SMART CITIES AND THE NECESSITY OF OPENING OF THE DATA IN THE CZECH REPUBLIC AS AN EXAMPLE OF CEE COUNTRY

Libor Pacovský[1]
Jan Jolič[2]

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Abstract: *Transparency and openness should be the basic principle of modern public administration. Many cities want to become smart cities, so they develop smart city strategies and realise specific smart city projects. However, only a few of the Czech cities are actually successful in this area. This paper studies the problems of the open data approaches in cities' practice. The public administration collects and stores data representing a smart city's critical element and one of the smart governance's essential tools toward modern public administration.*

The study aims to analyse the situation of open data and smart city measures in the Czech Republic and demonstrate the obvious separation of smart city implementation, data utilisation and smart governance in cities' practice.

The Czech Republic is one of the CEE countries that could benefit from more comprehensive smart cities measurement applications because some of its regions lag in digitalisation development. The opening of the data and the utilisation of them could be the first step for the cities or regions to implement advanced methods and technologies to become smart city. The only cities with successfully implemented smart city measures are the ones that are also relatively successful in open data publishing.

Keywords: *Public administration, Smart governance, Digitalisation, Open data.*

1. INTRODUCTION

The paper focuses on the importance of Open Data in the perspectives of Smart Governance and Smart City implementation. The problem of the open data approaches in cities' practice is demonstrated in the Czech Republic's case as an example of a CEE country. This paper consists of a theoretical literature review regarding Smart City and Smart Governance and Open data in the context of Smart Cities. This provides the theoretical framework for the case study in the empirical part. The case study deals with implementing open data in the Czech Republic. It compares the situation in the cities' practice in the Czech Republic and foreign experiences in CEE countries. The article discusses the results of the contemporary situation and the possibilities to improve, as well as the potential consequences.

2. SMART CITY AND SMART GOVERNANCE

Many cities want to become Smart Cities. The Smart City concept has become a widely discussed research topic in various perspectives such as technological, economic, public policy, social or environmental subjects. According to Gil-Garcia, Pardo, and Nam (2015 p. 62) and

[1] Jan Evangelista Purkyně University in Ústí nad Labem, Pasteurova 1, 400 96 Ústí nad Labem, Czech Republic

[2] Jan Evangelista Purkyně University in Ústí nad Labem, Pasteurova 1, 400 96 Ústí nad Labem, Czech Republic

Chourabi et al. (2012), Smart City creates a response to the solution of new problems arising from urban development and urbanisation. Moreover, ICT development/digitalisation and economic perspective are often considered as the key drivers of the development of a Smart City. Augustyn (2013, p. 4) refers to the growing importance of ICT as an initiating force for economic competitiveness, environmental sustainability and the general viability of urban development.

There are extensive academic discussions regarding the concepts of a Smart City and public policy decision-making. To build a Smart City, strategic planning and evidence-based/expert approaches are needed. The concept of smart cities usually includes several key concepts. Lombardi et al. (2012) define six fundamental smart dimensions – a smart economy, smart mobility, smart environment, smart people, smart living and smart governance.

Authors focus on Smart Governance, despite the fact that there is no single conclusive definition of this term. In authors' views, the objective of smart governance is the higher transparency of city planning and decision-making, as well as a higher level of information for citizens based on using ICT tools. Smart Governance represents smart management in public administration based on selected attributes and at the same time, an equally important role of SG is the management and implementation of Smart City projects. SG is therefore an important part of the Smart City concept.

Bolívar and Meijer (2016) identify six defining elements of Smart Governance – the use of ICT technologies, external collaboration and participation, internal coordination, decision-making process, e-administration and outcomes. These attributes are in various extents presented by academic discussion. Nam (2012) goes beyond that by promoting leadership, communication, data-exchange, accountability and transparency. Similarly, (Gil-Garcia et al., 2015) refers to governance based on ICT technology which represents a set of technologies, people, policies, resources and information supporting city management for governing cities. Furthermore, (Gil-Garcia et al., 2015) identify three parts of governance: e-governance, the involvement of stakeholders, the public, communities and networking, partnerships and cooperation.

Besides that, the weakness of the contemporary approach to Smart Governance is objectively measurable indicators that are unclear, and the non-standardization of rules or framework for SG implementation. This leads to a certain overall uncertainty of SG and ambiguity, what the implementation of SG means in practice and what outputs it brings. This is also the situation in the Czech Republic, where the implementation of SG is in the initial phase.

In general, academic discussions pay less attention to SG measurability (e.g. Giffinger et al., 2007; Lombardi et al., 2012). Although, Kumar, Singh, and Gupta (2016) state there is a wide list of SG indicators based on a literature review. A significant part of identified indicators has subjective character (e.g. friendly access to information for the public, transparency in management processes, etc.) and hereby it is limited in response to the problem of measurable indicators and the implementation of SG in practice.

Kumar et al. (2016) emphasise transparency and the openness of public administration together with orientation to the public, providing information and e-services as a best practice approach. Therefore, Smart Governance tools are oriented to benefit citizens. In general, it is characterised by increasing the number of public e-government services, enhancing public participation and data utilisation. SG tools represent open data, participatory budgeting, participation platforms, etc. The subject of study is focused on open data as an important tool to build modern public administration in a Smart City.

3. OPEN DATA IN THE CONTEXT OF SMART CITIES

In the Czech Republic, the Ministry of Regional Development (MMR) issued a methodology of evaluation of sustainable Smart Cities (Ministry of Regional Development, 2018). The methodology includes identified indicators for Smart Governance. The methodology assigns units and calculation determinations to specified indicators of sub-areas. There are often ratio indicators (%) used, although source data for calculations are usually not publicly available.

One of the sub-areas is defined as "ICT Infrastructure" which represents three objectives – maximise the utilisation of internet connection, increase the efficiency of data collection and their evaluation for practical use, and maximise the sharing of open data for their subsequent use. This objective consists of two indicators – the utilisation of municipal open data and the availability of open data.

There are several definitions of open data, but for the purposes of this article, the definition stated by M. Janssen, Charalabidis, and Zuiderwijk (2012) is going to be used. According to them, open data is data that is not confidential, created by using public money and is made completely public without any restrains concerning their usage.

Public administration is one of the biggest producers of data (K. Janssen, 2011), so the public sector can utilise the power of information and communication technologies by using only this data. Without proper open data about the municipality, there are negative consequences when it comes to urban management and planning (Chakraborty et al., 2015). Some authors also argue that the public sector's data should be publicly available for the reason that the public sector is gathering and processing the data using the tax-payers' money. Therefore, tax-payers (citizens and corporations) should be able to get and use this data.

The role of open data in the life of citizens is well described in the literature. For example, Tolbert and Mossberger (2006) explained how open data and online available governmental information improves public trust and transparency of public administration. In recent work, Ruijer et al. (2018) confirmed that open governmental data should enhance the transparency and participation of the public. However, the full potential of those improvements has still not been fulfilled. Despite the above stated benefits, there are still reasons why open data is not widely and universally used across all parts of public administration. There are also some barriers for (local) governments to publish open data. Conradie and Choenni (2014) conducted a study about the processes that lead to the publishing of open data. They also warn against publishing the data just for the sake of publishing and recommend taking small steps when it comes to data publishing rather than implementing big, expensive and complex open data programs.

4. OPEN DATA AND SMART CITIES IN THE CEE REGION

The region of central and eastern Europe has undergone rapid development in the last 30 years in virtually all areas. The utilisation of ICT and modern technologies in the public sector is one of them. The important aspect of this development is that this utilisation can improve the rate and the speed with which the region is further developing.

Table 1 shows a comparison of the CEE countries according to the Global Open Data index in 2017. The Open Knowledge Foundation (2017) is assessing open government data publication from a civic perspective. The best state of open data is in Latvia, which is ranked 14th. The Czech

Republic is third when it comes to all CEE countries that are on the list. From this perspective, the Czech Republic is one of the best in the given region but the overall state of open data in the CEE region is not good. Only one country is in the top 20, while the rest is rather far down the list. This means that the CEE region lags behind the more developed countries in the world.

Some cities or countries in the region are using smart city tools and applications to help promote themselves or to increase their attractiveness for visitors. An example could be the Romanian city of Brasov, which uses an augmented reality application, Virtual Brasov, which informs tourists about the city's history and points of interest (Briciu, Briciu, & Kavoura, 2020).

Table 1. The CEE counties results according to the Global Open Data Index

Rank	Country	Score
14	Latvia	64%
24	Romania	51%
27	Czech Republic	50%
28	Poland	49%
28	Slovenia	49%
31	Ukraine	48%
32	Slovakia	47%
36	Bulgaria	45%
41	Serbia	41%
44	Croatia	39%
47	Albania	36%
58	Bosna and Herzegovina	26%

Source: (Open Knowledge Foundation, 2017)

For a broader usage of open data and smart city measures, accepting the cities' management and employees is important. Several surveys studied the attitudes toward new technologies and methods in the government. For example, Bătăgan, Constantin, and Moga (2017) found that most employees from their survey in Romania think that using open data solutions are important and at the same time they acknowledge their positive effects. Despite those findings, some other authors see the attitude of public service and government employees as one of the barriers to broader usage. This disparity may indicate differences in the attitudes and knowledge of individual employees.

Pašalić, Ćukušić, and Jadrić (2020) present the state of research in the area of a Smart City in Southeast Europe. They point out that most research focuses on the Smart City's theoretical side and only a small part is based on actual empirical evidence. The lack of practical examples from this area can be the reason for this. The findings of other research support this theory. Jurlina Alibegović, Villa, and Šagovac (2018) say that only two cities in Croatia have a smart strategy. Only a few of the cities in the country have developed some kind of SC projects.

Usually, the capital city is often pursuing the goal to become one of the Smart Cities. Still, some other cities in the CEE region are also starting to implement some SC practices, for example, the cities of Debrecen and Szeged (Losavio et al., 2018).

5. OPEN DATA AND SMART CITIES IN THE CZECH REPUBLIC

According to the National Catalogue of Open Data, Prague is (with 322 published data sets) the fifth-biggest publisher of open data. Among the cities or regions, Prague is the biggest one (Ministry of the Interior of the Czech Republic, 2021). Second in this category is the city of

Pilsen, which has 166 published datasets. This is one of the signs that open data is much more developed in the capital city than in other regions or smaller cities.

Table 2 shows an overview of the state of open data in specific regions and municipalities of the Czech Republic. Most of the municipalities on the list are bigger cities, often capitals of the given region. However, there is one exception, being the municipalities of Bohumín and Huntířov, which are rather small towns but which are also collecting and publishing quite a large number of datasets. These towns can serve as an example that the opening of data and transparency, in general, are not limited to big cities.

Table 2. Overview of the state of open government data in regions of the Czech Republic

Publisher	Region / Municipality	Platform	# of datasets	URL
Municipality	Praha	CKAN	328	https://opendata.praha.eu/
	Plzen	CKAN	166	https://opendata.plzen.eu/
	Ostrava	Own solution	80	https://opendata.ostrava.cz/
	Brno	ArcGIS Hub	46	https://data.brno.cz/
	Decin	CKAN	39	https://opendata.mmdecin.cz/
	Bohumin	Own solution	20	https://www.mesto-bohumin.cz/cz/radnice/otevrena-data/
	Olomouc	CKAN	17	https://kod.olomouc.eu/
	Opava	ArcGIS Hub	14	https://okod-opava.opendata.arcgis.com/search
	Pardubice	Own solution	14	https://mapy.pardubice.eu/MyCity
	Huntirov	Own solution	5	http://www.huntirov.cz/datove-sady/ms-4033/p1=4033
	Karvina	CKAN	4	https://opendata.karvina.cz/
	Hradec Kralove	CKAN	3	http://opendata.mmhk.cz/
	Vrchlabi	Own solution	2	https://www.muvrchlabi.cz/otevrena-data/ds-1288/p1=7928
Region	Hradec Kralove	Own solution	62	https://www.kr-kralovehradecky.cz/cz/kraj-volene-organy/sklad/opendata/otevrena-data-301831/
	Central Bohemian	Own solution	1	https://doprava.kr-stredocesky.cz/site/openData
		ESRI ArcGIS	27	https://gis.kr-stredocesky.cz/JS/MAPY/
	Plzen	Own solution	8	https://www.plzensky-kraj.cz/otevreny-kraj
		ESRI ArcGIS	15	http://geoportal.plzensky-kraj.cz/gs/
	Vysocina	Own solution	16	https://opendata.kr-vysocina.cz/
	Olomouc	Own solution	17	https://data.olomouc.eu/
	South Moravian	Own solution	10	https://mapy.jmk.cz/geoportal/DATA/OTEVRENA-DATA.aspx
	Usti nad Labem	Own solution	7	https://portabo.cz/
	Zlin	Own solution	4	https://www.kr-zlinsky.cz/otevreny-urad-cl-3812.html
	Liberec Region	Own solution	3	https://dopravnimapy.kraj-lbc.cz/opendata/?id=584a7ad7-1680-4d8d-a20b-7068c371c416
	South Bohemian	Own solution	3	https://geoportal.kraj-jihocesky.gov.cz/
	Moravian-Silesian	Own solution	3	https://www.msk.cz/scripts/detail.php?pgid=47

Most municipalities and regions publishing data are doing it via their own solution without using some specialised platform. The reasons for this can be the lack of expertise or change aversion. That can lead to lower usability and efficiency of the data usage and can inhibit the open data's possibilities to be widely used in applications and for implementing it into the Smart City ecosys-

tem. An example from the Czech Republic could be that the open data in the region of Plzen is not in one place. There are datasets in different places on the region's website and the open geodata are even published on its own portal. The same situation is in the Central Bohemian Region.

There is an interesting difference between regions and municipalities. The municipalities seem to be more effective in publishing open data and using better ways to do it. 8 out of the 12 analysed municipalities are using a solution that is made for publishing data. In most cases, the platform is CKAN. This technology is widely used and thanks to its widely recognised quality, it is used by many institutions, for example, the open data portals of Switzerland[3], Canada[4], Mexico[5] and many others.

The regional open data portal or websites are not built on any platforms and in most cases, are just downloadable as a file from some city or region webpage. The only exceptions are geographical data provided by Plzen and the Central Bohemian Region. This disparity between two different government levels can mean that there is no effective system for knowledge and skill sharing.

Another difference between municipalities and regions is in the number of datasets that are published. The average municipality has published more datasets than the average region. The value of regional data can be higher because there are more potential users of the applications or services built on them. On the other hand, the data acquisition and processing for the bigger area with a bigger population can be more expensive and difficult.

Like almost all other European capitals, Prague is aiming to engage in processes towards implementing new technologies and the utilisation of them to improve the quality of life in the city as well as to enable better public participation in addition to the transparency of public administration.

In the Czech Republic, several cities are trying to implement Smart City measures (Prague, Plzeň, Brno, Jihlava). Still, Prague's Smart City initiative is undoubtedly (and without surprise – Prague is by far the biggest city with the most resources) the most developed in the Czech Republic. Its position is also good among the world's other cities. The city became the 19th smartest city in the world, according to the IMD Smart City Index 2019 (IMD World Competitiveness Center, 2019).

Although Prague today is the best in implementing the SC measures, other cities in the Czech Republic are implementing them as well. For example, the city of Plzen has its own Smart City portal, where it presents its projects and initiatives to improve the life of its citizens. The city regularly publishes its ICT and Smart City strategies, while there are more than forty finished or ongoing projects right now (City of Pilsen, n. d.).

The second biggest city in the Czech Republic is Brno, which has a strategy for becoming a Smart City. There is a Commission for the open and Smart City within the city's government and implementing the changes leading to a smarter city is one of the themes in the city's long-term strategy as is stated in the strategy Brno 2050 (https://brno2050.cz/).

[3] https://opendata.swiss/de

[4] https://open.canada.ca/ckan/en/dataset

[5] https://datos.gob.mx/

Several other smaller cities and towns declared their intentions to became a Smart City. For example, Pardubice and Jihlava both have published their Smart City strategies and both focus mainly on traffic and energy. Despite the word "city" in the term Smart City, the regions can adopt the Smart City measurements as well. Unfortunately, no Czech Republic regions adopted or implemented any significant project or measure in this regard.

6. FUTURE RESEARCH DIRECTIONS

The literature review revealed that the public sector employees could be discouraged by the possible disclosure of problematic information or misinterpretation of published data. Future research should aim to put those fears and anxieties in the context of real benefits so that future lobbyist in the open data field will be able to communicate these issues.

7. CONCLUSION

All three cities (Prague, Brno and Pilsen) currently pushing the SC projects are all at the top of the list of the cities with the most open data datasets published, and all are using an advanced platform to share their data. Open data is also one of the main themes the Smart City initiatives are built around.

On the one hand, this can mean the data's opening enabled the further application of SC measures and is therefore important. On the other hand, opening data and making the city smarter can be both taking place in parallel. The fact that both initiatives emerged simultaneously suggests that the later eventuality may be more likely.

Based on the literature review, one of the main barriers to changes in the public sector is the attitudes of the city's employers and managers as well as their risk and change. The relation between the advanced open data portal and the Smart City development may indicate that the city's management in addition to its courage and commitment to using modern technologies leads to success.

The open data's overall situation in the Czech Republic is not good, except for Prague and a few other big cities. The short analysis of the open data portals and websites presenting the open data of regions or bigger cities shows that there are significant differences among them and that there are not any generally accepted rules and standards for the publishing of open data.

The differences in the development level in these areas cannot even indicate greater differences in the way the cities are managed and in the overall state of the cities (or regions). Still, they can also contribute to further divergences in the cities' situations and development, so the poorer regions can even worsen their prospects and opportunities.

Part of the regions did not have any website or portal specifically dedicated to open data and even when they do publish some of the data, they place the data somewhere in the cities' or regions' website. This makes it difficult for public members who are interested in open information about the public sector to find and use the data.

Another possible factor slowing down the application of open data initiatives and Smart City measures can be the opinions and behaviour of the public sector employees. The solution for this can be to provide information and have better and more detailed training.

There is still a long way to go when it comes to the wider adoption of open data as well as SC methods and techniques. The first point should be the processing and publishing of the data. Since the public sector is already collecting a large amount of data, there should not be any significant amount of work or resources needed for that. The data opening can be the first step in pursuing more radical changes, like implementing procedures to make the city smarter. These small steps could also break the risk aversion of the management and can change the attitudes of public officers.

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