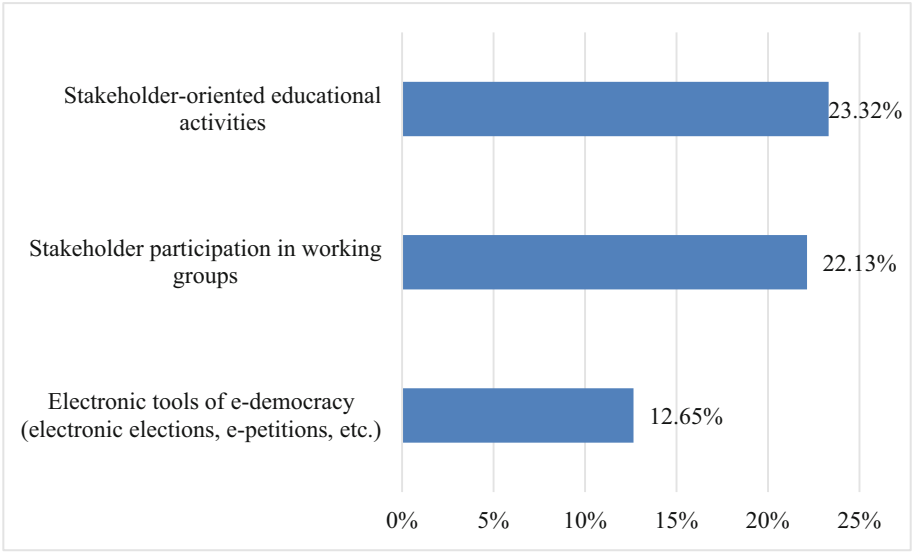


Fig. 2. Tools to promote participatory democracy.

Among the instruments for co-producing public services (Fig. 3), electronic/digital public services are particularly prevalent, with 47.83% of municipalities that offer them. However, it remains unclear how many local municipalities provide these public services beyond the scope outlined in the Act of the National Assembly of the Slovak Republic No. 305/2013 Coll., also known as the e-Government Act. These public services can be facilitated through the Data Centre of Municipalities and Cities (hereafter referred to as "DCOM"), a supra-ministerial information system catering to local municipalities and encompassing the entire range of responsibilities inherent to local municipalities.

Another tool utilized for co-producing public services is a participation in the exchange of experience and knowledge within the local municipality territory, employed

by 35.18% of municipalities. Notably, there is a relatively low proportion of municipalities employing participatory planning in municipal development (28.06%), despite the fact that, according to the methodology, it is recommended to integrate the knowledge and experience of citizens and other development stakeholders, which should stem from participatory processes. The involvement of socio-economic partners in drafting strategy is crucial for its wide acceptance, serving as a mean to achieve consensus and a prerequisite for the participation of socio-economic partners in its implementation.

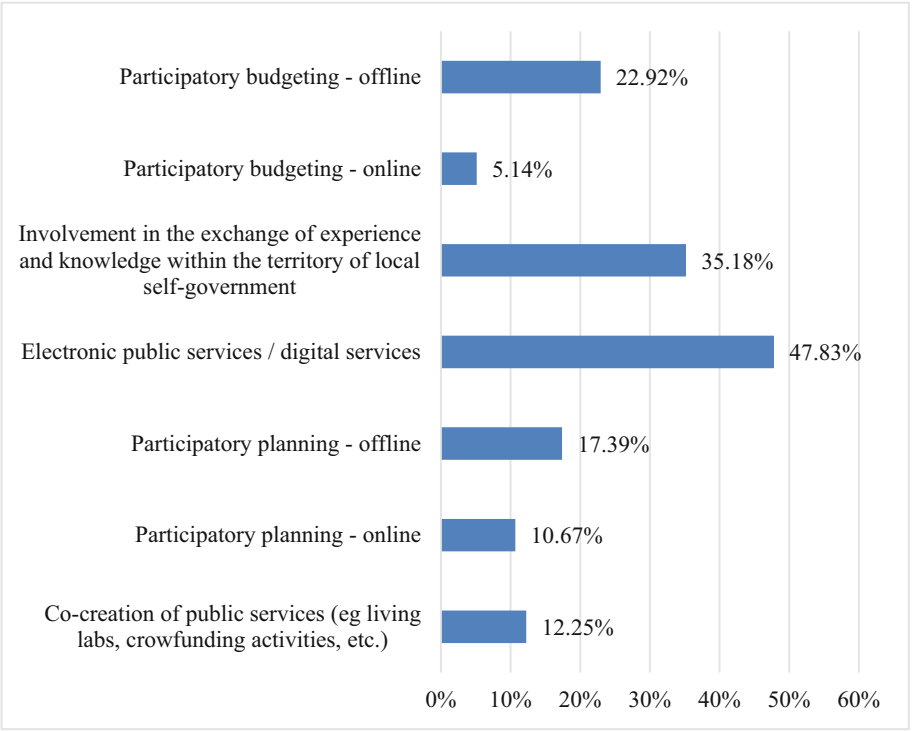


Fig. 3. Co-production tools for public services.

Physical participation in participatory planning is implemented by 17.39% of municipalities, while the online form is adopted by 10.67%. Although participatory budgeting is not mandatory for municipalities, 28.06% of them engage it. Of these, 22.92% utilize a form of physical participation in budgeting, while 5.14% utilize various online platforms and apps, typically based on freely available software solutions. Co-creation and co-production of public services, such as through living labs and crowdfunding activities are implemented by only 12.25% of municipalities. It is worth noting that a detailed examination of all these activities, in comparison to the theory of co-production, would likely reveal an even lower percentage of municipalities engaged in such practices.

Electronic/digital public services are more commonly provided by municipalities in larger size categories, as well as engaging in the exchange of experience and knowledge

within the local municipality territory. Furthermore, the representation of other tools is relatively consistent across the size categories of municipalities. Interestingly, participatory budgeting is more prevalent in the smallest size category of municipalities, despite the common issue in Slovakia, especially in small municipalities, of financing not only development activities but also the original competences mandated by law.

Among the communication tools (Fig. 4), the predominant ones include organizing events, which are implemented to different extents by all municipalities, and the municipality's website, which is established by 99.21% of municipalities. Surprisingly, three municipalities still have no website despite the digital age and the increasing trend towards digitization and the advancement of information and communication technologies.

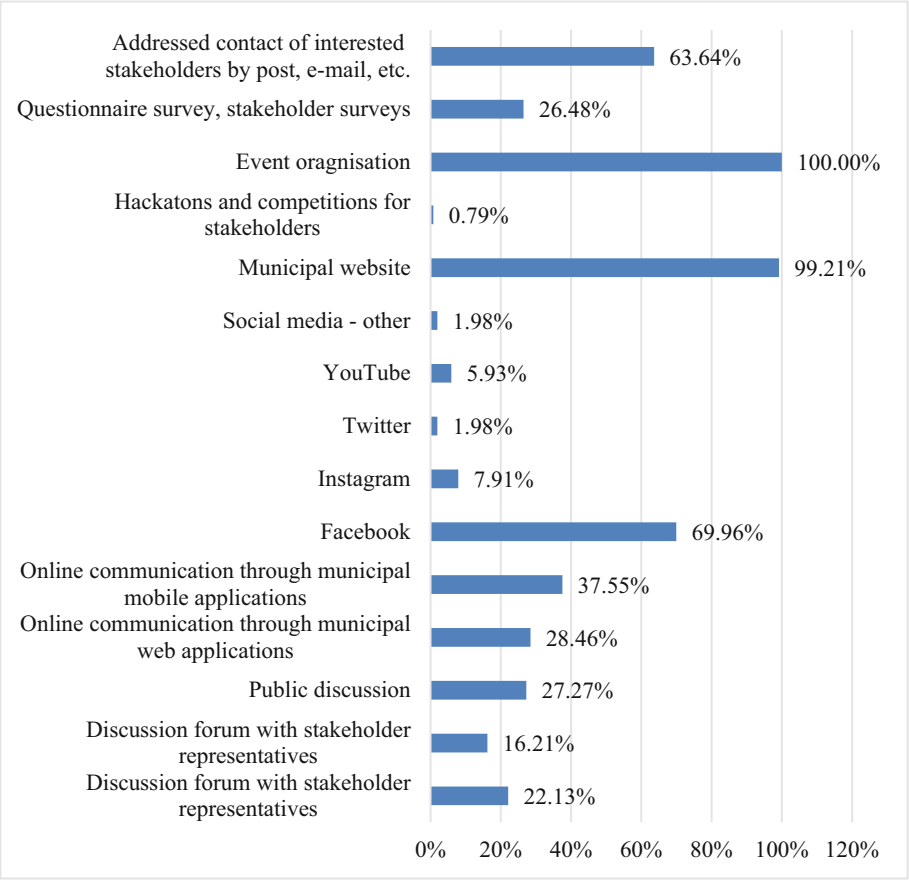


Fig. 4. Communication tools.

A positive aspect concerns the fact that 70% of municipalities maintain a profile on the Facebook social network. Other social media platforms are represented to a much lesser extent within municipalities. Among the communication tools, several are relatively

underrepresented in municipalities: public discussions (27.27%), questionnaire surveys (26.48%), online stakeholder feedback systems (22.13%), and discussion forums with stakeholder representatives (16.21%). Only two municipalities utilize hackathons and competitions for stakeholders as a part of their communication activities.

Interestingly, 64% of municipalities still rely on direct contact with stakeholders in traditional forms, notably by post or email, particularly prevalent in smaller-sized municipalities. This reliance on traditional communication methods may potentially hinder online communication, such as through mobile apps (37.55%) and web apps (28.46%). However, it can be assumed that this tendency is influenced by the age composition of the population in these municipalities.

When examining the communication activities of local municipalities, it is crucial to bear in mind that despite the advancements in information and communication technologies and the emergence of the "digital" generation, all citizens, irrespective of age or social status, should have access to information. This access is mandated by Article 26(4) of the Slovak Constitution. It poses a challenge for both municipalities and the state itself, not only in the provision of information, but also in the realm of further education aimed at acquiring digital skills and facilitating access to the Internet and ICT.

Of all the surveyed smart governance tools, Slovak municipalities with a population of up to 4,999 primarily utilize electronic/digital public services, 3D mapping systems, the municipality's website, communication with stakeholders via mail, email, and similar means, and online communication through mobile apps and social media platforms, specifically Facebook. Generally, as the size category of municipalities decreases, the use of each tool diminishes. This correlation was confirmed by the results of the correlation analysis, which indicated a weak direct linear dependence for up to 28 instruments.

The research also identified other factors that may influence tool implementation, such as the age and educational attainment of the mayor, as well as the existence of municipal development documents. For instance, the surveyed Slovak municipalities (253 in total) are governed by male mayors (67%) and female mayors (33%) (Fig. 5). However, the conducted research did not demonstrate a correlation between the gender of the mayor and the adoption of modern tools in the practices of Slovak municipalities.

The mayor of a municipality is an elected official expected to work professionally for the development of the municipality in line with the needs and interests of its inhabitants (Palúš, Hencovská 2013). Thus, this involves the implementation of smart governance tools into the practices of Slovak municipalities and the exercise of public power itself. Therefore, mayors should be competent individuals with appropriate education and expertise.

While current Slovak legislation does not mandate a minimum level of education or the demonstration of professional knowledge for elected representatives' duties, the educational background of mayors is notably positive. Over 56% of mayors possess a university degree, 40% have a secondary education, and none of the mayors in the research sample hold only a primary level of education (Fig. 6). Although a relatively high level of educational attainment among mayors is not a guarantee of expertise or effective municipal management, it does provide a foundation for general knowledge and further training. For only 23 tools, the correlation analysis revealed a weak direct dependence

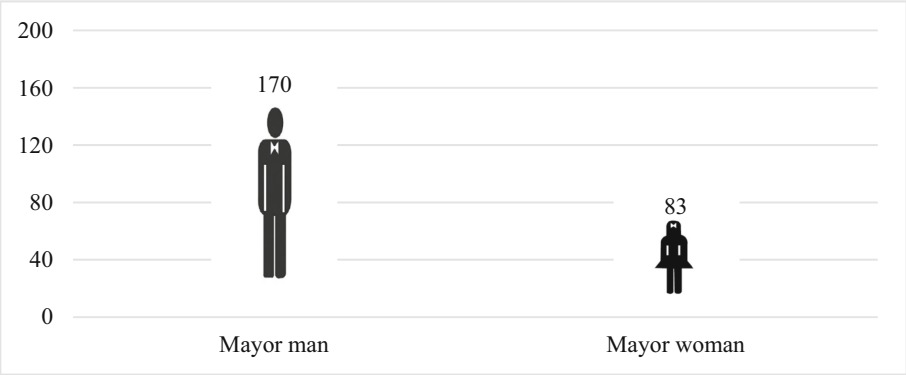


Fig. 5. Structure of mayors according to gender

between the mayor's highest level of education and the degree of implementation of modern tools in the practices of Slovak municipalities.

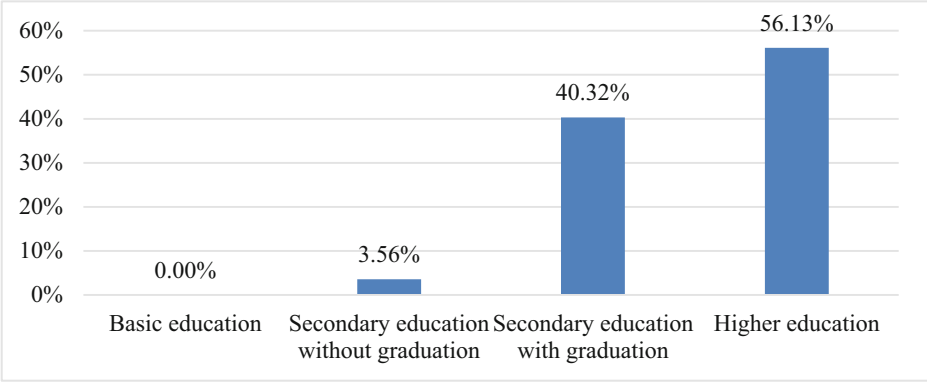


Fig. 6. Structure of mayors according to level of education.

As the research results show, we may observe a challenge with the average age of mayors (that is 51), which is relatively high. This is largely attributed to the trend of the gradual ageing of the population in small municipalities and the migration of young people from municipalities to cities in pursuit of education, employment, and a higher standard of living. The results of the correlation analysis indicate that the mayor's age plays a significant role in the implementation of modern tools in the practices of Slovak municipalities. For only 23 tools, the correlation analysis confirmed a weak direct relationship between the mayor's age and the implementation of modern tools.

A factor that could influence the implementation of smart governance tools in Slovak municipalities is a presence of a strategic document addressing the issue of smart municipalities or smart governance. According to the research findings, only seven (2.78%) small municipalities in Slovakia have developed a smart governance or smart municipality strategy, with four of them being in the largest size category. Additionally, it is

noteworthy that only 78.26% of municipalities possess a strategic development document of the municipality - the Programme of Economic and Social Development of the Municipality (hereafter referred to as "PHRSR"). Despite the requirement for municipalities to have a PHRSR in order to access resources from the state budget, the European Structural and Investment Funds (hereafter referred to as "ESIF"), and additional resources for development projects in the municipality (as stipulated by the Act of the National Assembly of the Slovak Republic No. 539/2008 Coll. on the promotion of regional development, as amended), not all municipalities have one in place.

As the size category of municipalities increases, there is a corresponding rise in the proportion of municipalities that have elaborated a Programme of Economic and Social Development of the Municipality (PHRSR), primarily due to the complexity of the elaboration process. Drafting a strategic development document is a demanding endeavour that necessitates substantial personnel and financial resources, which many municipalities, particularly the smallest ones in Slovakia, may lack. Additionally, there exists a challenge with motivating elected representatives of smaller municipalities to prepare a PHRSR, particularly if they lack sufficient financial resources to contribute to funding development activities from the state budget, European Structural and Investment Funds (ESIF), or other supplementary sources. The correlation analysis indicated a weak direct dependence between the completion of the PHRSR and the implementation of modern tools in practice for up to 23 tools.

The results of the "smart governance traffic light system" (Fig. 7) indicate that over 50% of municipalities are not actively pursuing smart governance initiatives in the realms of co-production tools and participatory democracy tools.

Within these categories, a considerable proportion of municipalities (more than 30% of Slovak municipalities) are currently in the process of developing smart governance within their self-government processes. Only around 10% of Slovak municipalities demonstrate a genuinely "smart" approach to governance within the co-production and participatory democracy toolsets. In the case of transparency and communication tools, over 50% of municipalities are in the developmental phase of adopting smart governance practices. However, while up to 43% of municipalities have yet to incorporate smart governance activities within the transparency tool category, only 8% of municipalities remain in this initial phase regarding communication tools. Additionally, 28% of municipalities are actively implementing smart governance approaches within their communication.

Correlation analysis within the framework of "smart governance traffic light" has also identified factors influencing the implementation of various smart governance tool groups by small Slovak municipalities. Alongside municipality size, the practical implementation of communication tools is influenced by the mayor's gender, regional affiliation, and the presence of strategic municipal documents (such as smart city or smart governance concepts and PHRSR). Research indicates that larger municipalities implement more often communication tools. Similarly, municipalities with developed strategic documents are more adept at applying smart governance communication tools. Interestingly, municipalities with male mayors tend to utilize communication tools more frequently.

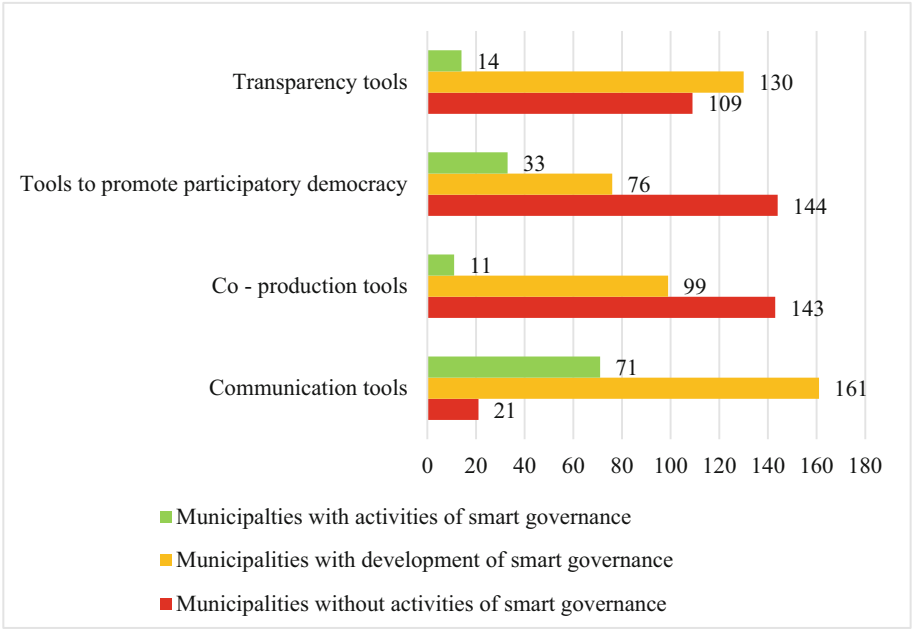


Fig. 7. Smart governance traffic light system

Moreover, there is a direct negative correlation between communication tools implementation and the regions of the municipalities, with tool usage increasing from east to west Slovakia.

Regional affiliation, municipality size, and the creation of PHRSR also impact the co-production tool group. In addition to these factors, the age of the mayor influences the implementation of co-production tools, with older mayors demonstrating higher usage rates of co-production tools.

Furthermore, the mayor's level of education affects the participation tool group, alongside municipality size and the presence of PHRSR. A mayor's educational attainment correlates with a greater implementation rate of participation tools. Lastly, alongside municipality size, the application of transparency tools is influenced by the mayor's age.

5 Conclusions

The research examines the adoption of smart governance tools in small local municipalities - villages (with less than 4,999 inhabitants) in Slovakia. The results show that while some tools are being used, their overall utilization remains relatively low.

The least widespread tools in small municipalities are e-democracy tools, but the inadequate utilization is also in case of the electronic/digital public services and direct forms. This may be related to the size of the municipalities studied and their financial and technical resources. We assume that the management of small and medium-sized

municipalities often believes that there is no need to prioritize digital forms of communication and public services due to the size of the territory/number of inhabitants in a small settlement. Another reason given by the management of small municipalities is an age structure of the population. By the research results, people of post-productive age represent on average more than a quarter of the population in smaller municipalities. It is generally assumed, and confirmed by our research that these people have lower levels of digital literacy. However, in the future, the management will have to expand the offer, as the number of users with digital skills is constantly increasing.

Communication is focused heavily on traditional forms. Despite the high use of websites and some social media, many local governments still rely on email communication and traditional forms of communication, which potentially hinders the availability of information for certain demographic groups, especially people of post-productive age and socially disadvantaged groups.

The insufficient use of transparency tools is a significant problem. Only a few local governments use tools such as open data portals or cloud storage, which hinders transparency efforts and slows down digitization and the building of an open data system.

Tools such as e-democracy platforms and electronic voting are rarely used, which indicates limited citizen participation in decision-making and limits the increase in engagement in the context of participatory democracy.

Another problem is a low co-production of public services in small local governments. While some local governments offer electronic public services and share knowledge, others have problems with the implementation of participatory planning or participation in general.

The results show that the size of the municipality affects the level of use of smart governance tools. Larger municipalities tend to use smarter governance tools more than smaller ones. In terms of the nature of the tools, the size of the municipality has a greater impact on the use of communication tools and tools focused on participatory processes.

Although a significant gender dependency has not been identified, the age of the mayor and the level of education may have an impact on the implementation of smart governance tools. The research also shows that the age of the mayor has an impact on the use of transparency tools and partly also on the co-production of public services, while the dependency on participation tools is mainly demonstrated in relation to the mayor's education.

According to our findings, another important factor in smart governance implementation is an existence of strategic documents. The results show that the existence of a development plan seems to be positively associated with the implementation of smart governance tools.

Based on our findings and empirical evidence, we have identified the following challenges for small local municipalities in Slovakia in the area of smart governance tools. The current challenge is to bridge the digital divide between users of smart governance tools through inclusion. It is important to use such forms of tools that ensure fair access to information and communication technologies for all citizens. The second current challenge is a continuous strengthening of digital literacy. Support for the development

of digital skills should be provided both among the inhabitants and employees of local governments, as it is necessary for the effective use of smart governance tools.

However, small local governments will not be able to cope with these challenges without targeted support from the state. Support and resources tailored to the specific needs of small local municipalities can help overcome specific challenges and help them move forward in smart governance.

Overall, the research emphasizes the need for further efforts to support the adoption of smart governance tools in Slovak local governments. By addressing the identified problems and providing targeted support, local governments can use these tools to enhance and increase transparency, citizen participation in governance and public service delivery, which will ultimately lead to improved governance and quality of life for their residents.

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References

Albino, V., Berardi, U., Dangelico, R.M.: Smart cities: definitions, dimensions, performance and initiatives. J. Urban Technol. **22**, 3–12 (2015)

Allahar, H.: What are the challenges of building a smart city? Technol. Innov. Manag. Rev. **10**(9), 38–48 (2020)

Anschütz, C., Ebner, K., Smolnik, S.: Size does matter: a maturity model of the special needs of small and medium-sized smart cities. Cities **150** (2024)

Ansell, C., Gash, A.: Collaborative governance in theory and practice. J. Public Adm. Res. Theory **18**(4), 543–571 (2008)

Baccarne, B., Mechant, P., Schuurman, D.: Empowered cities? An analysis of the structure and generated value of the smart city Ghent. In: Dameri, R., Rosenthal-Sabroux, C. (eds.) Smart City. Progress in IS, pp. 157–182. Springer, Cham (2014). https://doi.org/10.1007/978-3-319-06160-3_8

Bakici, T., Almirall, E., Wareham, J.: A smart city initiative: the case of Barcelona. J. Knowl. Econ. **4**(2), 135–148 (2013)

Bokun, K., Nazarko, J.: Smart villages concept – a bibliometric analysis and state-of-the-art literature review. Prog. Plan. **175** (2023)

Bolívar, M.P.R. (eds.): Smart Technologies for Smart Governments. Springer, Cham (2018). https://doi.org/10.1007/978-3-319-58577-2

Bolívar, M.P.R.: Transforming City Governments for Successful Smart Cities. Springer, Switzerland (2015). https://doi.org/10.1007/978-3-319-03167-5

Borseková, K., Korony, S., Vaňová, A., Vitálišová, K.: Functionality between the size and indicators of smart cities: a research challenge with policy implications. Cities **78**, 17–26 (2018)

Caragliu, A., Del Bo, C., Nijkamp, P.: Smart cities in Europe. J. Urban Technol. **18**(2), 65–82 (2011)

Castelnovo, A., et al.: Smart cities governance. the need for a holistic approach to assessing urban participatory policy making. Soc. Sci. Comput. Rev. **34**(6), 724–739 (2015)

Castelnovo, W.: Co-production makes cities smarter: citizens' participation in smart city initiatives, In: Fugini, M., Bracci, E., Sicilia, M. (eds.) Co-Production in the Public Sector. Experiences and Challenges, pp. 97–118 (2016)

Chichernea, V.: Smart cities communities and smart ICT platform. J. Inf. Syst. Oper. Manag. **1**(1), 1–11 (2015)
Chourabi, H., Nam, T., Walker, S., Gil-Garcia, J.R., Mellouli, S., Nahon, K., et al.: Understanding smart cities: an integrative framework. In Proceedings of the Annual Hawaii International Conference on System Science, pp. 2289–2297 (2012)
Cresbo, J.L., Cabral, J.: The institutional dimension to urban Governance and territorial management in the Lisbon metropolitan area. In: Análise Social, XLV (197), pp. 639–662 (2010)
De Guimarães, J.C.F., et al.: Governance and quality of life in smart cities: towards sustainable development goals. J. Clean. Prod. **253** (2020)
De Viron, C.K., Mudri, K.: Integrated approach to sustainable EU smart villages policies. In: Visvizi, A., Lytras, M.D., Mudri, G. (eds.) Smart Villages in the EU and Beyond (Emerald Studies in Politics and Technology), pp. 13–27. Emerald Publishing Limited, Bingley (2019)
Estevez, E., Janowski, T.: Electronic governance for sustainable development—conceptual framework and state of research. Gov. Inf. Q. **30**, 94–109 (2013)
Franzke, J., Roeder, E.: Chapter five Participatory budgeting in Berlin-Lichtenberg: an example of good urban governance? In: van den Dool, L., Hendriks, F., Gianoli, A., Schaap, L. (eds.) The Quest for Good Urban Governance. Urban and Regional Research International, pp. 87–103. Springer, Wiesbaden (2014). https://doi.org/10.1007/978-3-658-10079-7_5
Guenduez, A., Singler, S., Tomaczak, T., Schedler, K., Oberli, M.: Smart governmnet success factors. Swiss Yearb. Adm. Sci. **9**(1), 96–110 (2018)
Gil-Garcia, J.R., Pardo, T.A., Nam, T.: What makes a city smart? Identifying core components and proposing an integrative and comprehensive conceptualization. Inf. Policy **20**, 61–87 (2015)
Hajek, P., Youssef, A., Hajkova, V.: Recent developments in smart city assessment: a bibliometric and content analysis-based literature review. Cities **126**, 1–18 (2022)
Iammarino, S., Rodriguez-Pose, A., Storper, M.: Regional inequality in Europe: evidence, theory and policy implications. J. Econ. Geogr. **19**(2), 273–298 (2019)
Ibrahim, M., El-Zaart, A., Adams, C.: Smart sustainable cities roadmap: readiness for transformation towards urban sustainability. Sustain. Cities Soc. **60**(1), 530–540 (2018)
Johannessen, M.R., Berntzen, L.: Smart Technologies for Smart Governments: Transparency, Efficiency and Organizational Issues. Springer, Heidelberg (2018). https://doi.org/10.1007/978-3-319-58577-2
Kumar, V.T.M.: Smart Economy in Smart Cities, p. 1086. Springer, Singapore (2017)
Kumavat, H.R., Kumavat, R.V., Bhangale, H.V.: Proposed framework for sustainable village strategy in the semi-arid region of Maharashtra, India. In: Vadhera, S., Umre, B.S., Kalam, A. (eds.) Latest Trends in Renewable Energy Technologies. LNEE, vol. 760, pp. 161–171. Springer, Singapore (2021). https://doi.org/10.1007/978-981-16-1186-5_13
Lee, J., Lee, H.: Developing and validating a citizen-centric typology for smart city services. Gov. Inf. Q. **31**(1), 93–105 (2014)
Lombardi, P., Giordano, S., Farouh, H. Wael, Y.: An analytical network model for smart cities. In: Proceedings of the 11th International Symposium on the Analytical Hierarchy Process, Sorrento, Italy (2011)
Lopez, I., M., Oliveira, P.: Can a small city be considered a smart city? Proceedia Comput. Sci. **121**, 617–624 (2017). International Conference on ENTERprise Information Systems/ProjMAN - International Conference on Project MANagement/HCist - International Conference on Health and Social Care Information Systems and Technologies, CENTERIS/ProjMAN/HCist 2017, 8–10 November 2017, Barcelona, Spain (2017)
Lopez, N.V.: Smart governance: a key factor for smart cities implementation In: 2017 IEEE International Conference on Smart Grid and Smart Cities (ICSGSC) (2017)

Maheshwari, D., Janssen, M.: Reconceptualizing measuring, benchmarking for improving interoperability in smart ecosystems: the effect of ubiquitous data and crowdsourcing. Gov. Inf. Q. **31**, 84–92 (2014)

Mashau, N.L., Kroeze, J.H., Howard, G.R.: An integrated conceptual framework to assess small and rural municipalities' readiness for smart city implementation: a systematic literature review. In: Huang, Y.M., Lai, C.F., Rocha, T. (eds.) ICITL 2021. LNCS, vol. 13117, pp. 262–273. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-91540-7_28

Mellouli, S., Luna-Reyes, L.F., Zhang, J.: Smart government, citizen participation and open data. Inf. Polity **19**(1–4) (2014)

Michels, A., van Montfort, C.: Chapter nine Urban governance and partnerships in Indian and Chinese cities: examples from Delhi, Beijing and Shanghai. In: van den Dool, L., Hendriks, F., Gianoli, A., Schaap, L. (eds.) The Quest for Good Urban Governance. Urban and Regional Research International, pp. 165–183. Springer, Wiesbaden (2014). https://doi.org/10.1007/978-3-658-10079-7_9

Misuraca, G., Reid, A., Deakin, M.: European Commission, JRC Technical Notes, Serville (2011)

Nam, T., Pardo, T.A.: The changing face of a city government: a case study of Philly31. Gov. Inf. Q. **31**(1–9) (2014)

Nam, T., Pardo, T.A.: Conceptualizing smart city with dimensions of technology, people, and institutions. In: Proceedings of the 12th Annual International Conference on Digital Government Research, College Park, MD, New York, USA, pp. 282–291 (2011)

OECD: Smart Cities and Inclusive Growth. Building on the Outcomes of the 1st OECD Round Table on Smart Cities and Inclusive Growth, p. 59 (2020)

Osella, M., Ferro, E., Pautasso, E.: Toward a methodological approach to assess public value in smart cities. In: Gil-Garcia, J., Pardo, T., Nam, T. (eds.) Smarter as the New Urban Agenda. Public Administration and Information Technology, vol. 11, pp. 129–148. Springer, Cham (2016). https://doi.org/10.1007/978-3-319-17620-8_7

Peters, B.G.: The changing nature of public administration: from easy answers to hard questions. Viešoji Politika IR Administravimas **5**, 1–14 (2003)

Peters, P., Peters, G.: Governance, Politics and the State. Bloomsbury Publishing (2020)

Pianzola, J., Ladner, A.: Chapter six Voluntary public participation procedures in the City of Zurich: a step beyond direct democracy?. In: van den Dool, L., Hendriks, F., Gianoli, A., Schaap, L. (eds.) The Quest for Good Urban Governance. Urban and Regional Research International, pp. 105–125. Springer, Wiesbaden (2014). https://doi.org/10.1007/978-3-658-10079-7_6

Przeybilovicz, E., Cunha, M.A.: Governing in the digital age: the emergence of dynamics smart urban governance modes. Gov. Inf. Q. **41**(1), 1–14 (2022)

Ruhland, R.W.S.: The governance of smart cities: a systematic literature review. Cities **81**, 1–23 (2018)

Ruohomaa, H., Mäntyneva, M., Salminen, V.: Renewing a university to support smart manufacturing within a region. Digit. Transf. Smart Manuf., Chapter 8. IntechOpen (2018)

Schaap, L., Van Den Dool, L., Hendriks, F., Gianoli, A.: Good city-regional governance. In: International Conference the City Futures Conference, Paris, p. 21 (2014)

Scholl, H.J., Scholl, M.C.: Smart governance: a roadmap of research and practice. In: IConference 2017 Proceedings (2017)

Simonofski, A., Asensio, E.S., Wautelet, Y.: Chapter 4 - Citizen participation in the design of smart cities: methods and management. In: Visvizi, A., Lytras, M. (eds.) Smart Cities: Issues and Challenges, p. 372. Elsevier (2019)

Vaňová, A.: Trends in the Urban Development, p. 201. Univerzita Mateja Bela v Banskej Bystrici, Belianum, Banská Bystrica (2021)

Vitálišová, K.: Relationship Marketing in Local Municipalities, p. 227. Univerzita Mateja Bela v Banskej Bystrici, Belianum (2015)

Vitálišová, K., et al.: Smart Governance in Local Municipality – Governing with Reason, p. 231. Univerzita Mateja Bela v Banskej Bystrici, Belianum (2022)

Vitálišová, K., Sýkorová, K., Koróny, S., Laco, P., Vaňová, A., Borseková, K.: Digital transformation in local municipalities: theory versus practice. In: Rouet, G., Côme, T. (eds.) Participatory and Digital Democracy at the Local Level. CPS, pp. 207–226. Springer, Cham (2023). https://doi.org/10.1007/978-3-031-20943-7_13

Vitálišová, K., Vaňová, A., Borseková, K., Rojíková, D.: Promotion as a tool of smart governance in cities. In: Paiva, S., Lopes, S.I., Zitouni, R., Gupta, N., Lopes, S.F., Yonezawa, T. (eds.) Science and Technologies for Smart Cities. SmartCity360° 2020. LNICST, vol. 372, pp. 497–510. Springer, Cham (2021). https://doi.org/10.1007/978-3-030-76063-2_33

Weck, S., Beißwenger, S.: Coping with peripheralization: governance response in two German small cities. Eur. Plan. Stud. **22**(10), 2156–2217 (2014)

Wijnhoven, F. Ehrenhard, M., Kuhn, J.: Open government objectives and participation motivations. Gov. Inf. Quart. **32**(1), 30–42 (2015)

Zanella, A., Bui, N., Castellani, A., et al.: Internet of Things for smart cities. IEEE Internet Things J. **1**(1), 22–32 (2014)

Zhao, F., Fashola, O.I., Olarewaju, T.I., Onwumere, I.: Smart city research: a holistic and state-of-the art literature review. Cities **119** (2021)