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Urban socio-technical innovations with and by citizens

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Abstract

This article investigates bottom-up socio-technical innovations with and by citizen developers in an Urban living Lab, which is considered a platform for grassroots service creation in a city. In specific, the Living Lab framework is discussed as an instrumental platform within a Smart City, facilitating the governance of bottom-up innovation ‘by’ and ‘with’ citizens. The analysis is based on an in-depth case-study analysis on the use of Open Data and the ‘hackathon’ format within the Ghent Living Lab (Ghent, Belgium). The analytical framework focusses on the innovation ecosystem, urban transitions, user innovation, civic engagement, public and economic value creation and sustainability issues. Our findings explore the nature of the interactions and the outcomes of the projects. While hackathon events within an Urban Living Lab have already proven some of their potential, several opportunities remain. Especially the lack of involvement of private partners and a rather low focus on potential business models for the projects forecloses long-term sustainability and economic value creation. Central governance, focus on follow-up processes and a rigid innovation development framework are needed to overcome these challenges.

Keywords

Urban Living Labs, Smart Cities, Open Data, User-innovation, Socio-technical Innovations

Introduction

Increasing urbanization, grand societal challenges and rapid technological evolutions force cities to look for new ways to reinvent themselves. While urban new media is rapidly changing the social fabric of everyday life in the city (Atkinson, 1998), local governments often lack the capability and resources to react in a flexible way. In search for new ways to cope with this tension, transparency and close interaction with grassroots initiatives is increasingly put forward as one of the solutions to overcome this gap (ARUP, 2010). While the first generation of so-called Smart City projects and literature have a rather technological-deterministic point of view, this is changing slowly towards a more citizen-centric approach, focusing on smart citizens rather than on the Smart City as a high-tech solution to urban challenges (de Lange & de Waal, 2013). Smart cities thus embrace more user-centric points of view, such as an increased attention for user innovation, co-creation and collaboration with a wide variety of city stakeholders. Nevertheless, these interactions need to be governed and in some way be able to connect the traditional top-down approach with a grassroots or bottom-up approach.

This article investigates bottom-up socio-technical innovations with and by citizen developers in an Urban living Lab, which is considered a platform for open and systemic innovation and for grassroots service creation in a Smart City. In specific, we discuss the Living Lab framework as an instrumental platform which facilitates the governance of bottom-up innovation ‘by’ and ‘with’ citizens by analysing the use of Open Data and the ‘hackathon’ format within the Ghent Living Lab, an Urban Living Lab in the city of Ghent, Belgium, supervised by the local government. The analysis in this paper is being performed using an in-depth case-study analysis, ethnographic observations and adjuvant individual interviews with local civil servants involved in these activities. The analytical framework focusses on (1) the involved ecosystem, (2) urban transition, (3) user innovation, (4) civic engagement, (5) public and economic value creation and (6) sustainability issues. Through these dimensions an overall assessment is made of the potential of the Urban Living Lab framework to harness and govern citizen creation potential.

Literature review

Urban Living Labs

Worldwide, cities are transforming under the influence of rapid socio-technical innovations (Atkinson, 1998). Urban new media empower citizens through the democratization of knowledge and the availability of interactive ICT platforms (Castells, 2012; Tambini, 1999). At the same time, we are facing grand societal challenges such as global warming, congested traffic,

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ecological and economic challenges, aging populations, etc. Although these challenges transcend regions, nations and even continents, cities are often seen as the main driver for change and most relevant when it comes to tackle them (Grimm et al., 2008). With more and more people living in urbanized areas (Eurostat, 2012) cities are becoming central platforms for knowledge exchange and value generation. Against this backdrop, citizens are increasingly enabled to mold and tune their own urban environment and to collaborate with others to reach common goals (Foth, 2009). Nevertheless, city governments still struggle to cope with this unbounded citizen empowerment, since these grassroots initiatives take ownership of issues and solutions through decentralized networks (de Lange & de Waal, 2013) beyond governmental governance.

One of the frameworks that tries to overcome the tension between bottom-up initiatives and top-down governance is the Living Lab approach (Almirall, 2008). In EU programs such as i2010 and Europe 2020, the importance of Smart Cities is highlighted, and the Living Lab-approach is considered a best practice in this context (Paskaleva, 2011). By translating the Living Lab principles to an urban environment, (smart) cities are trying to foster user-innovation and tailor innovations to the needs of their citizens by stimulating collaborative development of innovations with multiple stakeholders. Juujärvi & Pessa (2013, p.22) define Urban Living Labs as “a physical region in which different stakeholders form public-private-people partnerships of public agencies, firms, universities, and users collaborate to create, prototype, validate, and test new technologies, services, products, and systems in real-life contexts”. Such urban innovation ecosystems allow innovation development processes ‘for’, ‘with’ and ‘by’ citizens (Kaulio, 1998). In this paper, we will discuss this framework in relation to the ‘hacker ethic’ (Himanen, 2001) and the role of ‘Open Data’.

Open Data

In order to support different forms of collaboration, certain data needs to be 'open'. This idea is reflected in the concept of 'Open Data' which derives from similar roots as 'Open Source' and 'Open Access'. Open Data refers to data that can be freely used, reused and redistributed by anyone, subject only, at most, to the requirement to attribute and share alike (OKFN, 2013). More concretely, Open Data is data that is published in an open format, is machine readable and is published under a license that allows for free reuse. Open Data is a part of a general trend towards open and transparent government, also coined Government 2.0 or Open Government. Scherpenisse et al. (2012) argue that this openness needs to be implemented on different levels, encompassing legal, technical, economic and political openness, thus providing a clear conceptual framework on openness and delineating Open Data further. Similarly, the Sunlight Foundation as well as Bauer and Kaltenböck (2012) narrowed down the concept by formulating principles to be 'open'. Their basic assumption is that Open Data itself creates and generates more value than the selling of data sets. Based on a qualitative research approach Janssen et al. (2013)

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clustered the benefits of Open Data in (1) political and social (e.g. democratic accountability), (2) economic (e.g. stimulation of innovation), and (3) operational and technical benefits (e.g. validation and sustainability of data sets).

The 'hackathon' format

Hackathons are short events during which developers, programmers, designers and computer amateurs with various expertise-levels meet physically and work intensively to create software in a very short period of time (typically between a day and a week). Derived from 'hack' and 'marathon', these events tend to have a specific focus (e.g. type of programming language or datasets used) and are initiated and organized from a variety of (institutional) levels. Interestingly, the 'hack' in hackathon (also known as a hack day, hackfest or codefest) points to the original meaning of a hacker as someone who "programs enthusiastically" and believes it is an ethical duty to facilitate access to computers and computing resources (ZapicoLamela, Pargman, & Ebner, 2013). In that context, hackathons link up to the 'maker culture', a subculture representing a technology-based extension of the DIY (Do-It-Yourself) culture which promotes the idea that anyone is capable of performing a variety of tasks rather than relying on paid experts or specialists. Hackathons thus challenge the producer-consumer model of technology and embody an democratized technological practice, unifying playfulness, utility, and expressiveness while creating demand for new types of tools and literacies (Tanenbaum, Williams, Desjardins, & Tanenbaum, 2013).

The city as a 'platform'

Hackathons can be considered as a component of 'Open Government', in which (collaborative) technologies are injected into society to better solve collective problems on a city, regional or (inter)national level. Open Government addresses the government as an open platform that allows internal as well as external stakeholders to innovate. Thus, cities can be conceptualized as platforms, as architectures of participation. Tim O'Reilly, who considered Web 2.0 as a platform delivering software as a continually-updated service that gets better the more people use it (2005) broadened his approach to the government domain and formulated seven lessons that government can take from the success of these Web 2.0 platforms (O'Reilly, 2010). These lessons consider the city as a platform and include guidelines such as 'Open Standards Spark Innovation and Growth', 'Build a Simple System and Let It Evolve' or 'Data Mining Allows You to Harness Implicit Participation', often pointing to processes that support and mutually maximize collective intelligence and added value for each participant or that turn the analysis of recorded interaction data and collective behaviour - 'implicit' data that citizens produce (see also 'exhaust data' (McCracken, 2007), 'read wear' (Hill, Hollan, Wroblewski, & McCandless, 1992), 'drive-by data' (Kedrosky, 2005) or 'attention metadata' (Najjar, Wolpers, & Duval, 2006) - into added

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value. Government as platform is a ‘service provider’ enabling its ‘local ecosystem’; actors in- and outside the public sector to innovate and evolve ideas through interaction.

While the abovementioned concepts of ‘Smart Cities’, ‘Urban Living Labs’, ‘Open Data’ and ‘Hackathons’ have gained a lot of attention (and funding) over the past years, only little research exists on the actual value creation and value creation potential of this approach. While both research and policy often promise disruptive solutions, improvement of life in the city and economic growth, there is a vast lack of evidence concerning the actual value that is being created and the processes that allow the exchange of value and knowledge. The next section briefly elaborates on the six research dimensions of our analysis.

The ecosystem

The collaborative nature of (Urban) Living Labs is related to the quadruple helix-model for innovation. Triple and quadruple helix-models deal with collaboration between universities, government(s), industry, and end-users (Arnkil, Järvensivu, Koski, & Piirainen, 2010). Co-operations like these have been claimed to facilitate exchange of ideas and technologies, with fewer barriers between academia, end-users, policy and industry (Etzkowitz, 2008). From this point of view, Living Labs facilitate university-industry relationships, but also relationships between large companies and SME’s, start-ups, entrepreneurs, and, most importantly, involve the citizens themselves, commonly referred to as public-private-people partnerships (4P’s) (Westerlund & Leminen, 2011). Various Living Lab authors stress the importance of collaboration and knowledge support activities as cardinal to a successful Living Lab (Buitendag, van der Walt, Malebane, & de Jager, 2012; Feurstein, Hesmer, Hribernik, Thoben, & Schumacher, 2008). Such collaborative ecosystems promise to contribute to the facilitation of knowledge and information exchange among the ecosystem actors.

Urban Transition

Central to the Living Lab approach is to facilitate experiment in a real-life environment (Følstad, 2008). By setting up such experimental environments, the potential of ideas can be experienced by the ecosystem, stimulating change on a higher level. In this context, Nevens et al. (2013) put forward the concept of the Urban Transition Lab which is described as “the locus within a city where (global) persistent problems are translated to the specific characteristics of the city [...] It is a hybrid, flexible and transdisciplinary platform that provides space and time for learning, reflection and development of alternative solutions [...]” Such approach is related to some of the principles of transition management (Schliwa, 2013). Transition management focusses on the governance of problem solving and improvements in societal systems and “[...] shapes processes

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of co-evolution, using visions, transition experiments and cycles of learning and adaptation” (Kemp, Loorbach, & Rotmans, 2007).

User innovation

A third concept related to this domain, is the concept of user innovation. Approaching end-users as a potential source of innovation goes back to the Lead User-concept, conceived already back in the seventies by Eric von Hippel (see e.g. 1976, 1986). Lead Users face specific needs months or years before they will be general in the marketplace and they expect to benefit significantly by obtaining a solution to these needs (von Hippel, 2005). When a company succeeds in integrating Lead Users into their innovation processes, they can possibly overcome ‘information stickiness’ and solve their own functional fixedness. As was demonstrated within Lead User-research, user innovation is quite common in several product domains (e.g. extreme sports, see e.g. Lüthje, 2003). Inspired by von Hippel’s early work, academia and practitioners started to explore end-user involvement in innovation development processes. To provide an overview in these approaches, Kaulio (1998) distinguishes three degrees of user involvement in NPD processes: ‘design for’, ‘design with’ and ‘design by’ citizens/end-users.

Civic engagement

The concept of civic engagement is broad and multidimensional. While some authors restrict its application to political engagement, others argue that this interpretation is too narrow and stress the equal importance of non-political activities (Bennett, 2008). Raynes-Goldie & Walker (2008, p.162), for example, define civic engagement as “any activity aimed at improving one’s community”. A more elaborate definition can be found in Ehrlich (2000, p.6), who describes civic engagement as “[...] working to make a difference in the civic life of our communities and developing the combination of knowledge, skills, values and motivation to make that difference. It means promoting the quality of life in a community, through both political and non-political processes”. An important side note when assessing civic engagement is that citizens can only be engaged when they have the necessary knowledge, abilities, motivations, skills, chances and resources (Carpini, Cook, & Jacobs, 2004). Especially in an online or high-tech environment, access is not equal and often biased towards individuals with a higher education and a younger age (Van Dijk & Hacker, 2003). Related to civic engagement, especially in an urban environment, is the concept of community engagement, which 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 goes further than participation and involvement because it also involves capturing people’s attention and focusing their efforts (Aslin & Brown, 2004, p. 5).

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Public and economic value creation

One of the central goals of an Urban Living Lab is to stimulate and facilitate the generation of value. Within an urban environment this value can be twofold, since it can have both a public and an economic nature. The concept of ‘public value’ refers to value that is generated through the creation and implementation of services and technologies that adequately harness opportunities within the city, tackle societal challenges and/or realize policy goals (Cosgrave & Tryfonas, 2012). It refers to, for example, reducing traffic jams, emancipating citizens, increasing neighbourhood cohesion or better governance. Because the generation of public value is the core of local governments (Baptista, 2005), Urban Living Labs differ fundamentally from traditional Living Labs and Open Innovation ecosystems which are often rooted in commercial contexts. Public value can be evaluated in terms of reach of the project (who and how many are going to use offered services), of impact (will it create benefits for all possible users), and of cost and value for money (how much will it cost and will it provide sufficient value in return) (Walravens, 2012). On the other hand, value can also address economic growth and innovation (e.g. less transaction costs in accessing/using information by providing Open Datasets). Such ‘economic value’ covers economic metrics such as the annual economic growth of cities and companies within the city, a decrease in unemployment, the extent to which new businesses (start-ups) are being generated and able to survive, a reduction of bankruptcies, an increased competitive advantage, attracting existing businesses to the city, etc.

Sustainability

Urban Living Labs contribute the goals of Smart Cities, which strive to become ‘greener’ (with smart energy, smart environments and smart mobility), and more ‘liveable’ (with smart health, smart education and smart living/working), increasing the overall quality of life and place for city inhabitants (Caragliu, Del Bo, & Nijkamp, 2009; Dolente, Galea, & Leporelli, 2010). In their work, Caragliu et al. put forward social and environmental sustainability as a major strategic component of Smart Cities. The collaborative ecosystem aims at an efficient allocation and (re)combination of resources which are present within the urban environment when developing innovations. On a generic level, sustainability can be defined as ” to meet the needs of the present without compromising the ability for the future generation to meet their needs” (World Commission on Environment and Development, 1987). The sustainability concept has a broad application range and can therefore be measured through various sets of criteria ranging from simple to complex. In the context of this paper, Hart (1995) suggests the following criteria: the process, service or product needs to (1) be multi-dimensional, linking two or more categories, (2) be forward looking (3) emphasis on local wealth, local resources and local needs (4) emphasis on appropriate levels and types of consumption (5) use measures that are easy to understand and display changes (6) produce reliable, accurate, frequently reported data that is readily available

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(7) reflect local sustainability that enhances global sustainability. On top of that, sustainability is also related to reuse of generated resources (e.g. knowledge, data and infrastructure). Reuse is critical, as it allows working on existing artefacts instead of starting from scratch, thereby enabling the development and deployment of software and services with greater ease. Consequently, time and human effort required to develop software product and pilots can also be effectively reduced. In addition to this, iterative reuse can also have a relevant, verifiable impact on product productivity and quality, as reusing existing artefacts can iteratively improve the quality of the product or service.

Methodology

The analysis in this paper is being performed using an in-depth case-study analysis, ethnographic observations and adjuvant individual interviews with local civil servants involved in these activities. Because of the exploratory nature of this research, a multidimensional case-study analysis is the most suitable approach (Yin, 1984). Case study research excels at bringing an understanding of a complex issue and can extend knowledge or add strength to what is already known through previous research. On top of that, case studies are most suited for processes which are poorly understood and lack a (solid) theoretical foundation (Eisenhardt, 1989), allow to analyse the process open-ended and on multiple levels (Yin, 1984) and gain deeper qualitative insights. Yin defines the case study research method as an empirical inquiry that investigates a contemporary phenomenon within its real-life context; when the boundaries between phenomenon and context are not clearly evident; and in which multiple sources of evidence are used. Given the complexity of the studied phenomenon and the multiple levels of analysis, a case-study design seems most appropriate.

For the case study analysis, we analyse the use of open data and the ‘hackathon’ format within the Ghent Living Lab, an Urban Living Lab in the city of Ghent, Belgium, supervised by the local government. Driven by the local translation of the Europe 2020 agenda, this Living Lab was founded by the city government as a platform to connect local stakeholders and enable socio-technical innovation to be co-developed and tested within an urban environment. More specific, we study a central case within this Living Lab, being a yearly bottom-up citizen developer project – Apps for Ghent – aimed at innovative urban service creation based on open (governmental) data sources. Besides the in-depth case-study analysis, ethnographic observations and three adjuvant individual interviews with local civil servants enriched the insights presented in this paper. The analytical framework focusses on (1) the involved ecosystem, (2) urban transition (3) user-innovation, (4) civic engagement, (5) public and economic value creation and (6) sustainability issues. Through these dimensions an overall assessment is made of the potential of the Urban Living Lab framework to harness and govern citizen creation potential.

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Ghent Living Lab

Ghent Living Lab (GLL) is an Urban Living Lab, governed by the city council. Key partners include the local government and its service partners, iMinds (Flemish organization supporting innovation in media and ICT), all major colleges and universities in the city, local (developer) networks and community organizations. GLL acts as a facilitator between the different parts of the collaborative network that has been established between the research community, businesses, the public sector, citizens and the wider community. Its primary focus is on Smart Cities and the development of Future Internet related services to support the further development of Smart Cities. GLL serves as a learning platform and as a test and development environment. It is a tool to work with researchers, entrepreneurs, citizens, digital creative forces and the city council on joint trajectories in function of product development, research, service delivery and policy strategy. GLL is also an effective member of the European Network of Living Labs.

Apps for Ghent

Apps for Ghent is a yearly hackathon event in the city of Ghent as a part of the activities of the Ghent Living Lab, organized by the city council, Open Knowledge Foundation Belgium, iMinds-MultiMediaLab and Ghent Web Valley. The goal is to stimulate both citizens and professionals in the city to work with the open governmental datasets, provided by the city council. The central philosophy is that governmental data is gathered with public resources and should therefore be open to the public. On top of that, it is believed that application-development can be more efficient and user-centric when this is outsourced by the local government. Three editions of this event have taken place (2011, 2012 and 2013) at the moment of this analysis (table 1). The format consists of a hackathon, during which participants are challenged by the city council and a plenary pitch of the developed prototypes. Each edition had several financial-material prizes that could be won by the best teams.

Table 1. Overview of the Apps for Ghent hackathons

	2011	2012	2013
Professional teams	4	6	8
Student teams	1	2	5
Other teams	5	2	2
Total teams participating	10	10	15

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Results

This section reflects on the previously theoretically discussed research dimensions in relation to the Apps for Ghent case. For this analysis we frame the hackathons as innovation development projects within the Ghent Living Lab, which is considered an Urban Living Lab contributing to the local Smart City strategy.

Ecosystem

One of the foundations of GLL is the establishment of an ecosystem in which all city stakeholders can collaborate, which should allow optimal valorisation of intelligence and skills that are present in the city. Such collective was set up through a formal agreement. The Apps for Ghent event strengthens ties between the ecosystem partners and showcases the possibilities of collaborations. It lowers the barriers for future collaboration, thus enhancing the collaborative capacity of the innovation ecosystem and putting quadruple helix models in practice. The format is successful in creating a fertile ground for innovation, albeit on a limited scale. The Apps for Ghent format mainly involves the city government, IT students, IT start-ups and research partners. Since this is only a section of the innovation ecosystem, including more city stakeholders could enhance knowledge exchange. Current knowledge exchange includes the exchange of governmental data, private data (e.g. power company and waste collection), knowledge between students and professional developers and research knowledge (Open Data management system). Especially the aggregation and (re)combination of different data resources in the city is considered very valuable.

Through this approach, the local government aims at increasing its capacity to respond more adequately to opportunities. Not in a traditional top-down way, but by stimulating, supporting and connecting grassroots initiatives, meanwhile allowing a more 'lean and mean' interaction with the local government. Innovation ecosystems exist in a city, even without involvement of a government. An Urban Living Lab allows for cities to play a role in these ecosystems. This role should, however, be carefully considered, since a local government cannot control these ecosystems, but should instead fulfil a facilitating and connecting role.

Urban Transition

Apps for Ghent is organized as an experiment, instigated by local civil servants (as an internal bottom-up initiative). For the local government, these experiments were the first step towards an Open Government policy, embedded in a long-term strategy. The current and future regulatory

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frameworks are considered impossible without these experiments. Hackathons can therefore be considered a medium which allow leveraging policy innovation. The tangible outcomes of the experiments are indeed showcases, but they contribute to a higher, more sustainable, level of change. Hackathons and Urban Living Labs should in the first place be considered spaces for experiment and learning. But meanwhile, ‘it becomes some sort of alibi for much more than Open Data’. For experiments at the micro level, the involvement of the local government is rather limited. At the meso level however, the local government increasingly acts as a facilitator, trying to detect and connect micro level experiments and providing supporting (technological) infrastructure such as a central data portal. At the macro level, finally, urban transition should in the long run evolve towards an Open Government, focusing on transparency, co-creation and participation and even towards an Open City System in which all city stakeholders follow this policy, thus optimally enabling knowledge exchange and collaborative value creation.

The format of a hackathon and an Urban Living Lab also allow experiencing change. This is important for civil servants, politicians and other city stakeholders. Since temporary allowing experiment reduces uncertainty (e.g. fear of unwanted data usage) and convinces stakeholders of the benefits. It opens eyes and allows assessing an innovative idea more clearly. Concerning the potential of this approach to meet the before mentioned grand societal challenges one of the interviewees pointed out that ...

“Tackling long-term problems is hard and can only be achieved by a long sequence of short-term experiments. The sustainability is not to be found at the level of the products and services that come out of these experiments; it is that what is hidden behind these artefacts that will solve societal problems in the long run.”

[translated interview transcript]

User innovation

Mobile applications are not considered sustainable investments by the local government. Therefore the development of such innovations is outsourced to citizen developers, students and private actors in the city. The city positions itself as an enabler in this domain by providing data, a central platform and by facilitating collaboration. On a higher level, this frames within a broader reconfiguration of the role of the government. Citizens used to expect everything of the government, but this is no longer tolerated. In practice, this means that citizens are increasingly empowered to take initiative themselves. This, however, does not mean that these initiatives substitute governmental activities but it rather supplements them. The local government tries not to control these bottom-up innovations, but to develop a canvas for creation, learning and experiment through the facilitation of collaboration and the provision of governmental data.

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When assessing the nature of user involvement in the innovation development processes from the perspective of the local government, three levels of analysis should be taken into account. The innovation can occur at the policy level, at the level of the product or service and at the intermediary level. However, all three dimensions are coupled and should always resonate in order to each be successful. On the level of policy innovation, hackathons are considered as valuable input for the optimization of governmental processes, products and policy. This reveals a clear ‘design for’ strategy; since civil servants and politicians will translate this knowledge and develop the innovations themselves. It is considered a way to capture ‘sticky knowledge’ through the act of creation (in line with design thinking literature). It allows talking about city improvements in another language. On the level of products and services, on the other hand, user involvement can be defined as ‘design by’ citizens, since the developers are completely free in the act of creation, which also means that this process is hard to govern. Hackathon participants translate the available data to their own context and needs. Finally, at the intermediary level, allowing people to play with governmental data forces the local government to clean these data and develop standards. Intense interaction with developers allows co-creating tools which optimize information exchange between the government and the developers (‘design with’).

Civic engagement

Civic engagement used to be very much institutionalized. However, civil society is now deinstitutionalizing, which creates space for a new form of civic engagement. This civic engagement is rather ad hoc and based on a shared set of values and motivations (Rheingold, 2002). In this case, hackathon-engagement is mainly driven by (1) motivation to improve their city, (2) enhancing the individual portfolio and network, (3) being part of a ‘hacker’ community (4) show-off and benchmark skills (friendly competition) and (5) the fun of coding. These projects are ‘tech-driven’, which only attracts participants with a high level of technological knowledge and skills. However, this niche can be stimulated to use their (unique and valuable) skills for the improvement of the community, to make a difference and increase the quality of life in the city.

“... they start to consider their skills as a way to co-mold the city, like an artisan [...] it can be considered as a new form of digital citizenship.”

[translated interview transcript]

However, high barriers exist to participate. Participants need the right knowledge, skills and motivation. When it comes to coding and hackathons, technical barriers are very high for the average citizen. This makes it hard to reach ‘mainstream’ citizens. Attempts to include them as

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'thinkers' in the hackathon teams have not been successful due to the niche perception of the hackathon format. What is interesting, however, is that several hackathon creations aim at enabling and facilitating citizen engagement (e.g. facilitating interaction between the government and citizens). This way, a developer niche creates an instrument for a broader civic engagement.

Public & economic value creation

When looking at the level of products and services, none of the hackathon outcomes has been economically successful. This might be explained by the limited scale in which urban mobile applications can be deployed and the lack of attention for possible business models which causes the artefacts to create value, but not to capture it. Instead, the economic value of hackathons in an Urban Living Lab has a derivative, second order nature. What is perceived as the true value is the enabling network, the increased closeness of ecosystem actors. This creates a fertile ground for collaborations, but also for start-ups and spin-offs. Furthermore, this format contributes to the branding of the city as an innovative environment, which (successfully) attracts new economic activity. It is part of the acquisition strategy of the city government and is in line with the morphology of the city (with a prominent presence of students and universities, and a vibrant scene of digital creatives). This approach has also been successful in keeping talent in the Ghent area (a lot of the student-hackers are now employed in local IT firms) and stimulating local start-ups. However, this dimension is hard to measure and hard to link directly to the hackathon and/or Urban Living Lab.

Besides the potential for urban transition and the close interaction with civic engagement, as discussed above, public value is also generated through an increased social cohesion. Different hackathon outcomes focus on (re)connecting city inhabitants through urban new media (e.g. social games and applications to meet likeminded citizens). However, a lot of potential is still untapped since actual implementation of the hackathon outcomes is rather exceptional. This can be explained by a lack of attention for value capture and follow-up processes. Innovation ecosystems such as an Urban Living Lab increase the ability of a local government to monitor different initiatives in the city. If a government stumbles upon a solution that contributes substantially to a significant problem, public resources should be invested to leverage this initiative and generate public value with an increased sustainability.

Sustainability

As discussed before, the single act of creation does create value as such, but fails to capture the value, which is needed for further development and long-term maintenance incentives. The process of translating conceptual initiatives to market ready products is still lacking. This is

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mainly because this is not the primary goal of the hackathon. Sustainability on a product and service level could be leveraged by implementing these artefacts in a NPD process, following an Urban Living Lab approach. In this context, the nature of the user involvement would shift from ‘design by’ to ‘design with’ citizens. The combination of a hackathon and an Urban Living Lab can be considered as an untapped potential for bottom-up innovation. Many hackathons exist, but the embeddedness within an Urban Living Lab is rather unique. This holds some interesting opportunities to overcome digital divide and sustainability issues. Some follow-up tracks exist for the hackathon outcomes (allowing students to continue their work during the summer break), but a lot of barriers still hamper successful outcomes. This is closely related to the limited availability of public resources. A hackathon requires very little resources, as opposed to intensive iterative long-term multi-stakeholder follow-up processes. However, the single moment of creation contributes to other dimensions, as discussed in the context of urban transition it contributes to the evolution towards an Open Government, including a collaborative innovation ecosystem, which can be considered more sustainable. In the light of Hart’s (1995) sustainability dimensions, an Urban Living Lab is able to connect different domains and stakeholders, is forward looking (long-term strategy), emphasises local value creation, answers local needs and contributes to solving global issues starting from a local initiatives. However, (hard, objective) measurements are needed to reflect and support these assumptions.

From a reuse point of view, Urban Living Labs have an interesting (untapped) potential concerning the reuse of different networks (people and organizations), (technical) infrastructures, (governmental) data, code and knowledge. The deployed innovation ecosystem, with the local government in a central enabling position, could integrate such resources in a single framework, increasing access for secondary use. This would greatly increase the connective capacity (Lichtenthaler & Lichtenthaler, 2009) of the innovation ecosystem. However, it is, once again, important for the governmental actor to choose its role in this ecosystem wisely. Such central governance cannot be about ownership, but should be about access.

“An Urban Living Lab can play an important role to interconnect all these resources. Not to use it for themselves, but to make them accessible, to make sure that the soil for innovation is as fertile as possible. It sort of goes back to the old concept of the government as a director.”

[translated interview transcript]

Discussion and conclusion

In this article, an Urban Living Lab is considered a collaborative ecosystem allowing for the co-creation of sustainable, future proof innovations that improve life in the city and boost the economy, in which Open Data plays an enabling role. More specifically, we discussed the

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dynamics of a hackathon, embedded in an Urban Living Lab. Our findings show the multilevelness of these projects and highlight the strengths, weaknesses and opportunities. The Urban Living Lab framework is a useful framework to combine top-down governance with bottom-up initiatives in the city. However, some challenges remain. Whereas experimental activities within an Urban Living Lab activate and reinforce the quadruple helix ecosystem, facilitating collaboration and enabling interaction with the city government, it is still hard to harness the creation potential within a city in a sustainable way. Nevertheless, sustainable enabling value is being created on higher levels (intermediary infrastructures, increased transparency, favourable policy, lowered barrier for knowledge exchange and collaboration). Urban Living Labs facilitate urban transitions through an accumulation of experiments, which allow experiencing change, causing transitions on the meso (facilitating infrastructures) and the macro (policy and society) level in the long run. From an innovation development perspective, hackathon projects involve users in three ways. At the level of the products and services, a 'design by' citizens approach is followed, at the level of policy innovation, local governments 'design for' citizens and at the level of the intermediary infrastructure a 'design with' citizens approach is followed. This approach raises barriers for participation but also generates useful knowledge for local governments.

Furthermore, Urban Living Labs should act as 'reuse enablers' through central governance of 'fertilizing' resources. Within the Urban Living Lab as an innovation ecosystem - and in line with Janssen et al. (2013) - Open Data provides social and political benefits (e.g. transparency and accountability), economic benefits (e.g. fostering innovation and attracting economic activity) and operational benefits (improving data quality, standardisation, data portal and cohesion). In the evolution towards an Open Government, the Urban Living Lab should also govern and disclose networks (interpersonal and inter-organizational), infrastructure (e.g. sensor networks), artefacts (e.g. code and algorithms) and knowledge (e.g. research data) to increase connective capacity (Lichtenthaler & Lichtenthaler, 2009) in the city thus enhancing the sustainability of the generated value and knowledge.

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