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Open Data Reuse and Information Needs Satisfaction: A Method to Bridge the Gap

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Abstract: Data providers share open government data (OGD) to be transformed by reusers into products and services. OGD is believed to lead to many benefits but is not reaching its expected level of reuse. Data providers have attempted to use crowdsourcing contests to tackle this issue, but reusers seem to participate more for themselves than the needs of citizens. This paper presents a tentative workshop method to capture activity-based information needs of end-users in an everyday context, in order to inform publishers and inspire reusers to bridge the gap between them and end-users. The workshop is developed using design science research. It is presented as a facilitator script that can be used by practitioners, data providers, or reusers. The outputs can inform data providers about valuable datasets to release and inspire reusers to innovate sought after solutions and be adapted by open data researchers to collect data about information needs.

Keywords: Open Government Data, Information Need, Workshop, User-centred method

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1. Introduction

Public organizations, in the new role of data providers, are releasing open government data (OGD) (Davies, 2010). They produce and provide the data to others without restrictions on its use or distribution. Data providers hope that OGD will lead to better transparency, citizen engagement, and innovation (Charalabidis et al., 2018). Reusers of OGD can reuse the data to deliver information and develop or improve products and services (solutions) (Davies, 2010). Solutions can be used by end-users who are anyone seeking information to satisfy their information needs. The information needs can be experienced when they attempt to satisfy a primary need and encounter a gap in their knowledge (Wilson, 1981). However, OGD is not reaching its expected level of reuse (Safarov, Meijer

and Grimmelikhuijsen, 2017), which can come from a lack of awareness or interest (Hellberg and Hedström, 2015). Data providers attempt to tackle the issue and engage reusers to develop innovations with OGD via crowdsourcing and innovation contests, like Hackathons (Johnson and Robinson, 2014). Hackathons can be based on citizens' needs (Hjalmarsson and Rudmark, 2012). However, satisfying the needs of citizens is the developers' fourth motivation to participate in such events, after the fun and enjoyment, intellectual challenges, and status and reputation (Juell-Skielse et al., 2014). These approaches result in technology-driven solutions that seem to have limited impact (Carr and Lassiter, 2017). Thus, the solutions developed on OGD may not meet the needs of the crowd, and that the contests gnaw on a gap between reusers' solutions and real end-users' information needs.

This paper presents a tentative participatory workshop method that can capture information needs that are encountered in activities when trying to satisfy primary needs. The method bridges the gap between a group of end-users, their information needs, and OGD solutions in a specific everyday context of information use (e.g., citizens finding their way to work or keeping up-to-date on changes in their region). The workshop uses an end-user centred approach inspired by service design. The workshop's output aims at helping data providers to identify publicly valuable datasets, and reusers to identify relevant information needs and promising opportunities, which can then be satisfied by solutions they develop. This research is guided by the following research questions:

- How can a workshop method be used to identify end-users' information needs in an everyday context?
- How can its output support data providers and reusers to provide valuable data and desirable solutions?

The paper is structured as follows: we present the background, explain the research approach, present a summary of the workshop method, and conclude on an outlook for future development.

2. Background

The background explains information needs and approaches to capture them, based on a (general) literature review (Grant and Booth, 2009). The authors describe this type of literature review as general, focusing on describing previous work to identify gaps, without maximizing the scope.

2.1. Information Needs

People gain information when they make sense of data, where data can be defined as a representation of objective facts or unprocessed information (Hey, 2004). OGD offers many different reuses. Data reuse aims first of all to produce information (Hey, 2004). When there is an extra processed layer added to the information, it can become a digital information solution (e.g., dashboards and journalists' blogs (Davies, 2010), an improved service (e.g. improved waste collection), or an aggregated service (e.g. an optimized route planner based on different data sources) (Berends *et al.*, 2017). These solutions can be used to satisfy information needs, which (Wilson, 1981) considers to be a secondary need that emerges when people try to satisfy primary needs. When people recognize a gap in their knowledge, information needs arise (Belkin and

Vickery, 1985) that are personal and contextual. Information needs are determined by the roles an individual fill in social life, the environment within the role is performed, and depend on the individual's level of knowledge on the matter (Wilson, 1981).

2.2. Approaches and Methods to Capture End-User Information Needs

Previous research contains schools of thoughts on how to capture needs and information needs of end-users. User involvement is a growing innovation strategy to develop internet-based applications, which can help reusers to understand (end-)user requirements, access to useful information, new ideas, and define the scope of a project. If the goal of a method is to imagine or envision a future practice or product, and to seek inspiration together with end-users, Steen, Kuijt-Evers and Klok (2007) suggest using co-design and empathic design, two approaches to participatory design. In participatory design, tools and artefacts are developed to enable the communication between the end-users, experts in their usage experience, and the reusers, experts in their field and technologies (Sanders and Stappers, 2008). Barbosa Tavares, Hepworth, and De Souza Costa (2011) demonstrate that a collaborative approach and techniques including scene-setting, brainstorming, cards for people to express ideas, individual and group work and discussions are efficient to help people identify their information needs. In sum, previous research shows that collaborative methods with end-users can help capture information needs and support reusers in their attempt to match technology with end-users' experiences, needs, and preferences. However, to our knowledge, this approach has not been applied in the field of OGD.

3. Research Process

The development of the tentative workshop method followed the design science research (DSR) methodology and the steps suggested by (Peffers *et al.*, 2007): (1) problem identification and motivation, (2) definition of the objectives for a solution, (3) design and development, (4) demonstration, (5) evaluation, and (6) communication. In total, we conducted three iterations using step (2) to (5). Johannesson and Perjons (2014) explain that the steps included in DSR can be used in sequence from start to end or as individual steps as iterations. The result of this research is a tentative workshop method artefact that is summarized in this paper. The artefact is presented as facilitation script (extensive description of steps, tasks, and roles to conduct the method without prior knowledge) accessible at https://tinyurl.com/wojwlq4.

3.1. Problem Identification, Motivation, and Objectives

We started the study while discussing the disconnection between end-users' information needs, published open data, and reusers' developed information solutions. We conducted a literature review on citizens' involvement in OGD and methods to capture information needs. We identified the necessity for a method to first, increase the likelihood of generating value for OGD end-users, second, enhance the possible development of solutions that reach their usage objectives. These considerations are also crucial for small and medium cities that want to publish OGD but are cautious regarding the resources invested in publishing OGD and do not have large and diversified reuser communities. The practical motivation for the study is the perceived lack of OGD value for

the end-users, while the theoretical motivation is the contribution to previous research of OGD and information needs (Barbosa Tavares, Hepworth and De Souza Costa, 2011). The objectives of the workshop method are: (1) to enable a defined group of end-users to express their information needs, and (2) to inform data providers and inspire reusers with the output. The output should help reusers develop desirable OGD solutions for end-users and support data providers to identify valuable datasets.

3.2. Design and Development

In this study, OGD is datasets published by municipalities, while end-users are citizens. The first iteration had the objective to capture the information needs of end-users in their everyday life. Observations combined with interviews and scenario were used as preliminary methods. After evaluation, we decided to follow the path of Barbosa Tavares, Hepworth and De Souza Costa, (2011) with a participatory approach using scenarios, as observations did not provide rich data and interviews were time-consuming. At this point, we started to develop the tentative workshop method presented in this paper and designed steps and tools to structure the reasoning process of the participants. The method was tested and developed in the following two iterations.

3.3. Demonstration

For the first workshop, we invited nine Belgian researchers as end-users and citizens of their working city. As researchers, they were critical and knowledgeable participants that contributed to improving the workshop method. For the second workshop, eleven Belgian students participated. All participants were invited as they belonged to a homogeneous group of end-users and citizens, are perceived to share similar needs regarding information related to the city, and could represent a customer category for a reuser. Participation was voluntary, and people were recruited through e-mails, posters, and direct contact. Both workshops lasted one hour.

3.4. Evaluation

The researchers, who developed the study, reflected on and evaluated the artefact after each iteration by comparing the conducted method and outputs with the study's objectives. The participants of the first workshop, researchers, provided methodological feedback and the ones of the second workshop, students, were asked about the clarity of the instructions. Finally, we presented the workshop method and outputs to the intended audience for feedback: potential data providers and experienced reusers. We contacted representatives from two small Belgian municipalities that had no previous experience with OGD and no published data but a strong will to start. We organized a two-hour-long meeting per municipality, attended by one local deputy and one civil servant responsible for OGD. They received the facilitation script per e-mail three days before the meeting. Additionally, we introduced the workshop method and the outputs visualized on mind-maps to a digital company, expert in OGD-based applications. We selected them for their seven years of experience with OGD reuse and relevant field knowledge. The CEO, a UX Designer, and a front-end developer attended the meeting which lasted one hour.

4. The Workshop Method

This section presents a summary of the designed workshop method. The method relies on the roles of participants, facilitator, and workshop sponsor. Participants are voluntary end-users recruited based on the match between their profile and the objective of the workshop. Facilitators are people who take charge of the workshop and enable the discussions. Workshop sponsor is the final beneficiary of the workshop's output and insights. The method follows three phases: (1) preparation, (2) execution of the participatory workshop, and (3) analysis of the output. We elaborate on each of the phases, exemplified with the final workshop run.

4.1. Phase 1. Preparation

The purpose of the preparation phase is to define the participants' profiles and the workshop settings, which are based on input from the workshop sponsor. The workshop settings (general context and activity domains) needs to be linked to sponsor's core activity (releasable data or developable solutions). The choice of context and activity domains can be made based on prior knowledge or prepared with a representative group. The context constrains the participants to situate themselves in an environment and help them to identify their social role and status (Wilson, 1981). For the last iteration, the general context was the city; the relevant participants were students in their social role of citizens; the activity domains (specific themes) were the needs of socialization, eat and drink, discovering the city, and be involved in the local life. Finally, to ease the participation, a sensitization kit (Visser *et al.*, 2005) should be sent a few days before the workshop session. This kit helps the participants to understand the context and the concepts which will be discussed, to become aware of their habits in a reflexive posture, and to note down their first ideas. The kit was added after the last iteration.

4.2. Phase 2. Execution of the Participatory Workshop

In the second phase, the facilitator guides the participants through the identification of information needs by using a scenario to generate knowledge gaps anchored in a particular role and life situation of the end-user. The participants fill out question cards to help them go from basic, satisfied needs to unsatisfied, latent, unexpressed needs. The cards also carry the output of the workshop. Examples of blank cards are available in the facilitator script. Table 1 presents an overview of the workshop, the objectives of each step, the work dynamics, and allocated time.

Table 1: Representation of the Workshop Session

	Objectives	**Description**	**Work Dynamic**
Step 1	Select an activity domain, within the scope of the workshop topic.	The facilitators give the instructions for the entire workshop with the timing and purpose of the phases. The topic is formulated in a scenario, and the activity domains limited to a small number of choices. If done, the sensitization kit's results are briefly discussed and used as a warm-up.	Altogether, by tables of 4 to 6 participants Duration: 5 min (20 min with sensitization kit)
Step 2	Identify activities (primary needs) in the chosen domain and the information needed for them (secondary needs).	The facilitators remind the instructions of step 2 and give a set of cards n°1. The participants brainstorm and report their ideas on the cards.	In pairs Duration: 15 min
Step 3	Identify existing solutions and possible issues (unsatisfied secondary needs)	The facilitators remind the instructions of step 3 and give a set of cards n°2. The participants report their problems and new ideas on the cards.	Alone Duration: 10 min
Step 4	Identify existing solutions and possible issues (unsatisfied secondary needs)	The facilitators remind the instructions of step 4 and give a set of cards n°3. The participants report their problems and dream solutions on the cards, based on the previous cards. They can mix all of them and use ideas and needs from the other team on the same table. When done, they present one dream solution to all.	Altogether, by tables of 4 to 6 participants Duration: 30 min

4.3. Phase 3. Output Analysis

The workshop results in a set of information needs accumulated and developed through the different phases, captured on question cards, and the suggestion of dream solutions explained in context. The content on the cards is analyzed and sorted out by the facilitator. The cards' content has to be repacked for the intended audience. In our case, we used mind-maps that allowed us to track and visually connect the many sprawling activities and information needs.

4.4. Relevancy of the Method and Outputs for OGD Reusers and Data Providers

The reusers' feedback was that the method brings up interesting insights. The visualizations of the output (mind-maps) help to make links between the needs and dream solutions with a context, an end-user profile, and primary needs, leaving the reusers enough leeway to come up with ideas. However, the risks are to open too many doors, go beyond the core business of the reuser and the available OGD, and result in unrealistic solutions. The analysis showed that most of the expressed information needs were data belonging to the private sector. The interviewed municipalities were currently unsure about the method's applicability for their needs. The main impediment was the participation of citizens. It challenged their vision of the data provider's role as the one deciding which datasets to publish as well as taking an interest in OGD solutions and development (assumed to be the reuser's role, a third party). They also expressed their concerns about the provision of information solutions instead of data. They were very cautious about citizens' participation since it commits them as public actor and publisher to provide solutions for the expressed needs.

5. Conclusion and Outlook

The artefact developed is a tentative method to capture the information needs of end-users through a participatory workshop which output can inform reusers and publishers. It was tested with two homogeneous groups of end-users. However, this research's limitations are the number of participants and the workshop's coverage. It does not cover the entire cycle of gathering information needs and improving OGD release and reuse. Nevertheless, compared to interviews and observation, the workshop substantially increased the quantity of the output and the perception of degrees of importance in the expressed information needs. The participants start with what we call their top-of-mind information needs ("What information do I need for X, that I already get from Y), which we also saw in the street interviews. Then through the identification of issues with existing solutions, they can express a deeper level of needs, the latent and not spontaneously expressed needs (frustration and missing features help them to find out the must-have, what information they value most). The creative part, dream solutions, allowed them to express their wishes, the "nice-to-have" (what they would value and are not yet satisfied with present solutions). The final two were only identifiable through the workshops and not the observations and interviews. Future research needs to further develop and test the tentative workshop with more participants, comparing the method's features and outputs with other similar methods and explore alternatives to test and optimize the relevancy of the workshop output on the publisher and reuser work. In this way, we believe we could improve the impact of OGD. We plan to follow this path forward.

References

Barbosa Tavares, R., Hepworth, M. and De Souza Costa, S. M. (2011) 'Investigating citizens' information needs through participative research: a pilot study in Candangolândia, Brazil', Information Development, 27(2), pp. 125–138.

Belkin, N. J. and Vickery, A. (1985) 'Interaction in information systems: A review of research from document retrieval to knowledge - based systems', CIMMYT, 35.

Berends, J. et al. (2017) Re-using Open Data: a study on companies transforming Open Data into economic & societal value.

Carr, S. J. and Lassiter, A. (2017) 'Big Data, Small Apps: Premises and Products of the Civic Hackathon', in Thakuriah, P., Tilahun, N., and Zellner, M. (eds). Cham: Springer International Publishing (Springer Geography), pp. 543–559.

Charalabidis, Y. et al. (2018) 'The Open Data Landscape', in The World of Open Data, pp. 1–10.

Crusoe, J., Gebka, E., and Ahlin, K. (2020) . Open Government Data from the Perspective of Information Needs - A Tentative Conceptual Model. Proceedings of EGOV-CeDEM-ePart, Sweden [Accepted].

Davies, T. (2010) 'Open data, democracy and public sector reform: A look at open government data use from data. gov. uk', pp. 1–47.

Grant, M. J. and Booth, A. (2009) 'A typology of reviews: an analysis of 14 review types and associated methodologies', Health Information & Libraries Journal, 26(2), pp. 91–108.

Hellberg, A. S. and Hedström, K. (2015) 'The story of the sixth myth of open data and open government', Transforming Government: People, Process and Policy, 9(1), pp. 35–51.

Hey, J. (2004) 'The Data, Information, Knowledge, Wisdom Chain: The Metaphorical link', Intergovernmental Oceanographic Commission, 26, pp. 1–18.

Hjalmarsson, A. and Rudmark, D. (2012) 'Designing Digital Innovation Contests', in 7th International Conference, DESRIST 2012 Las Vegas, NV, USA, May 14-15, pp. 9–27.

Johannesson, P. and Perjons, E. (2014) An introduction to design science. Springer International Publishing.

Johnson, P. and Robinson, P. (2014) 'Civic Hackathons: Innovation, procurement, or civic engagement?', Review of Policy Research, 31(4), pp. 349–357.

Juell-Skielse, G. et al. (2014) 'Is the public motivated to engage in open data innovation?', Lecture Notes in Computer Science (including subseries Lecture Notes in Artificial Intelligence and Lecture Notes in Bioinformatics), 8653 LNCS, pp. 277–288. doi: 10.1007/978-3-662-44426-9_23.

Peffers, K. et al. (2007) 'A Design Science Research Methodology for Information Systems Research', Journal of Management Information Systems, 24(3), pp. 45–77.

Safarov, I., Meijer, A. and Grimmelikhuijsen, S. (2017) 'Utilization of open government data: A systematic literature review of types, conditions, effects and users', Information Polity, 22(1), pp. 1–24.

Sanders, E. B.-N. and Stappers, P. J. (2008) 'Co-creation and the new landscapes of design', CoDesign, 4(1), pp. 5–18.

Steen, M., Kuijt-Evers, L. and Klok, J. (2007) 'Early user involvement in research and design projects–A review of methods and practices', Paper for the 23rd EGOS Colloquium, pp. 1–21.

Visser, F. S. et al. (2005) 'Contextmapping: experiences from practice', CoDesign, 1(2), pp. 119–149.

Wilson, T. D. (1981) 'On user studies and information needs', Journal of Documentation, 37(1), pp. 3–15.

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