Open Government Data in Western Balkans: Assessment and Challenges

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Abstract— **In order to improve availability and usage of public data, national, regional and local governmental bodies have to accept new ways to open up their data for everyone to use. In that sense, the idea of open government data has become more common in a large number of governmental bodies in countries across the world in the past years. This study gives an overview of open government data that are available on the Internet for Serbia, Montenegro, Bosnia and Herzegovina and Croatia. Three most common methodologies for open data assessment are described and one of them is used to indicate advantages and disadvantages of available data. The detailed research provided enough information to make proposals for eliminating open government data shortcomings in these countries.**

I. INTRODUCTION

Public data represents all the information that public bodies in one government produce, collect or pay for. One part of the public data is presented in the form of open data which is defined as data in a machine-readable format that is publicly available under an "open" license that ensures it can be freely used, reused, redistributed by anyone for any legal purpose [1]. Government data is a subset of open data. It is important to consider the distinctions between "open data" and "open government". Opening up existing datasets is just the first step and does not automatically lead to a democratic government [22]. According to Jonathan Gray [22], director of policy and research at Open Knowledge, opening up is just one step and no replacement for other vital elements of democratic societies, like robust access to information laws, whistleblower protections, and rules to protect freedom of expression, freedom of the press and freedom of assembly. National, regional and local governments have to find appropriate strategies to deliver large amounts of data that is made for public use.

The main reason for opening the data is to increase transparency, the participation of other institutions and citizens, government efficiency and to create a new job and business opportunities [16]. For example, UK Government saved £4 million in 15 minutes with open data [2] and overall economic gains from opening up public data could amount to €40 billion a year in the EU [3]. The European Commission is investing large amounts of finances in finding adequate strategies to use open data which additionally indicates how open data is significant [15]. However, open data strategies are relatively new, so evidence of this expected impact is still limited. One big challenge is the exploitation of the Web as a platform for data and information integration as well as searching and querying the Web. If we combine the Web with sensitive information that government possesses, there we can find answers why some public data is not yet available. Some of the excuses which representatives of different governmental bodies give are that publishing data is technically impossible, data is just too large to be published and used, data is held separately by a lot of different organizations and cannot be joined up or IT suppliers will charge them a fortune to do that [4]. To try to overcome that, it is important that governmental bodies, as well as civil society, are willing to accept the concept of open data. Also, it is very important that data does not collide with existing laws of one country, e.g. data protection law, copyright law, etc.

In this paper, we present representative methodologies for assessing the openness of open government data, as well as their advantages and disadvantages. Further, we pick one of the presented methodologies which we feel that contains principles which open government data should fulfill. After that, we explore available open government data for some Balkan countries to see how the data fits in listed principles. In the end, we propose some solutions for eliminating observed shortcomings of presented methodologies and open government data that is available.

The following text has been organized as follows. The next section describes related work that helped us with our research. In section three, representative methodologies for assessing the openness of data were presented. Section 4 describes the current state of open data in Serbia, Montenegro, Bosnia and Herzegovina and Croatia based on one methodology proposed in section 3. Results of the research are presented in section 5. Proposals to overcome observed shortcomings are presented in section 6. Finally, the last section concludes the paper giving the future directions of this research.

II. RELATED WORK

The main implementations of open government data initiatives are data portals in a number of different ways [21]. Those are catalogs that contain a collection of metadata records which describe open government datasets and have links to online resources [18]. The implementation of a catalog raises an important question - what metadata should be stored and how should it be represented? This question is especially significant when automatic importing of metadata records (also known as harvesting) is performed, as metadata structure and meaning are not usually consistent or self-explanatory. Open data portal software such as CKAN

(Comprehensive Knowledge Archive Network) [11] or vocabularies such as DCAT (Data Catalog Vocabulary) [19] provide solutions for this problem.

The government in the United Kingdom has a site *data.gov.uk* which brings all data together in one searchable website [10]. If the data is easily available, people will be easier to make decisions about government policies based on provided information. Website *data.gov.uk* is built using CKAN to catalog, search and display data. CKAN is a data catalog system used by various institutions and communities to manage open data. The UK government continues to use and develop this website and the site has a global reputation as a leading exemplar of a government data portal. Besides the UK portal, there are three more major sites – *data.gov* (the US), *data.gouv.fr* (France) and *data.gov.sg* (Singapore).

In the last few years, the Linked Data paradigm [23] has evolved as a powerful enabler for the transition of the current document-oriented Web into a Web of interlinked data and, ultimately, into the Semantic Web. Aimed at speeding up this process, the LOD2 project [12] ("Creating knowledge out of interlinked data") partners have delivered the LOD2 Stack, "an integrated collection of aligned state of the art software components that enable corporations, organizations and individuals to employ Linked Data technologies with minimal investments" [13]. As partners of the LOD2 project, the Mihailo Pupin Institute established something similar to *data.gov.uk* website - the Serbian CKAN [14]. This is the first catalog of this kind in the West Balkan countries, with a goal of becoming an essential tool for enforcing business ventures based on open data in this region [15].

There are several studies that contain valuable information that helped us notice what are the challenges every country faces implementing the idea of "open data". In an inquiry for the Dutch Ministry of the Interior and Kingdom Relations, TNO (the Netherlands Organization for Applied Scientific Research) examined the open data strategies in five countries (Australia, Denmark, Spain, the United Kingdom and the United States) and gathered anecdotal evidence of its key features, barriers and drivers for progress and effects, which is described in [16].

Serbian government hired open data assessment expert Ton Zijlstra to make Open Data Readiness Assessment (ODRA) [9] for Serbia [17] which helped us understand current situation in one of the countries of Western Balkans.

The paper [21] presents an overview of the open government data initiatives. The aim of this research was to answer a set of questions, mainly concerning open government data initiatives and their impact on stakeholders, existing approaches for publishing and consuming open government data, existing guidelines and challenges.

There are some requirements which make government data open government data. Research presented in [8] proposes 14 principles which describe open government data. The number of principles is still expanding since every new principle opens new questions. For example, how can governmental body guaranty that the public data presented is primary? Or what is considered to be safe file format and what is not? Also, what are the ways citizens can review the data? How can an open license be presented in machine-readable form? These are only some questions to bear in mind.

III. METHODOLOGIES FOR ASSESSING THE OPENNESS OF DATA

The following two methodologies could fall into evaluating implementation category. Sir Tim Berners-Lee, the inventor of the Web and Linked Data initiator, suggested first presented methodology, a 5-star deployment scheme for open data. The five star Linked Data system is cumulative. Each additional star presumes the data meets the criteria of the previous step(s) [20].

1. Star – Data is available on the Web, in whatever format, under an open license
2. Stars – Available as machine-readable structured data (i.e., not a scanned image)
3. Stars – Available in a non-proprietary format (i.e., CSV, not Microsoft Excel)
4. Stars – Published using open standards from W3C (RDF and SPARQL)
5. Stars – All of the above and links to other Linked Open Data

These steps seem very loose, but exactly that gives them required simplicity. Of course, achieving 4 and 5 stars are not easy and Linked data has its own problems such as the way of publishing and consuming data, etc. For example, although the UK open government program is doing remarkable stuff, only a small percent of all datasets released so far could score 5 stars. It seems that this 5-star scheme mainly targets the technical aspects, but there are more aspects it needs to be considered such as political, social and economic.

Each year, governments are making more data available in an open format. The Global Open Data Index (GODI) tracks whether this data is actually released in a way that is accessible to citizens, media, and civil society and is unique in crowd-sourcing its survey of open data releases around the world [5]. The Index measures and benchmarks the openness of data around the world, and then presents this information in a way that is easy to understand and use. Each year annual ranking of countries is produced and peer reviewed by their network of local open data experts [5]. The Index is not a representation of the official government open data offering in each country, but an independent assessment from a citizen perspective which benchmarks open data by looking at fifteen key datasets in each place (including those essential for transparency and accountability such as election results and governments spending data, and those vital for providing critical services to citizens such as maps and transport timetables). These datasets were chosen based on the G8 key datasets definition [6]. Fifteen key datasets are [7]: election results, company register, national map, government spending, government budget, legislation, national statistical office data, location datasets, public transport timetables, pollutant emissions, government procurement data, water quality, weather forecast, land ownership and health performance data.

Each dataset in each place is evaluated using nine questions that examine the technical and the legal openness of the dataset. In order to balance between the two aspects, each question is weighted differently and worth a different score. Together the technical questions are worth 50 points, the three legal questions are also worth 50 points [7]. Questions that examine technical openness with corresponding weights in parentheses are: does the data exist? (5), is the data in digital form? (5), is the data available online? (5), is the data machine-readable? (15), is the data available in bulk? (10), is the data provided on a timely and up to date basis? (10).

Questions that examine the legal status of openness are: is the data publicly available? (5), is the data available for free? (15), is the data openly licensed? (30).

Contributors to the Index are people who are interested in open government data activity and who can assess the availability and quality of open datasets in their respective locations. The assessment takes place in two steps. The first step is collecting the evaluation of datasets through volunteer contributors, and the second step is verifying the results through volunteer expert reviewers. The reason why this methodology focuses only on fifteen key datasets is because the Global Open Data Index wants to maximize the amount of people who contribute to the Index, across local administrations, countries, regions and languages [7].

The good thing about this methodology is that the Index tracks whether the data is actually released in a way that is accessible to citizens, media, and civil society, and is unique because results are delivered by volunteer contributors [7]. The Index plays a big role in sustaining the open government data community around the world. So, if the government of a country does publish a dataset, but this is not clear to the public and it cannot be found through a simple search, then the data can easily be overlooked [7]. In that case, everyone who is interested to find this particular data can review the Index results to locate it and see how accessible the data appears to citizens [7].

The current problem when looking at national datasets is that there is generally no standardization of datasets between countries. Datasets differ between governments in aggregation levels, metadata, and responsible agency. The Index does not define what level of details datasets have to meet, so we have examples where data about spending is very detailed and data about national maps is very vague.

Another downside of GODI methodology is the number of datasets being assessed. The Index wants to gather as many contributors as possible for a big number of countries, but it seems that 15 datasets on a country level are not enough. Although we can record progress compared to 2014 when there were only 10 datasets, it seems that has room for a few more – for example, datasets referring to public safety (e.g. crime data, food inspection, car crashes, etc), available medications, educational institutions, public works (e.g. road work, infrastructure), transportation (e.g. parking, transit, traffic) and utilities (e.g. water, gas, electrical consumption and prices). Of course, the problem with these datasets can be that they are owned and produced by a company and not the state because some of the government services might be privatized. It is not a bad idea to consider evaluating

municipal datasets. With that, public services can gain in efficiency and users in satisfaction by meeting the expectations of users better and being designed around their needs and in collaboration with them whenever possible. Also, another indicator in addition to 9 questions should be the one concerning provenance and thrust of the data. Public data should have some kind of digital license which provides authenticity and integrity of the data. Also, datasets should be multi-lingual because of national minorities.

The next methodology mentioned is called Open Data Readiness Assessment (ODRA) [1]. This methodology could fall into readiness assessment category. The World Bank's Open Government Data Working Group developed ODRA which is a methodological tool that can be used to conduct an action-oriented assessment of the readiness of a government or individual agency to evaluate, design and implement an Open Data initiative [1]. This tool is freely available for others to adapt and use. The purpose of this assessment is to assist the government in diagnosing what actions the government could consider in order to establish an Open Data initiative [1]. This means more than just launching an Open Data portal for publishing data in one place or issuing a policy. An Open Data initiative involves addressing both the supply and the reuse of Open data, as well as other aspects such as skills development, financing for the government's Open Data agenda and targeted innovation financing linked to Open Data [1].

The ODRA uses an "ecosystem" approach to Open Data, meaning it is designed to look at the larger environment for Open Data – "supply" side issues like the policy/legal framework, data existing within government and infrastructure (including standards) as well as "demand" side issues like citizen engagement mechanisms and existing demand for government data among user communities (such as developers, the media and government agencies) [1]. The assessment evaluates readiness based on eight dimensions considered essential for an Open Data initiative that builds a sustainable Open Data ecosystem. The readiness assessment is intended to be action-oriented. For each dimension, it proposes a set of actions that can form the basis of an Open Data Action Plan. Eight dimensions are [1][17]: senior leadership, policy/legal framework, institutional structures responsibilities and capabilities within government, government data management policies and procedures, demand for open data, civic engagement and capabilities for open data, funding and open data program, a national technology and skills infrastructure.

In order to make a better assessment, significant numbers of governmental body representatives have to be interviewed. That takes time, and it is questioned if everybody from selected government sections is willing to participate. ODRA is free to use but it can be a big problem for someone to use it to make an assessment on their own. Usually, open data experts are hired by the government to make an assessment for their internal reasons. The process of making the assessment is long, expensive and very detailed. After making an assessment based on ODRA, action plan applies. The suggested actions are provided to be taken into consideration by some kind of Open Data Working Group, and it is suggested to consider them in the context of existing policies and plans to determine priorities and order of

execution in detail [17]. Readiness assessments tend to operate at the country level, although the World Bank suggests their ODRA can also be applied at sub-national levels [1].

We described the GODI methodology most detailed among three widely used methodologies as we feel it is the most accessible way for every citizen to explore open government data and make an assessment. Another reason for choosing this methodology is because Serbia, Bosnia and Herzegovina, Croatia and Montenegro have not been scored in official assessment since they did not submit all datasets to 2015 year's Index. In this way, we can see the true state of open government data in these countries.

IV. WESTERN BALKANS RESEARCH

This section describes how open data collected from different governmental bodies in Serbia, Montenegro, Bosnia and Herzegovina and Croatia fits in the GODI methodology described in section 3. The first step was to visit open data portals that have specialized data concerning these countries. If the data were not found there, specialized government websites were visited for desired information. Scores were given based on survey score [7]. Summarized results for four countries were given in Tables I-IV. After the research total score for Serbia is 520/1300, for Bosnia and Herzegovina 375/1300, for Croatia 510/1300 and for Montenegro 390/1300. Kosovo[1] is ranked 40th in the 2015 Index with a total score of 555/1300.

V. RESULTS

Considering that Taiwan is 1st on the list with the score of 1010/1300 and based on provided information, it can be concluded that the openness of the data in given countries is not on a high level. Datasets that were observed fulfill minor part of 14 principles defined in [8]. Data is online and free, primary, timely and partly accessible. Further, data is non-discriminatory, permanent and considered in safe file formats. Shortcomings are more visible. There is a lack of information about licenses. Data is not digitally signed or provided with some kind of authenticity and integrity. It has big problem when it comes to machine readability. Datasets are predominantly available in PDF and Microsoft Word files which are not preferred formats for computer processing. Also, data is partly proprietary which refers to datasets available in Microsoft Word file.

TABLE I.
OPEN DATA ASSESSMENT FOR SERBIA

Serbia	Data exists	Digital form	Publicly available	For free	Online	Machine-readable	In bulk	Open license	Timely & up-to-date	Score
Election Results	5	5	5	15	5	15	10	-	10	70
Company Register	5	5	5	15	5	-	-	-	10	45
National Map	5	5	5	15	5	-	-	-	10	45
Government Spending	5	5	-	-	-	-	-	-	-	10
Legislation	5	5	5	15	5	-	-	-	10	45
National Statistical Office Data	5	5	5	15	5	15	-	-	10	60
Location	5	5	-	-	-	-	-	-	-	10
Government budget	5	5	5	15	5	-	10	-	10	55
Pollutant Emissions	5	5	5	15	5	-	-	-	10	45
Gov. procurement data	5	5	5	15	5	-	-	-	10	45
Water quality	-	-	-	-	-	-	-	-	-	0
Weather forecast	5	5	5	15	5	-	-	-	10	45
Land ownership	5	5	5	15	5	-	-	-	10	45

TABLE II.
OPEN DATA ASSESSMENT FOR BOSNIA AND HERZEGOVINA

Bosnia and Herzegovina	Data exists	Digital form	Publicly available	For free	Online	Machine-readable	In bulk	Open license	Timely & up-to-date	Score
Election Results	5	5	5	15	5	-	-	-	10	45
Company Register	5	5	5	15	5	-	-	-	10	45
National Map	5	5	5	15	5	-	-	-	10	45
Government Spending	-	-	-	-	-	-	-	-	-	0
Legislation	5	5	5	15	5	-	-	-	10	45
National Statistical Office Data	5	5	5	15	5	-	-	-	10	45
Location	-	-	-	-	-	-	-	-	-	0
Government budget	-	-	-	-	-	-	-	-	-	0
Pollutant Emissions	-	-	-	-	-	-	-	-	-	0
Gov. procurement data	5	5	5	15	5	-	-	-	10	45
Water quality	-	-	-	-	-	-	-	-	-	0
Weather forecast	5	5	5	15	5	15	-	-	10	60
Land ownership	5	5	5	15	5	-	-	-	10	45

flow provided by the GODI. Scores for transport timetables and health performance are omitted from final

[1] References to Kosovo shall be understood to be in the context of Security Council Resolution 1244 (1999).

TABLE III.
OPEN DATA ASSESSMENT FOR CROATIA

Croatia	Data exists	Digital form	Publicly available	For free	Online	Machine-readable	In bulk	Open license	Timely & up-to-date	Score
Election Results	5	5	5	15	5	15	10	-	10	70
Company Register	5	5	5	15	5	-	-	-	10	45
National Map	5	5	5	15	5	-	-	-	10	45
Government Spending	5	5	-	-	-	-	-	-	-	10
Legislation	5	5	5	15	5	-	-	-	10	45
National Statistical Office Data	5	5	5	15	5	-	-	-	10	45
Location	-	-	-	-	-	-	-	-	-	0
Government budget	5	5	5	15	5	15	10	-	10	70
Pollutant Emissions	5	5	5	15	5	-	-	-	10	45
Gov. procurement data		5	5	15	5	-	-	-	10	45
Water quality	-	-	-	-	-	-	-	-	-	0
Weather forecast	5	5	5	15	5	-	-	-	10	45
Land ownership	5	5	5	15	5	-	-	-	10	45

TABLE IV.
OPEN DATA ASSESSMENT FOR MONTENEGRO

Montenegro	Data exists	Digital form	Publicly available	For free	Online	Machine-readable	In bulk	Open license	Timely & up-to-date	Score
Election Results	5	5	5	15	5	-	-	-	10	45
Company Register	5	5	5	15	5	-	-	-	10	45
National Map	5	5	5	15	5	-	-	-	10	45
Government Spending	5	5	-	-	-	-	-	-	-	10
Legislation	5	5	5	15	5	-	-	-	10	45
National Statistical Office Data	5	5	-	-	-	-	-	-	-	10
Location	-	-	-	-	-	-	-	-	-	0
Government budget	5	5	-	-	-	-	-	-	-	10
Pollutant Emissions	5	5	5	15	5	-	-	-	10	45
Gov. procurement data	5	5	5	15	5	-	-	-	10	45
Water quality	-	-	-	-	-	-	-	-	-	0
Weather forecast	5	5	5	15	5	-	-	-	10	45
Land ownership	5	5	5	15	5	-	-	-	10	45

All data is predominantly found on specialized websites of corresponding governmental bodies and not on existing open data portals. It is unknown if all of the observed countries have appropriate governmental bodies which control open data. Definitely, the big problem is interoperability between different governmental bodies, i.e. lack of it. Besides that, public input is crucial to disseminating information in such a way that it has value, and lack of different datasets prove that this principle is hard to please.

VI. MEASURES FOR SHORTCOMINGS REMOVAL

First two things that should be done are creating a marketing campaign in which relevant political bodies will be familiarized with strategies for open data and creating a specific governmental body which will ensure interoperability between existing governmental bodies. Also, government agencies need to know what are the expenses of collecting and exchanging data as well as which are the ways of income generation. A wider range of datasets can be used if data is anonymous and in accordance with existing data protection laws of one country. In order to include more different government bodies, creating open data pilot projects with participation of different ministries and agencies is advised. Also, publishing government data that is regularly requested as open data is a good way to reduce the workload of government officials. During the research, it was observed that different governmental bodies have their own websites, but it is a bit difficult to find appropriate data. The solution can be found in the United Kingdom and their centralized website. If the data is easily available, people will be easier to make decisions about government policies based on provided information. If making a new website with all the data that exists on known websites is too much work, then this website can contain only links to other websites with adequate information. Different ways for providing access to files would be via File Transfer Protocol (FTP), via torrents or via Application Programming Interface (API). The solution for certifying data to be primary can be found in existing or a new law of a country. Question about safe file format will always be open for debate. The fact is that most of the data are presented in PDF, Microsoft Word, and OpenOffice's OpenDocument files. In most cases later two formats are better for open government data than PDF as they are print-ready like the PDF but also allow for reliable text extraction. The second condition for making file format appropriate for documents would be machine readability. That feature none of the above file formats can satisfy. That is why the data should be available in formats such as XHTML, RDF/XML or CSV, too. As the best solution for open data machine-readability problem, for now, we suggest using linked data paradigm which gives benefits to users like discovering more related data while

consuming the data, making data discoverable and more valuable.

Another shortcoming discovered during our research is related to license under which the data is published. In most jurisdictions there are intellectual property rights in data that prevent third-parties from using, reusing and redistributing data without explicit permission. Licenses conformant with the Open Definition which can be found at *http://opendefinition.org/licenses* are recommended for open data. More precise, using Creative Commons CC0 (public domain dedication) or CC-BY (requiring attribution of source) is suggested. Another flaw is that some government sites have the required data but it is not downloadable in a bulk. Earlier in this section, as one way of providing access to data, API was proposed. It is important to understand when bulk data or an API is the right technology for a particular database or service. Bulk data provides a complete database, but data APIs provide only a small window into the data. Bulk data is static, but data APIs are dynamic. A good data API requires that the agency does everything that good bulk data requires (because ultimately it delivers the same data), plus much more. Therefore, governmental bodies should build good bulk open data first, validate that it meets the needs of users, and after validation, invest in building a data API to address additional use cases. Of course, both bulk and API as possible ways of reading the data are desired.

VII. CONCLUSION

In this paper were presented some methodologies for assessing the openness of the data. Research concerning Serbia, Montenegro, Bosnia and Herzegovina and Croatia is carried out and observations were expressed. Further, some proposals how to overcome observed shortcomings were listed. During our research, "open data" have been placed on the political and administrative agenda in the Republic of Serbia. Ton Zijlstra made the ODRA for Serbia [17] and different governmental bodies were engaged in improving open government data. There is action plan prepared in Montenegro in accordance with the principles of Open Government Partnership committed to making some difference. In Bosnia and Herzegovina awareness about open data was raised through an EU-funded PASOS project. Government officials in Croatia launched open data portal which offers in a single place different kind of data related to public administration and is an integral part of the e-citizens project. Many hackathons with open government data as a theme were organized for young people, to include them in open data popularization process. The research also demonstrated that opening the data is hard because there is a kind of closed culture within government which is caused by fear of the disclosure of government failures and even escalating political scandals. Also, databases which contain significant data are not well organized and there are not sufficient human and financial resources to collect a big amount of data. Although there is a willingness to apply strategies for open data, governmental bodies still hesitate to actually do this because they do not understand true effects of those strategies.

In the future work, we will try to contribute more to governmental bodies' open data actions like hackathons and open data pilot projects and to provide latest data to the GODI. Also, we will try to expand our research on open data concerning judicial systems and parliaments which would give us a complete picture of open data which one country should provide. The other direction of future work would be developing special software tools for consuming open data by people who are not so technically skilled.

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