Are the Croatian Cities Smart?

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Abstract. *E-Government, e- services, e-governance as they are realised in nowadays are just some of relevant characteristics of smart city.*

Having ICT resources and knowing to use it are the main preconditions for e-Governance and e-services development. Having optimal ICT resources nowadays is a challenge.

In this article will be presented actual world standards, characteristics, factors and indicators of smart cities and the possibilities in Croatia.

The authors will articulate the frame of the law and possibilities for developing environment for being smart in Croatia. Authors will present the advantages of being smart for sustainable urban development.

Keywords. e-Government, e-service, ICT resources, Smart City, ISO 37120

1 Introduction

The time when the IT solutions for business systems were main topic is behind us. Nowadays we are looking for different usage of ICT in everyday life. New modern ICT solutions integrated in all things around us is called Internet of things. There are no borders only creativity and innovations. In this article authors will present some approaches to the Smart City Concept. But first, the smart city should be defined. A smart city uses information and communications technology (ICT) to enhance its liveability, workability and sustainability (Berst J, Enbysk L, Ebi K, Cooley D, Peeples D., 2015). That means that Smart City collects information about itself through sensors, other devices and existing systems (Berst J, Enbysk L, Ebi K, Cooley D, Peeples D., 2015). Next, it communicates that data using wired or wireless networks (Berst J, Enbysk L, Ebi K, Cooley D, Peeples D., 2015). Third, it analyses that data to understand what's happening now and what's

likely to happen next (Berst J, Enbysk L, Ebi K, Cooley D, Peeples D., 2015).

In recent time Smart City has become more and more often a research subject. That is because there are lot of possibilities to apply results to improve implementation of concept of Smart City.

The authors KLIMOVSKÝ, PINTERIČ, ŠAPARNIENĖ have presented the process of creation of Smart City concept, it development through the time, and its possibility to improve quality humans life (Klimovský D, Pinterič U, Šaparniené D., 2016).

There are two similar sections of the aspects assessment if some city is smart. International Standard Organisation (ISO) has defined standard for certificating cities as Smart City. It is ISO 37120:2014 as "Sustainable development of communities -- Indicators for city services and quality of life"(ISO 37120:2014 Sustainable development of communities -- Indicators for city services and quality of life, 2014).

2 Approaches to the Smart City

As mentioned earlier, this article will present actual international standard, characteristics, factors and indicators of smart cities and the possibilities of implementation in Croatia.

The most applicable and consistent approach for consideration is ISO 37120 standard. The standard proposes 100 indicators to be declared and proved the facts that are evidence of being on the top of the roof (ISO 37120:2014 Sustainable development of communities -- Indicators for city services and quality of life, 2014).

Another source used for the scientific articles about Smart City is "Research gate" (ResearchGate - Share and discover research, 2016). There are a lot articles about Smart City published on this portal, including sustainable development and Internet of things.

Figure 1 shows 6 components of smart attribute that interact between themselves. It could be described as a special level of considering economy, mobility, environment, people, living, governance. These components are commonly and separately always in focus of politicians who govern a local community, but the attribute "smart" gives the special view to those components. It is usually shown through implementing of any kind of ICT solutions (software, hardware, netware...) to manage with local community services to fulfil population needs.
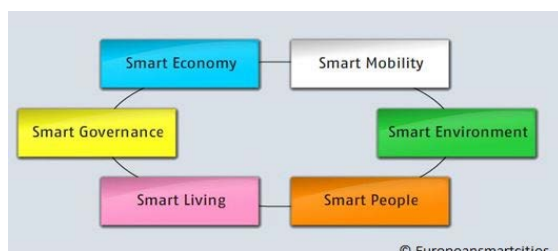

Figure 1. Smart City Concept (Smart City) Concept: Smart people, Smart Living, Smart Governance, 2016)

Source: http://technicity.osu.edu/what-makes-a-smart-city/smart-city-concept-smart-people-smart-living-smart-governance, downloaded May 9th 2016.

Integrating Smart City management and assessment standards, Service standards, ICT standards, Building and physical infrastructure standards. Standard in every dimension of this overview provides a possibility to set benchmarking model to compare issues of local governments by same criteria.

On the Figure 2 it is systematically presented four categories of smart city standards. The presented overview is general model applicable for developing and implementing Smart City model (Sharma DC. Smart Cities – Standards Seconded European Standardization Expert In India, 2015).

Through the process of literature and scientific articles, on the Research Gate mostly, the authors get the view of many aspects of Smart City and topics. The informatics and technology implementation aspect in any of Smart City component, for example Big Data and Internet of Things are very often observed. The application for big data (Al Nuaimi E, Al Neyadi H, Mohamed N, Al-Jaroodi J, 2016), usage control of for data handling in Smart Cities (H. Cao Q, Madhusudan G, Farahbakhsh R, Crespi N, 2016), how can big data help Smart Cities (Haddara M,: Smart City and Big dana, Techne Summit 2015, 2016). In the area of transportation it was conducted research about High Capacity Trucks serving as Mobile Depots for Waste Collection in IoT-enabled Smart Cities (Anagnostopoulos T, Georgiou S, et al,

2015), also about how will smart cities change SCM_researchgate (Mendonça Tachizawa E, Zaslavsky A, 2015). A lot of possible applications and implementations of ICT in everyday living things could be a matter for research, because this way of thinking and observing every days life started few years ago, and the effect are starting to be visible in the future.

Smart City concept is a modern way of thinking and governing of city. The interaction between different components and synergy produced by interaction is also a potential topic to research. Is it possible to expect that small smart cities can contribute to global goals of protecting environment, or to make percentages of poverty lower.

3 Standards for Smart City

Important matter for making competitors, in competition who is the smartest, is to make things standardized. Comparability and benchmarking between world cities is possible by using standards – international or special – for example European.
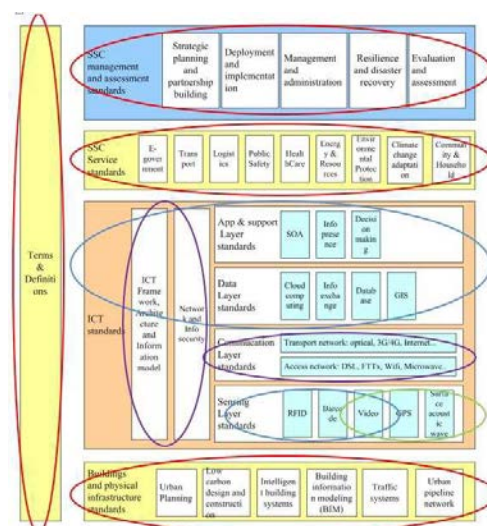

Figure 2. Smart City Overview: ITU Technical Report

Source: Smart City Summit 2015: Smart City Standards, http://eustandards.in/wp-content/uploads/2016/01/SESEI-Smart-Cities-20052015-1.pdf

3.1 ISO 37120:2014 standards for sustainable developments of communities

ISO 37120 was published in May 2014 by International Organization for Standardisation. It defines and established methodologies for a comprehensive set of indicators that will enable any sized city to track and measure its social, economic and environmental performance in relation to other cities.

Setting concrete request through ISO 37120 for the evaluation of the city attributes is based on 100 parameters (46 core and 54 supporting). They are grouped on 17 groups as follows: finance, fire and emergency response, governance, health, recreation, safety, shelter, solid waste, telecommunication and innovation, transportation, urban planning wastewater, water and sanitation (ISO 37120:2014 Sustainable development of communities -- Indicators for city services and quality of life, 2014).

By setting this standardised indicators cities can benchmark their performance between each other. The most important positive expectations of implementing ISO 37120 are effective governments and efficient service delivery by fostering more informed and also the decision making process is based on evidence. This kind of doing business provides a framework for resilience planning and sustainability. This standard also foster comparative learning and sharing of solutions and informed practices across cities.

The main world organisation who manages the city data is World Council on City Data (WCCD). WCCD is founded as non-profit organization (www.dataforcities.org).

From the Mayors point of view the Smart City concept gives to local government responsiveness through transparency by communication with citizens (people). The data exchange is bidirectional.

One of the most important components for successful development of any kind of system is competencies of employees. Systematic and continued development of Smart City is the base of efficient city government and citizen inclusion. In this kind of sustainable environment development the private sector has good conditions for investments, business improvement and social responsibility development. Measuring regional development obligatory includes evaluations of every local government unit development.

Local governments usually found the utility company whose mission is to implement the modern and ICT oriented solutions in the living environment and providing smart solutions in every sense of making living standards better. Developing digital society is a potential for having significant progress in economy, environment, telecommunication and innovation and most of other fields of parameters. Technologies and trends of Smart City are Ubiquitous computing, Networking, Open Data, Big Data, Geographical Information System (GIS), Cloud computing, Service-Oriented Architecture (SOA), E-government, Embedded networks, Internet of Things

(IoT) (ISO/IEX JTC 1 Information technology: Smart city - Preliminary Report 2014, 2015). All of those technologies are used for connectivity, interoperability, security and privacy, data management, computing resources, analytics.

Basic preconditions for implementation of Smart City model of governance are knowledge source, funding source, organisational culture, governance framework, business management, project management that includes measuring success and results.

3.2 Smart City standards - European Context

In the European context it is important to articulate developing H2020 Smart Cities & Communities researches and developing new especial standards for Smart City components. At the European level there are a lot of organisations who develop standards in the field of ICT to be applicable in smart solutions of everyday living in smart city. For example CEN-CENELEC-ETSI SSCC-CG are going to develop Common European Standardization Strategy, through ISO/TC 268 (Sustainable development in communities), ISO TMB Smart Cities Advisory Group, ISO/IEC JTC1 Smart Cities, IEC SEG 1 Systems Evaluation Group, ITU-T SG 5 Smart Cities (ISO/IEX JTC 1 Information technology: Smart city - Preliminary Report 2014, 2015).

Smart City – ICT Standards @ETSI are: xDSL / Fibre (TC ATTM), Broadband Wireless (TC BRAN), Fixed network (NTECH/NFV), Intelligent Transport (TC ITS), Service level platform (oneM2M), Environmental Issues (TC EE), Mobile Broadband (3GPP), Smart Card / NFC (TC SCP), Power line (TC PLT), Satellite (TC SES), Aeronautical (TC AERO), Railway communications (TC RT), Radio Aspects (TC ERM), Low power radio (LTN) and others.

As the authors mentioned before in this chapter there are set 100 indicators for measuring the success of being Smart City. This article will focus on data sources for these getting indicators values in Croatian case of Smart City.

4 Croatian case – the research

The authors of this article have researched sources of data that are declared as ISO 37120:2014 indicators by which cities are declared as smart.

The procedure of getting ISO 37120 certificates has four steps. Introducing the ISO 37120 themes and core indicators selections, data collection, data upload into the Smart City Platform DataBank and certification process. Collecting the data is a process that takes more time than the other phases, so the authors of this article put the stress on it.

The research was conducted during April until May in 2016. Determination of data sources started

with local institutions and it was expended to regional and state level institutions. Most data that was collected from the local level has been getting by direct communication between official staff, by e-mail, or was requested by phone. Regional and state level of institutions mostly requested a formal letter as request for data delivery. Just one of state level institution instructed the official staff to the official procedure for requesting information.

In the process of collecting data, there were situations that for calculating some indicator value the researchers have to consult at least two institutions or business subjects. For example, the indicator: "Kilometres of light passenger public transport system per 100 000 population", "Annual number of public transport trips per capita" , "Number of cell phone connections", "Number of landline phone connections per 100 000 population" was specified as protected data, and it has to be signed a contract for keeping these data as secrete business information.

During the research, the reports of result for big and medium sized cities were accessible on the internet. When the team determine inputs and calculate the valued of indicator it could be a private data, there is no obligation to publish it. In that case, it will be impossible to benchmark and organise competition between cities in the same category of size.

The values for calculating some indicators are unreachable exactly for the city territory. For example, the indicators about environment as Fine particulate matter (PM2.5) concentration, Particulate matter (PM10), Greenhouse gas emissions measured in tones per capita, Nitrogen dioxide (NO2), Sulphur dioxide (SO2), Ozone (O3) because the data are measured for the wider area (the territory of three county in Croatian territorial organization are not measured continually in the city territory.

The experience from Croatian case of collecting data for defined indicators in ISO 37120 leads to general conclusions grouped by aspects that will be presented hereafter:

The authors have focused on the following attributes of indicators during the process of collecting data for indicators:

- Period or moment at the time in which data is recorded and period of time in which data are processed. Authorised institutions collect data continually and processing mostly annual. The special case is population census, which takes place in every 10 years. The last was in 2011.
- Jurisdiction: State, regional and local authorities mostly publish annual reports on their web sites. More problems with unreachable data were with data that have to be accepted as report on local representation authorities (assembly) and the reporter is an institution of lower rank. In these cases reports were accepted on parliamentary sitting but it is not easy to find concrete data if it is

not known the number of sitting. Also the data are not structured as they are requested in ISO 37120:2014.
- Transparency: Authors mostly sent request to collect data to appropriate institution and mostly get data. In just three of all cases the authors get answer that the recipients of request do not dispose the data.
- Degree of automation in the process of making data: More than 90% of data that were collected during this research were not created from any kind of system directly. Almost all of data were found in some kind of report as processed information. It could not be said that the process of collecting data is automated. In the context of Big Data concept it will require complex model and the procedures for developing the model will be also complex. This is also a potential topic for the research.

The indicators are classified as core and supporting. Seven of seventeen areas (41%) have declared more and equal core than supporting indicators.

When the data were collected for the indicators it was important to understand the global character of implementing ISO 37120. For example some indicators seem that they are not useful in the context of Croatian law, life habits and tradition.

The State authorities and companies that gave support to the researchers in the process of collecting data were: Central Bureau of Statistics, City police station, Croatian Electrical Utility, Croatian Employment Institute, Croatian Institute of Public Health, Croatian Pension Insurance Institute, Croatian Regulatory Authority for Network Industries (HAKOM), Master registry office, State intellectual property office.

Table 1. Number of indicators by areas and levels of administration that collect data

AREA	STATE	LOCAL	REGIONAL	TOTAL
ECONOMY	6		1	7
CORE INDICATOR	2		1	3
SUPPORTING INDICATOR	4			4
EDUCATION	1	1	5	7
CORE INDICATOR		1	3	4
SUPPORTING INDICATOR	1		2	3
ENERGY	6		1	7
CORE INDICATOR	3		1	4
SUPPORTING INDICATOR	3			3
ENVIRONMENT		1	7	8
CORE INDICATOR			3	3
SUPPORTING INDICATOR		1	4	5
FINANCE		4		4
CORE INDICATOR		1		1
SUPPORTING INDICATOR		3		3
FIRE AND EMERGENCY RESPONSE		6		6
CORE INDICATOR		3		3
SUPPORTING INDICATOR		3		3
GOVERNANCE		6		6
CORE INDICATOR		2		2
SUPPORTING INDICATOR		4		4
HEALTH	3		4	7
CORE INDICATOR	2		2	4
SUPPORTING INDICATOR	1		2	3

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RECREATION		2		2
SUPPORTING INDICATOR		2		2
SAFETY	5			5
CORE INDICATOR	2			2
SUPPORTING INDICATOR	3			3
SHELTER	1		2	3
CORE INDICATOR	1			1
SUPPORTING INDICATOR			2	2
SOLID WASTE		10		10
CORE INDICATOR		3		3
SUPPORTING INDICATOR		7		7
TELECOMMUNICATION AND INNOVATION	3			3
CORE INDICATOR	2			2
SUPPORTING INDICATOR	1			1
TRANSPORTATION	4	3	2	9
CORE INDICATOR	1	2	1	4
SUPPORTING INDICATOR	3	1	1	5
URBAN PLANNING		4		4
CORE INDICATOR		1		1
SUPPORTING INDICATOR		3		3
WASTEWATER		5		5
CORE INDICATOR		5		5
WATER AND SANITATION		7		7
CORE INDICATOR		4		4
SUPPORTING INDICATOR		3		3
TOTAL	29	49	22	100

The regional authorities and companies that gave support to researchers during the process of collecting data were: County office in charge of health and social care, for education, for traffic, energy management.

The indicators related with energy consumption in public buildings are collected by local and regional level of government institutions. Those indicators related with education are collected from all of three levels authorised institutions (state, regional and local). That is the reason why all of three levels of authorities collect the data is in their jurisdiction. The education is a matter of large cites for primary schools and of county for secondary and primary schools (outside the large cities), but the enrolment of children in primary and secondary school is a matter of Office of the State Administration in county.

The web services used for collecting data was ViaMichelin for documenting calculation and travel route to the nearest airport.

During the process of collecting data, some facts were determined that could generate open data services for public purposes in the future. For example, institution in charge of collect some data could not give the data because the reporting module of information systems does not offer such operations. Any data, which is inputted in the information system, could be criteria for search group and could be an object to analyse it. Nowadays the information systems of the public authorities, here was observed mostly at state level, are not open data even for the officers in their organisational unit. If the information system could serve as a source of row data that could be exported to spreadsheet calculator for further processing the collecting data for Smart City will be easier and quicker. It could be a source of data for qualitative analyse that is important in societal systems.

Generally, it is a challenge to influence to all levels of public governance systems in Croatia to make available data necessary to calculate indicators, with the reason of improvements of the quality living conditions in the cities. The main precondition to improve things is to be sure about the reality analysis. The intention of the authors of this article is to form a register of data source for indicators for ISO 37120 certification. The main reason is simplify annual checking of progress in making better the indicators value and the secondary reason is to assure information about sources for other cities in Croatia to collect data.

5 Conclusion

Having a smart city includes the benefits like:
- Efficient resource utilization: With many resources becoming either scarce or very expensive, it is important to integrate solutions to have better and more controlled utilization of these resources. Enterprise resource planning (ERP) and Geographic Information System (GIS) will be useful are nowadays well known technological systems. Monitoring systems at work can make easier to spot waste points and better distribute resources while controlling costs and reducing energy and natural resources consumption. Smart city applications are designed for interconnectivity and data collections, which can also facilitate better collaboration across applications and services.
- Have a better quality of life with better services, more efficient work and living models, and less waste. This is the result of better planning of living/work spaces and locations, more efficient transportation systems, better and faster services, and the availability of enough information to make informed decision.
- Higher level of transparency and openness, which drive the interoperability and openness to fulfill needs for better management and control of the different smart city aspects and applications. The standard will be data and resource sharing. This will encourage collaboration and communication between entities and creating more services and applications that further enhance the smart city.

By making a register of data source for indicators, the authors give the practical contribution to implementing ISO 37120 in Croatian cities. It gives a possibility to make benchmarking between smart cities.

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