Connecting societal issues, users and data. Scenario-based design of open data platforms

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ABSTRACT

Governments around the world make their data available through platforms but, disappointingly, the use of this data is lagging behind. This problem has been recognized in the literature and to facilitate use of open datasets, scholars have focused on identifying general user requirements for open data platform design. This approach however fails to take into account the variation of open data practices and specific contexts of usage. This study, therefore, argues that next to general requirements: we also need to collect context-specific user requirements for open data platforms. We take different societal issues as the starting point for open data platform design. To illustrate the value of this context-specific approach, we apply scenario-based design methodology in the Province of Groningen in The Netherlands. The results show that different scenarios result partly in similar but also partly in different user requirements, leading to a deeper and richer understanding of user requirements. We conclude that a context-specific approach thereby connecting data, users and societal issues can be used to guide government agencies and designers in efforts to develop open data platforms that actually meet the needs of citizens.

1. Introduction

Governments all around the world have started to make their datasets available to the public with high expectations of benefits to society (Dawes, Vidiasova, & Parkhimovich, 2016; Susha, Grönland, & Janssen, 2015). Open data platforms aim to foster democratic processes by promoting transparency through the publication of government data and they aim to provide opportunities for innovation through the development of new products and services (Dawes & Helbig, 2010; Janssen, 2011; Lourenço, 2015). A key benefit of these platforms is that they make it easier for citizens to articulate their opinions and interact with public administrators and political representatives on societal issues (Wijnhoven, Ehrenhard, & Kuhn, 2015, p. 30; Taylor et al., 2014). However the actual use of open government data is lagging behind (Attard, Orlandi, Scerri, & Auer, 2015; Dawes et al., 2016; Hossain, Dwivedi, & Rana, 2015; Janssen, Charalabidis, & Zuiderwijk, 2012; Safarov, Meijer, & Grimmelikhuijsen, 2017; Wang & Lo, 2016).

In order to stimulate and facilitate the use of open data platforms, scholars have formulated a range of general user requirements, such as usability, timeliness and value, (Jaeger, Bertot, & Shilton, 2012; Lourenço, 2015; Zuiderwijk & Janssen, 2014a, 2014b) and data quality (Vetro et al., 2016). These studies either take data, portals, or users as point of departure for analysis, but fail to take into account the specific context of open data use (Meijer, Hoog, Steen, & Scherpeniss, 2012). The basic assumption of open data is that data can be used for every purpose and that patterns of usage cannot be predicted (Janssen, 2011). This assumption, however, may actually impair usage since there may not be a 'match' between context-specific user requirements and data provision. Attention to context-specific user requirements may therefore contribute to the usage of open data. This study takes a specific purpose, a context-specific issue, as point of departure for open data platform design. Our context-specific approach builds on participatory and problem driven open data models (Sieber & Johnson, 2015; Susha et al., 2015) and implies incorporating a contextual frame in the collection of user requirements. The contextual frame consists of real-life or societal issues around different types of utilizations by different users.

The aim of this study is two-fold. First of all, this study explores the value of a context-specific approach for the collection of user requirements for platform design. Different societal issues might imply the involvement of different users with different information needs (Susha

et al., 2015) and different social interaction and usability needs. Second, this study proposes a collective intelligence scenario-based design methodology to collect context-specific user needs. This methodology builds upon the service design literature and uses collective intelligence methodologies (Warfield, 2006), scenario-based design (Caroll, 2000) and agile user story (Cohn, 2004). Combining collective intelligence methods that gather input from a diverse range of representative stakeholders in the design process ensures that scenario-based design thinking, incorporating stories about people and their activities (Caroll, 2000), is grounded in a comprehensive understanding of the societal issue. The advantage of scenario-based design is that it is helpful in dealing with complex problems in which the actors have diverging knowledge and backgrounds (Broome, 2009; Janssen et al., 2012; Warfield & Cárdenas, 2002).

This study contributes to the literature by embracing contextuality and showing that collecting context-specific user needs results in a deeper and richer list of user needs that can be incorporated and integrated in the design of an open data platform that might be more valuable for citizens. For practice the scenario-based approach may help guide government agencies and designers in developing and implementing open data platforms.

The paper is organized as follows. In Section 2 we argue why collecting context-specific user requirements could be valuable for open platform design by comparing our approach with related work on user requirements. In this context we propose a collective intelligence scenario-based design methodology that will be described in Section 3. In Section 4, we describe how scenario-based design was conducted in our case study that focused on the societal issue population decline in Groningen, a province in The Netherlands. In Section 5 we will present the results of the collective intelligence scenario-based design in Groningen, followed by a discussion of these results. Finally, we draw conclusions and describe the limitations of our study.

2. Collecting context-specific user requirements

2.1. Open data, users and societal issues

Open data can be used as an instrument for public policy development and for gaining insight in and proposing solutions to societal problems (Janssen, 2011; Napoli & Karaganis, 2010). Several scholars (Janssen, 2011; Napoli & Karaganis, 2010) point out that open data are indispensable for public policy development and service delivery. It has the potential to facilitate citizen participation in which citizens e.g. help to set the policy agenda, propose policy solutions and shape the policy dialogue (Wijnhoven et al., 2015, p. 30; Taylor et al., 2014; Harrison & Dayogo, 2014; OECD, 2001; Sieber & Johnson, 2015).

Realizing these potential benefits of open data however prove difficult in practice. Several scholars have analyzed barriers to open data usage (Barry & Bannister, 2014; Conradie & Choennie, 2014; Dawes et al., 2016; Huijboom & Van den Broek, 2011; Janssen et al., 2012; Zuiderwijk & Janssen, 2014a, 2014b) and have pointed out that so far few platforms have been developed with the user in mind (Dawes & Helbig, 2010; Patrício, Fisk, & Cunha, 2008; Zuiderwijk, Janssen, Choenni, Meijer, & Alibaks, 2012). They stress the importance of a user centered approach thereby identifying user requirements such as understandability, availability, quality, timeliness, but also value and usefulness (Lourenço, 2015; Zuiderwijk & Janssen, 2014a, 2014b; Zuiderwijk et al., 2012). Other scholars (Barry & Bannister, 2014; Susha et al., 2015; Zuiderwijk & Janssen, 2014a, 2014b) take government agencies as provider of open data as point of departure of analysis. Susha et al. (2015) for instance develop strategies for stimulating open data usage such as enhancing interaction with open data users and

setting up an open data infrastructure that can leverage the capabilities of open data users. Furthermore, Sieber and Johnson (2015) distinguish models of open data provision in the current open data landscape: 1) "Data over the wall"; the status quo form of government supplying information; 2) "Code exchange" with government acting as data activist; 3) "Civic issue tracker", where government accepts direct feedback from citizens; and 4) Participatory open data, where government and citizens co-produce data. The assumption underlying the first two models is that open data can be used for every purpose and that patterns of usage cannot be predicted (Janssen, 2011). There are examples of useful apps for citizens created by tech-savvy developers that use government open data to generate content. But questions are raised whether this can truly enrich citizen-government relationships (Johnson & Robinson, 2014). Releasing random datasets however does not automatically lead to them being useful or valuable for citizens (Sieber & Johnson, 2015; Susha et al., 2015). There might not be a match between the data released and the data users are interested in related to a societal issue. According to Sieber and Johnson (2015) the last two models that emphasize interaction between users and providers are more in line with the realization of open government principles.

Hence, these models and approaches to enhance open data usage either take citizen users, data or government agencies as point of departure for analysis. Though important, these general patterns fail to acknowledge that open data usage also relates to a specific context. A contextual frame, is essential for motivating and engaging citizens and public administrators (Meijer, 2015, p. 205). Rather than just presenting information, a frame tells a story. It is a way to integrate citizens in public problem solving and value creation activities (Hutter, Fuller, & Koch, 2011). Citizens engage in open government platforms because they have an intrinsic interest in the discussion of societal issues and generation of ideas for potential solutions (Hutter et al., 2011). Along these lines, Susha et al. (2015) argue that data publishing should not be supply or demand driven but should be problem driven to enable real-life problem-solving. They therefore indicate that governments in collaboration with citizens need to identify which information or data sets need to be published to help participants solve a societal issue (Susha et al., 2015). The participation model and problem driven model require collaboration spaces and virtual communities where users can exchange expertise, stimulate each other and can co-produce data (Sieber & Johnson, 2015; Susha et al., 2015). Moreover, in these models both citizens and public administrators become users of the open data platform. However so far government portals often do not facilitate interaction, participation and collaboration (Sandoval-Almazan & Gil-Garcia, 2012; Sivarajah et al., 2016).

The context-specific approach we propose (see Fig. 1) builds on the participatory open data model as pointed out by (Sieber & Johnson, 2015) and the problem-driven approach suggested by Susha et al. (2015). A societal issue can be used as the story or the frame that connects open data with users. Our study takes into account a contextual frame, a societal issue (a), for collecting user requirements. Users (b) refer to both public administrators and citizens interested in a societal issue. The open data platform (c) refers to a platform that supports information, social interaction and collaboration and usability needs of users in relation to the societal issue.

2.2. Open data as a service

The service design literature stresses the importance of the context of use. An open data platform can be considered a service. A service consists of a combination of processes, people, skills and systems (Goldstein, Johnston, Duffy, & Rao, 2002, p. 121). According to Kotamraju and Van der Geest (2012, p. 261) e-Government services
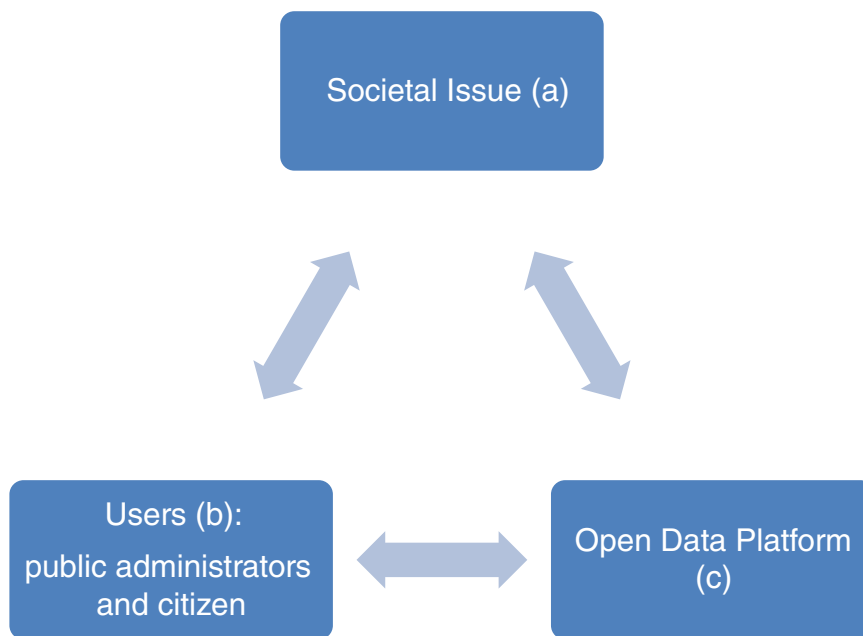
"must be designed with a clear view of the prospective users' prior knowledge and context of use and must meet users' expectations to be considered satisfactory." Furthermore, service design literature emphasizes the importance of the service experience (Teixeira et al., 2012). Conceptualizing services as experiences implies that instead of viewing services as pre-produced offerings, services are viewed as unique experiences resulting from user interactions with contexts and systems, tailored toward individual needs, enabling users to co-create their unique value through the usage of the service (Patrício et al., 2008, p. 320; Teixeira et al., 2012). Services are designed to engage users in a personal way (Zomerdijk & Voss, 2010). The service concept includes the service strategy of *what* is offered: the function and outcome of the system; and *how* it is offered: the context of use and process of usage (Patrício et al., 2008), and ensures integration between these two (Goldstein et al., 2002).

Following the work of Goldstein et al. (2002), in order in order to connect societal issues, users and open data for an open data platform design we need to identify the function and outcome of the open data platform. This refers to the outcome or value of using the open data platform in relation to societal issue or problem to be solved. A deep considering of the context of usage refers to the societal issue itself, but also to identifying and understanding factors influencing the process of the use of the open data platform, such as possible barriers to the use of open data by government and citizens. The process of usage refers to using the open data platform and more specifically to identifying platform design features that can support the information needed related to the societal issue, deliberation and collaboration within the user community and the usability of the platform. The next section describes how these context-specific user requirements can be collected.

3. Incorporating societal issues: collective intelligence scenario-based design

In this study a collective intelligence scenario-based design methodology is proposed to collect user requirements grounded in societal issues for an open data platform design. Collective intelligence

scenario-based design builds on three existing methods: 1) collective intelligence (Warfield, 2006) 2) scenario-based design (Caroll, 2000) and 3) agile user story (Cohn, 2004) methods. First of all, collective intelligence methods are helpful in dealing with complex societal issues in which key users have diverging knowledge and backgrounds (Broome, 2009; Janssen et al., 2012; Warfield & Cárdenas, 2002). In the current study, the application of collective intelligence methodologies allows users to understand and identify the full range of barriers that may influence the process of using open data, and the *options* to overcome these barriers. This shared understanding provides a framework for working with scenarios involving multiple users of open data portals. Second, scenario-based design is widely used in service design (Kankainen, Vaajakallio, Kantola, & Maatelmaki, 2011). Scenarios are stories about people and their activities (Caroll, 2000, p. 44). They envision different types of utilizations around societal issues, which will help to guide the development of the open data platform. Scenarios are concrete, flexible, allow multiple views of interaction and evoke reflection (Caroll, 2000). Importantly, scenarios are work-oriented objects. They describe platforms in terms of the work that users will try to do when they use such a platforms to contribute to solving societal issues. In this way, they help to ensure that design work remains focused on the needs and concerns of users of the open data platform. In light of these scenarios, users can identify specific information needs, social-collaboration needs and usability needs, and the outcome or reason of the needs specified using ideawriting and group presentation and discussion of ideas. Third, these needs are written in accordance with agile user story idea-writing method, which allows singular needs and reasons for needs to be specific in a way that support higher level analysis and synthesis of needs across multiple participants in a collective intelligence session.

In sum, the collective intelligence scenario-based design to collect context-specific user requirements consists of (see Fig. 2): a) defining the societal issue relevant for users, both public administrator and citizens, and developing scenarios related to this societal issue; b) identifying barriers in accessing, understanding, and using open data and c) formulating options to overcome barriers in order to understand factors that influence the process of open data and to stimulate general

Fig. 2. Collective intelligence scenario-based design.
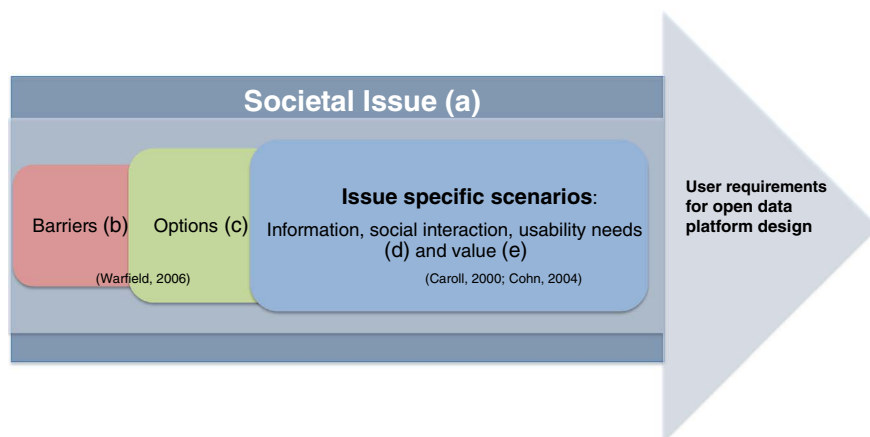
thinking about open data usage; d) identifying information needs, usability, and social-collaboration needs based on specific scenarios that encourage context-specific thinking about function of an open data platform and finally; e) the outcome or value of these needs in relation to the scenarios developed.

4. Case study Groningen, The Netherlands

4.1. Background

The empirical research took place in in the Province of Groningen, a rural area in The Netherlands. The Dutch Freedom of Information Act (Wet Openbaarheid Bestuur, Wob), implemented in 1980, forms the framework for the re-use of open government data for the Province of Groningen. In 2003 the Directive of the European Parliament and the Council of the European Union on the reuse of public sector information was released. The Directive was implemented in the Wob in 2006 (Zuiderwijk & Janssen, 2014a, 2014b). Whereas the Wob is mainly focused on reactive release, a letter to the Dutch Second Chamber (Tweede Kamer, 2011) states the importance of the proactive release of open data by each public body.

The Province of Groningen has an open data portal containing 70 datasets. In the first phase of the study, the topic population decline was identified in an initial meeting between two researchers and three public administrators as a societal issue relevant for public administrators and potential citizen users. Groningen is one of the areas with the highest population decline in The Netherlands (www. provinciegroningen.nl). In some regions of the province, the population will decline with almost 20% by 2040 (www.provinciegroningen. nl). Population decline has several effects for citizens such as fewer schools, a drop in housing prices, less care facilities, fewer employment opportunities, fewer sports and theatre facilities and fewer people travelling by public transport, which are thus more costly to run (www. government.nl). The overall policy strategy of the Province is to foster cooperation between housing associations, schools, care institutions, active members of the community and businesses in order to develop solutions together (Provincie Groningen, 2011–2013). At the start of the study open data was not yet used as an instrument for solving population decline issues together with citizens, but the province had the ambition to do so and wanted to cooperate in an innovation project aimed at developing a new platform for open data.

4.2. Collective intelligence scenario-based approach in Groningen

After identifying the context-specific issue population decline, scenarios within this theme were developed. One obvious but important requirement is that the scenarios must be believable; hence, considerable effort needs to go into the specification of credible scenarios (Bryman, 2012, p. 263). Therefore a document analysis was conducted. In order to find a common perception of what is valuable for both citizens and government (Dahlander, Fredriksen, & Rullani, 2009; Goldstein et al., 2002), we studied central, provincial and local government websites and reports such as evaluation reports and long term strategies in order to define government intentions, ambitions and needs regarding the societal issue of population decline. In addition, citizens' initiatives and best practices related to population decline were examined in order to identify relevant themes. We identified the closing of schools in the region, the effects of earthquakes as a consequence of gas drilling on the housing market, unemployment and enhancing livability in small villages in general as important themes. The findings resulted in the development of four scenarios (see Appendix A) focused on accountability and participation in the context of pursuing both individual and collective objectives (see Table 1). After all, citizens' voices, individually or collectively should be heard and reflected back to transform existing government policies (Chun, Shulman, Sandoval, & Hovy, 2010, p. 1).

In order to validate the scenarios, 3 public administration researchers, 1 psychologist and 2 policy experts of the Province of Groningen were asked to read the scenarios and to provide feedback on the credibility of the scenario. Each scenario involved hypothetical citizens' users and public administrators. The second research phase consisted of a scenario-based collective intelligence design session with 8 public administrators and 8 potential stakeholders interested or working in the field of population decline (see Table 2). The invitation letter indicated that they were invited for a group session on *Open Data and Population Decline*. The group session was held in May 2015. The specific aim of the session was to collect user needs for the design of a new open data platform.

In order to stimulate thinking about open data use and in order to analyze the factors that influence the process of use of the open data platform, the participants in Groningen involved or interested in population decline were asked to identify barriers to the use of open data two weeks before the group session. Based on the list of 69 barriers received before the workshop, three researchers analyzed the barriers and distinguished different categories of barriers. In line with the barriers to e-government innovation identified by Meijer (2015) a

Table 1
Typology of different scenarios.

	Accountability	Participation
Individual objectives	a) Scenario Marianne: Citizen uses open data to analyze what the current politicians have done to address population decline and education e.g. she would like to get insight in the education budget	c) Scenario Ben: Focused on employment, whereby a citizen uses data to explore new business opportunities in Groningen.
Collective objectives	b) Scenario Sanne: Sanne is a member of a citizen group who critically assess government-housing policies in response to population decline and the consequences of gas drilling.	d) Scenario Henk: "Policython", citizens propose new policy options for declining population in their local village.

Table 2
Participants workshop.

Participant	Stakeholder representation	Type of organization
1	Stakeholder	Citizens' initiative
2	Stakeholder	NGO
3	Journalist	Newspaper
4	Stakeholder	Consultancy/research company
5	Stakeholder	Communications company
6	Stakeholder	Consultancy/research company
7	Researcher	University
8	Researcher	Higher education
9	Researcher	Statistical agency
10	PA (policy maker)	Local government
11	PA (communications)	Local government
12	PA (open data expert)	Ministry
13	PA (policy maker)	Province
14	PA (policy maker)	Province
15	PA (policymaker)	Local government
16	PA (information manager)	Province

distinction was made between government barriers and citizen barriers. In addition, structural and cultural barriers (Meijer, 2015) were distinguished resulting in four lists of barriers. Based on these lists, the participants at the beginning of the group session were asked to vote for the most important barriers. Each participant was allowed seven votes across the 69 barriers. Following, the participants were divided in four groups, each consisting of four people with varying expertise: an open data expert, a government policy expert on population decline and two potential stakeholders interested in or already working on population decline. Some participants had limited experience with open data but worked on population decline issues on a daily basis whereas the open data experts had limited experience with population decline issue. By making sure that within each group a variation of expertise was present, a more fruitful discussion and idea generation could be stimulated. Each group was assigned one list of barriers and was asked to generate options to overcome these barriers. The thinking about barriers and options and discussing them within the group with a varying expertise stimulated a shared understanding of the general process of open data use.

The groups used the nominal group technique, idea writing, and field representations to facilitate idea generation and the structuring of ideas into fields or categories. The following five steps were taken (Dwyer, Hogan, Harney, & O'Reily, 2014, p. 696): (a) presentation of stimulus question; (b) silent generation of ideas in writing by each participant working alone on a form. After writing down several needs the participants in the group would exchange the form with another group member allowing another member to read the ideas for inspiration. After reading, the other group member would then add ideas to the form. This exchange occurred several times during the silent writing thereby stimulating creativity within the group; (c) presentation of ideas by participants with recording on flipchart of these ideas and posting of the flipchart paper on walls surrounding the group; (d) discussion of the listed ideas by participants with the purpose of clarifying their meaning; and (e) a closed voting process in which each participant is asked to select and rank five ideas from the list. Voting helps the group to identify issues that have the most critical impact on

the problem (Harney, Hogan, & Broome, 2012, p. 519). Using this technique, the four groups identified in total 106 options to overcome barriers. Next, the participants were asked about possible functions and outcomes of the platform related to a specific scenario. They were asked to identify issue-specific information needs and requirements based on their specific scenario, repeating the five steps to generate and structure ideas. Finally, the participants were asked to identify social interaction needs and usability needs for their issue-specific scenario using this technique, for each again using the same five steps to generate and structure ideas. For each type of need participants had to indicate the value or reason for this specific need. The form used consisted of a table that addressed the statement:

As User Type …, I want …, so that I can ….

The forms filled out by the participants, the field notes and the transcripts of the presentations held during the session were coded and analyzed (Bryman, 2012). Two public administration researchers conducted the coding independently and the results were compared in order to enhance inter-coder consistency. Based on the context-specific needs, patterns and categories were identified in relation to the context, process and value of the service, resulting in requirements for an open data platform. The results were discussed in a multi-disciplinary research team that consisted of a psychologist, computer scientist and public administration scholars and served as input for functionalities of an open data platform design. In the next section we will present the findings of the scenario-based approach in Groningen.

5. Results

5.1. Barriers and options to overcome barriers

5.1.1. Government barriers and options

Two categories of government structural barriers were identified (see Fig. 3[1]): *Resources and Management*, and *Ownership and Privacy* issues. In addition, two categories of cultural government barriers were identified: *Fear of Losing Control* once data is released and a fear for *Extra Work*. Participants identified options for overcoming these barriers. Regarding the structural barriers participants proposed that government actively organizes meetings around a social or policy issue with intermediaries in which will be discussed what data should be made available. Moreover civil servants should be offered training in how to use open data for policy documents. There should be mechanisms within the organization that help civil servants with the use of open data. Anonymization of data is important and culture change within the government is necessary in order to deal with the conflicting roles between government, politicians, management and citizens. Using open data requires a different way of thinking. The participants highlighted that government should incorporate open data into their regular work process. Open data is not extra work: "it is your work, so there is nothing extra about it" (R3). The participants considered information as the most important production of the government: "Every policy

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[1] In this figure only the barriers are depicted that received one or more votes from the participants.

TECHNICAL
(Total 20 votes)
Insufficient information about the data: how is it collected? How reliable? Which definitions used (5 votes)
Wrong information: not updating the information leads to wrong information (4 votes)
It is not a usable format (4 votes)
Too technical (4 votes)
It is incomplete (2 votes)
Can our target group do something with this data? (1 vote)

ACCESS
(Total 17 votes)
How do you know the data is there? (7 votes)
Data is published but cannot be found and does not have a user-friendly format (4 votes)
Users miss the skills to process data and translate it into information (2 votes)
Can find it but do not have access (2 votes)
Do not know where the data is. (1 vote)
Project is based on volunteers who do not have time for open data (1 vote)

RESOURCES AND MANAGEMENT
(Total 14 votes)
Data is spread out over different organizations and departments. (8 votes)
We do not structurally collect data (4 votes)
Lack of cooperation with third parties (1 vote)
Our management says no (1 vote)

OWNERSHIP AND PRIVACY
(Total 13 votes)
Privacy (3 votes)
Some data you'd rather not disclose (3 votes)
Conflicting roles and interests between civil servants, politicians, management and public (3 votes)
Conflict between privacy and openness (2 votes)
Commercially sensitive. (1 vote)
The data is not ours and we do not have permission of the owner (1 vote)

Citizen structural barriers

Citizen cultural barriers

BARRIERS

Government structural barriers

Government cultural barriers

KNOWLEDGE AND INTEREST
(Total 7 votes)
Lack of trust by government in competence of citizens to use data (5 votes)
No idea what anyone should do with it (2 votes)

USE AND VALUE
(Total 15 votes)
Lack of usability (6 votes)
Unclear how relevant the information is (4 votes)
The quality is unknown (3 votes)
Unclear how to use open data (2 votes)

FEAR OF LOSING CONTROL
(Total 14 Votes)
Afraid to lose control over themes. (5 votes)
Having difficulty with the changing role of government in society from a directing role to a facilitating role (5 votes)
Avoiding risks, fear of disclosing strategic or financial data. (2 votes)
Reputation loss. (1 vote)
Refusal by politician to transfer knowledge or power (1 vote)

EXTRA WORK
(Total 9 Votes)
It will take a lot effort to convince people to use data (3 votes)
There are mistakes in the dataset, people will send us improvements that we have to process (2 votes)
It is not our job (2 votes)
It will need to unnecessary discussion (1 vote)
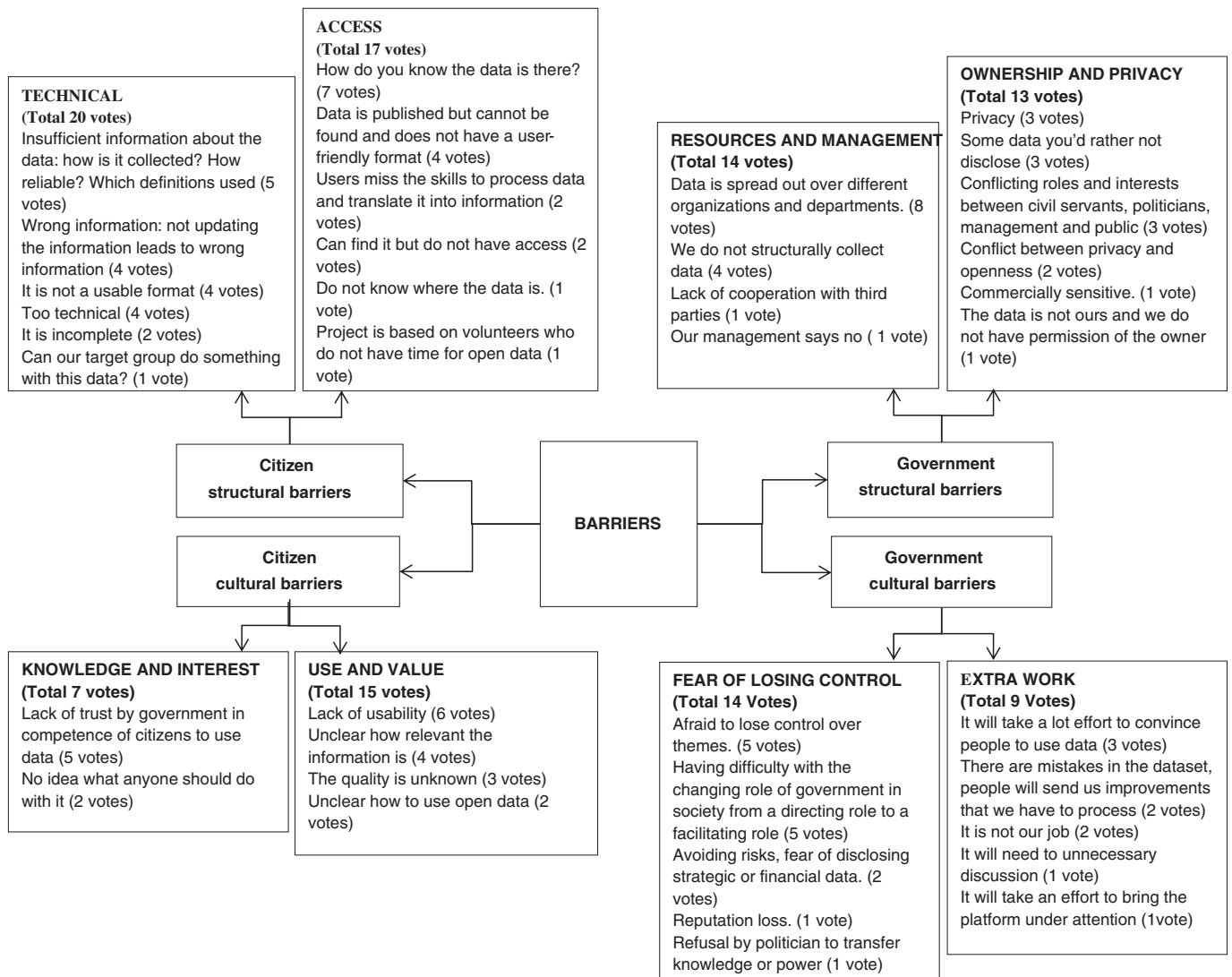It will take an effort to bring the platform under attention (1vote)

Fig. 3. Barriers to open data use.

question is in fact also an information question" (R3). Moreover open data could be used as input for discussion. Furthermore, participants emphasized that fear is a bad advisor.

5.1.2. Citizen barriers and options

Citizens' structural barriers related to *Access* and *Technical* issues. The cultural barriers identified related to *Use and Value* and *Knowledge and Interest*. Participants identified options to overcome citizens' structural barriers. They proposed that there should be a connection between a societal question and intermediaries for whom the data is interesting. Furthermore, the datasets should be findable e.g. via Google but off-line public information campaign strategies might also be helpful to make data more findable. Central should be the social and practical relevance of data for citizens. To overcome the cultural citizen barriers, participants emphasized that there should be information about what kind of data the government possesses and what one can do with the data. They also emphasized a help-desk or a central contact where questions regarding open data can be asked.

5.2. Information, social interaction and usability needs

Based on their scenario, the groups identified in total 95 information needs for citizen users (85%) and public administrators (15%). The

information needs were quite diverse (see Fig. 4), depending on the scenario. Demographic data was most frequently mentioned, but also other types of data such as health data and market developments (scenario collective accountability), business data and mobility data (scenario individual participation), policy data and budget data (scenario collective participation and individual accountability) and educational data (individual accountability). For example, one participant indicated that a projection was needed for the amount of students for the coming 10 years in the region (see Table 3). Another mentioned in relation to the collective participation a need for an overview of health and support facilities in the region. Next to specific data, participants also referred to user preferences. For instance it is important for public administrators to know what questions citizens have; and citizens might want to know what the government is doing in terms of population decline and education. Not all of the information identified was however found on the current open data portal of Groningen, which implied that more datasets needed to be released in relation to population decline issues.

A total of 29 social and collaborative interactions needs were identified: 83% from the perspective of citizens, 3% from public administrators and 14% for both citizens and public administrators. The groups mainly mentioned the need for individual contact information with e.g. public administrator or other citizens and other forms of

Table 3
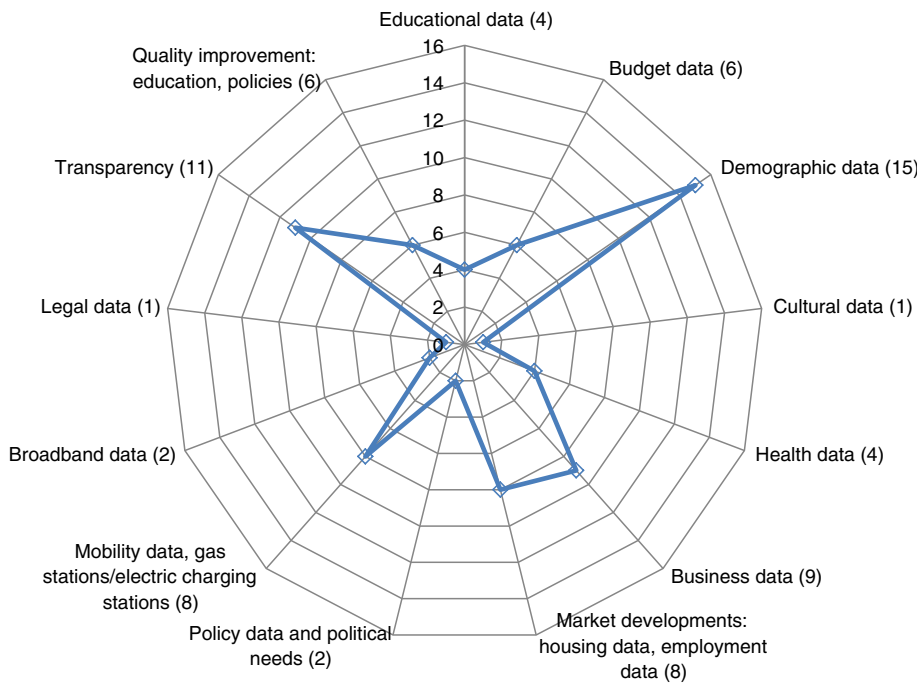Examples of information, social collaborative and usability needs.

Scenario	I want…	So that I can…
Information needs		
Individual accountability	Projection of the amount of students for the coming 10 years	Insight in the possibilities of keeping my elementary school
Individual accountability	What the available budget for education and related services are	Know how much I can spend
Collective accountability	Available data about health services in my village	Know where I should move to
Collective accountability	That the NAM discloses all information and not impose silence on citizens	Can obtain information regarding the amount of money the NAM pays for a house
Individual participation	Location of electric charging station for electric cars	To determine whether one can go to work in an environmentally friendly way
Individual participation	Where is broadband available?	Important to know when you want to start a business
Collective participation	Information regarding health services	Livable village, good health care
Social interaction and collaboration needs		
Individual accountability	Personal contact	
Collective accountability	Stories of others, network, neighborhood	So that I can stay [in the area] but with quality [of living]
Individual participation	Contact the Commerce Department	How do I get relevant data?
Collective participation	Stay informed	Participate
Usability needs		
Individual accountability	Visual data, clearly classified	Do a targeted search and end up with a personal overview
Individual accountability	Understandable regional maps with the option to zoom in at different levels → lists graphs with explanation and filter options	
Collective accountability	Select/screen/previews [of data, maps and graphs]/forum	Inform, convince, share, connect/be able to call if I don't understand
Collective accountability	Information specific for me + that I can understand + that I can trust	Better able to make decisions that concern my company
Individual participation	Feedback option/reminder by e-mail/social media integration	
Individual participation	Know the quality of the data	Communicate with the owner of the data
Collective participation	Website with information about new initiatives, progress and feedback	Stay in tune, give opinion

interaction such as collectively sharing experiences or finding people in a similar situation. Looking at the specific scenarios we observed that mainly in the scenarios of individual and collective accountability, the participants referred to sharing best practices and being able to find one another via an open data platform so that one can work together. For instance in the collective accountability scenario someone mentioned that they would like the platform to provide information and provide the option to interact with a broad range of groups such as citizens, local municipalities, the Province and the Action group against gas drilling in the region. They noted that the information should not only be provided in excel sheets but that it should be possible to visualize the data and share it via other social media in order to convince others. In

the scenarios of individual and collective participation, the emphasis was on receiving feedback and requesting and sharing information but also on connecting with social media groups with followers who live in the local village of Ulrum. Interestingly, the group working on the scenario of individual accountability explained that in their scenario personal contact with stakeholders might be preferred over online contact via a platform: "a [technical] platform is not necessary. If I would like to share information then I will discuss it with the school director and a member of the legislative body […] in order to come to a good solution (R1)". It was explained that in small villages in the Province of Groningen people know one another and would rather make a phone call. The group indicated that both online and offline
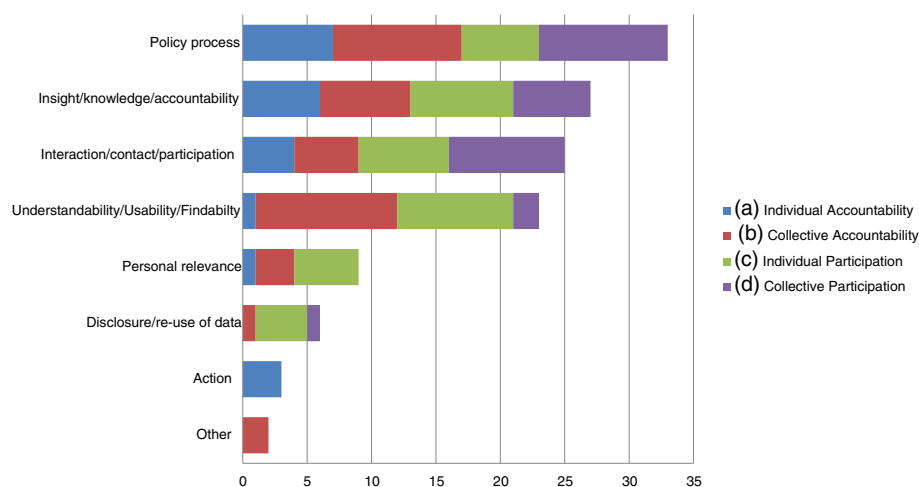
interactions are important for solving societal issues.

All groups were able to identify understandability and usability needs based on their scenarios. In total 56 needs were identified, 86% from the perspective of citizens, 7% from public administrators and 7% from the perspective of both. In general the groups emphasized the need to personalize the platforms and the data, with e.g. a personal calendar with activities, situation specific visuals and pictograms based on their interests. A participant working on the individual participation scenario pointed out that "It is of course important for him [Ben] that he receives quality data. […]. It requires from the provider that he is clear regarding the quality, availability and the most recent data" (R3). If we look at the specific scenarios we can conclude that the ability to personalize platform or data was mentioned especially in the scenarios of individual accountability and participation. In the scenarios of collective accountability and participation, the groups also emphasized the need for guidance and support tools such as a portal with contact information or easy navigation to browse through documents. Data analysis and reporting tools were also frequently mentioned in these scenarios; e.g. metadata, a data quality analysis tool, the ability to preview data, and visualize data on maps.

5.3. Value of open data platform

Participants were also asked about reasons for their information, social interaction and usability needs. Several categories emerged from the in total 117 reasons (see Fig. 5). Across the scenario's most participants indicate that the reason they need open data and platform affordances is to inform the policy process, to gain insight and knowledge, and to promote participation. Some differences between the scenarios can be observed in this regard. In the collective accountability scenario, the policy process and the value of understandability/usability and findability is central, while for the collective participation scenario, understandability/usability and findability, seems to be more important. Personal relevance is especially important in the scenario of individual participation.

6. Discussion of findings

This study explored the value of the collection of context-specific user requirements for platform design. This approach is different from a status quo of "data over the wall" form of data publishing or the government as open data activist model where government takes a more promotional position in encouraging the development of saleable products based on the provision of data (Sieber & Johnson, 2015). The assumption underlying these models is that open data should be generic enough to facilitate reuse in scenarios not foreseen by government. However, releasing random datasets does not automatically lead to

them being useful or valuable for citizens (Janssen et al., 2012; Sieber & Johnson, 2015; Susha et al., 2015). Furthermore, in these models the private sector might influence the release of datasets, resulting eventually in benefits for the private sector and not necessarily to government or civil society (Sieber & Johnson, 2015). A context-specific approach where government users (data experts and policy experts) and potential different citizen user groups identify together which datasets are needed to solve concrete societal issues and identify together which functionalities can facilitate democratic government-citizens' relationships may result in an open data platform design more valuable for users. In fact, participants in this study indicated that the value of open data and platform affordances should inform the policy process, should help to gain insight and knowledge in issues, and should promote participation and collaboration. The scenario-based design methodology resulted in rich and diverse user requirements for a platform design.

Our context-specific approach has several implications. First of all, it identified the mismatch between the information provided and the information needed for each scenario. For the Province of Groningen this implied that the organization would have to disclose *more and other* datasets than they currently have in relation to population decline in order to obtain the match between the open data released and needed by users. Second, this study confirmed the need for social and collaborative interaction in order to enhance the impact of an open data platform. Often open data platforms do not yet facilitate interaction (Sandoval-Almazan & Gil-Garcia, 2012; Sivarajah et al., 2016). The participants in our study however generated ideas for functionalities that would facilitate this type of interaction such as dialogue and discussion spaces to allow for collectively sharing experiences or finding people in a similar situation and a need for contact information of public administrators or of other citizens and feedback options. Third, next to similarities, differences in user requirements between the scenarios were found as well. This implies that the need and value of social interaction via an open data platform might vary depending on the societal issue, on the local region or for user groups. In the scenarios of individual and collective accountability, the participants referred to exchanging knowledge and expressed a need to work with others in the community based on open data. In the scenarios of individual and collective participation, the emphasis was on receiving feedback and requesting and sharing information. Remarkably, stakeholders compared to public administrators mentioned fewer social and collaborative needs. Personal contact over online contact was preferred in one scenario where participants mentioned that in the small villages in the population decline region, people in the education field prefer making a phone call or meet someone in person because everyone knows one another. Notably, an open data platform is just one part of a larger response to societal challenges. Another reason might be as several

scholars (Attard et al., 2015; Bonsón, Torres, Royo, & Flores, 2012) conclude that in general e-participation is still in its infancy at the local level. Finally, the found usability needs on an open data platform are partly in line with general platform requirements found by (Attard et al., 2015; Lourenço, 2015; Vetro et al., 2016) e.g. data quality, timeliness, comprehensibility and granularity (meta-data). However, what the scenario-based design methodology adds is that participants generated detailed ideas regarding the need for personalization where information is tailored to one's preferences that include deeper analysis of open data with data analysis and reporting tools. The platform should allow for the creation of visualizations of data for a specific situation e.g. putting data on regional maps, and the option of sharing data or visualizations based on data with people who live in the same village dealing with the same issues. Moreover, regarding the usability needs, some differences were also found between the scenarios, showing again that different contexts might require different usability needs.

Hence, an open data platform needs to facilitate various needs of different users (both citizens and public administrators) in different contexts. It is a challenge for designers to take into account to all these needs when designing an open data platform. It implies that a broad range of functionalities need to be developed based on user requirements grounded in different contexts, allowing eventually for unique satisfactory context-specific user experiences of a service (Patrício et al., 2008). The output of this study served as input for a platform design team that will develop an open data platform that facilitates social interaction, collaboration and decision making for specific contexts. The collective intelligence scenario-based design methodology has shown to be valuable in other contexts as well and could be used by government agencies and designers in particular to collect user requirements for platform design (Hogan et al., 2017).

7. Conclusion

The current usage of open government is largely falling behind expectations. Datasets are being released on platforms with the assumption that these datasets are meant to be used for any purpose. However this assumption might impair the reuse of open data because there might not be a match between the data released and the data users are interested in. Therefore in this study we proposed that an open data platform could be considered as a service that must be designed with a clear view of what specific purposes or contexts it might be used for. Therefore, in this study we took a context-specific approach thereby connecting societal issues, users and open data.

This study contributed to the literature in two ways. First, it showed the value of a context-specific approach in identifying user requirements that were grounded in an understanding of a specific societal issue. Users are not only attracted to the functional features of an open data platform. Value and sense-making qualities that support democratic processes are important as well. Furthermore, the approach allowed public administrators and potential users involved or interested in the societal issue to identify together what information and what type of social interaction and usability is actually needed in order to solve the issue.

Second, the proposed collective intelligence scenario-based design methodology was useful in collecting user requirements for platform design. The empirical findings highlight that the collective intelligent scenario-based design helped to identify context-specific user needs and requirements. Different scenarios resulted partly in similar but also partly in different user requirements. For instance online discussion spaces where more needed on some scenarios than in others. Eventually, this lead to rich and broad range set of user requirements. These requirements served as input for designers to develop a broad range of functionalities in an open data platform design that facilitates different utilizations. Scenario-based design and agile user story facilitate interactive systems design and analysis, and encourage a reasoning process about people using technology in relation to concrete scenarios, while collective intelligence methods are helpful in dealing with complex societal issues in which the actors have diverging knowledge and backgrounds.

However, we would like to highlight that the approach we proposed should not be understood in isolation but rather as one component of a broader strategy to develop open data platforms. There are a variety of approaches available for design and a combination of these approaches is expected to yield the best results. The collective intelligence scenario-based design of open data platforms should be used in combination with more general methodologies. The combination of methods will result in rich user requirements that are needed for open data platforms that will actually be used. Furthermore, our context-specific may help guide government agencies in developing and implementing open data platforms that can result in stronger usage by meeting specific needs of citizens.

An issue that needs to be explored further is whether there can be a tension between catering the open data platforms to context-specific user requirements and the objective of meeting generic needs that cannot even be predicted yet. One might argue that the approach we presented, developing open data platform for specific patterns of usage, could hinder more generic patterns of usage. However, in this study we showed that the various user-requirement collected by the different context-specific scenarios needs to be synthesized and integrated in different functionalities of an open data platform design. One could even propose that zooming in on specific user-requirements results in open data platforms that are better catered to other forms of usage since the focus on specific usage may help the users to be more explicit about their needs. Another issue that needs to be pointed out is that the societal issue population decline discussed in this study is a broad theme which affects many different areas ranging from education, business opportunities to unemployment and the effects of gas drilling. This allowed for a broad variety of relevant issue-specific scenarios. We expect that this method can also be used for other societal issues such as air pollution. However, it is likely that another societal issue might result in different information needs and perhaps also in different social and collaborative needs. As pointed out earlier the information needs and social interaction needs slightly varied for the different scenarios. Hence, the proposition that zooming in on specific needs can result in better generic open data platforms needs to be tested further in new empirical research.

Acknowledgement

Appendix A. Developed scenarios

a) **Marianne** is the principal of a primary school in Leens. Within education population decline is noticeable. Marianne is worried about the quality of education and the possibility that her school might be closed down. Due to a decrease in pupils, the school budget has been lowered. The costs per student increase and the competition between schools is becoming more severe. The region does not yet have a broadband network, making it difficult to work with new online teaching methods. Marianne searches for information that can help her solve the problems at her school. She would like to know, for instance, what the pupil prognosis is for the next ten years. She furthermore questions what the province and municipality are doing in relation to population decline and education and she would like to get insight in the budget for education and related facilities. From colleagues she has heard that in particular regions of

the province a start has been made with the construction of a broadband network. Marianne would like to know whether others in her village have an interest in the construction of such a network. The more entrepreneurs, schools and households participate, the higher the chances of success. Marianne wonders whether and how local government is facilitating a broadband network. She wants to get in contact with the municipality through a platform. Marianne wants to raise her voice and take part in the conversation about education policy. This on behalf of the quality at her school.

b) **Sanne** is a member of the Groninger Bodem Beweging. She would like to have an insight in the problem of population decline and the housing market in the province of Groningen; in addition she would like to know how the government anticipates this matter. Eastern-Groningen deals with a surplus on the housing market. Citizens are worried about the low prices of houses as a result of the earthquakes. However, also other factors play a role. Due to the rise of the elderly, there is a changing demand for houses with healthcare facilities. In addition, the decline in youth across the 'ommeland' may have consequences after 2020 for the amount of young people who move from the countryside to the city of Groningen. The quality of the housing market for this group is subject to great pressure, but this may change. Sanne needs information about, for example, the forecast of households, the house prices, unoccupied houses and zoning plans, but also other information regarding the housing market in the province of Groningen. If the data is not available, she considers filing an information request. Sanne would like to lay out the information in such a way that citizens can find information about their own neighborhood. Sanne would like to get in touch (through a platform) with citizens, but also with the government in order to know how the new provincial government, the countryside municipalities and the municipality of Groningen cope with this development. Sanne would like to share her thoughts regarding housing policies. On top of that, she wants to be able to share data and her experiences with the data, with the members of the Groninger Bodem Beweging and other interested persons.

c) **Ben** has recently graduated and started his own consultancy firm in Groningen. Ben would like to build an app for entrepreneurs in areas where population decline takes places, so that they can start using his services. For companies in the region it is hard to find the right employees. High educated people want to work for big companies and move to the Randstad. The city of Groningen provides the region with important economical assets. Nevertheless, in order for the region to profit from these assets, good infrastructure is crucial in terms of both roads, and public transport. When the commute is long, people will look for jobs closer to their home. Therefore, Ben is for example looking for information about what the municipality and province are doing regarding the accessibility of the city. Furthermore, he would like to point out favorable locations for entrepreneurs to locate their shops based on facilities and demographic information. But other information might be useful as well for these employment issues. Ben would like to link the various data. Ben would like to get in contact with the municipality and the provincial government, but also with companies and applicants to explore the further possibilities of his app and collaborations.

d) **Henk** is entrepreneur and lives in Ulrum. Ulrum is also dealing with the consequences of population decline. Henk is one of the initiators of the project Ulrum 2034. The purpose of the project is to make sure that Ulrum remains to be a pleasant place to live and work. Henk is planning to write a livability plan in cooperation with other citizens. This plan will concern various policy topics, from culture, tourism and economic matters, to health and youth facilities. In order to write his plan, he is searching for information that can help him map the problems in the region and find solutions. Henk would like to get in touch with local actors, such as entrepreneurs, but also governments and universities of applied sciences that are willing to help with writing and implementing the plan. Besides that, he wants

to get in touch with groups that are not very easy to address, such as youth and elderly. Henk would like to share information with other project participants through a platform and would like to exchange data. The platform needs to facilitate the process of interchanging ideas and information, but also provide the possibility to vote on the most promising initiatives. The municipality provides financial support for the project Ulrum 2034. The public servants is a bit nervous, because in the end there needs to be accounted for the money that citizens have spent in line with their own preferences. In that respect, clear insight in the budget, the progress and results of the project are essential. The municipality would like to facilitate and collaborate with the initiators.

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