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APPLICATION OF SMART CONCEPT IN SMALL CITIES (EXAMPLE: CROATIA)

Key Words

Smart city;
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Things

Abstract

The term "smart cities" usually is connected with the functioning of the big cities. It is connected with the fact that today, as much as 54% of the world's population lives in urban areas (according to the 2014 UN Review, New York 2015). This trend is expected to continue, and it is projected that by 2050 the percentage of the population in urban areas will reach 66% of the world population. The urbanization process has affected most European and world cities, big as well as small. The increase in the urban population increases the need for mobility and the increasing consumption of food and energy. This leads to an increase in living costs, loss of time (e.g. in traffic), and to the development of poor living habits. That is why there is a need to find innovative solutions that will improve the quality of life of citizens and ensure sustainable economic growth in small cities, to preserve the regions from over-urbanization. The solution to these problems lies in the concept of small smart cities and modern technologies. It is a smart city that should solve the 21st century challenge posed by ubiquitous urbanization.

1. INTRODUCTION

Smart cities are human-sized cities. They represent developed urban areas that enable efficient use of natural resources and existing urban infrastructure,

sustainable economic growth, support capacity building for research, development, and innovation and ensure a high quality of life and accessibility of digital services to all its citizens through the use of modern technology. According to the definitions of the European Commission, smart cities are striving for the development of holistic and sustainable solutions in which the quality of human life, as well as the environment, will be at a much higher level.

There is a perception that smart cities are just a vision of the future of what highly developed cities should one day look like. But the truth is different. Many smart cities still exist today, and some of them are approaching 100% energy independence through renewable energy.

This paper aims to present the characteristics of small smart cities and to analyze their determinants, citing examples from Croatia.

2. SMART CITIES

There is no universal definition of a smart city, but all definitions include the fact that smart cities are human-developed urban areas that enable efficient use of natural resources and existing urban infrastructure, sustainable economic growth, support capacity building for research, development, and innovation and ensure high quality of life and accessibility of digital services to all its citizens. Most importantly, smart cities are created not only by technology but also by the vision of those who lead it.

At its simplest, we can define a smart city as a system that uses digital and communication technologies to meet the needs of its citizens and improve the quality of city services. A smart city integrates all public service functions, such as lighting, transport, energy production, thereby increasing their efficiency, reducing energy costs, speeding up and economizing traffic, and reducing greenhouse gas emissions.

Smart city:

- a) Maximizes in all activities citizens who are end-users of services,
- b) innovative information and communication technologies (ICTs) should be used,
- c) to have a vision of development that connects and integrates all segments to make it easier to use and accessible to citizens.

On the other hand, citizens with their knowledge and skills represent the main advantages of modern smart cities. The synergy of citizens and technological solutions achieves economic growth and a better quality of life in urban areas.

3. SMALL SMART CITIES IN EUROPE

The notion of a smart city is more likely to evoke the image of a bustling metropolis than a small town. However, cities of all sizes can become smart because the foundation of every smart city is the ability to collect and use data collected using different sensors. In the past, fewer residents meant fewer resources, but that

dynamic is changing. While there are internet access and especially high-speed mobile broadband, anyone can connect to anything at any time. In the future, people will aspire to smaller cities, which support their desire for flexibility and freedom. Small and medium-sized cities face challenges in implementing smart solutions.

Interesting and useful innovations can also be found in smaller cities that have unexpected solutions, just to cope with the lack of money, experts, or the necessary infrastructure. Moreover, initiatives do not necessarily have to be “big” to have a big impact on smaller communities. Some of the advantages that come with smaller cities are easier to overcome regulatory hurdles, as fewer people slow down the process. Also, in a smaller place, it's easier to connect with people living in the city and design better solutions for citizens.

Each city is unique in that it has its unique past, position, and personality. An individual city can be positioned as a cultural center or business center. As the concept of “smart city” embodies multiple concepts, every city doesn't need to implement “smart” solutions in all areas. This is especially true for smaller cities.

4. SMALL SMART CITIES IN CROATIA

When it comes to smart cities in Croatia, it should be borne in mind that there are 4 major cities in Croatia: Zagreb, Split, Rijeka, and Osijek, while all other cities, compared to intelligent European and world cities, can be classified as smaller cities.

Croatia has a total of 128 cities, and 40 of them are developing and implementing some of the smart solutions that make it easier to manage the city and improve the lives of its citizens. On December 15, 2017, a round table entitled “Smart City” was held at the round table organized by the Institute for Urban Transport at the Faculty of Transport Sciences in Zagreb. This term is increasingly used, and research has shown that Croatian cities are increasingly looking to become “smart” [10].

4.1. Smart urbanization concept in Croatia

When it comes to smart urbanization in Croatia, it should be said that, according to some studies, Croatia is a relatively conservative society when it comes to adopting new technological ideas. However, it can still be said that Croatia is making progress in introducing modern technologies into the daily lives of its citizens.

During 2017, the Department of Urban Transport of the Faculty of Transport Sciences, with the support of the University of Zagreb, conducted a scientific research project entitled “Mobility Indicators in the Smart City Concept”. The research aimed to establish a database at the national level, which will serve to analyze urban mobility indicators.

The results of the research showed that the concept of smart city was accepted in Croatia because of the surveyed Croatian cities, 32% of them have participated in

the implementation of the Smart City concept, and 64% plan to apply it. One of the key roles in the Smart City concept is the "intelligent mobility" of citizens, which is a necessary precondition for the prosperity of the urban environment, and its important segments are the intelligent use of information and communication technology (86.2%), intelligent public urban transport (65, 6%) and intelligent parking (58.6%). So far, air quality control (33%), traffic control and monitoring (22%) and intelligent parking (11%) are in place.

In the future, cities plan to implement intelligent use of information and communication technology (60.7%), intelligent parking (50%), traffic control and monitoring (39.3%) and intelligent public transport (32.1%) [11].

Out of 128 Croatian cities, 40 of them are developing and implementing some of the intelligent solutions that make managing the city easier and providing a better life for citizens.

4.2. Existing smart features

Below will be a brief overview of existing smart features in some Croatian cities and certain categories. It is important to emphasize that no solution can be mapped on the example of another city, but they can certainly be a signpost for further development and the search for new, better intelligent components.

4.2.1. Intelligent mobility - the city of Koprivnica

Koprivnica became the leader of the electromobility in Croatia. This was achieved through the *Civitas Dynamo* project. A common problem with smaller cities is the lack of public transport. It is with this project that the problem has been addressed. Electric buses whose market and service base are still underdeveloped in Croatia represent a particular innovation. Energy efficiency is particularly pronounced in the extent of electromobility where the city has established car-sharing of electric vehicles for city employees and businesses and has developed a fast-charging infrastructure for electric vehicles in the city, built in partnership with the *HEP-ELEN* program and accessible to all citizens and visitors city.

4.2.2. Intelligent Management - the cities of Karlovac, Jastrebarsko, Rovinj

Many Croatian cities seek to encourage citizens to participate actively in solving problems of local importance. Many cities develop intelligent governance.

The city of **Karlovac** has developed the *DigitalkA* project, which has upgraded the capacities of the city administration as a service to citizens so that their operations are efficient, transparent, and optimal to budgetary resources. The project was launched in 2011, and positive experiences have encouraged Karlovac to introduce information and communication technologies into all other work and

administrative processes. To speed up the process of marking, assigning, processing, sending and storing documents, Karlovac has established an e-office using information, and communication technologies (ICT). This provided the conditions for efficient office operations, organization and productivity in day-to-day operations.

Better solving of citizens' problems in the work of local government and establishment of a more efficient system of management and maintenance of unclassified roads was the main goal of the **Jastrebarsko E-road** project launched in the first half of 2014.

The system is designed in such a way that every authorized person, who has access to the system, has the opportunity to report problems on the ground in the field of transport infrastructure, ie road maintenance by photographing or making a video of the problem with his intelligent device, which is then automatically recorded in the system by obtaining a tag 'intervention'. With the introduction of this system, the city was able to consolidate several individual separate organizational systems into one central system, which accelerated the implementation of the process by at least 50% compared to the previous way of functioning.

An innovative Smart Rovinj system was developed and implemented in the city of **Rovinj**. Smart Rovinj - Rovigno is an intelligent IT system that enables the citizens of Rovinj to send suggestions and / or report various problems they see in their environment and thus contribute to their solution. The implementation of Smart Rovinj - Rovigno began in December 2015. The system is currently used by 4000 citizens.

The reason for the introduction and implementation of this project is to promptly address specific community problems, contribute to improving the quality of life of citizens, and improve the work of city institutions and organizations.

The city of **Dubrovnik** is the best example of a city that has focused on intelligent solutions on the waste collection and separation system. *Bigbelly* is not only a bin that compacts and announces when full but also an IoT platform that can host other intelligent solutions such as Wi-Fi hotspot and various urban sensors (measuring climate, noise, air quality). It is important to emphasize that it is fully solar-powered [13].

5. CONCLUSION

In the 21st century, everyone is connected to the internet 24/7, but most cities are not organized accordingly. By 2050, more than 70% of humanity will live in urban areas, whose infrastructure is already on the brink of congestion. Electricity consumption, garbage collection, transportation are all infrastructure problems of today, which will grow even more in the future. This latter is the trigger and roadmap for the adoption of intelligent solutions and the development of - Smart Cities.

These are innovations that quickly become widespread and make life easier for citizens. Examples of this are smart benches, parking by SMS, solar collectors, and

the like. But in cities that want to become smart, it is not enough to satisfy just one segment, but the emphasis is on implementing as many intelligent solutions as possible. The major metropolises of the world, by nature, are implementing more intelligent solutions than smaller cities, mostly because of more money, infrastructure, and availability of professionals. However, smaller cities are also starting to follow the examples of big cities and are seeking to develop innovative solutions in organizing citizens' lives, primarily focused on transport mobility, energy management, and the development of intelligent governance. The advantage of smaller cities is that the impact of a solution in a smaller environment is far greater than the impact of more of them in a larger city. In smaller cities, the city government can better assess the needs of its citizens and accordingly develop an intelligent solution that will have the greatest impact on the lives of citizens.

Croatian cities have also recognized the importance of development in this direction. In addition to the four major Croatian cities, smaller cities also seek to implement some of the intelligent solutions to be labeled as smart cities. In this direction, they develop strategies and work to achieve them. The downside is the lack of money to finance innovative projects, but European funds remain available that could and should be better used to develop cities into smart centers of living.

Our research in the field of small smart cities, planned for the period 2019-2022 will be continued with additional papers on that matter.

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