Assessing Smart City Initiatives: A Case Study of Croatian Municipalities

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Abstract The smart city concept is increasingly represented in Europe, where many cities try to achieve as high a level of smartness as possible, through different smart city initiatives. Smart city initiatives are not only limited to urban areas, but also to wider and narrower geographical areas. Such initiatives are also implemented in rural areas and municipalities, better known as smart villages and smart municipalities. Given the possibility of implementing various smart solutions at multiple levels, there is a need to evaluate such solutions and initiatives. Within the HORIZON 2020 programme, a set of indicators for evaluating smart initiatives was developed through CITYkeys methodology. Based on selected indicators from this methodology, five municipalities on the territory of the Republic of Croatia were analysed and compared. The conducted research shows that the municipality that meets the most indicators, but also has quite high results, comes from Varazdin County, while the lowest results are identified in the municipality positioned in Koprivnica-Krizevci County and Virovitica-Podravina County, which is also one of the least developed self-governments unit in the Republic of Croatia.

Keywords Smart cities · Smart municipalities · CITYkeys · Mobility · Quality of life

1 Introduction

The development of the concept of smart cities begins with the process of urbanization. Urbanization is defined as a process which transforms traditional settlements into urban environments under the influence of various achievements, the most significant of which is the technological one. Accordingly, there are challenges related to development and life in a created urban environment [1]. The concept of smart cities introduces a number of new initiatives, not only applicable to urban areas, but also to smaller areas such as municipalities and rural areas. For such an area to achieve

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progress and to be considered smart, it should be able to pool all its resources and act effectively to meet the set objectives [2]. Cities, municipalities and rural areas around the world have started looking for solutions that enable transport connections, mixed land use and high-quality urban services with long-term positive effects on the economy. For example, one of the key elements for city's growth is efficient public transport that meets economic needs. Many new approaches concerning urban services are based on the exploitation of new technologies [3]. Smart cities' philosophy is to look at challenges as opportunities and take advantage of other trends such as digitalization [4]. But it is also important to highlight several barriers that limit the potential of innovative smart technologies, such as high technological risk, user security and privacy, financial and business difficulties, uncertain return on investment or regulatory difficulties, and lack of cooperation [4]. When designing smart city initiative, it is necessary to look at all aspects, namely all advantages and opportunities, as well as all potential risks.

Given the fact that many cities, municipalities and villages implement smart initiatives, various initiatives need to be evaluated. Existing research on implemented smart initiatives is exclusively related to smart cities and specific projects and project proposals for the observed area. There are few studies in early stage related to the development of smart villages, but only few researches mention municipalities and similar spatial units. In the territory of the Republic of Croatia, municipalities are defined as the lowest level political–territorial units, and are defined by law as units of local self-government. As such, municipalities have the opportunity to apply for funds to finance projects in the field of smart cities, and also implement numerous initiatives to improve life quality.

Different methodologies were suggested and developed to compare different initiatives within the concept of smart cities, and one of those methodologies is CITYkeys. This methodology contains a set of indicators categorized in several areas used for measuring and monitoring performance. The CITYkeys is financed by the European Union's HORIZON 2020 programme with assistance of cities and is used for collecting data for joint and transparent monitoring of smart city initiatives. The aim of this paper is to, through the methodology presented by the European Union, CITYkeys methodology, evaluate smart city initiatives implemented through projects in the territory of the Republic of Croatia, namely in selected Croatian municipalities. This paper aims to present the situation of individual Croatian municipalities in adapting to the postulates of sustainable development and the concept of smart cities, and compare the results to identify potential differences between selected municipalities. The research observes municipalities in the context of the counties where they are located, which have a significant impact on the performance of initiatives implemented in municipalities.

In addition to all the above, this paper consists of several basic chapters. The first part gives an overview of the literature related to the smart cities. The second part describes the use of the methodology, namely the CITYkeys methodology, which will be used for the analysis of selected municipalities according to selected indicators. The last part includes comparison of obtained results, discussion of conducted research and conclusion of the entire work.

2 Background

As for terminology, a smart city can be considered an intelligent city, a sustainable city, a digital city and a city aimed at achieving a high quality of life [5]. In this context, an intelligent city emphasizes its intellectual capital and creates synergy between each component of the city. The smart city concept is often seen through technology, as smart cities must use technological advances to improve their own services and improve the quality of life of inhabitants in the city. It is important to emphasize that smart cities are not based on technology, but need to use technology to make better choices and to manage the city. Due to the high level of technological advancement for a smart city, often used term is digital city, and this results from the digital transformation of numerous activities and services in the city. The technology itself in a smart city is also used to improve the quality of mobility, space and overall logistics. This is why smart cities are often called technology cities. What is crucial is that smart cities are achieving economic, ecological and social sustainability, and thus produce the highest possible quality of life for all citizens and visitors. A summary overview of key indicators for understanding the concept and definition of smart city is shown in Table 1.

Every smart city has several key components. The starting point is always a defined geographical area, i.e., the area where the city itself operates and where the population resides. On the other hand, the human component is one of the key components of smart city itself, encompassing all residents, visitors and decision makers. In addition to the human component, there is a connection between the public administration and the government of the city itself, i.e., persons who manage the city and make all relevant decisions for the development of the city. In addition, smart cities must implement certain technological solutions for more efficient and effective decision-making. From all this, a smart city has a spatial component, a human component, a control component and a technological component. Looking at the scope of a smart city, although the concept of smart city refers to an urban area, it is also possible to talk about smart villages and smart communities, which is a lower level than the smart city itself, because it covers a smaller geographical area. The concept of smart city, excluding urban areas, is also applicable to a higher level, such as regions, urban networks, the entire nation, and it is possible to speak

Table 1 Understanding smart cities [5]

	Explanation
Terminology	The concept of smart city can be compared with the term's intelligent city, digital city, sustainable city, technological city and city intended for quality of life
Components	Geographical area, technological infrastructure, services, management processes, population, government
Scope	Rural areas, municipalities, cities, regions, networks of cities, nations, global level
Goals	Ecological, economic and social sustainability, quality of life, participation in decision-making, knowledge and intellectual capital

about the global level. The smart city concept focuses on smart governance and is therefore applicable to all levels. Efforts are made through the smart cities concept and initiatives, to connect all elements of the city and to encourage the participation of citizens in making important decisions. Smart city initiatives are most often implemented through numerous projects that partially affect the improvement of the entire system.

3 Methodology

Smart city initiatives can be implemented at different levels. Considering that in the territory of the Republic of Croatia there are a total of 16 large cities out of 128 cities [6] covering more than 35,000 inhabitants and 428 municipalities, where the largest municipalities have up to 15,000 inhabitants, representing local self-government units, it is defined that research on smart initiatives should be carried out at the municipal level. For this purpose, four counties within three statistical regions of the second level were selected, and representative municipalities were selected within each county. CITYkeys methodology will be used to evaluate and compare smart city initiatives and projects. The aim of this methodology is to accelerate the introduction of smart city services and solutions in order to influence fundamental social challenges. The methodology aims to facilitate and enable all interested parties to learn from each other through projects, create trust and monitor progress through the set framework. Indicators developed through the CITYkeys methodology are in line with basic areas of sustainable development, which is an economic, environmental and social area. Therefore, the indicators are divided into groups as shown in Table 2.

Indicators for defined municipalities in the Republic of Croatia are selected according to the above categories. This methodology is also presented and suggested by Huovila et al. [8], Airaksinen et al. [9], Wendling et al. [10], Caird and Hallett [11] and others. The list of all indicators proposed through the CITYkeys methodology and selected for this research is presented in Table 3.

These indicators will be used to describe smart city initiatives in 5 municipalities on the territory of the Republic of Croatia; one from Koprivnica-Krizevci County, two from Virovitica-Podravina County, one from Varazdin County and one from Zadar

Table 2 Methodology indicators [7]

People	Planet	Prosperity	Governance	Propagation
Health, safety, access to services, education, diversity and social cohesion, quality of housing and the built environment	Energy and mitigation, materials, water and land, climate resilience, pollution and waste, ecosystem	Employment, equity, green economy, economic performance, innovation, attractiveness and competitiveness	Organization Community involvement Multi-level governance	Scalability, replicability

Table 3 Selected indicators from CITYkeys methodology [7]

Indicator	Unit of measurement	Definition
Access to basic health insurance	% people	Share of population with access to health services within a distance of 500 m
Encouraging healthy lifestyle	Scale from 1 to 5	The level of political efforts to foster a healthy lifestyle
Traffic accidents	#/1.000	Number of accidents per thousand inhabitants
Availability of public transport	% people	Number of persons with a public transport at a maximum distance of 500 m
Length of cycling track	% in km	% of cycling paths and lanes in relation to street length (excluding motorways)
Availability of high-speed internet	#/100	Number of users subscribed to fixed (wire) broadband network (per 100 inhabitants)
Environmental education	% of schools	% of schools that have environmental education in their programmes
Green area	ha/1.000	Quantity of green area in ha per 1000 inhabitants
Water consumption	(Average) no. of litres per person per day	Total water consumption per capita on a daily basis
Population density	#/km^2	Number of persons per km^2
Municipal waste	(Average) weight of waste per capita in tonnes	Amount of municipal waste generated annually per capita
Percentage of waste recycling	% in tons	Percentage of waste to be recycled
Unemployment rate	% people	Percentage of unemployed labour force
Youth unemployment rate	% people	Percentage of unemployed young workforce
Share of green public procurement	% in HRK	Percentage of public procurement using the criteria of green public procurement in the implementation of public procurement procedures (total amount of green public procurement carried out/total amount of LGU) * 100 = % in HRK)

(continued)

Table 3 (continued)

Indicator	Unit of measurement	Definition
Gross domestic product	HRK/person	Amount of gross domestic product in the municipality/town per person
Newly registered operations	#/1.000	Number of newly registered jobs per 1000 inhabitants
Entrepreneurial incubators	#/1.000	Number of entrepreneurial incubators per 1000 inhabitants
Tourism intensity	#/1.000	Number of overnight stays per year per 1000 inhabitants
Availability of state data	Scale from 1 to 5	To what extent government data is available
Smart city policy	Scale from 1 to 5	To what extent the city/municipality has an incentive policy of a smart city
Expenditures by the municipality for a transition towards a smart city	HRK/person	Annual expenditures by the municipality for a transition towards a smart city

County. According to defined indicators, these municipalities will be compared in the next chapter. For privacy reasons, municipalities will not be named, but they will be categorized by the county in which they are positioned. We conducted interviews with the representatives of the municipalities and collected the requested data. The data was obtained exclusively from the competent persons. For indicators for which representatives do not have a defined value, the value is estimated, and this value is marked with the symbol *.

4 Results

Based on the conducted research and collected data, Table 4 is marked with poor, average and good values of the indicators. The values that are considered poor are marked in red, the average values are marked in yellow, while the good values of the required indicators are marked in green.

The assumed values (marked with *) are based on a review of the available literature, as well as the websites of the Croatian Employment Service, ministries or the police administration. In addition, telephone conversations were conducted with these institutions to obtain the assumed value of needed indicators.

When it comes to basic health insurance as a foundation for better quality of life of the user, in average 45% of citizens from the surveyed municipalities have access to basic health insurance services within 500 m. However, the obtained data shows that smaller municipalities have the lowest values. This result confirms the

Table 4 The results of the research (made by authors)

Indicator	Viroviti ca-Podravi na county (1)	Koprivn ica-Krizevci county	Varazdi n county	Viroviti ca-Podravi na county (2)	Zadarsk a county	Explanation
Access to basic health insurance (% people)	50%	35%	25%	10%	60%	Up to 50%—poor 50–70%—average Above 70%—good
Encouraging healthy lifestyle (scale from 1 to 5)	1	4	4	4	4	1—poor 2, 3—average 4, 5—good
Traffic accidents (#/1000)	1.25*	20	13	6.68	1*	Above 10—poor 5–10—average Under 5—good
Availability of public transport (% people)	90%	50%	80%	50%	70%	Up to 50%—poor 50–70%—average Above 70%—good
Length of cycling track (% in km)	0%	0%	70%	0.5%	0%	Up to 50%—poor 50–70%—average Above 70%—good
Availability of high-speed Internet (#/100)	0	10	10	33	80	Up to 50—poor 50–70—average Above 70—good
Environmenta l education (% of schools)	100%	100%	100%	100%	100%	Up to 50%—poor 50–70%—average Above 70%—good
Green area (Ha/1000)	0.15 ha/perso n*	0.18 ha/perso n*	0.33 ha/perso n	0.15 ha/perso n	0.1 ha/perso n	Up to 5 m^2 (0.0005 ha)—poor 5–10 m^2 (0.0005–0.001 ha)—average Above 10 m^2 (0.001 ha)—good
Water consumption ((average) no. of litres per	32 lit/perso n*	30 lit/perso n	80 lit/perso n	30 lit/perso n	120 lit/perso n	Above 150 lit/person—poor

(continued)

Table 4 (continued)

person per day)						80–150 lit/person—average Under 80 lit/person—good
Population density (#/km^2)	40 person/km^2	70 person/km^2	241 person/km^2	63.6 person/km^2	52.42 person/km^2	Above 200 person/km^2—poor 50–200 person/km^2—average Under 50 person/km^2—good
Municipal waste ((average) weight of waste per capita in tonnes)	0.2 t/person *	0.2 t/person	0.17 t/person	0.2 t/person	0.15 t/person	Above 0.4 t/person—poor 0.2–0.4 t/person—average Under 0.2 t/person—good
Percentage of waste recycling (% in tons)	10.12%	0.00%	40.28%	16.38%	5.00%	Up to 50%—poor 50–70%—average Above 70%—good
Unemployment rate (% people)	7.4%*	25%	8.93%	3.8%	10%	Above 10%—poor 5–10%—average Under 5%—good
Youth unemployment rate (% people)	1.5%*	20%	0%	15%	10%	Above 10%—poor 5–10%—average Under 5%—good
Share of green public procurement (% in HRK)	0%	0%	0%	0 %	0%	Up to 50%—poor 50–70%—average Above 70%—good
Gross domestic product (HRK/person)	3617.00 kn/person	3534.00 kn/person	3800.00 kn/person	3113.00 kn/person	7301.00 kn/person	Under 10,000 kn/person—poor 10,000–50,000 kn/person—average Above 50,000 kn/person—good
Newly registered	1*	0	7	2	3	Under 3—poor 3–5—average Above 5—good

(continued)

Table 4 (continued)

operations (#/1000)						
Entrepreneurial incubators (#/1000)	0	0	0	0.1	1	Under 0.5—poor 0.5–1—average Above 1—good
Tourism intensity (#/1000)	10*	2*	944	100	9	Under 500—poor 500–700—average Above 700—good
Availability of state data (scale from 1 to 5)	3	3	4	4	3	1—poor 2, 3—average 4, 5—good
Smart city policy (scale from 1 to 5)	3	5	2	3	0	1—poor 2, 3—average 4, 5—good
Expenditures by the municipality for a transition towards a smart city (HRK/person)	1.00 kn/person	0.00 kn/person	100.00 kn/person	0.00 kn/person	0.00 kn/person	Under 1000 kn/person—poor 1000–5000 kn/person—average Above 5000 kn/person—good

fact that smaller municipalities do not have access to all health services and in order to use certain services they must reach larger nearby cities (usually county centres), which are often quite far from the municipality itself. Despite the fact that most municipalities do not have access to basic health services, they still estimate that they promote a healthy lifestyle at a high level, with the exception of the municipality in Virovitica-Podravina County, which rates this indicator with the lowest grade-1.

The availability of health services is closely related to the state of traffic in the observed municipalities, but also in the counties. The indicator that shows the number of traffic accidents indicates that more developed areas, such as the northern part of Croatia, have higher number of traffic accidents from less developed areas. Less developed areas have lower number of residents, and this can support the results obtained. Also, when observing the availability of public transport, it is evident that municipalities with smaller population reach up to 90% of the availability of public transport to the population. This can be explained by the fact that they have either bus stations or railway stations that cover all areas of municipalities. The area of the municipality is geographically smaller, which makes it easier to develop public transport and to cover the entire municipality with public transport. When it comes to the percentage of the length of bicycle lanes in kilometres, it can be noticed that three of five municipalities do not have cycling tracks, and that the municipality from the north side of Croatia has 70% street length covered with cycling tracks. This shows

the assumption that most of Croatian municipalities don't have a developed network of bicycle paths.

The availability of high-speed internet is ensured in 4 out of 5 municipalities and an average of 27 households out of 100 have this option. In each of the surveyed municipalities, educational institutions maintain education on environmental protection, which is of great importance nowadays given the amount of waste produced. When observing the results of green space per 1000 residents, two municipalities do not keep track of this data. From the municipalities that provided such data, it is evident that the green area per 1000 residents is distributed in accordance with their geographical position. Water consumption per resident varies from municipality to municipality like most data, but the average given by 4 municipalities that have data on water consumption per resident is 65 l/person. Population density varies depending on the number of residents and the geographical area it covers. The most densely populated municipality is the most developed municipality, and that is the municipality from Varazdin County, while the least populated is the municipality from the area of Virovitica-Podravina County. Waste production in each of the observed municipalities is approximately the same, and the average for 4 municipalities is 0.18 t/person. Waste recycling is carried out in four municipalities out of five surveyed, and in all municipalities the recycling percentage is very low, although the municipality from Varazdin County stands out from the rest in waste recycling with its 40.28%. An interesting result is shown by the municipality from Koprivnica-Križevci County with a value of 0%, which is a surprising result because it is the only county (except the City of Zagreb) in which the county centre has a Smart City certificate and where the county develops waste recycling plans. This decrease may indicate the fact that municipal representatives do not know or do not have this information, which may mean a lack of waste management in the area.

The unemployment rate in the surveyed municipalities ranges from 3.8 to 25%, and it can be concluded that more developed municipalities have a lower unemployment rate. The same applies to youth unemployment, where the more developed municipalities have a lower unemployment rate. It is again visible that the Varazdin county municipality has 0% of youth unemployment. Gross domestic product varies, but in this case the highest GDP has the Zadar region municipality (7301.00 km/person), which is not surprising considering that it is a tourist destination, and that tourism takes place throughout the year, especially in the summer months. When it comes to the indicator of newly registered jobs in the previous year, the results are very low, only 11 newly registered jobs at five municipalities in the year 2020. The most of them are in Varazdin county municipality.

All municipalities have a smart city policy. Based on the results obtained by five municipalities, their view is that on average their smart city policy is stimulating on the level of 3.4 on a scale from 1 to 5. For the indicator tourism intensity 2 municipalities have no data on the number of nights per 1000 residents in a year, while in the remaining three municipalities we see quite different numbers, which is again influenced by the position and development of municipalities. The Varazdin county municipality has a high number of overnight stays per year per 1000 residents because it offers various touristic attractions, and has also developed entrepreneurial

tourism. A high number of overnight stays is expected in Zadar county municipality, considering that this area is attractive for tourists, especially in the summer months, because it is positioned near the Adriatic Sea. The availability of state data on a scale from one to five received an average score of 3.8, which indicates that work needs to be done on the availability of state data, which municipalities need to operate. Furthermore, when observing the indicator entrepreneurial incubator in 3 municipalities out of 5 there are no entrepreneurial incubators. The municipality in Zadar County owns 1 entrepreneurial incubator per 1000 persons, and the municipality from the area of Virovitica-Podravina County owns only 0.1 per 1000 persons.

The obtained results show that no funds were invested into public procurement with an emphasis on green public procurement in any of the surveyed municipalities, i.e., that no conducted procurement procedure was treated through the elements of green public procurement. Thus, it is evident that municipalities do not have sufficient experience and knowledge in the application of green public procurement. Smart city investments are low, and it is shown by the last answer related to the costs caused by investments in the smart city concept. Very interesting fact is that the Virovitica-Podravina County municipality, which did not invest any funds into smart city concept development, rated their smart city policies with the highest value. 3 of 5 municipalities, made no investments, one municipality invested 100 HRK/person and it is a Varazdin county municipality, in the northern part of Croatia, which again confirms that the municipalities from the north of Croatia are more developed. At the same time, the Virovitica-Podravina county municipality, which belongs to the category of underdeveloped local self-government units, invested 1 HRK/person, which indicates that there is a desire for further progress and development, and the creation of conditions for a better life of locals in a municipality that is less developed.

5 Discussion

Based on the previously shown table, out of a total of 22 indicators, the first municipality located in Virovitica-Podravina County has a total of 7 indicators with good value, 5 indicators with average value and 10 indicators with poor value. Another municipality from the same county has 6 indicators with good value, 5 with average, with 11 with poor value. The Koprivnica-Krizevci County municipality has a total of 5 indicators with good value, 4 with average and 13 with poor value. The Varazdin County municipality shows 10 indicators with good value, 3 with average, and 9 with poor value. Finally, the Zadar County municipality has 8 indicators with good value, 5 with average and 9 with poor value. These results are presented on Fig. 1.

Research conducted on 5 municipalities shows that the municipality that meets the most indicators, but also has quite high results, is a Varazdin county municipality. This is the only municipality in which there are more good values of indicators than poor ones, and only this municipality has the largest number of good values of indicators. Also, this is the one of the two municipalities that participated in the survey, which independently defined the values of the indicators, which indicates the fact that this

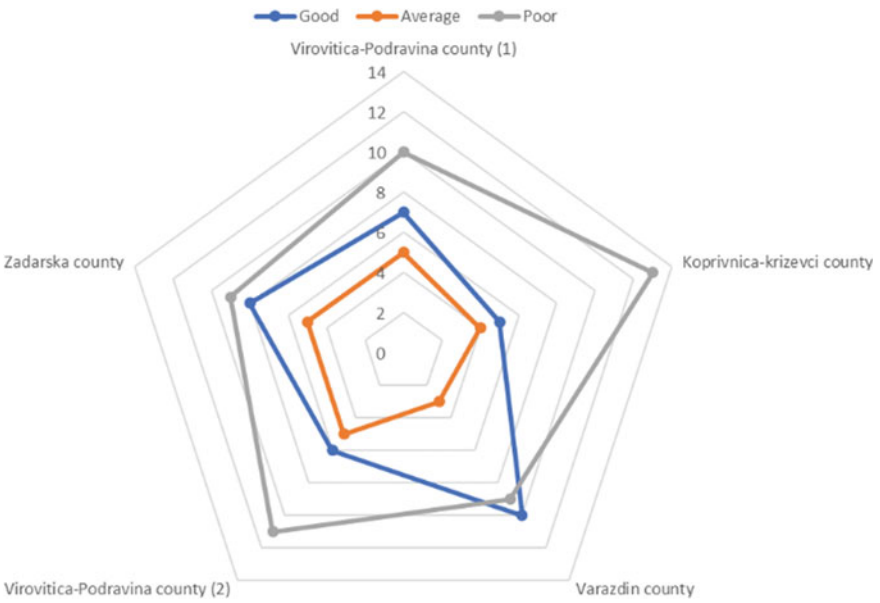

Fig. 1 Number of good, average and poor values by municipality (made by authors)

municipality has all the data. This also shows the fact that within Varazdin County the data is collected and used for decision-making and tracking progress which reflects on the management and development of municipalities within this county.

According to Fig. 1, the worst result is shown by the Koprivnica-Križevci County municipality due to the largest number of poor values of indicators, but very close is the Virovitica-Podravina County municipality (2). Another municipality from Virovitica-Podravina County (1) also shows many poor values of indicators, but there is a significantly higher number of good ones. The Virovitica-Podravina country municipality (1) is also positioned in group 1 according to the index of development of local self-government units, which means that it belongs to the category of the least developed local self-government units in the Republic of Croatia. In the Virovitica-Podravina country municipality (2) is evident that smart city policy is being implemented, but to an insufficient extent the same as in the Koprivnica-Krizevci county municipality. The main problem within the collected data is that there are no results to some of the presented indicators, which indicates that some municipalities do not track data needed to make smart initiatives and projects and that are also needed for making better management choices.

A priority matrix will be used to demonstrate which of the presented municipalities has the best and which the worst result, good, average and poor values need to be weighed through the priority matrix. Therefore, bad value indicators will be weighted with a value of 1, average with a value of 3, and good with a value of 5. Table 5 shows the priority matrix.

Table 5 Priority matrix (made by authors)

Municipalities/counties	Poor value		Average value		Good value		Total
	Weight	1	Weight	3	Weight	5	
Virovitica-Podravina County (1)	10	**10**	5	**15**	7	**35**	60
Virovitica-Podravina County (2)	11	**11**	5	**15**	6	**30**	56
Koprivnica-Krizevci County	13	**13**	4	**12**	5	**25**	50
Varazdin County	9	**9**	3	**9**	10	**50**	68
Zadarska County	9	**9**	5	**15**	8	**40**	64

The priority matrix, shows that the Varazdin County municipality showed the best results, but very close to it is the Zadar County municipality. Varazdin County and the north of Croatia are one of the most developed parts of Croatia, which is why this result is not surprising. Also, Zadar County, as one of the most developed tourist counties, is expected to show high results. The city of Koprivnica as the centre of Koprivnica-Krizevci County is becoming one of the most important smart cities in the Republic of Croatia and is implementing numerous projects in this area, which is a surprising indicator of how the municipality from that county shows the worst results. This could be an indication that investment in smart initiatives is too centralized and that additional investment should be made in the surrounding areas. The results of two municipalities from Virovitica-Podravina County are very interesting. Despite the fact that the result is very similar, and both municipalities show a very similar number of good and poor values of the indicators, there is a significant difference in the availability of data. The Virovitica-Podravina County municipality (2), along with the Varaždin County municipality, has all the values of the required indicators. This indicates that the municipality is focused on development planning and monitoring of implemented activities. Unlike the mentioned municipality, another municipality from the same county provided the least data and most of the values were based on an estimate.

6 Conclusion

The analysis provides an overview of Croatian municipalities which gave data to assess smart city indicators through CITYkeys methodology. 5 municipalities where interviewed and surveyed through this research. Conducted research showed that the most developed municipality by the presented indicators is in Varazdin County. This county is also one of the most developed counties, so it is not surprising that this municipality shows the best results.

The limitations of this research are mainly related to the fact that the values of individual indicators have been estimated and how it is possible to manipulate the given data. It is especially important to emphasize that for some indicators an assessment is needed in assigning values from 1 to 5, where municipalities can be subjective in assessing an individual indicator.

To conclude, the obtained results are not surprizing. In the Republic of Croatia there is an official document in which municipalities and cities are assigned to a certain development group based on the development index. By studying this document in advance, certain conclusions and assumptions were reached. This research can help municipalities move towards the concept of a smart city and serve as a framework for development towards smart municipalities. For further research, more municipalities should be involved in the research and additional correlation between the development of the county in which the municipality is located and the development of municipality should be made.

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