

Crowdsourcing for smart engagement apps in an urban context: an explorative study

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Abstract

This paper elaborates on the first results of an ongoing living lab project on 'smart' city engagement and offers a theoretical, methodological and empirical contribution to the field of user-driven innovation by describing a crowdsourcing experiment conducted in collaboration with the city of Ghent (Flanders).

Our presented living lab approach has a double goal. First, it wants to empower citizens by systematically transforming the relationship(s) between citizens and between citizens (as service users) and local city-related governmental institutes (as service providers) by offering smart city applications. Second, it has the ambition to go beyond reactively studying information systems as change agents and wants to pro-actively improve engineering systems that can contribute to the desired changes in city engagement. Supporting citizens as self-actuating sensors to open up more innovative ways of collecting data is an important boundary of the research within a living lab context. We aim for user-driven innovation by involving citizens in the co-production of new electronic public services. Therefore we choose to go through a co-design process (Sanders & Stappers, 2008) with citizens defining the smart engagement applications that most probably will be developed and implemented in a living lab setting.

Today, various innovation companies and organizations envision a central role for the user when looking for innovations. The attention for participation of the user is growing since the 80's, although that the meaning of the concept 'participation' is not stable. Different people have used 'participation' in a wide variety of different situations and the widespread use of the term has tended to mean that 'participation' is used to refer to a wide variety of different situations by different people (Pateman, 1972). Therefore some point to participation as an empty signifier (Carpentier, 2007). The history and origin (and radicalism) of the concept as related to power issues is fading away under the diversity of its different meanings. Recently different participative methods were developed and are used to learn about users and their needs. Some known user-centered methods within industry are working with living labs (Niitamo, Kulkki, Eriksson, & Hribernik, 2006) and crowdsourcing (Hudson-Smith, Batty, Crooks, & Milton, 2009). Although participative methods were initially mainly focused on handing over the power to the user, currently much more attention is given to usability of applications and market forecasting when in the context of user involvement or co-creation. The analysis of power relations is fading slowly away. In our research the notion of participation is used in two ways: as a political phrase, referring to users who are gaining more power and impact on societal changes, and as a practical phrase referring to the forecasting of the success of urban smart engagement apps.

This paper is structured in four parts. The first part of the paper introduces the concepts of engagement and 'smartness'. The second part of the paper introduces crowdsourcing and also elaborates on the related concepts of 'Web 2.0', 'collective intelligence' and 'wisdom of crowds'. The third part of the paper describes our methodology, introduces the online crowdsourcing enabler 'mijndigitaalidevoorgent', and presents the first, preliminary results of our crowdsourcing experiment. The fourth and last part of the paper formulates a conclusion and discussion of the results.

1. Smart engagement 'unpacked'

1.1 Engagement as a multidimensional concept

We consider 'community engagement' to be a multidimensional concept, containing an emotional and behavioral component (Finn & Voelkl, 1993; p. 249). The behavioral component is termed participation; the emotional component refers to identification. Community engagement connotes with involvement, commitment, passion, enthusiasm and focused effort. It requires social cohesion, civic skills, civic commitment or civic duty and civic action (Bobek, Zaff, Li, & Lerner, 2009, p. 616).

Community engagement is typically defined along a continuum of participation. In our opinion, the phrase goes further than participation and involvement because it also involves capturing people's attention and focusing their efforts (Aslin & Brown, 2004, p. 5). Thus, one can distinguish many forms of community engagement, with varying levels of communication and dialogue present, such as providing information to the public, consulting the public, involving the community, collaborating with the community or empowering the community to make decisions and to implement and manage change (Thompson, Stenekes, Kruger, & Carr, 2009, p. 8).

Diane Scarce (2011, p. 7) relates engagement in a recent report for the Knight Foundation with five dimensions; (1) 'Listening to and consulting the crowds' refers to actively listening to (online) conversations and openly asking for advice, (2) 'Designing for serendipity' involves creating environments, in person and online, where helpful connections can form, (3) 'Bridging differences' means trying to deliberately connect people with different perspectives, (4) 'Catalyzing mutual support' or helping people directly help each other, (5) 'Providing handrails for collective action' means that one gives enough direction for individuals to take effective and coordinated action.

1.2 Smartness: a buzzword?

The concept of 'smart cities' is adopted by many cities as a strategic priority which recognizes the growing importance of digital technologies in enabling the commitments of those cities to competitiveness and sustainability. At the same time the phrase is used as a marketing concept by both cities and businesses alike, to envision a city of the 'future'. The main focus is on cities being 'greener', with smart energy, smart environments and smart mobility, and on cities being more liveable, with smart health, smart education and smart living/working. This focus on sustainability and quality of life has raised concerns that not enough attention is given to the question of inclusiveness. This is now becoming an important cross-cutting theme, especially within the Digital Agenda for Europe (DG INFSO, 2011). The issue of inclusiveness, or 'e-inclusion', is also closely related to concerns about citizens' acceptance of internet-enabled services, within the wider context of issues related to trust, security and privacy.

Caragliu et al. believe that a city is smart when "(...) investments in human and social capital and traditional (transport) and modern (ICT) communication infrastructure fuel sustainable economic growth and a high quality of life, with a wise management of natural resources, through participatory governance" (Caragliu, Del Bo, & Nijkamp, 2009). Within engineering the concept 'smartness' is much related to work on context-aware systems, ubiquitous computing and Internet-of-Things technologies (ITU, 2005). Central in all these technologies is the collection of information in a city through the use of public or private sensors. This information can be made public and used in 'smart city' applications that transform and visualize this data on smart phones, on public/smart displays (Ojala et al., 2010) or on the web. Some examples include tracking crowds or objects in a city via Bluetooth signals (see e.g.: Van Londersele, Delafontaine, & Van de Weghe, 2009), executing parking management (see e.g.: Grush, 2008;

Suhas et al., 2010) or obtaining ecological footprints of different regions in a city (see e.g.: Maisonneuve, Stevens, & Ochab, 2010) ...

In our project we define 'smartness' in another way. With 'smart' we are referring to the use of (human) sensors and external data through new information and communication technologies (ICTs). We then describe 'smart (city) engagement' as the use of (future) ICTs in order to increase participation and involvement in city-related issues by informing and raising awareness, through consultation and through involving and working with people.

2. Crowdsourcing as tool for polling 'ordinary' users as innovators

2.1. Web 2.0 and implicit and explicit participation

Web 2.0, usually understood as a large-scale shift toward a participatory and collaborative version of the web, enables internet users to get involved and create content (Beer, 2009) thus supporting and mutually maximizing collective intelligence and added value for each participant (Hoegg, Martignoni, Meckel, & Stanoevska-Slabeva, 2006, p. 32; Jaokar, 2006). On Web 2.0 platforms, content is created externally from the Internet companies themselves (Jakobsson & Stiernstedt, 2010) in contrast to web environments that use proprietary data sources or information (Hudson-Smith, et al., 2009, p. 527).

Typically there is little or no direct push from the owners, managers or designers of these sites. Some 2.0 websites assume active, explicit and knowingly participation of their users (e.g. adding photos to Flickr). Other 2.0 websites turn to the analysis of recorded interaction data and collective behavior (e.g. click behavior on the website Amazon). This type of 'implicit' data that users produce is often described as 'exhaust data' (McCracken, 2007), 'read wear' (Hill, Hollan, Wroblewski, & McCandless, 1992), 'drive-by data' (Kedrosky, 2005) or 'attention metadata' (Najjar, Wolpers, & Duval, 2006).

Very often Web 2.0 is associated with phrases 'collective intelligence' or 'wisdom of the crowds'. However, these two phrases have different semantic meaning. Therefore, we will explain the differences between these two concepts in the next sections.

2.2. Collective intelligence

Pierre Lévy (1994, 1998) popularized the phrase 'collective intelligence' to refer to the intelligence extracted from the collective set of interactions and contributions made by website users (Alag, 2009, p. 6). Thus, collective intelligence points to the capability of a group of people to collaborate in order to achieve goals in a complex context (Noubel, 2004, p. 19) and their ability to produce a result that is better than any single individual could achieve alone (Hiltz & Turoff, 1978; Hiltz & Turoff, 1997).

Collective intelligence is studied in a variety of academic disciplines such as artificial intelligence (e.g. Gregg, 2009; Santana & Correia, 2010; Segaran, 2007; Yu, Kim, Shin, & Jo, 2009) or social sciences (e.g. Jenkins, 2002, 2006; Lévy, 1998; Malone, Laubacher, & Dellarocas, 2009; Noubel, 2004; Weiss, 2005). Collective intelligence emphasizes the deliberative nature and the consultation process that occurs when people share, evaluate and correct information in order to reach a consensus. Thus, the emergence of online networks and communities-of-interest/practice constitutes an incentive to achieve a better 'collective intelligence' (as information can be easily digested and processed). Collective intelligence refers to a situation where nobody knows everything but everybody knows something, and the information of a specific person is available on request and on an ad hoc basis.

2.3. Wisdom of crowds

Wisdom of crowds carries a completely different meaning. The phrase was popularized by James Surowiecki (2004) in his book 'The wisdom of crowds'. In this book, Surowiecki argues that aggregating individual input from website users may result in decisions that are better than the decisions of a single member of the group (see also: Herzog & Hartwig, 2008; Kameda, 2008). Decisions are most likely to be good ones when they are made by people with diverse opinions reaching independent conclusions, relying primarily on their private information (Surowiecki, 2004, p. 57).

Thus, the emergence of online networks and communities-of-interest/practice poses a threat to the wisdom of crowds because website users may lose their independency. In order to harness the wisdom of crowds on an online platform one needs to ensure that the individual website users can form (and have) their own opinion, even if it is a specific or eccentric interpretation of the facts. Also, someone's opinion should not be influenced or determined by the opinions of those around him or her. People should be able to specialize and need to have access to decentralized information. A last condition for wisdom of crowds is the presence of mechanisms enabling the aggregation and transformation of individual opinions into collective decisions. Wisdom of crowds thus stresses the process of aggregating isolated input while collective intelligence focuses on the process of collaborative knowledge production and management.

2.4. Crowdsourcing

Crowdsourcing-processes involve three different stakeholders: the individuals forming 'the crowd', the companies or organizations looking to benefit from the crowd input, and an intermediation platform, the so-called 'crowdsourcing enabler' (Schenk & Guittard, 2009). Some well-known examples of 'crowdsourcing enablers' or crowdsourcing platforms are CrowdSpring, Amazon's Mechanical Turk or InnoCentive.

Reichwald & Piller (2006) give 'crowdsourcing' a very broad definition and identify two different forms user involvement: 'mass customization' (enabling consumers and customers to create and buy a personalized product or service) and 'open innovation with customers' (a cooperative relation between a firm or organization and its customers developing new products or services). Poetz & Schreier (2011) adopt the narrowest definition of crowdsourcing and position crowdsourcing as a process relying on self-selection among users willing and able to respond to widely broadcast idea generation competitions against the active company-initiated search for specific types of users with the most promising ideas.

Schenk and Guittard (2009) characterize different forms of crowdsourcing on two dimensions: selection and task characteristics, enabling them to differentiate crowdsourcing initiatives. Their first dimension ranges from integrative crowdsourcing to selective crowdsourcing. With the former, many individual inputs together allow to complete a much larger task, thus bringing value to the firm or institution. In the latter case, the client firm chooses an input from a set of options that the crowd has provided. The second dimension in crowdsourcing distinguishes between routine tasks, complex tasks and creative tasks.

3. Crowdsourcing research in the city of Ghent (Flanders)

This paper reports on the results of a research track that is carried out in close collaboration with the city of Ghent and Alcatel-Lucent Bell Labs. The research track is part of a larger research project, called SMARTiP (Smart Metropolitan Areas Realised Through Innovation & People) funded by the CIP (Competiveness and Innovation Programme) of the European Commission.

In this third part of the paper we describe the platform 'Mijndigitaalideevoorgent' ('mydigitalideaforghent', see: www.mijndigitaalideevoorgent.be) that was set-up as a crowdsourcing platform in an ongoing living lab project on 'smart' city engagement. We first elaborate on the (planned) methodology. Next, we contextualize and describe the platform 'Mijndigitaalideevoorgent'. In the last section we sketch some preliminary results.

3.1 Methodology

The goal of our research is to reveal a list with a broad range of applications (including 'wild ideas') for smart (city) engagement. In order to keep a broad focus and not to be limited by the limited imaginative capacity of citizens, a series of interactive focus groups/in-depth interviews with experts is set up. However, this paper is limited to the idea generation stage aimed at 'ordinary' citizens.

The subsequent research activities involve a reduction of the long list of applications through a confrontation with a small group of stakeholders (originating from technology, business, academia and city perspective) in order to make a first selection of ideas that will be further explored on a large-scale basis. Next, a number of ideas will be described using scenario techniques. After refining the 'wild ideas' into 'most likely applications' and going through the different stages of feedback from both demand and supply side, the selected prototypes will be developed. The technical feasibility of the ideas will be an important factor for selecting the final prototype. The prototype will be implemented in a Living Lab environment and user feedback will be assembled through a mix of qualitative and quantitative methods such as observations, focus group interviews and questionnaires.

The question that the visitors of the website Mijndigitaalideevoorgent.be were asked to answer was: 'How can ICT make it even more pleasant to live in Ghent?'. The crowdsourcing enabler was officially launched on April 1st 2011 at the weekly press conference of the city of Ghent. Although, the website's launch got very little press coverage, our crowdsourcing website got 'picked up' in the conversations on Web 2.0 platforms and social networking sites such as Facebook, Twitter and LinkedIn. Furthermore, we disseminated the URL (to the online crowdsourcing platform) via an electronic newsletter to the university students in the city.

3.2 Mijndigitaalideevoorgent.be

In collaboration with the city of Ghent we launched the crowdsourcing platform in the beginning of April 2011. The platform was based on proprietary software of UserVoice (www.uservice.com). Launched in 2008, UserVoice provides hosted feedback forums, which allow customers to create, discuss, and vote for ideas. It encompasses an online forum structured around users providing actionable ideas and users 'voting up' the best ideas to the top (with an extra constraint of having a limited number of votes to spend, thus focusing people on what is really important to them).

Inspired by city engagement cases in Seattle and Vancouver (see: <http://www.ideasforseattle.org/> and <http://vancouver.uservice.com/>) we used this platform to generate 'wild' ideas on smart engagement, but also on mobility and environment for cities. The stakeholders involved in this crowdsourcing process were about 5,500 internet users who learned about or discovered the website, the city of Ghent and IBBT, looking to benefit from the crowd input, and the intermediation platform or 'crowdsourcing enabler': Mijndigitaalideevoorgent.be (see fig. 1). This platform enabled selective and creative crowdsourcing (see Schenk and Guittard, 2009).

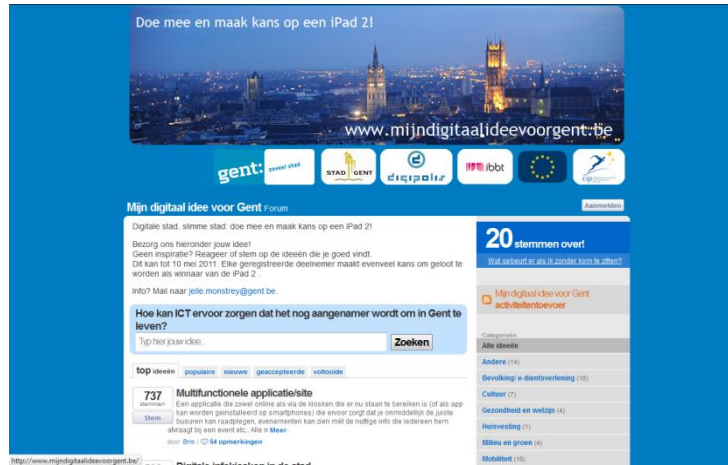


Figure 1: screenshot of the crowdsourcing platform 'Mijndigitaalideevoorgent'

The crowdsourcing platform 'Mijndigitaalideevoorgent' was open to answers on the question 'How can ICT make it even more pleasant to live in Ghent?' between April 1st and May 15th. In this period the website was visited by 5,451 unique visitors and counted 17,873 page views. The city blog 'GentBlogt.be', Facebook, Twitter and the city of Ghent's website were amongst the top referrers to the site. More than 1400 people registered their e-mail on 'Mijndigitaalideevoorgent', enabling them to submit an idea or cast votes (a total of 20) on already submitted ideas.

3.3 Results

A total of 128 ideas were submitted, which received more than 4800 votes, mainly in the first week after launch (see fig. 2).

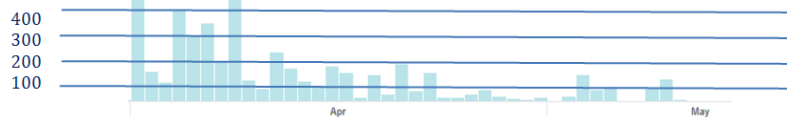


Figure 2: amount of votes cast per day

Idea submitters could choose a pre-defined category for their ideas or could leave their idea uncategorized. Table 1 shows the distribution of the ideas. Especially the categories 'E-government', 'Mobility' and 'Other' catch the eye as they all received more than 20 ideas. On the other hand, categories such as 'Houses', 'Security' and 'Sport' only received a couple of ideas. This shows that the goal of our crowdsourcing initiative was understood and that 'Mijndigitaalideevoorgent' achieved its targeted outcome: people contributing ideas on the relation between citizens and the city (e-government), and on citizens and mobility in the city (mobility).

| Category | # |
|--------------|----|
| E-Government | 24 |
| Mobility | 24 |
| Other | 21 |
| Leisure | 15 |
| Culture | 10 |
| Health | 7 |

| | |
|-------------|---|
| Environment | 7 |
| Tourism | 6 |
| Education | 4 |
| Sport | 2 |
| Security | 2 |
| Houses | 2 |

Table 1: distribution of the submitted ideas in the pre-defined categories

Table 2 shows the top 20 ideas with the amount of votes and comments that each idea received. Especially the ideas ‘Multifunctional application or website’, ‘Digital information kiosks placed in the city’ and ‘ASUM: Automatic System for Unified Mobility’ proved to be very popular, not only in the amount of votes they received but also in the comments that were submitted on these ideas. We will discuss the top-3 ideas briefly.

‘Multifunctional application or website’ is a very broad idea that was further described by the submitter as: *“An online application, through kiosks or smartphones, that enables you to consult in real time the bus schedules, the upcoming events in the city and all the relevant facts associated with these points-of-interest. In this app you can also find culture, leisure, tourist spots, sports accommodation etc.”*. Most comments on this idea targeted the content that such a generic app should provide, or mentioned the ‘digital divide’ and the fact that not all Ghent citizens have a smartphone or internet access.

The idea ‘Digital information kiosks placed in the city’, which received 662 votes, was described as *“A means to provide information on a variety of topics such as public toilets, parking spaces, museums, ... But also an input channel for the online reporting of offenses or city issues, including broken street lighting, vandalism and such”*. Most comments on this idea addressed the fact that Ghent already has digital information kiosks placed in the streets and on the squares of the city, that afford citizens to consult information or report certain issues to the city council, suggesting that the user interface of these kiosks should be merely updated.

The idea that was ranked third through collaborative filtering was ‘ASUM: Automatic System for Unified Mobility’, described as *“Would it not be wonderful to have a multi-platform application, where you simply say ‘I want to go from here to there’, and the app than calculates, based on real-time information (such as traffic jams, weather conditions, schedules of public transport, ...) how to most optimally (fast, dry, quiet, ...) reach your destination. The availability can also come in the unified mobility system. Credo: One problem, One app ...”*. In contrast to the two previous ideas, this idea only got one comment suggesting to implement Google Transit in Ghent, a service from Google that enables people to plan a trip using public transportation.

| Idea | Votes | Comments | Category |
|---|-------|----------|---------------|
| Multifunctional application or website | 812 | 54 | Uncategorized |
| Digital information kiosks placed in the city | 662 | 91 | Uncategorized |
| ASUM: Automatic System for Unified Mobility | 397 | 1 | Mobility |
| Digital opinion / feedback platform for urban projects | 224 | 3 | E-government |
| A mobile app for the Ghent street festival | 222 | 15 | Leisure |
| Wifi coverage all over the city | 216 | 12 | Other |
| QR codes in public buildings | 103 | 4 | E-government |
| A systems that enables voting from the comfort of your own home | 99 | 4 | E-government |
| Interactive street map / route planner (with | 92 | 3 | Tourism |

| | | | |
|---|----|---|--------------|
| indication of shops, people...) | | | |
| API's on government data that are open for public development and DIY | 76 | 0 | E-government |
| Digital garbage collection calendar + Mobile App | 72 | 2 | Environment |
| A tool that helps you to take buses, transfer buses etc. | 65 | 4 | Mobility |
| Free Internet over fiber broadband in the city | 55 | 4 | E-government |
| An app that shows free stuff, take-away items, eBay-style | 55 | 1 | E-government |
| An app that shows last minute leisure activities | 54 | 1 | Culture |
| An library app that generates e-mail alerts when loaned items are due | 53 | 0 | Culture |
| A digital cultural agenda for the city of Ghent | 46 | 1 | Culture |
| An app for visitors to Ghent called 'Welcome to Ghent' | 37 | 2 | Tourism |
| A digital post-it wall for ideas and complaints | 35 | 2 | Other |
| A digital e-government desk | 34 | 1 | E-government |

Table 2: top 20 ideas with amount of votes and comments and the category the idea was submitted to

Using an iterative approach loosely based on Grounded Theory (Glaser & A.L., 1967; Strauss & Corbin, 1998), and through various group discussions with internal project partners, we also tried to cluster these ideas in broad categories that transcend the previous pre-defined categories. This resulted in 10 main clusters of ideas:

- Alert services, e.g. when official documents are about to expire or when loaned books need to be returned to the library;
- Augmented reality applications, e.g. through the use of QR codes in the city (QR is short for Quick Response and is a specific matrix barcode readable by dedicated readers or camera phones);
- E-gov applications, e.g. receiving SMS alerts from the city council, a digital e-government desk ...;
- Interactive maps and points of interest, e.g. dynamic route planners, recommendation engines that suggest activities and points-of-interest based on the user's profile and location;
- Complaint and alert platform where users can suggest improvements or communicate the location of orphan bikes or litter and street refuse;
- Real-time information outlets; these ideas were often targeted at mobility issues and mainly included some ideas on web portals and applications that display the traffic and the number of people at any given location;
- Social tools that connect people and enable networking between citizens (e.g. a carpool application);
- Tourism applications aimed at tourists visiting the city (e.g. an app where people from Ghent can suggest tourists attractions and points-of-interest in the city);
- Supply and demand apps that match the demand and the supply for certain goods or services (e.g. an app that shows where you can get free stuff);
- Other initiatives: this final category encompassed ideas not directly related to ICT applications (e.g. offer a discount on smartphones).

Because it was impossible to give a refined question to the crowd, the technical boundaries for developing the application and the available datasets (or willingness to open up datasets) and logistical issues are the next filters the project partners will apply on the generated ideas. More detailed scenarios will be developed and presented to the crowd for feedback and voting.

4. Discussion and conclusion

This paper reports on an explorative study about the use of crowdsourcing for gathering ideas for smart engagement apps in an urban context. As such this research track is part of a larger research project that aims to develop a mobile or browser based future internet application that is targeted towards stimulating citizen engagement in Ghent. In particular, the goal is to implement an application that stimulates engagement by analyzing and implementing data which is generated both from institutions and by citizens themselves. This a growing domain, with lots of highly-commercialized, internationally aimed applications and initiatives (e.g. City Sourced, San Jose 311, SeeClickFix, GORequest, Spotted by Locals, DIY Democracy) but also with rather small-scale, local or bottom-up initiatives (e.g. Wheresmyvillo, Afvalkalender, iCouldUseNet, C.O.P. - Citizens on Patrol, Shippy).

Although this is only the first phase of a larger process of opportunity identification, the results seem to offer a lot of interesting and valuable knowledge. After a crowdsourcing enabler was set up using an off-the-shelf software solution, the broad and general question 'How can ICT make it even more pleasant to live in Ghent?' resulted in a lot of useful (and sometimes surprising) answers and inputs. In addition, in extensive forum threads citizens engaged in conversation and discussions about the usefulness, fairness and relevance of some ideas and about their cost benefits ratio.

In that sense, the crowdsourcing enabler 'Mijndigitaalidevoorgent.be' proved its merits to support research that aims to develop 'smart engagement' tools. As a result, the city of Ghent is likely to implement the platform on a permanent basis to serve as a feedback and communication platform on the evolution and transformation of Ghent into a 'smart city'. Although the uservice.com software has certainly proved its value, the project partners are currently considering open source software solutions such as IdeaScale (<http://ideascale.com/>) or the Drupal extension IdeaTorrent (<http://drupal.org/project/ideatorrent>).

The results of the crowdsourcing enabler 'Mijndigitaalidevoorgent.be' and the collaborative filtering that took place, reveal that the participants especially emphasize generic tools or platforms: one-stop service points where they can find all the information they need on any subject. These one-stop service points should provide personalized information and should also offer affordances to start a dialogue and direct interaction with the city council or with other citizens. Most ideas were submitted in the category 'E-government' indicating that people increasingly expect local governments to embrace new and mobile technologies as service outlets. 'Mobility' was also a category that generated a lot of user-driven ideas, suggesting that citizens in Ghent want more help and assistance in navigating and travelling through the busy and bustling streets of the city. The pre-defined category 'other' was also popular and encompassed ideas such as 'free WiFi in the city', 'social network sites centered around local urban neighborhoods' or 'streaming the city council live'.

To conclude, our presented crowdsourcing approach underlines the importance of local people and their organizations taking ownership over the process of implementing and realizing smart engagement tools or apps. The notion of people 'owning' a problem drives home the importance of identifying stakeholders who are affected by an issue. Thus, identifying the 'problem owner' and the relevant stakeholders can influence how a problem is addressed and emphasizes that those who 'own' a problem should be involved in resolving it. Creating this 'user involvement' will be the next hurdle to tackle after the long list of ideas is further reduced and refined by an expert committee.

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