

Data Literacy for Greater Civic Participation in Smart Cities – Visualising Open Mobility Data

Veeckman, C.; McCrory, G., Walravens, N.

imec-SMIT-VUB, 1050 Brussels, Belgium

E-mail: carina.veeckman@imec.be

This study examines how open data and its visualisations allow for effective citizen engagement and sense making, drawing from the experience of four European pilot studies in the OpenTransportNet project.

I. INTRODUCTION

Nowadays, governments are faced with multiple challenges, often regarding the use of technology as an enabler, to tackle urban problems. Amidst recent ‘Smart City’ initiatives, open data is becoming a defining element to bridge the needs of citizens with decision-making processes of public actors [1]. Governments are currently ‘sitting’ on a wealth of information related to divergent aspects of life in the city. This has sparked a movement to encourage the opening of datasets in a structured and machine-readable way, under the ‘open data’ moniker. According to the third edition of the Open Data Barometer, open data is entering the mainstream with a majority of countries having an open data initiative in place [2]. The process of opening up government data has been fuelled by several drivers, such as transparency and accountability as a response to citizens demands to build trust, economic and social value, public service improvement in terms of efficiency, etc. [3]. Open data is thus becoming an essential element in the transparency and democracy discourse of governments, and offers an opportunity for public participation and citizen engagement [4].

However, getting the data out in the right technical format is not enough. The Open Data institute comments that *‘Open data initiatives cannot be effective if not supported by a culture of openness where citizens are encouraged to ask questions and engage...’*. In some cases, it can be argued that there is a discrepancy between the potential of open data and the added value for stakeholders, particularly for citizens that have difficulties consuming and understanding the data ([5]. Frank et al. (2016) posit that little attention until now has been paid to how data would be used, with what support it is possible and for whom it is usable. Without being able to make sense of data, co-innovation and participatory discussion-making processes with citizens are unlikely to happen [6].

To a large extent, citizens still rely on intermediaries or ‘communicators’ such as journalists, scientists and researchers, to help them select and interpret the data on their behalf. The ability to do this by themselves, without any help, can be increasingly identified as data literacy [5]. Data literacy can be defined as *“the ability to ask and answer real-world questions from large and small datasets through an inquiry process, with consideration*

of the ethical use of data” [7]. Data literacy can be seen as an inquiry process, reflecting a set of different competencies, such as performing problem definitions, analysing and making explanations of data, using appropriate visualisation tools, understanding data formats, etc. [7]. Hence, visualizations are emerging as an aesthetically appealing way to present and understand complex datasets [8], [9].

II. RESEARCH APPROACH

Within the OpenTransportNet project, data literacy was investigated through the perspectives of two different stakeholders: (i) civil servants and pilot coordinators, and (ii) participating stakeholder groups in four European cities. OpenTransportNet is a CIP-funded project that ran from January 2014 - 2017, which aimed to build a collaborative service hub with tools for aggregating, harmonizing and visualizing spatial data in mobility. Four pilot sites, Birmingham (UK), Issy-les-Moulineaux (France), Antwerp (Belgium) and the Liberec Region (Czech Republic) were involved, each with a specific focus in mobility (crisis management, road safety, etc.). The hub and its visualization components were developed by consortium partners with expertise in geographical information science (GIS), and co-created with users through a living lab approach (cfr. [10]). The co-creation process through the living lab methodology had to ensure that the interface fitted the needs of skilled and non-skilled users. The main component on the hub is the ‘map composition tool’, enabling users to make basic map compositions of open data that is either uploaded or linked from the data portal of the participating cities in the project. Users were able to make map compositions consisting of one or multiple data layers, with the possibility of adding real-time open data, to save it and share it with others. For the experienced users in GIS, dataset downloads and an API were made available for creating own applications or services in mobility, which offered more advanced visualization techniques.

Results about data literacy were collected through regular self-assessment questionnaires with civil servants and pilot coordinators, logging statistics, and qualitative feedback gathering during workshops, observations and interviews.

III. RESULTS

A. Visualisations in Mobility

In total, more than 650 map compositions were created with 150 datasets and 200 Web Map/Web Feature services (WMS/WFS), and 15 advanced visualisations in mobility. Amongst the most popular visited map compositions were a traffic volume map in the Paris region and a hydrology map in the Liberec Region; among the advanced visualisations, the traffic safety application in Birmingham obtained the highest number of visitors. In total, more than 800 citizens were engaged during the course of the project, with 317 active user accounts on the hub. More than 20 data jam workshops were organised, during which citizens were introduced to the tools and were guided in the experimentation of making map compositions.

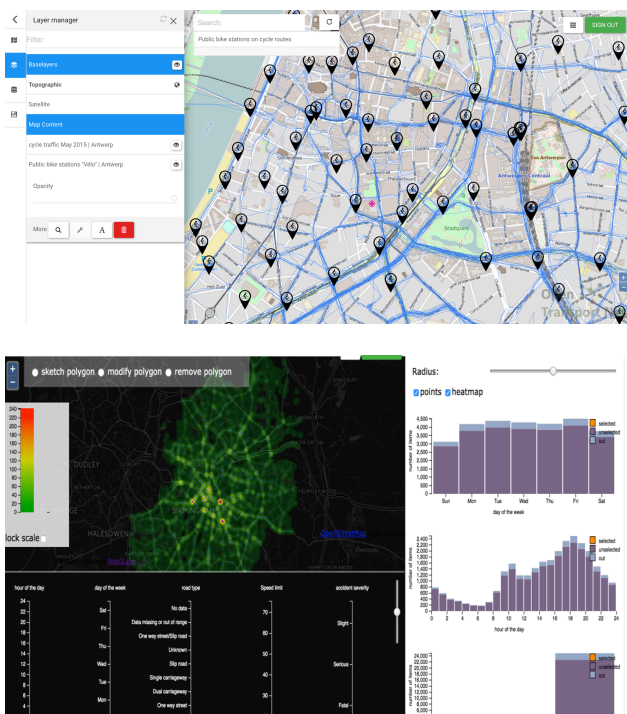


FIGURE 1-2: INTERFACE COMPONENTS.

B. Data Literacy

Findings show that at the beginning of the test trial (mid 2015), civil servants and pilot coordinators struggled to use visualisation tools on the hub independently. The interface was perceived as not easy to use, and terminology was perceived as not accessible enough for non-experienced GIS users. Due to the iterative nature of the living lab methodology, a new interface was developed and perceived better by civil servants; this was then launched to diverse stakeholder groups in the city, such as students, hackers, professionals in transport, and any interested citizen. Participating civil servants and pilot coordinators testified that learning how to work with the tools improved with experience; gradually they acquired more knowledge about the assets of the tools, the difference in data formats, harmonisation processes, etc.

Civil servants and pilot coordinators tested the tools independently for six months, ensuring that they felt in a comfortable position to transfer knowledge to other users.

From the stakeholder feedback, it is evident that non-experienced GIS users were struggling to create problem definitions around the open datasets in a natural and creative way. Users needed a specific scenario for visualising the data, or a specific challenge to start creating visualisations in an independent way. To a large extent, performing problem definitions, as well as uploading data, combining data layers, seeing patterns in the visualisation and formulating conclusions were activities that were guided by civil servants, still with the role of “communicators” of open data. From the coordinators’ experiences, it seems that all above-listed skills in data literacy were merely acquired by technical users, and that for non-skilled citizens in GIS a longer learning process with support was necessary.

The logging statistics and experiences from coordinators, however, suggest that although non-skilled citizens were unable to do all activities on the hub independently, they could find their own way around in ‘reading perspective’. Non-skilled citizens in GIS preferred to access the hub and navigate around in the map gallery of previously made map compositions, while more technically skilled users began creating their own map compositions and downloading data. This finding can be confirmed by the fact that the logging statistics for accessing datasets were lower (below 20 visits for the most popular datasets), than for map compositions (above 300 visits for the most popular ones).

At the end of the project, 3 in 4 city pilots affirmed that their data literacy skills gradually improved during the course of the project, while 9 in 10 consortium partners also felt that they acquired more knowledge and skills about GIS tools, including how to make the interface more usable and universal for any type of user. It is difficult to tell whether a minimum level of data literacy skills has been established among citizens; some pilot coordinators felt that citizens were able to do some type of inquiry processes in an independent way, whereas others suggest that technical users gained mostly from it. However, the City of Birmingham noticed a decrease in the number of Freedom of Information requests, each of which allows citizens to request access to materials that would be otherwise not publically available. In this sense, the tools of OpenTransportNet empower citizens to investigate data at their own pace.

IV. CONCLUSION

The results of this project show that the open data movement is at its next frontier: data literacy. Publishing open data is not enough; sense making, through visualisations for example, can support a wider range of citizens to take active citizenship about certain topics of mobility in the city. However, there is still a long way to go before specialised tools in GIS are democratised to such an extent that citizens can strengthen their literacy skills and tell stories about data for other to digest. From an inclusion perspective, it is important to stress that the open data movement should be 'socialised', in order to make open data relevant for everyone, skilled or not.

V. ACKNOWLEDGEMENTS

This project has received funding from the European Union's Competitiveness and Innovation Framework Programme under grant agreement no. 620533.

REFERENCES

REFERENCES

- [1] A. Ojo, E. Curry, and F. A. Zeleti, "A Tale of Open Data Innovations in Five Smart Cities," 2015, pp. 2326–2335.
- [2] Iglesias and K. Robinson, "Open Data Barometer - ODB Global Report Third Edition," World Wide Web Foundation, 2015.
- [3] N. Shadbolt, "data.gov.uk - The Linked Data Revolution," presented at the Innovating Through Information Lecture Series, 17-Mar-2010.
- [4] T. Thoeye, C. Veeckman, P. Colpaert, and M. Van Compernelle, "How Open Data is fuelling Co-Creation in Municipalities," in *In Proceedings of the Central and Eastern European eDem and eGov Days 2015.*, Boedapest, Hungary, 2015, pp. p.61–71.
- [5] M. Frank, J. Walker, J. Attard, and A. Tygel, "Data Literacy - What is it and how can we make it happen?" *J. Community Inform.*, vol. 12, no. 3, Sep. 2016.
- [6] M. B. Twidale, C. Blake, and J. P. Gant, "Towards a data literate citizenry," 2013.
- [7] A. Wolff, D. Gooch, J. J. C. Montaner, U. Rashid, and G. Kortuem, "Creating an understanding of data literacy for a data-driven society," *J. Community Inform.*, vol. 12, no. 3, pp. 9–26, 2017.
- [8] A. Degbelo, C. Granell, S. Trilles, D. Bhattacharya, S. Casteleyn, and C. Kray, "Opening up Smart Cities: Citizen-Centric Challenges and Opportunities from GIScience," *ISPRS Int. J. Geo-Inf.*, vol. 5, no. 2, p. 16, Feb. 2016.
- [9] A. Wolff, D. Gooch, J. J. C. Cavero Montaner, U. Rashid, and G. Kortuem, "Creating an Understanding of Data Literacy for a Data-driven Society," *J. Community Inform.*, vol. 12, no. 3, Sep. 2016.
- [10] S. Leminen, M. Westerlund, and A.-G. Nyström, "Living Labs as Open-Innovation Networks," *Technol. Innov. Manag. Rev.*, pp. 6–11, 2012.