Trends and Prospects of Opening Data in Problem Driven Societies

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EDITORIAL: TRENDS AND PROSPECTS OF OPENING DATA IN PROBLEM DRIVEN SOCIETIES

This special issue of the interdisciplinary **INDECS journal is** planned to offer the results of research on opening and sharing data in the context of the European Data Strategy striving towards a single European data market, the implementation of the Open Data Directive[1] by EU Member States and other EU measures promoting open data being expected soon.

In the last two decades open data has revolutionised the data landscape in the European Union. In the beginning of the 21st century government data was typically available at high cost accompanied by restrictive licences that only a few could afford. How different is the data landscape in 2022: in the EU27 thousands of government datasets are provided as open data, including many high value datasets and this may only be the beginning of the next wave of open data foreseen if the European Data Strategy is fully implemented. Europe is working towards this goal with the soon to be expected draft *Implementing act on high-value data sets* as part of the Open Data Directive, the proposed *Data Act*[2], and the proposed *Data Governance Act*[3].

Although the availability of open government data has significantly grown over the past twenty years, the provision is still mostly provider led, leaving even today many users in the dark when they are trying to find, access and reuse open government data for their purposes. As such the supply of open government data is not yet based on the major challenges we have to encounter in our information societies anno 2022. The upcoming *Interoperable Europe Act* will help the Member States further on their way to digital transformation facilitating the creation of eco-system of integrated digital public services. This Act will be adding to the building blocks upgrading governing digital services in the EU agreed upon earlier this year by the European Commission, European Parliament and European Council: the Digital Services Act[4] and the Digital Markets Act[5].

Academic research on and with open data so far has been mostly single disciplinary and single domain, providing new insights limited to these disciplines or domains, ignoring the fact that most challenges go beyond these and require interdisciplinary and multi-domain research approaches to obtain a more comprehensive understanding of the nature of the challenges and ways to overcome them.

The ongoing project TODO (Twinning Open Data Operational) that has received funding from the European Union's Horizon 2020 research and innovation programme (grant agreement No 857592) aims to leverage the interdisciplinary scientific excellence and innovation capacity of the University of Zagreb in the field of open data and multi-domain research approach on the open data life cycle to boost the supply and the use of open government data in Croatia and beyond. All of the planned activities of the project, especially the capacity building and the transfer of the knowledge and the experience are fostered by the expert research groups from the two universities with pronounced excellence in open data research and ecosystem development: the Delft University of Technology and the University of Aegean.

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[1] Directive (EU) 2019/1024 of the European Parliament and of the Council of 20 June 2019 on open data and the re-use of public sector information. OJ L 172.

[2] European Commission, 2022, Proposal for a of the European Parliament and of the Council on harmonised rules on fair access to and use of data (Data Act). COM(2022) 68 final.

[3] European Commission, 2020, Proposal for a of the European Parliament and of the Council on European data governance (Data Governance Act). COM(2020) 767 final.

[4] See for the text of the proposal: Proposal for a Regulation of the European Parliament and of the Council on a Single Market For Digital Services (Digital Services Act) and amending Directive 2000/31/EC. COM/2020/825 final.

[5] See for the text of the proposal: Proposal for a Regulation of the European Parliament and of the Council on contestable and fair markets in the digital sector (Digital Markets Act), 2020/0374 (COD).

The decision to organise a special issue of research focusing on the prospects of open data was a logical step in building the multi-disciplinary teams. The TODO consortium researchers were introduced to a number of domain focused open data research topics at the National Open Data Conference 2021 (NODC2021), September 20th to September 22nd, 2021 in Zagreb. Most of the articles of this special issue are addressing the Croatian open data ecosystem and are a development of the initial domain/discipline approach. Several articles present a breakthrough in connecting the disciplines to address the real world challenges by exploiting the open data and by improving the open data ecosystem.

This special issue entitled "Trends and Prospects of Opening Data in Problem Driven Societies" identifies several of societal challenges and explains the role of open data in making our world a little better. The trends we draw from the submission to this special issue are:

Trend 1: Extending the open data supply;
Trend 2: Applying open data to real world challenges;
Trend 3: Improving the open data ecosystem.

The first trend (Extending the open data supply) is exemplified by the following articles:

1. *Improving the availability of space research spatial data* where the authors Nevistić and Bačić provide an overview of planetary spatial data archives, data storage and retrieval methods, and their shortcomings in the context of easy search, download and interpretation of data, with the aim of establishing Spatial Data Infrastructure of Celestial Bodies that would make space data better accessible to the public and non-planetary scientists.

2. *Open National CORS data ecosystems: A cross-jurisdictional comparison* by Supinajaroen *et al.* explores the divergence in the openness of the National Continuously Operating Reference Stations (NCORS) in the Netherlands, Germany and Sweden. NCORS networks collect and process data from the Global Navigation Satellite Systems (GNSS) to provide precise positioning data to support spatially related activities.

3. In *Identifying and overcoming the barriers towards open data of public undertakings,* Boone and Van Loenen consider the third wave of open data where open government data is complemented by open data of the public undertakings. They assess expected legal, organisational and technical barriers for the case studies of the Port of Rotterdam and Schiphol Airport in Amsterdam.

4. *Firefly occurrences in Croatia – One step closer from citizen science to open data* by Virić *et al.* deals with data deficient nature protection issues and species, which can be addressed by applying the citizen science approach as well as with the value of data collected by non-experts.

The second trend discovered in the submissions for this special issue, applying open data to real world challenges is evident in the following articles:

1. *Urban dog spaces: the openness of dog-related data in the City of Zagreb, Croatia* by Varga *et al.* is an assessment of data provided via official websites and portals of the city required for construction and maintenance of urban infrastructure. Five-star system of ranking the data formats was used for the published data and the quality of data was cross-checked with the field survey and citizen science collected data.

2. *Importance of the open data approach for multimodal travel improvement* by Mandzuka *et al.* examines *Multimodal Journey Planners* (MJPs). MJPs provide travellers with better and more complete information when choosing a mode of transport so they can select the most suitable option for their needs. The *open data* approach is crucial for defining a system that responds to the end-users' actual needs and aspirations. In this

    research, the importance of traffic data collection, acquisition and distribution according to the open data concept is described.

3. *Open election data: Evidence from Croatia in a comparative perspective* by Đurman *et al*. compares the seven major groups of electoral data available for the electoral process in EU27 and the United Kingdom, focusing on the temporal aspect of the timeliness of pre- during and post- election process data as well as providing additional details on the open electoral data available in Croatia.

4. *Open access on GNSS permanent networks data in case of disaster* by Latinčić *et al*. pointed out that although open access to Global Navigation Satellite Systems (GNSS) permanent networks is highly beneficial for natural disaster management, access is currently often restricted. A high percentage of GNSS permanent network providers that participated in the research presented agreed that these data should be freely available in instances of natural disasters.

The third identified trend: Improving the open data ecosystem, deals with the research not focused on the data sets itself, but rather in the components of the ecosystem required for its effective re-use and value generation:

1. In the article *Framework for federated learning open models in e-Government applications*, Guberović *et al*. develop a concept of the Federated Learning Open Model (FLOM) as an example for the third generation e-Government machine learning tool in the cohabitation of ethical computing and intelligent services. The authors apply the proposed FLOM framework to the horizontally partitioned data environment with the example of the agricultural commodity price prediction, as well as the vertically partitioned data environment on the example of the loan approval prediction.

2. In the *Serious games for building data capacity*, Di Staso *et al*. recognized the need for the fast awareness raising and the capacity building of the public institution employees and provide an overview and the assessment of twelve available teaching games covering that potential.

3. *Towards digital innovation: Stakeholder interactions in agricultural data ecosystem in Croatia* is an article in which Hrustek *et al*. analyse the requirements and the potential for data flow in Croatian agriculture data ecosystem, focusing on data supply from this data rich sector. In complex systems such as agriculture is, effective cooperation in promoting of the best management practices and sustainable value creating depends on understanding the myriad of stakeholders operating often in a decentralized data ecosystem. Identifying the stakeholders and their relationships is achieved by superimposing the stakeholder importance with respect to the estimated data supply based on the on-line queries and semi-structured interviews.

Basically, the most important challenge in the research community today is enabling the multi- and inter-disciplinary collaboration. The speed of the societal challenge of data empowered development and sustainability achievement in EU27 depends on the three trends identified in the submissions for the "Trends and Prospects of Opening Data in Problem Driven Societies". We can consider the dedicated issues on open data research as the important step in enabling multi-domain and interdisciplinary approach in applying open data to real world challenges through the maturation of open data ecosystems.

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