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DEVELOPMENT OF SMART GOVERNANCE IN CROATIAN CITIES - THE SIZE OF A CITY AS A DETERMINANT OF SMART GOVERNANCE

Abstract

Purpose: The paper discusses the role and importance of smart governance as a modern form of urban development, identifies the key determinants of smart governance, analyzes models, evaluation and measurement indicators in smart and sustainable cities, and ranks 127 Croatian cities, regardless of city size.

Methodology: A comprehensive database was prepared for the preparation of the study, including ten indicators of key smart governance determinants related to political participation of citizens, delivery of quality services to citizens, and sustainable functioning of city administration, in line with a review of models and indicators from previous studies.

Results: The main goal of this research is to determine a correlation between the size of the city according to the number of inhabitants and statistically significant indicators of smart governance and, based on the value of the correlation coefficients, to determine the weights for the indicators in the process of city ranking. By aggregating the weighted z-scores, the Smart Governance Index was created for all Croatian cities and that index is not related to the size of a city.

Conclusion: Statistically significant indicators for the formation of the Smart Governance Index for 127 cities in Croatia are the indicators of political participation and sustainable functioning of city administration. It is necessary to include as many indicators as possible in the future period so that the ranking results are as relevant as possible.

Keywords: Smart governance, Hellwig's information capacity method, ranking, smart and sustainable city

1. *Introduction*

The paper highlights the importance of smart governance as one of the dimensions of a smart and sustainable city, i.e., the aim of this research is to evaluate the impact of a set of indicators through political participation of citizens, the provision of quality services to citizens, and the sustainable functioning of city management after a review of similar studies. Therefore, the first part of the paper presents a research gap, motives and reasons for research, and defines the hypotheses and research questions of the study. The sample in this

research consists of 127 Croatian cities to fill a gap in the scientific literature, which mainly lists large cities, county centers or only certain regions of the country, as Jurlina Alibegović et al. (2018) ranked the 25 largest Croatian cities and county centers by Urban Development Index. The Apsolon Strategy (2020) ranked 20 largest Croatian cities by the Digital Readiness Index. The motive for this research is to fill precisely this gap in order to give small and medium-sized cities the opportunity to evaluate and compare themselves with large cities, as this research includes the entire population of the cities in the Republic of Croatia (with the exception of Zagreb[1]). One of the motivations is also the fact that numerous small and medium-sized cities undertake a number of activities to provide quality public services to their citizens, which is why the study is guided by the following research questions (RQ):

RQ1: Do large Croatian cities achieve better results in terms of the Smart Governance Index?
RQ2: What is the relationship between the size of a city in relation to the number of inhabitants and statistically significant indicators of smart governance in the Republic of Croatia?

In the second part of the paper, the definitions of smart governance and all of its segments are presented according to the scientific literature. Then, a detailed overview of models and indicators from previous research in the dimension of smart governance is presented in *Appendix 1,* such as European Smart City Ranking [ESCR] - Griffinger et al. (2007), Triple Helix Approach [THA] - Lombardi et al. (2012), The Smart City Index Master Indicators [SCIMI] - Cohen (2014), City Keys - Bosch et al. (2017), as well as various organizations, such as the International Standardization Organization [ISO], the International Telecommunication Unit [ITU], the United for Smart Sustainable Cities [U4SSC], the World Council on City Data [WCCD], and other companies like Cisco, Microsoft, Ericsson, IBM, Siemens, Oracle, etc. A review of models and international standardization organizations refers to the identification of indicators that can be used to monitor progress of the city in terms of the quality of urban services, digital channels for interaction with citizens and legal entities in the city, rapid communication with citizens through social networks, citizen participation in the work of city administration through their participation in forming the city budget, warning of deficiencies in the physical environment, monitoring satisfaction with the introduction of new technologies, and defining and monitoring the performance of an individual city to determine its position and identify the best and worst places and activities undertaken for the purpose of improvement.

The methodological part of the paper presents the concept, an empirical model and explanations of the correlation analysis method developed by Hellwig (1969), which is known in the scientific literature as Hellwig's information capacity method. The method was applied to determine the relationship between the size of the city and the number of inhabitants and ten smart governance indicators. Based on the value of correlation coefficients, only four indicators were selected and weighted so that the Smart Governance Index could be created by calculating the weighted sum for each city.

The ranking of the cities and the interpretation and explanation of the research results are presented for the three groups of cities (i.e., large cities - more than 35,000 inhabitants, medium-sized cities - from 10,000 to 35,000 inhabitants, and small cities - up to 10,000 inhabitants) used in the model. The conclusions, recommendations and implications for future research are given in the last part.

2. Literature review

2.1 Determinants of smart governance

Smart governance is becoming an indispensable component of smart and sustainable cities, mostly as one of the dimensions of smart and sustainable cities.

According to the definition of a smart city provided by the International Organization for Standardization (ISO, 2014), a smart city is a new concept that uses a new generation of information technologies such as the Internet of Things, cloud computing, Big Data, and geographic information integration for easier planning, governance building, and smart city services.

A similar definition exists for smart governance as one of the most important dimensions of smart and sustainable cities, which includes activities related to transforming local government into a transparent, efficient, and open administration for its citizens using information and communication technologies, and formulating appropriate smart city policies (Gil-Garcia et al., 2014).

1 As the capital of the Republic of Croatia, the City of Zagreb is excluded from the analysis because in addition to city status, it also has county status, and the values of Zagreb indicators are incomparable with those of other cities (Official Gazette, 2020; Law on Local and Regional Self-Government - consolidated text).

There are many different views and perspectives on the concepts of smart city and smart governance. Some of them are very broad and encompass the essence of governance, but most definitions focus on the use of new information and communication technologies, especially in the literature of the last two decades.

In the early 21st century, Kliksberg (2000) defined smart governance as city governments finding intelligent and elegant solutions to complex administrative problems in local government.

Scholl & Scholl (2014) believe that smart governance is the umbrella term for many digital initiatives in the public sector that use new technologies to creatively connect the physical, digital, public, and private environments.

According to Meijer & Bolivar (2016), effective and efficient city governance depends on city authorities turning to innovative solutions to address the challenges of financing the development of a smart city while maintaining a strong citizen focus. Smart governance means making the right policy decisions and implementing them effectively. Smart governance emphasizes the need for smart decision making and involves the processes and implementation of those decisions. New technologies are used to strengthen management rationality by using more complete and better information in the decision-making process.

According to Andermatt & Göldi (2018), smart governance is not only about digitizing existing processes and services, but also about developing and establishing entirely new processes and public services in a participatory way for citizens.

The authors Juričić & Zekić (2018) believe that smart governance implies a new approach to managing all city resources using ICT tools and refers to people, processes, data, and technological solutions that aim to create a more sustainable and productive community. This includes establishing a transparent and publicly visible decision-making process, and the processes should be presented and made available to all stakeholders and ensure citizen participation in public actions. It is critical that public services provided to citizens be accessible and measurable in order to improve services and make them more cost-effective, accessible, and useful.

Some authors emphasize the role and importance of implementing city government policies and decisions since the transformation to smart governance, which means creating a smart administration that uses sophisticated information technologies to connect and integrate information, processes, institutions, and physical infrastructure to better serve citizens and communities (Meijer & Bolivar, 2016).

Research on public administration highlights various aspects of smart city administration and governance, such as e-government (Vinod Kumar & Dahiya, 2017), performance management, employee financing, leadership, and vision, but the activities are mainly related to the role of city authorities in providing better public services.

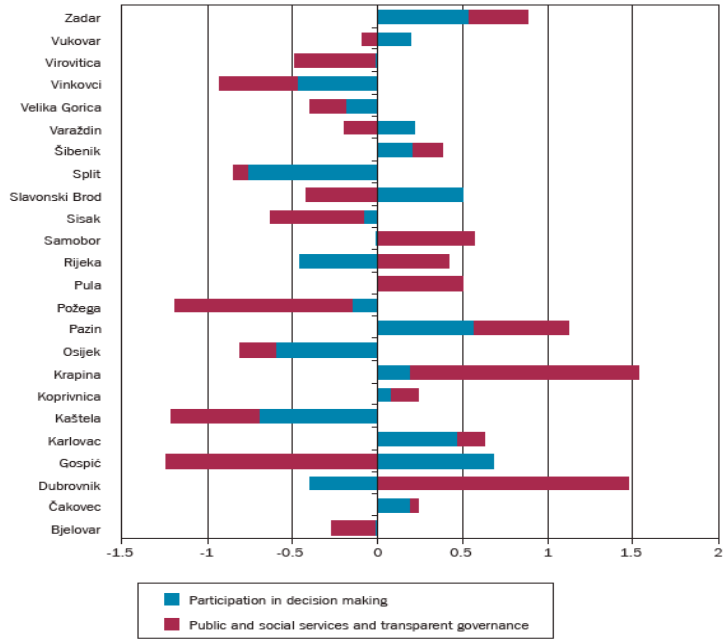
According to Bertot et al. (2016), modernization occurs through seven innovations in digital public services: transparent - citizens are aware of service decisions made by the government, participatory - citizens can participate in such government decisions, anticipatory - the government initiates service delivery to citizens, personalized - citizens choose how they want to receive services, co-created - the government and citizens participate in co-provision of services, context-aware - service providers are aware of the service context, and intelligent context - service providers use context awareness for better service delivery.

Komninos et al. (2021) presented the standardization of smart city government projects that include online citizen management services, public service co-creation, citizen applications, complaints, sending requests to the cities, a citizen database and profile platform, open data, data sharing with citizens and entrepreneurs, a GIS data center, digital payments, an integrated city management system, and a command center.

3. *Ranking in Croatia and in the world*

Croatian cities are on a particular upswing in terms of their development, and this is not the first time they have been ranked. A group of authors conducted research and ranked the 25 largest Croatian cities and county centers according to the ESCR model, focusing on urbanization and evaluation of individual cities represented by the Smart Urban Development Index (Jurlina Alibegović et al., 2018). It is interesting to note that similar indicators were used in this research and that the size of the city by population did not affect the position in the ranking of Croatian cities, because the best small Croatian cities are Krapina and Pazin, and the best large city is Zadar (Figure 1).

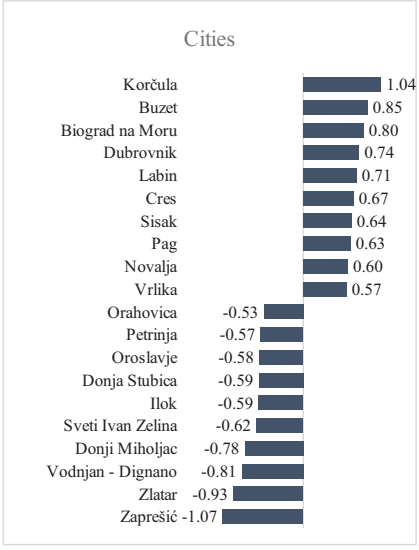
Figure 1 Ranking of 25 cities, smart governance dimension - ESCR model



Source: Jurlina Alibegović et al. (2018)

Babić (2021) created a model to evaluate the efficiency of 127 Croatian cities according to the method of equal weighting, and in the smart government dimension (Figure 2), according to seven indicators, most small Croatian cities (Korčula, Buzet, Biograd na Moru, Labin, Cres, Pag) and two large cities (Sisak and Dubrovnik) took the top position.

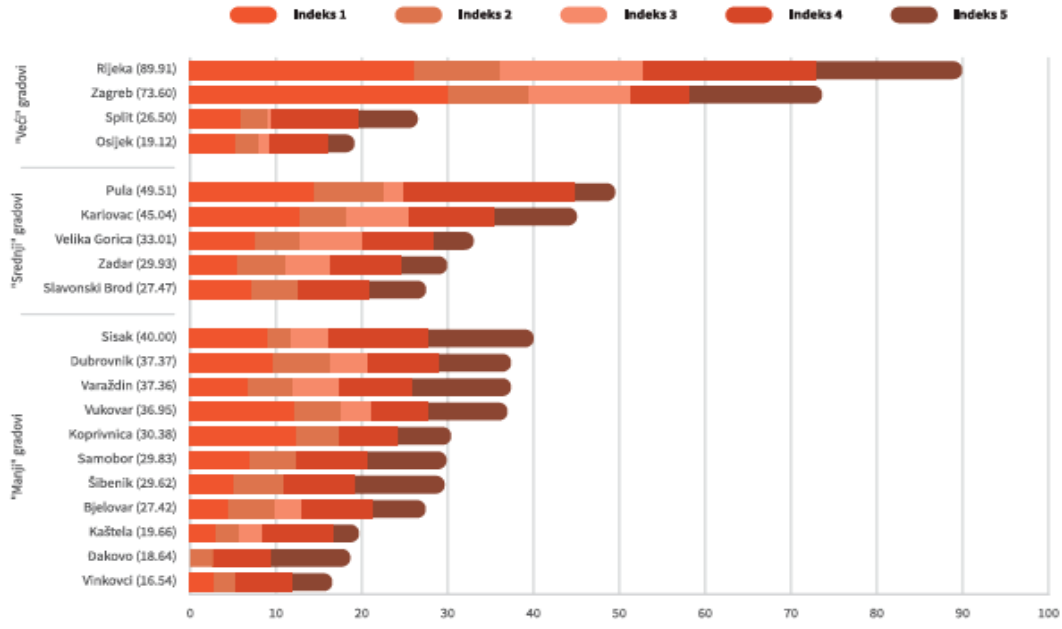
Figure 2 Ten best and worst cities - smart governance



Source: Babić (2021)

Every year, 20 largest Croatian cities are evaluated based on the Digital Readiness Index, which is a complex index consisting of the following five individual indices: availability and quality of e-services, service information and unique payment systems, availability of city data, citizen participation in decision-making, and communication channels between city administration and citizens (Apsolon Strategy, 2021). The city with the best rating in terms of the Digital Readiness Index is Rijeka. Since the conducted research refers to indicators that are most similar to the smart governance indicators, a realistic basis for extending research to all other cities was created so that they can be evaluated and compared with the best in the ranking.

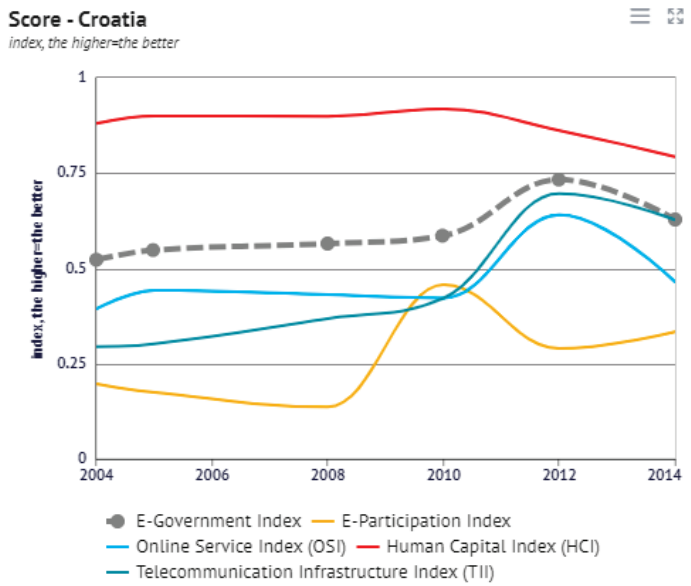
Figure 3 Ranking of the 20 largest Croatian cities - Digital Readiness Index



Source: Apsolon Strategy (2021)

Globally speaking, the ranking is conducted mainly in large cities. Every two years, the United Nations (2020) ranks 193 UN member states and their cities on the relative ability of their governments to use ICT to provide online services and engage their citizens in public policy through the E-Government Development Index [EDGI]. In addition to countries, cities are also evaluated; 40 cities in 2018, among which Moscow performed best, and 100 cities in 2020, with Madrid performing best. In addition to cities, the aforementioned index also ranks countries, and it is noticeable that according to the EDGI index, out of 193 countries, the Republic of Croatia rises from 51st place in 2003 to 39th place in 2020 (United Nations, 2020).

Figure 4 EDGI index - Croatia



Source: United Nations (2020)

4. An overview of models and indicators related to smart governance

In the phase of selecting suitable indicators for empirical research, the model, the structure of indicators, the basic purpose of the model and the scope of application were studied in order to create a model for evaluating the influence of individual indicators in the smart governance dimension. How successful Croatian cities are can be determined by well-defined standards that enable each city to develop in the desired direction.

Therefore, *Appendix 1* provides a detailed overview of the models and indicators used in previous research. Based on these models and indicators, Croatian models of smart governance are formed, including indicators of political participation (proportion of voters in local elections, citizen participation in budget preparation), economic transparency (budget transparency, a list of utilities, digital communication channels, household expenditure per capita), and sustainable functioning of city administration (digital forms for citizens, Wi-Fi, e-invoice, GIS).

It is important to note that almost all models are developed for a particular segment and research object, and most often the main segment is the size of the city and a particular territorial unit. For example, the ESCR model was developed for medium-sized European cities only, the U4SSC model adapted the number of dimensions to the city being evaluated, and the City Keys model used a structured data set as indicators to monitor the evolution of large cities over time. ITU focused its indicators on the technical component of the city, i.e., the impact of ICT technologies in all dimensions of highly developed cities, while ISO 37120 and 37122 included indicators developed for all cities regardless of their size and geographical location (Babić, 2021).

The frequency of occurrence of certain indicators in the smart governance dimension in almost all models speaks to the importance of these indicators and their influence on thinking about the level of intelligence and sustainability in the smart governance dimension.

This paper uses indicators based on the ISO 37120 (ISO, 2018) and ISO 37122 (ISO, 2019) standards, which apply to all cities regardless of their size and geographical location, creating a new framework for comparing cities based on available indicators for all cities in Croatia.

5. Methodology

All data for the creation of indicators are from 2019 and 2020. Taking into account the holistic approach and local specifics of Croatian cities, the model for ranking Croatian smart cities in the smart governance dimension consists of 10 indicators, i.e., three quantitative and seven categorical indicators.

These indicators are the proportion of voters in local elections - the State Electoral Commission of the Republic of Croatia (2021), budget expenditure per inhabitant and budget transparency, upon official request to the Institute of Public Finance (2020), digital communication channels, a list of city utilities, citizen participation in budget preparation, digital forms for citizens, GIS - author's insight into the websites of 127 Croatian cities, retrieved on 23 and 25 June 2021.

It is also important to note that the Wi-Fi indicator will be fulfilled by all Croatian cities after the accession and successful implementation of the European initiative WiFi4EU (Knezović, 2020), and the e-invoice indicator will also be fulfilled by all Croatian cities according to the 2019 legal provision (Law on Electronic Issuance of Invoices in Public Procurement, 2018). Descriptive statistics are presented in tables 1 and 2.

Table 1 Descriptive statistics of quantitative indicators of smart governance

Indicators	Smart Governance							
	Valid N	Mean	Median	Min	Max	Percentile 25%	Percentile 50%	Std.Dev.
Proportion of voters in local elections	127	46%	46%	29%	65%	42%	46%	7%
Budget expenditures per capita	127	6.126	5.471	2.542	14.426	4.493	5.471	2.428
Budget transparency	127	4.5	5	1	5	4	5	0.84

Source: Authors

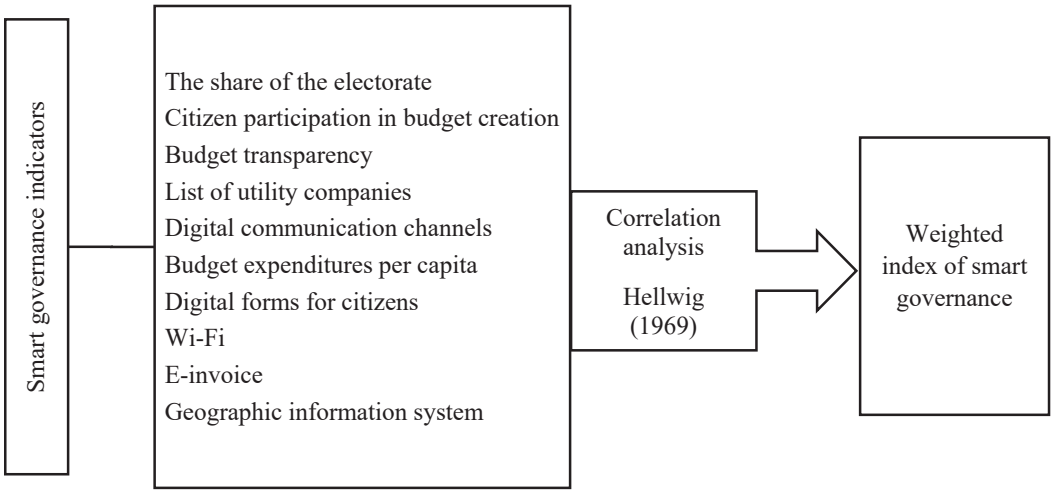
Table 2 Descriptive statistics of categorical indicators of smart governance

Wi-Fi			**Frequency**	**Percent**	**Cumulative Percent**
	Valid	Have	127	100 %	100 %
E-invoice			**Frequency**	**Percent**	**Cumulative Percent**
	Valid	Have	127	100 %	100 %
GIS			**Frequency**	**Percent**	**Cumulative Percent**
	Valid	No	98	77 %	77 %
		Have	29	23 %	100 %
		Total	127	100 %	
Digital communication channels			**Frequency**	**Percent**	**Cumulative Percent**
	Valid	No	23	18 %	18 %
		Have	104	82 %	100 %
		Total	127	100 %	
Citizen participation in budget creation			**Frequency**	**Percent**	**Cumulative Percent**
	Valid	No	113	89 %	89 %
		Have	14	11 %	100 %
		Total	127	100 %	
List of city utility companies			**Frequency**	**Percent**	**Cumulative Percent**
	Valid	No	35	28 %	28 %
		Have	92	72 %	100 %
		Total	127	100 %	
Digital forms for citizens			**Frequency**	**Percent**	**Cumulative Percent**
	Valid	No	35	28 %	28 %
		Have	92	72 %	100 %
		Total	127	100 %	

Source: Authors

Based on the presented descriptive statistics of the indicators, a smart government model for the creation of the Smart Governance Index was presented, which is the basis for ranking the cities.

Figure 5 Smart governance model



Source: Authors

Descriptive statistics and correlation analyses were calculated using Statistica software. Correlation represents a relationship between different phenomena represented by the values of two variables. In accordance with the presented research objective, we tried to investigate whether the size of the city by population is related to the values of the smart governance indicators, and based on the values of the correlation coefficients, we tried to interpret the importance of each indicator in the model.

Prior to correlation analysis, referred to as "information capacity" (Hellwig, 1969), all indicator values are standardized using the z-transformation method, which determines the universal unit of measurement and the relative position of the value in the overall distribution in relation to the average value, and accordingly, all indices are expressed as positive and negative values according to the formula:

$$z = \frac{x - \mu}{\sigma}$$

In addition to studying the relationship between the above indicators, correlation analysis is also used to assign weights in the ranking process (Booysen, 2002; Organization for Economic Co-operation and Development [OECD], European Union [EU] & Joint Research Center [JRC], 2008; Greco et al., 2019). This method uses correlation coefficients to determine the weights of the indicators. This ensures that the indicators with the highest correlation (Table 3) receive the highest weights, i.e., the weights of the indicators are proportional to the sum of the absolute values of the correlation coefficients from the correlation matrix (Hellwig, 1969; Ray, 2008). This is an objective weighting method that is widely used in scientific research. The basic requirement for an indicator to be included in the weighting procedure is that it must be statistically significant with respect to the assumed significance level of 0.05 (Barańska, 2019; OECD, 2008), i.e., McGranahan et al. (1970) consider that indicators that are not significant should be excluded from the model. Therefore, the model of this study is based on 4 indicators that are marked as statistically significant in Table 3.

Table 3 Correlation analysis of the endogenous population variable with ten smart governance indicators

Correlations (Spreadsheet2) Marked correlations are significant at p < .05000 N = 127 (Casewise deletion of missing data)	
Variable	**Population estimates 2019**
Proportion of voters in local elections	**0.323**
Budget expenditures per capita	0.140
Budget transparency	0.160
Digital communication channels	0.055
List of city utility companies	**0.183**
Citizen participation in budget creation	**0.206**
Digital forms for citizens	0.143
Geographic information system (GIS)	**0.271**
E-invoice	
Wi-Fi	

Source: Authors

It is important to note that the **Wi-Fi** network and **E-invoice** indicators are met in all Croatian cities and are therefore not included in the table.

The calculated correlations are used as a basis for further calculation of weighted z-values with significant variables. The values are calculated as follows:

$$w_i = \frac{|k_i|}{\sum_{j=1}^{5} |k_j|}, \text{ for i = 1, 2,..., 5,}$$

where $\sum_{i=1}^{5} w_i = 1$ to obtain the weighted sum as a final product.

Then, each indicator is multiplied by the obtained weight and we obtain a weighted sum for each city as

$$y_j = \sum_{i=1}^{5} w_i z_{ij} \text{ for j = 1, ..., 127.}$$

The obtained result represents the Smart Governance Index for each city and is the basis for ranking.

The performed correlation analysis shows a positive correlation between the size of the city, measured by the number of inhabitants, and four smart governance indicators, which were found to be significant and reached the highest correlation, namely proportion of voters in the last local elections (0.323), GIS (0.271), citizen participation in the creation of a budget (0.206), and a list of city utility companies (0.183).

Indicator weighting naturally leads to the last step in the formation of a composite index using the aggregation method. All standardized values of the indicators were multiplied by the weights that resulted from correlation analysis and aggregated into an index with positive and negative values. A detailed overview of the z-values of the four smart governance indicators and the values of the Smart Governance Index can be found in *Appendix 2.*

Using correlation analysis, Ray (1989) produced the Social Development Index [SDI] for 40 countries that includes 13 indicators of urbanization and industrialization, health status, nutritional level, educational level, and social communication. High cross-correlation coefficients of the variables resulted in weights according to which the SDI represents a combination of weighted variables in 40 countries.

6. Results and discussion

From the overview given in Chart 1, the number of positively and negatively rated cities is divided into three groups according to the number of inhabitants, i.e., the total number of positively rated cities is 60, and the number of negatively rated cities is 67, again confirming the hypothesis that the size of the city is not related to the smart governance indicators.

Chart 1 Positively and negatively rated Croatian cities

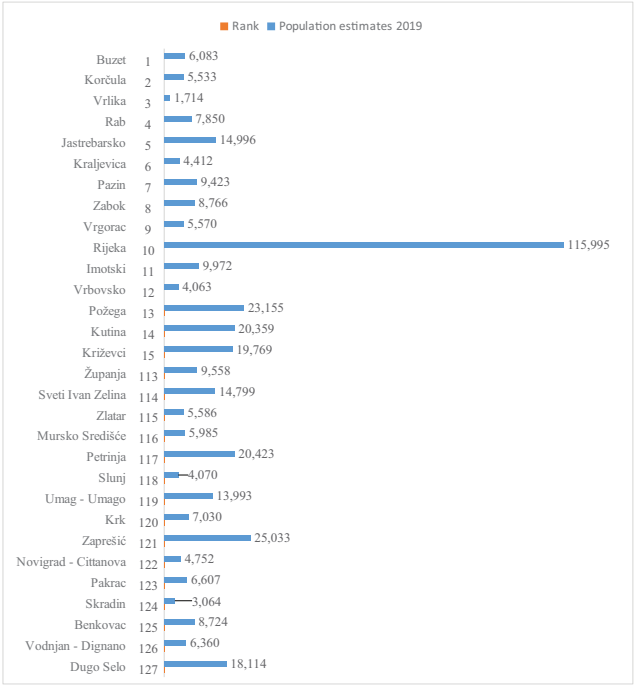
Source: Authors

In the category of large cities, there are 9 positively rated cities, and the research results overlap with the results obtained in previous studies by Apsolon Strategy (2020) - Figure 2. These cities are: Rijeka, Sisak, Dubrovnik, Split, Karlovac, Velika Gorica, Osijek, Bjelovar, and Pula - Pola.

The situation is almost the same in the category of medium-sized cities with 10,000 to 35,000 inhabitants, i.e., it is similar to the category of the smallest cities with up to 10,000 inhabitants.

To better understand the ranking, Chart 2 shows 15 best and 15 worst ranked cities. For all cities, Graph 2 highlights rank and population as endogenous variables.

Chart 2 Fifteen best and fifteen worst-ranked cities in the smart governance dimension



Source: Authors

All of the top 15 ranked cities achieved high levels of turnout in local elections (e.g., Buzet 54%, Korčula 58%, and Vrlika 57%). The top ranked cities also achieved high scores in citizen participation in the preparation of city budget indicators, mostly positive scores for categorical indicators such as GIS and the list of city utilities on the city websites.

The lower ranked cities scored below average on quantitative and categorical indicators, such as the proportion of voters in local elections, i.e., Benkovac 29%, Krk 32%, and Vodnjan - Dignano 35%.

It is noticeable that among the first 15 cities there is only one big city, Rijeka, while the rest are small Croatian cities. The City of Rijeka also ranks first among the 20 largest Croatian cities when it comes to the Digital Readiness Index in previous research (Apsolon Strategy, 2021).

In accordance with the research objectives, we can conclude that there is no correlation between the size of the city, measured by the number of inhabitants, and statistically significant indicators of smart governance.

Similarly, among the 15 lowest ranked cities, there is not a single large city, i.e., all cities are small or medium-sized. From the chart above, we can reconfirm that the size of the city, in terms of population, is not associated with a better ranking position, and that small and medium-sized cities take many initiatives in the field of smart governance. These index values justify the correlation analysis performed to determine a correlation between the size of the city by population and four statistically significant indicators of smart governance finding positive but mostly weak correlations with the endogenous variable.

Comparing the results shown in Chart 2 and the ranking shown in Figure 2, we see that there is much overlap in the results, regardless of the type of methodology and the number of indicators. Above are the Croatian small towns of Buzet and Korčula, below are Zaprešić, Vodnjan-Dignano, Pakrac, and others.

In all studies on previous results and in this study, two large Croatian cities, Rijeka and Dubrovnik, are among the best rated cities.

From the study conducted and previous research, we can conclude that it is necessary to implement a large number of initiatives to introduce new technologies and ICT solutions to enable the connection and digitalization of all actors to achieve savings and better quality of services to citizens, which has been confirmed by numerous studies.

Lopes (2017) conducted six interviews with people involved in smart city initiatives in Brazil, Singapore, Colombia, Portugal and Uruguay to find out what management models are implemented in smart cities, and to prove that smart cities and e-government represent a similar development path and that advanced technologies, innovations and smart governance are important prerequisites for the development of smart, creative, innovative and sustainable cities.

Based on a survey of 17 smart city experts and 60 citizens of Split, Čukušić et al. (2019) concluded that a strategic point of view should be the starting point for the implementation of smart solutions in smart cities and that it is necessary to monitor the development of innovations, and set clear goals by undertaking activities towards implementation in urban infrastructure, taking into account the priorities and needs of citizens. In addition, the authors proposed 59 smart solutions, such as digital licensing and business licensing, online retraining programs, disaster early warning systems, real-time crime mapping, predictive policing, etc.

Tomor et al. (2019) examined the relationship between ICT-enabled collaboration between citizens and policymakers in cities and concluded that while governments encourage online and offline citizen engagement, in practice they do not adequately support citizen participation, and that responsibility for the lack of collaboration lies with citizens and government leaders, regardless of the availability of ICT technologies for communication.

7. Conclusions and implications

In the conducted research, using Croatian cities as an example, we found that the size of the city, measured by the number of inhabitants, has no significant relationship with the values of smart governance indicators, which was confirmed in the ranking phase, when we aggregated the weighted values of the significant indicators to the Smart Governance Index. The study showed that small Croatian cities with up to 10,000 inhabitants hold a high-ranking position, and that the situation is similar at the lower end of the ranking, where mainly small and medium-sized cities are found, which confirmed the hypothesis that the size of the

city by the number of inhabitants does not affect a better ranking position, and that the Smart Governance Index is also not related to the size of the city by the number of inhabitants. Another objective of this study was also achieved, namely to allow small and medium-sized cities to evaluate and compare themselves with the top-ranked cities from previous studies.

The main scientific contribution of this study is the first complete analysis that includes all Croatian cities and new methodological guidelines for ranking cities.

The practical contribution of the study is reflected in the possibility of providing guidelines for local decision makers to increase the transparency of the economy, promote political participation and create more trust among citizens, as well as in additional investments in digitalization, which enables the collection and processing of large amounts of data with the help of ICT technologies.

The study has additional potential in terms of extending the analysis of the existing model with new indicators such as the number of online visits to the city open data portal, the average response time of the city system to relevant requests, etc. The applied method, like any other, has its advantages and disadvantages. The advantage is that weights were calculated for each indicator based on certain correlation coefficients to avoid subjectivity in assigning weights when calculating the Smart Governance Index. For future research that includes ranking, there is an opportunity to use multi-criteria ranking methods such as principal component analysis [PCA], factorial analysis, and data envelopment analysis [DEA] to determine the efficiency, maturity, and the functionality of smart governance, which is certainly an important scientific contribution.

There are unanswered questions in the implementation of smart solutions in smart cities, where both government and citizens play a key role, but also that progress depends on the strategic approach of those who manage. It is necessary to increase citizen engagement and support the development of new smart governance models, introduce new smart city governance indicators, and create rankings in the future to monitor progress of Croatian cities. There is a need to create a register of open data listing all implemented, ongoing and planned activities in the field of smart governance.

References

1. Andermatt, K. C. & Göldi, R. A. (2018). Introducing an Electronic Identity: The Co-design Approach in the Canton of Schaffhausen. *Swiss Yearbook of Administrative Sciences, 9*(1), 41-50. https://doi.org/10.5334/ssas.122
2. Apsolon strategija (2020). *Digital readiness index of Croatian cities*. https://apsolon.com/publikacije/analiza-digitalne-spremnosti-hrvatskih-gradova-2020/
3. Babić, A. (2021). *A Study of the Efficiency of Cities in the Republic of Croatia in Accordance with ISO 37120 and ISO 37122 Standards and the Dimensions of Smart Cities* [Doctoral dissertation, University of Rijeka]. University of Rijeka.
4. Barańska, A. (2019). Correlation Analysis in the Process of Weighting Real Property Attributes. *Real Estate Management and Valuation, 27*(4), 74-84. https://doi.org/10.2478/remav-2019-0037
5. Bosch, P., Jongeneel, S., Rovers, V., Neumann, H. M., Airaksinen, M. & Huovila, A. (2017). *CITYkeys indicators for smart city projects and smart cities*. http://nws.eurocities.eu/MediaShell/media/CITYkeysD14IndicatorsforsmartcityprojectsandsmartcitiesFINAL.pdf
6. Booysen, F. (2002). An Overview and Evaluation of Composite Indices of Development. *Social Indicators Research, 59*, 115-151. https://doi.org/10.1023/A:1016275505152
7. Bertot, J., Estevez, E. & Janowski, T. (2016). Universal and contextualized public services: Digital public service innovation framework. *Government Information Quarterly, 33*(2), 211-222. https://doi.org/10.1016/j.giq.2016.05.004
8. Cohen, B. (2014). *The main indicators of a smart city.* Smart Cities Council. http://smartcitiescouncil.com/resources/smart-city-index-master-indicators-survey
9. Čukušić, M., Jadrić, M. & Mijač, T. (2019). Identifying challenges and priorities for developing smart city initiatives and applications. *Croatian Operational Research Review, 10*(1), 117-129. https://doi.org/10.17535/crorr.2019.0011
10. Gil-Garcia, J. R., Helbig, N. & Ojo, A. (2014). Being smart: Emerging technologies and innovation in the public sector. *Government Information Quarterly, 31*(S1), 1-18. https://doi.org/10.1016/j.giq.2014.09.001
11. Greco, S., Ishizaka, A., Tasiou, M. & Torrisi, G. (2019). On the Methodological Framework of Composite Indices: A Review of the Issues of Weighting, Aggregation, and Robustness. *Social Indicators Research, 141*(1), 61-94. https://doi.org/10.1007/s11205-017-1832-9
12. Griffinger, R., Fertner, C., Kramar, H., Kalasek, R., Pichler-Milanovic, N. & Meijers, E. (2007). *Smart cities: Ranking of European medium-sized cities*. http://www.smart-cities.eu/download/smart_cities_final_report.pdf
13. Hellwig, Z. (1969). On the problem of weighting in international comparisons. In Gostkowski, Z. (Ed.), *Toward a system of human resources-indicators for less developed countries. A selection of papers prepared for a UNESCO research project*. The Polish Academy of Sciences Press.
14. Institute of Public Finance (2019). *Transparency of Local Budgets (November 2019 - April 2020)*. https://www.ijf.hr/transparentnost/?params_1=transparentnost
15. International Organization for Standardization (2014). *ISO 37120 2014 - Sustainable cities and communities - Indicators for city services and quality of life*. https://www.iso.org/standard/62436.html
16. International Organization for Standardization (2018). *ISO 37120 2018 - Sustainable cities and communities - Indicators for city services and quality of life*. https://www.iso.org/obp/ui/#iso:std:iso:37120:ed-2:v1:en
17. International Organization for Standardization (2019). *ISO 37122 2019 - Sustainable development in communities - Indicators for Smart Cities*. https://www.iso.org/obp/ui/#iso:std:iso:37122:ed-1:v1:en
18. International Telecommunication Unit (2016). *Series Y: Global Information Infrastructure, Internet Protocol Aspects and Next-generation Networks, Internet of Things and Smart Cities.* https://www.itu.int/rec/dologin_pub.asp?lang=e&id=T-REC-L.1601-201606-I!!PDF-E&type=items
19. Juričić, D. & Zekić, Z. (2018). *Pametno upravljanje gradskim resursima*. TIM4PIN MAGAZIN. https://tim4pin.hr/wordpress_9/wp-content/uploads/2018/07/TIM4PIN-Magazin-br.-7-8 pdf.

20. Jurlina Alibegović, D., Kordej-De Villa, Ž. & Šagovac, M. (2018). *Smart City Indicators: Can They Improve Governance in Croatian Large Cities?* (EIZ Working Paper No. EIZ-WP-1805). Zagreb: The Institute of Economics.
21. Kliksberg, B. (2000). Rebuilding the State for Social Development: Towards Smart Government. *International Review of Administrative Sciences, 66*(2), 241-257. https://doi.org/10.1177/0020852300662002
22. Knezović, G. (2020). *460 Croatian municipalities and cities received WiFi4EU vouchers.* Network - for IT professionals. https://mreza.bug.hr/460-hrvatskih-opcina-i-gradova-dobilo-wifi4eu-vaucere/
23. Komninos, N., Tsampoulatidis, I., Kakderi, C., Nikolopoulos, S. & Kompatsiaris, I. (2021). *Projects for Intelligent and Smart Cities: Technology and Innovation Transforming City Ecosystems*. Preprints 2021. https://doi.org/10.20944/preprints202108.0080.v1
24. Law on Local and Regional Self-Government (Official Gazette 33/01, 60/01, 129/05, 109/07, 125/08, 36/09, 36/09, 150/11, 144/12, 19/13, 137/15, 123/17, 98/19, 144/20) https://narodne-novine.nn.hr/clanci/sluzbeni/2020_12_144_2762.html
25. Law on Electronic Issuance of Invoices in Public Procurement (Official Gazette 94/18). https://www.zakon.hr/z/1163/Zakon-o-elektroni%C4%8Dkom-izdavanju-ra%C4%8Duna-u-javnoj-nabavi
26. Lombardi, P., Giordano, S., Farouh, H. & Yousef, W. (2012). Modelling the smart city performance. *Innovation: The European Journal of Social Science Research, 25*(2), 137-149. https://doi.org/10.1080/13511610.2012.660325
27. Lopes, N. V. (2017). Smart governance: A key factor for smart cities implementation. In *Proceedings of the IEEE International Conference on Smart Grid and Smart Cities (ICSGSC)* (pp. 277-282). IEEE. https://doi.org/10.1109/ICSGSC.2017.8038591
28. Marava, N., Alexopoulos, A. & Stratigea, A. (2019). Tracking Paths to Smart Governance: The Case of Korydallos Municipality - Greece. In Stratigea, A. & Kavroudakis, D. (Eds.), *Mediterranean Cities and Island Communities* (pp. 81-112). Springer. https://doi.org/10.1007/978-3-319-99444-4_4
29. McGranahan, D. V., Richard-Proust, C., Sovani, N. V. & Subramanian, M. (1972). *Contents and Measurement of Socioeconomic Development. A Staff Study of the United Nations Research Institute for Social Development.* Praeger.
30. Meijer, A. & Bolivar, M. P. R. (2016). Governing the smart city: a review of the literature on smart urban governance. *International Review of Administrative Sciences, 82*(2), 392-408. https://doi.org/10.1177/0020852314564308
31. OECD (2008). *Handbook on Constructing Composite Indicators: Methodology and User Guide*. OECD Publishing. https://doi.org/10.1787/9789264043466-en
32. Ray, A. K. (1989). On the measurement of certain aspects of social development. *Social Indicators Research, 21*(1), 35-92. https://doi.org/10.1007/BF00302403
33. Ray, A. K. (2008). Measurement of social development: An international comparison. *Social Indicators Research, 86*(1), 1-46. https://doi.org/10.1007/s11205-007-9097-3
34. Scholl, H. J. & Scholl, M. C. (2014). Smart governance: A roadmap for research and practice. In *iConference 2014 Proceedings* (pp. 163-176).
35. State Election Commission of the Republic of Croatia (2021). https://www.izbori.hr/arhiva-izbora/#/app/lokalni-2021
36. Tomor, Z., Meijer, A., Michels, A. & Geertman, S. (2019). Smart Governance for Sustainable Cities: Findings from a Systematic Literature Review. *Journal of Urban Technology, 26*(4), 3-27. https://doi.org/10.1080/10630732.2019.1651178
37. United 4 Smart Sustainable Cities (2017). *Collection Methodology for Key Performance Indicators for Smart Sustainable Cities*. https://unece.org/DAM/hlm/documents/Publications/U4SSC-CollectionMethodologyforKPIfoSSC-2017.pdf
38. United Nations (2020). *United Nations E-Government Survey 2020*. https://publicadministration.un.org/egovkb/en-us/Data/City
39. Vinod Kumar, T. M. & Dahiya, B. (2017). Smart Economy in Smart Cities. In Vinod Kumar, T. (Ed.), *Smart Economy in Smart Cities. Advances in 21st Century Human Settlements* (pp 3-76). Springer. https://doi.org/10.1007/978-981-10-1610-3_1

Appendix 1 Detailed overview of the model, indicators, authors, and the year of the model

Model / Year / Authors	Description	Smart Governance Indicators
The European Smart Cities Ranking - ESCR Griffinger et al. (2007)	This model was developed for European medium-sized cities. In this model, the dimensions and indicators for 70 medium-sized cities were defined for the first time according to the number of inhabitants.	Participation in decision making Public and social services Transparent government Political strategies and perspectives
Triple Helix Approach - THA Lombardi et al. (2012)	To explore the concept of a smart city, the authors proposed to focus on the production of college and government knowledge and innovations patented by industry and universities as an index of intellectual capital.	Number of universities and research centers in the city Number of courses that can be fully downloaded from the Internet / Total number of courses Online availability of e-government (percentage of the 20 basic services that are fully available online) Percentage of households with computers Percentage of households with Internet access at home E-government use by individuals (percentage of individuals aged 16 to 74 who used the Internet to interact with the government in the past three months) Number of research grants funded by corporations, foundations, and institutes / No annual grants
The Smart City Index Master Indicators - SCIMI Cohen (2014)	This model represents an initiative of the Smart Cities Council to rank cities in terms of livability, feasibility, and sustainability indicators.	Proportion of government services that citizens can access online Existence of electronic compensation for citizens Number of Wi-Fi access points per km^2 Proportion of users with Internet download speeds of 2 Mbit/s Proportion of users with Internet download speeds of at least 1 gigabit/s Number of infrastructure components with built-in sensors (traffic, public transportation demand, parking, air quality, waste, H2O, public lighting) Integrated and unique real-time services (ambulance, emergency response, fire, police, weather, traffic, air quality) Open use of data Mobile applications based on open data Existence of an official city policy for the protection of citizen data
ITU - ITU -T Y.4901 / L.1601 International Telecommunication Unit (2016)	The authors identified Key Performance Indicators (KPIs) to establish criteria for assessing the contribution of ICT to the creation of smarter and more sustainable cities, and to provide cities with the means for self-assessment.	Transparency of data on budget, city plans, public procurement Proportion of city residents using online information and anonymous feedback mechanisms Existence of an application to assist visitors and tourists Existence of information literacy organizations for all city residents Existence of online reservations (e.g., selection of schools, reservation of public sports facilities, library services, etc.) ICT-enabled services and information to assist people with disabilities; NOTE - People with special needs here refers to people with disabilities, including older people with disabilities

Model / Year / Authors	Description	Smart Governance Indicators
CITY KEYS Bosch et al. (2017)	These indicators aim to monitor the evolution of a city towards an even smarter city. The temporal component, i.e., "development over the years", is an important feature.	Government project support A unified project team that includes all relevant experts and stakeholders Involvement of the city government in the development of the project, apart from the financial aspects A clear division of responsibilities for achieving the social and sustainability objectives Continuous monitoring and reporting Market orientation - to what extent is the project planned based on market analysis Involvement of professional stakeholders - to what extent were professional stakeholders outside the project team involved in planning and implementation Bottom-up - did the project idea come from the local community Involvement of the local community in the planning phase Involvement of the local community in the implementation phase Proportion of the population participating in Internet platforms
United 4 Smart Sustainable Cities U4SSC (2017)	This is a publication that provides cities with a methodology for capturing KPIs for Smart Sustainable Cities (SSC).	Public Wi-Fi Open data E-government E-procurement in the public sector
International Organization for Standardization (ISO) 37120 - Sustainable cities and communities - indicators for city services and quality of life (2018)	The World Council on City Data (WCCD) enabled certification of smart cities based on the guidelines and methodology of ISO 37120 and ISO 37122 standards for smart and sustainable cities.	Proportion of women elected as heads of city government departments Number of city government convictions for corruption or bribery Number of registered voters as a percentage of voting age Proportion of voters in local elections (as a percentage of registered voters)
International Organization for Standardization (ISO) 37122 - sustainable cities and communities (2019)		Percentage of publicly available city records Number of online visits to the city open data portal Proportion of city services available online Average city system response time to relevant emergency assistance requests Average disruption to IT infrastructure in the city

Source: Authors

Appendix 2 Croatian cities by the Smart Governance Index (Top-bottom ranking)

Cities	Population estimates 2019	Voter turnout in the last local elections	GIS	Citizen participation in budget creation	List of city utility companies	Smart Government Index (Descending)
Buzet	6,083	-0.52	-0.30	-0.07	-0.15	**-1.044**
Korčula	5,533	-0.10	0.11	-0.07	-0.15	**-0.211**
Vrlika	1,714	0.32	0.11	-0.07	0.51	**0.872**
Rab	7,850	-0.19	0.11	-0.07	-0.15	**-0.304**
Jastrebarsko	14,996	-0.05	-0.30	-0.07	0.51	**0.084**
Kraljevica	4,412	-0.15	-0.30	-0.07	-0.15	**-0.673**
Pazin	9,423	-0.29	0.11	-0.07	0.51	0.268
Zabok	8,766	0.18	0.11	-0.07	-0.15	**0.068**
Vrgorac	5,570	-0.29	-0.30	-0.07	-0.15	**-0.812**
Rijeka	115,995	0.04	-0.30	-0.07	-0.15	**-0.487**
Imotski	9,972	0.41	-0.30	-0.07	-0.15	**-0.115**
Vrbovsko	4,063	0.50	0.11	-0.07	-0.15	**0.393**
Požega	23,155	0.04	-0.30	-0.07	-0.15	**-0.487**
Kutina	20,359	0.09	0.11	-0.07	-0.15	**-0.025**
Križevci	19,769	0.22	0.11	-0.07	0.51	**0.779**
Delnice	5,437	-0.15	-0.30	-0.07	-0.15	**-0.673**
Čazma	7,190	-0.15	0.11	-0.07	-0.15	**-0.257**
Ploče	8,841	0.41	0.11	-0.07	-0.15	**0.300**
Novska	11,455	-0.15	-0.30	0.59	0.51	**0.657**
Ivanec	13,080	0.04	0.11	-0.07	0.51	**0.593**
Mali Lošinj	7,876	-0.19	-0.30	-0.07	-0.15	**-0.719**
Sinj	24,348	-0.29	0.11	-0.07	-0.15	**-0.397**
Pag	3,731	-0.05	0.11	0.59	-0.15	**0.501**
Gospić	11,761	0.13	-0.30	-0.07	-0.15	**-0.394**
Senj	6,162	-0.15	0.11	-0.07	0.51	**0.407**
Opuzen	3,111	0.18	0.11	-0.07	-0.15	**0.068**
Sisak	42,326	0.13	-0.30	-0.07	-0.15	-0.394

Cities	Population estimates 2019	Voter turnout in the last local elections	GIS	Citizen participation in budget creation	List of city utility companies	Smart Government Index (Descending)
Dubrovnik	44,743	-0.24	-0.30	-0.07	-0.15	**-0.766**
Labin	10,794	0.04	0.11	-0.07	0.51	**0.593**
Bakar	8,160	-0.19	0.11	-0.07	-0.15	**-0.304**
Split	169,577	0.04	0.11	-0.07	-0.15	**-0.071**
Karlovac	51,063	0.04	0.11	-0.07	-0.15	**-0.071**
Solin	26,578	0.04	0.11	-0.07	-0.15	**-0.071**
Krapina	11,816	0.27	0.11	-0.07	-0.15	**0.161**
Vis	2,068	0.22	0.11	-0.07	-0.15	**0.114**
Čakovec	27,757	-0.33	0.11	-0.07	-0.15	**-0.443**
Crikvenica	10,692	-0.15	-0.30	0.59	0.51	**0.657**
Metković	16,296	-0.43	0.11	-0.07	0.51	**0.129**
Hrvatska Kostajnica	1,967	0.09	0.11	-0.07	0.51	**0.639**
Cres	2,907	-0.01	0.11	-0.07	-0.15	**-0.118**
Velika Gorica	62,550	-0.19	0.11	-0.07	-0.15	**-0.304**
Supetar	4,457	0.18	0.11	-0.07	-0.15	**0.068**
Osijek	101,117	-0.10	0.11	-0.07	0.51	**0.454**
Varaždinske Toplice	5,729	0.41	0.11	-0.07	-0.15	**0.300**
Novi Vinodolski	4,783	-0.24	0.11	-0.07	0.51	**0.314**
Pleternica	9,382	0.04	0.11	-0.07	-0.15	**-0.071**
Knin	11,513	0.09	0.11	0.59	-0.15	0.640
Lipik	5,038	-0.43	0.11	-0.07	-0.15	**-0.536**
Bjelovar	37,948	0.32	0.11	-0.07	0.51	**0.872**
Kutjevo	4,985	-0.66	0.11	-0.07	-0.15	**-0.768**
Novalja	4,109	0.04	0.11	-0.07	0.51	**0.593**
Đurđevac	7,686	0.27	0.11	-0.07	-0.15	**0.161**

Cities	Population estimates 2019	Voter turnout in the last local elections	GIS	Citizen participation in budget creation	List of city utility companies	Smart Government Index (Descending)
Sveta Nedelja	18,558	-0.01	0.11	-0.07	-0.15	**-0.118**
Pula - Pola	56,349	0.41	0.11	0.59	-0.15	**0.966**
Orahovica	4,586	-0.47	0.11	0.59	0.51	**0.747**
Vrbovec	14,063	0.13	0.11	0.59	-0.15	**0.687**
Ogulin	12,717	0.64	0.11	-0.07	-0.15	**0.533**
Grubišno Polje	5,381	0.64	-0.30	-0.07	-0.15	**0.117**
Biograd na Moru	5,878	0.55	-0.30	-0.07	-0.15	**0.024**
Otočac	8,842	0.64	0.11	-0.07	-0.15	**0.533**
Pregrada	5,988	0.60	-0.30	-0.07	-0.15	**0.070**
Omiš	14,661	-0.10	-0.30	-0.07	-0.15	**-0.626**
Prelog	7,546	-0.05	-0.30	-0.07	-0.15	**-0.580**
Lepoglava	8,631	-0.43	0.11	-0.07	0.51	**0.129**
Novi Marof	12,071	-0.01	-0.30	-0.07	0.51	**0.131**
Varaždin	46,269	-0.33	-0.30	-0.07	-0.15	**-0.859**
Čabar	3,131	0.27	0.11	-0.07	-0.15	0.161
Belišće	9,435	0.13	0.11	-0.07	0.51	**0.686**
Otok	5,056	-0.10	0.11	-0.07	-0.15	**-0.211**
Klanjec	2,628	-0.38	0.11	-0.07	-0.15	**-0.489**
Daruvar	10,371	-0.80	0.11	-0.07	-0.15	**-0.907**
Opatija	11,042	0.18	0.11	-0.07	-0.15	**0.068**
Hvar	4,493	0.18	-0.30	-0.07	-0.15	**-0.348**
Trogir	12,944	-0.29	0.11	-0.07	-0.15	**-0.397**
Poreč - Parenzo	17,833	0.69	0.11	-0.07	-0.15	**0.579**
Kaštela	40,894	-0.43	0.11	-0.07	-0.15	**-0.536**
Ivanić-Grad	13,705	-0.19	0.11	-0.07	-0.15	**-0.304**
Nova Gradiška	12,287	0.04	0.11	-0.07	-0.15	**-0.071**
Glina	6,718	-0.38	0.11	-0.07	-0.15	**-0.489**

Cities	Population estimates 2019	Voter turnout in the last local elections	GIS	Citizen participation in budget creation	List of city utility companies	Smart Government Index (Descending)
Đakovo	25,063	-0.15	0.11	-0.07	-0.15	**-0.257**
Vinkovci	33,489	-0.29	0.11	-0.07	-0.15	**-0.397**
Komiža	1,484	-0.33	0.11	0.59	-0.15	**0.222**
Drniš	6,126	0.04	-0.30	-0.07	-0.15	**-0.487**
Samobor	37,905	0.22	-0.30	-0.07	-0.15	**-0.301**
Ludbreg	7,450	-0.01	-0.30	0.59	-0.15	**0.132**
Garešnica	8,831	-0.33	-0.30	-0.07	-0.15	**-0.859**
Beli Manastir	8,235	-0.19	0.11	-0.07	-0.15	-0.304
Šibenik	44,275	-0.05	-0.30	-0.07	-0.15	**-0.580**
Makarska	14,362	0.04	-0.30	-0.07	-0.15	**-0.487**
Nin	2,943	0.04	0.11	-0.07	-0.15	**-0.071**
Stari Grad	2,887	-0.15	0.11	-0.07	-0.15	**-0.257**
Trilj	8,251	-0.33	0.11	-0.07	-0.15	**-0.443**
Duga Resa	10,552	-0.52	0.11	-0.07	-0.15	**-0.629**
Ozalj	5,993	-0.01	0.11	-0.07	-0.15	**-0.118**
Popovača	10,860	0.18	0.11	-0.07	0.51	**0.732**
Obrovac	3,649	-0.70	0.11	-0.07	0.51	**-0.150**
Našice	15,180	-0.15	0.11	-0.07	-0.15	**-0.257**
Koprivnica	29,758	-0.19	0.11	-0.07	-0.15	**-0.304**
Vukovar	22,401	0.09	0.11	-0.07	-0.15	**-0.025**
Buje - Buie	4,878	0.04	0.11	-0.07	0.51	**0.593**
Donja Stubica	5,948	-0.15	0.11	-0.07	0.51	**0.407**
Oroslavje	5,951	-0.10	0.11	-0.07	0.51	**0.454**
Valpovo	10,339	0.18	-0.30	-0.07	-0.15	**-0.348**
Ilok	5,256	0.36	0.11	-0.07	-0.15	**0.254**
Slavonski Brod	53,083	-0.24	0.11	-0.07	-0.15	**-0.350**
Donji Miholjac	8,432	-0.01	0.11	-0.07	-0.15	**-0.118**

Cities	Population estimates 2019	Voter turnout in the last local elections	GIS	Citizen participation in budget creation	List of city utility companies	Smart Government Index (Descending)
Rovinj - Rovigno	14,464	0.50	0.11	- 0.07	- 0.15	0.393
Kastav	11,021	0.88	0.11	- 0.07	- 0.15	**0.765**
Zadar	75,627	0.50	0.11	- 0.07	0.51	**1.058**
Virovitica	19,689	- 0.33	0.11	- 0.07	- 0.15	**-0.443**
Vodice	9,345	0.36	0.11	0.59	0.51	**1.584**
Slatina	11,925	- 0.10	0.11	0.59	- 0.15	**0.455**
Županja	9,558	- 0.29	- 0.30	- 0.07	- 0.15	**-0.812**
Sveti Ivan Zelina	14,799	- 0.01	- 0.30	0.59	0.51	**0.796**
Zlatar	5,586	- 0.01	0.11	- 0.07	- 0.15	**-0.118**
Mursko Središće	5,985	- 0.47	0.11	0.59	- 0.15	**0.083**
Petrinja	20,423	- 0.38	0.11	- 0.07	- 0.15	**-0.489**
Slunj	4,070	- 0.24	- 0.30	- 0.07	- 0.15	**-0.766**
Umag - Umago	13,993	- 0.43	- 0.30	- 0.07	- 0.15	**-0.952**
Krk	7,030	- 0.05	0.11	- 0.07	0.51	**0.500**
Zaprešić	25,033	0.55	0.11	0.59	- 0.15	**1.105**
Novigrad - Cittanova	4,752	0.83	- 0.30	- 0.07	- 0.15	**0.303**
Pakrac	6,607	0.64	0.11	- 0.07	- 0.15	**0.533**
Skradin	3,064	0.74	0.11	- 0.07	- 0.15	**0.625**
Benkovac	8,724	- 0.19	0.11	- 0.07	0.51	**0.361**
Vodnjan - Dignano	6,360	- 0.15	- 0.30	- 0.07	- 0.15	**-0.673**
Dugo Selo	18,114	0.09	0.11	- 0.07	- 0.15	**-0.025**

Source: Authors