Open Government: Transforming Data into Value-Added City Services

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Abstract Open data and open government are topics which are not new, but today we can see initiatives which transform data into value-added services. But are there real world examples where those services make the city "smart?" We are going to define open urban government data in the context of e-Government and m-Government. This chapter reports on an investigation about the open urban government data and hackathon movement on a global scale and takes a deeper look at the real world examples of Amsterdam, Barcelona, and Paris. It will be discussed which challenges governments are confronted with to make open data available as well as the role of hackathons in the development of mobile applications based on this data.

Keywords Open data · Open government · e-government · m-government · Hackathons · Smart city

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1 Introduction

Establishing open data in the government sector was recognized in the European Union (EU) since the end of the 1980s (Janssen 2011). So the concepts of open government and open data are not new, but with the development of ICT and digitization we arrive at new possibilities which may result in value-added data or services. These concepts aim at enhancing transparency, participation, and collaboration between the public and political agencies (McDermott 2010; Lathrop and Ruma 2010). In 2003, the EU introduced the Public Sector Information Directive (van der Waal et al. 2014). In this case, restrictions for using and reusing public data have been eliminated, but the data access was charged by governments. The pricing was calculated as cost covering, but this is not really "open data." Today, we understand open data as (online) accessible data which is free of charge or with just marginal costs of use (Jetzek et al. 2013). When we talk about open data, which is generated by the government, we can refer to "open government data" [OKF (date unknown)]. Until now, we can find a lot of open government data initiatives on the national level, e.g., data.gov (USA), data.gov.uk (UK), on the international level open-data.europa.eu (European Union Open Data Portal), and on the city level open.wien.at (Vienna, Austria), or nycopendata.socrata.com (New York City, USA). To open government data causes a lot of challenges which need to be faced. In addition, it is not clear whether these efforts result in a more open, transparent, and collaborative government.

Just opening datasets is not the whole concern of open government; they also like to animate citizens, startups, and other stakeholders to reuse the data. For this reason, workshops or hackathons (hack marathons) are organized with the goal to reuse open government data collectively (Baraniuk 2013; Briscoe and Mulligan 2014). Here, we can differ between top and down initiatives headed by government agencies, e.g., "apps4austria" in Austria, or bottom-up run by engaged citizens, e.g., the "Open City" volunteers in Chicago. In many cases, the output of those hackathons is mobile applications (m-apps) which intent to solve urban problems. Hackathons have established themselves as common solutions for building m-apps based on open government data, but the outcomes attract just little attention in academic research (Johnson and Robinson 2014). Thus, we do not know whether the output of hackathons results in a value-added city service.

The chapter is structured into five parts. After the introduction, the aim of open government data initiatives and our research approach is presented (Sect. 2). This will be followed by the used methods (Sect. 3) and the results of interviews conducted with experts from politics and universities in Paris, Amsterdam, and Barcelona (Sect. 4.1) as well as an investigation of the hackathon movement and output on a global scale (Sect. 4.2). In Sect. 4.3, the open data initiatives and hackathons of the three cities (Paris, Amsterdam, and Barcelona) are analyzed. Finally, the chapter ends with the conclusion (Sect. 5).

2 Open Government Data Initiatives

In our context, *data* means quantitative values resulting from measurements and other sources. *Open data* refers to data, which is freely accessible online, while there are no technical or legal restrictions to reuse such data (Jetzek et al. 2013). *Open government data* is defined as "open data produced by the government" [OKF (date unknown)] as a subset of public sector information. Finally, *open urban government data* is open government data on the municipal level.

There are two types of sources for open urban government data: official statistics and sensor-based data. Official statistics include data on population, business and economics, jobs, crimes and justice, and health. Additionally, there are city-specific official data collections such as the urban forest map of San Francisco with detailed data about trees in the city. Sensor networks (Kitchin 2014) consist of sensors which are embedded in specific structures and measure—in real time—levels of light, humidity, temperature, air pressure, movements, speeds, etc., and of transponders monitoring empty spaces in car parks, data from closed circuit television (CCTV), or the progress of trains and buses along a route (Kuhn 2011). All in all, sensor-based "big data" with relevance for the city (Bettencourt 2014).

This open urban government data can be combined with user-generated content, for example, GPS-based data from mobile devices and posts on micro-blogging services, such as Twitter, since cities' e-governments allow citizens to give feedback on mobile or Web applications and use social media channels (e.g., Facebook, YouTube, Flickr; Mainka et al. 2015a; Mergel 2013). It is also possible that private companies open parts of its data, e.g., on the companies' products or services with relation to the city (Immonen et al. 2014).

Combining these data, we see many services programmed by governmental agencies, by private developers (Mainka et al. 2015b) or which evolved from hackathons (Johnson and Robinson 2014). Reviewing the literature of the last decades, not everybody could imagine that citizens would act as developers for governmental services—*without being paid for it*. What we see today is a game between open data support by governments and data reuse by residents and other stakeholders. Its gain is called public, social, or economic value and an enhanced quality of life. Public value is in our history often a reason for volunteering, for example, citizens acting as bodyguards in neighborhood safety patrols. Citizens may "provide more and better services than they would have received" by their government (Bellone and Goerl 1992, p. 134). Today, we have a kind of *data bodyguards*, who help themselves and their community to handle open data and transform it into value-added services, for example, smartphone apps. Nevertheless, the new possibilities arriving with ICT and digital open data confront us with different challenges which need to be faced. In the Apps for Smart Cities Manifesto, we read, "to harness the true potential of Smart cities, the city must become a platform i.e. an enabler for developers, creativity and applications. In doing so, the city becomes like the internet i.e. a connector and an enabler for citizens which aims to empower the citizen" (Apps for Smart Cities 2012). Urban m-apps are

indicators for the evolution of "ubiquitous government" (Belanger et al. 2005) or "smart government." "Smart Government will share resources and information and interoperate with other governments, citizens, NGOs and for-profit businesses much more smoothly than today" (Scholl 2012, p. 324).

The shared resources include "big data" as well as "accurate, comprehensive, and reliable information" (Scholl and Scholl 2014, p. 167). Open urban government data shows its assets best in combining it with further open data and open tools such as OpenStreetMap.org in the sense of mashups. In addition, urban m-apps include location-based participation, "for example helping to redesign the park you're walking in, or the hospital organization which kept you waiting and you think you have a solution" (Millard 2010, p. 8). But citizens' participation goes far behind the simple commenting of communal problems and includes the production of urban m-apps as well. Desouza and Bhagwatwar (2012) call such applications to solve even complex urban problems *citizen apps*.

Reviewing the ongoing research on governmental development in association with information and communication technology, diverse terminologies are used. In our context, m-government is the use of mobile technologies (e.g., mobile phones, smartphones, and tablets) in e-government. M-government enables location-based services (Carroll and Ganoe 2009), which are "personalized services delivered to a mobile device user at a remote location." To make open data reusable, standards have already been established, e.g., by a W3C eGovernment Interest Group (www.w3.org/egov). They should help the government to open their data and other stakeholders to reuse this data. Concerning OECD and ITU (2011), we are in need of application developers (programming the interfaces between the device and the network) as well as content developers and enablers (compiling content into mobile-ready formats). Hence, citizens become "data prosumers (both consumers and providers of data)" (Charalabidis et al. 2014). Thus, "factors as the cost and availability of Internet access, the language in which the data is presented, the technical or professional requirements for interpreting and making use of the data, and the availability of training in data use and visualization, among others" are important for the success of open government data (Gurstein 2011). Additional factors are the adoption by citizens in their mobile phone use, social factors, income level, and trust of service, but not demographic factors (Liu et al. 2014; Reddick 2014; Venkatesh et al. 2014). The critical success of an m-government service or m-app is the service's perceived usefulness (Hung et al. 2013).

The development of urban m-apps should be embedded in an "open data based business ecosystem" (Immonen et al. 2014, p. 88), which consists of elements such as key partners, co-creation, revenue strategies, customers and markets, data structure, business development, and the value added (Immonen et al. 2014, p. 92). The objective of a business ecosystem is to ensure the sustainability of m-apps (and not a quick development of an app followed by stopping the product some weeks later). Figure 1 gives an overview on issues of developing urban m-apps.

To build m-apps based on open urban government data in order to enhance collaboration, quality of life, and to solve urban problems is a common topic in many cities around the world (Mainka et al. 2015a). Some cities are fast adopters of this
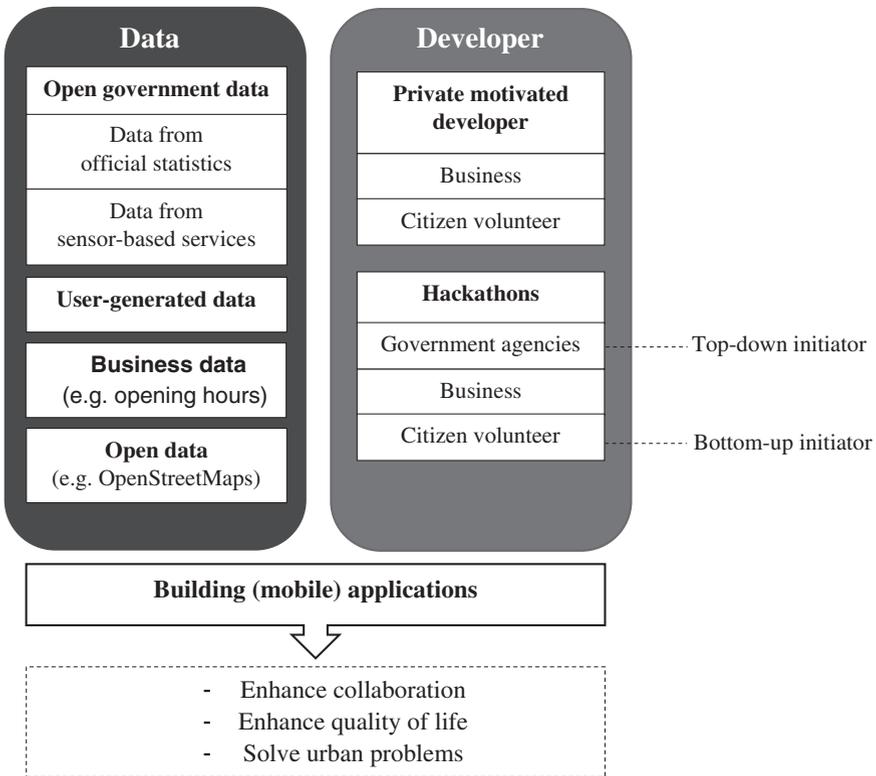
Data			**Developer**	
Open government data			**Private motivated developer**	
Data from official statistics			Business	
Data from sensor-based services			Citizen volunteer	
User-generated data			**Hackathons**	
Business data (e.g. opening hours)			Government agencies	----- Top-down initiator
Open data (e.g. OpenStreetMaps)			Business	
			Citizen volunteer	----- Bottom-up initiator

Building (mobile) applications

- Enhance collaboration
- Enhance quality of life
- Solve urban problems

Fig. 1 Entities related to the development of m-apps based on open urban government data

approach, and other cities are latecomers or still fear the challenges which emerge with open government data initiatives (Janssen 2011). Other cities start hackathons without certainty of its usefulness (Johnson and Robinson 2014). Since there is just little research on this development, we want to locate the challenges of opening data and analyze in a case study the cities Paris, Barcelona, and Amsterdam. Therefore, we interviewed persons from politics and research to get insights about the current development and its obstacles. Furthermore, we analyzed the hackathon movement in 24 cities to identify best practice examples and detect whether these hackathons help governments to overcome fears and barriers.

3 Methods

For the investigation of the challenges of open government, we choose expert interviews, because this method is appropriate "for an orientation in the field" (Flick 2009, p. 528). In our approach, the interviews are used to identify the

challenges this development poses. The interviews are based on a semi-structured method with open and closed questions (Creswell 2012).

The interviewed experts are familiar with topics such as urban planning, e-government, public institutions, and ICT. In total, eight experts from government agencies and universities participated in the interview. Two experts are from Barcelona, two from Paris, and four from Amsterdam. The interviews have been conducted between December 2013 and March 2014. The results do not aim at reflecting the opinion of a whole city but to give an insight into how *open government* is understood from experts in different European cities (result Sect. 4.1).

The hackathon movement was analyzed through a simple Web content research. Since hackathons are related to online available resources, promotions and reviews are hosted on online platforms, e.g., blogs or online news as well. Additionally, we refer to a prior conducted content analysis on m-apps based on open urban government data (Mainka et al. 2015a). Here, a set of 24 cities was analyzed by searching for m-apps based on open data on the cities' governmental Web sites. These cities are our base for the analysis of hackathon outcomes around the globe (result Sect. 4.2). The cities Amsterdam, Barcelona, and Paris are deeper analyzed concerning their open data initiatives and hackathon movements (Sect. 4.3).

4 Results

4.1 Challenges of Open Urban Government Data

Today, we see a lot of barriers and opportunities to make open urban government data accessible. In this section, we want to take a deeper look at current barriers which hamper governments to open their data. In their study, Huijboom and Van Den Broek (2011) have mentioned, for example, a "closed government culture …, privacy legislations …, confidentiality, risk avoidance and fear of political escalation" as the main reasons. To better understand where these fears and unwillingness come from, we asked the experts which challenges they define as the biggest within the open government trend. According to a prior literature review, the challenges were structured into the following six categories:

1. *Political Challenge*: Politicians fear to lose their monopoly in public affairs. To shift from a close to a more open government, "a deep reform of public administration ways of thinking and behavioral patterns, organizational structures, and operational approaches" are needed (Moro 2005, p. 110).
2. *Legal Challenge*: Security reasons, privacy, and copyright are often used as arguments to protect data from the public (Huijboom and Van Den Broek 2011).

3. *Governance Challenge*: Governments' motivation to open their data and to collaborate includes the participation of business and citizens as well (Huijboom and Van Den Broek 2011). In addition, it is questionable in which form the data should be opened.

4. *Human Resource Challenge*: Diverse skills are needed from government and stakeholders. It is a highly complex task to prepare the data to be reused in a variety of ways (Dawes and Helbig 2010). Government agencies are in need of talents who are able to prepare the data to be open and reusable.

5. *IT Infrastructure Challenge*: Information and communication technology is the essential driver of digital open data. Thus, it is considerable for a government to be connected through an enhanced IT infrastructure to make online services available to the public.

6. *IT Budget Challenge*: How governments spend their funds may differ in every country and depends on their overall available budget. The financing plays a role especially when governments have implemented charging models for their data (Huijboom and Van Den Broek 2011). To open those data will entail a financial lack.

The literature review points out that open government is not a new idea, but becoming an open government is still in process. The experts were asked to indicate which of the mentioned challenges they perceive as the main challenges to the provision of public data as open data by their (1) municipality and (2) central government. Additionally, a brief motivation of their decision was given by the interviewees. The experts had to choose two challenges which they see as the main ones. For the most interviewees, the political challenge was identified as one of the biggest challenges. It could also be described as a "strategic challenge." If they open data, they can lose the control about urban services. In Web 2.0 services, the users provide the information, which is a very important development. Accordingly, "the government won´t be the monopolist of data" (Alain Rallet, 11 December 2013, Paris). Another aspect is the priority of this topic within the municipality. "Open data is not one of the most important topics for the politics" (Marta Carrasco Bonet, 4 December 2013, Barcelona). However, one of the major problems in the political challenge could be the fear to lose power. "The politicians think that information is power and they do not want to lose this power. They are not aware of the fact that cross information makes sense. Not just open data but also internal data sharing will improve a lot" (Joan Batlle-Monterrat, 4 December 2013, Barcelona).

As a legal challenge, most experts mentioned privacy rights. It is not clear who will be the owner of open data and who will be accountable for them. Furthermore, the experts are consistent in their concerns about the governance challenge. The data needs to be collected and shared in a reusable form which is a very big issue. The challenges "human resource," "IT infrastructure", and "IT budget" are deeply related to each other. Thus, depending on the budget, talents can be hired who implement and maintain the IT infrastructure. Unlike in the literature, where the IT infrastructure is a challenge for suburbs or not connected

regions, the experts live and work in cities with enhanced IT infrastructures. Therefore, they associate this question with the internal IT infrastructure of their government. The IT infrastructure is especially a challenge in Amsterdam where "the national government had several 'disaster' in IT infrastructure projects in the past few years" (Marco Bontje, 21 January 2014, Amsterdam).

If we take a look at the main challenges for the municipal government and the central government, there are just marginal differences. It highly depends on the political structure in each city and nation. If the central government is accountable for the IT budget, then IT budget could not be a challenge for the municipality and vice versa. In the case of Amsterdam, we can see that the experts count the IT infrastructure not just as a challenge for the central but also for the municipal government.

4.2 The Hackathon Movement

In the last few years, a new trend has appeared on how governments and citizens work together to reuse open urban government data and build useful services with it. In order to realize this, events are hosted which are named "hackathon," "app contest" (Johnson and Robinson 2014), or "app competition." But what is it all about? Do hackathons or similar contests help to develop value-added services? To find evidence about these aspects, we analyzed hackathons in 24 cities, which are prototypical cities of the knowledge society (Mainka et al. 2015a). First, we will specify the types of those events and their aim, and identify the participants. According to a prior research on m-apps based on open urban governments (Mainka et al. 2015a), we will investigate if and how these hackathons are related to successful m-apps based on open urban government data.

The term hackathon combines the two words "hack" and "marathon" which is also a hint at the temporal construction of those events, in which the term "hack" refers to smart programs or programmers and not to criminal hack attacks. In general, those events are often hosted to solve specific problems or to address stated topics, e.g., tourism and culture, democracy, mobility, security, energy, waste, transportation, and water efficiency (Apps for Amsterdam 2012; Cleanweb Worldwide 2012). The idea is to bring people from different backgrounds together and see whether they are able to create value-added products. The initiative can come from the government (top-down) as well as from the hacker community (bottom-up). However, the aim to host such events is mostly to build a bridge between government, citizens, and economy. Vienna stated that the citizens are the most needed and emphasize that especially statisticians as well as librarians are wanted participants (Barcamp 2013). There is no limitation on the participation level, e.g., the "apps4austria" competition invites companies, institutions, and

administrative organizations to participate as well (Digitales Österreich n.d.). But not only governments and citizens organize hackathons, there are also new companies that emerge to host these events. One example is angelhack which is operating since 2011 and organizes hackathons for other companies, e.g., Adobe in San Francisco (AngelHack 2011).

Hackathons are often hosted in and by cities and regions all over the world, e.g., Amsterdam, as well as for bigger areas, e.g., the whole country, such as in Finland (Apps4Finland) or the whole European Union (Apps for Europe n.d.). However, it has its origins in the USA where the first hackathon has been held in 2011 (Headd 2011).

Another aspect which can differ between events is whether the hackathon is awarded or just for fun. Furthermore, which status do the developed applications or services have. Are prototypes ready for use? In some cases, ideas to solve problems are highly welcomed and awarded, e.g., for the Stockholm Award. This award is part of the "Vision 2030, where Stockholm will be a vibrant, humane and creative world-class city, the competition was to bring the City a step in the right direction" (Studentcompetitions 2012).

If the resulting ideas or applications will bring a social or economic value after the hack, will be decided by the market. The ideas and products have to be accepted and used. In some cases, the developer gets some assistance by the city or the initiators of the hackathon. This can be financial or technical aid, or arrangements in order to connect the developer with existing project groups. An example of "crowdfunding" is the platform sf.citi by San Francisco. They try to support developers and products by organizing fund through the public. For example, citizens can fund the projects they prefer on platforms like "citizenvestor" (Hunter 2013).

The challenge is not to develop a m-app, but to make it successful. Therefore, the products of civic hacking have to be promoted after these events so that they get recognition by a larger quantity of citizens. For this purpose, Chicago provides a good example. They call for residents to become a member of "The Civic User Testing Group" (CUTGroup) which is a project by the "Smart Chicago Collaborative."

The increasing popularity of open data also changes the quality of the data. Now, governments see that the data is used and they try to face the new challenges. Thus, new jobs need to be created as well; for example, a Chief Data Officer was proved for the city of San Francisco (Hunter 2013). Hackathons and app challenges have even become so popular that guides, e.g., "How to run a hackathon"[1] and books, e.g., "Civic Apps Competition Handbook"[2] were published to support hosting these events.

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[1]http://www.socrata.com/wp-content/uploads/2013/05/How-to-Run-a-Hackathon.pdf.

[2]http://govfresh.com/2012/12/civic-apps-competition-theres-a-book-for-that/.

4.3 Open Government Data Initiatives and Hackathons in Amsterdam, Barcelona, and Paris

The biggest challenge to become an open government mentioned by the interviewed experts is the political challenge (see Sect. 4.1). The cities Amsterdam, Barcelona, and Paris have already started to open their urban government data online. Of course, there are differences in the amount of open data sets and addressed topics, but strategies and plans to join open data initiatives are already transformed into real action. Amsterdam supports a metadata platform (www.amsterdamopendata.nl), which links to the open datasets of available geo data (maps.amsterdam.nl/open_geodata) and statistical data (www.ois.amsterdam.nl/feiten-en-cijfers) of different government institutions. In contrast, the open data portals from Barcelona and Paris host the datasets on one portal. All cities use different licensing types, e.g., creative commons or own licenses. They have in common that the data is allowed to be reused in further projects, e.g., in new applications. All cities mention in their terms of use that the city is the owner of the data but is not responsible for the accuracy of it. The major part of the data is available in machine-readable formats, e.g., CSV, JSON, or ODATA, and for geographical data in Shapefiles (SHP) or GeoJSON. Amsterdam and Barcelona also offer PDF files or even images. Some of these "datasets" are scanned documents, e.g., administrative bylaws, which are not machine-readable. Table 1 gives an overview of the open data portals, datasets, data formats, and the categorized themes of data for each city.

The interviewed experts see that human resource, IT budget, and IT infrastructure are related topics. Barcelona, for example, has established new jobs which are responsible for the open government movement in their city. These positions are called for instance "Smart City Director & Deputy CIO" or "Mobile, e-Government & Data Director." In contrast, Paris follows a defined action plan which is dedicated to the modernization of public action directed by the prime minister of France. A particular institution was founded, called Etalab (www.etalab.gouv.fr), which is responsible for the national open data development. In Amsterdam, the Amsterdam Smart City platform was founded to bring partners from business, research, government, and citizens together.

Barcelona's open data initiatives are based on tools developed by Microsoft (Microsoft 2014). Thus, they have datasets, e.g., ODATA, which are mostly used in Microsoft environments. In addition, the governmental internal IT infrastructure is based on Microsoft products. Whether Barcelona receives benefits from Microsoft for using their tools and operating systems is not clear. They also collaborate with Cisco concerning their smart city initiatives, e.g., implementing sensors in the city (Cisco 2011). In addition, the cooperation in research and technology between IBM and the Barcelona Supercomputing Center helps the city to become a vanguard of open government (IBM 2015). To adapt m-government services, citizens and tourists may use one of the 700 Wi-Fi hot spots all over the city. Amsterdam also collaborates with companies to improve its open data initiatives. Together with the navigation system company TomTom, they built an open

Table 1 Open datasets in Amsterdam, Barcelona, and Paris (retrieved June 2015)

| • **City** • Amount of open datasets • Open data portal • License	Data format	Themes
• **Amsterdam** • 424 • www.amsterdamopendata.nl • Own license (data is allowed to be used and re-used for commercial and non-commercial purpose. City of Amsterdam has to be cited as source holder)	(Images) PDF XLS CSV GeoJSON GeoRSS SHP	Management and organization Population Services Economics and haven Education, youth and diversity Energy Geography Environment and water Public order and safety Public space and green Sport and recreation Urban development Tourism and culture Traffic and infrastructure Elections Work and income Housing and environment Care and welfare
• **Barcelona** • 323 • opendata.bcn.cat • Creative commons licenses 3.0	PDF CSV XML ODATA	Administration Economy and business Population Territory Urban environment
• **Paris** • 130 • opendata.paris.fr • Own license inspired by the open data-base license (ODbL) v1.0 (data is allowed to be used and re-used under share-alike conditions)	CSV XLS JSON GeoJSON SHP	Culture Urban planning Citizens Environment Movement Service

dataset to detect free parking slots in the city (Balch 2013). This community-driven approach is also reflected at their open data portal where the Amsterdam Economic Board, the Waag Society, the Vrije Universiteit, and the Universiteit van Amsterdam work together. In Paris, the open data initiatives are inspired by the Open Knowledge Foundation. This foundation is a non-profit organization and supports others, e.g., governmental organizations, to join in the open data movement. Direct corporations on the city level as in Barcelona could not be detected in Paris, but national government institutions work together with OpenDataSoft (www.opendatasoft.com) in France.

Having all the data online allows these cities to run own hackathons which may reuse open urban government data. The majority of the detected hackathons are initiated by NGOs, universities, governments, or companies. In Amsterdam, we can find hackathons such as the Open Data FWD, which is a project of the

Department of Infrastructure, Traffic and Transportation (DIVV) of the City of Amsterdam, and Waag Society, or Apps for Amsterdam which focuses on getting Open Data apps on the market and is organized by the Waag Society in corporation with the Economic Development Board Amsterdam (EDBA). In Barcelona, no hackathon could be found which is dedicated to work on urban government data. Nevertheless, a hack community is present in the city, and other hackathons such as Hackathon for Social Good, Journalism Hackathon, or A Smart Cities Hackathon are held there. Also, workshops for hackers are offered during the Barcelona Smart City App Hack. Bottom-up initiatives are hosted by a community called the Databeers. They arrange meet-ups at irregular intervals. Equally in Paris, no open urban government data hackathon could be located. However, national or commercial hackathons are hosted in Paris, too.

Thus, the questions arise as follows: Are open data initiatives and hackathons useful to build value-added city services? In the case of Amsterdam, we have to answer "yes." They have a lot of open data available and host hackathons. For example, the Apps for Amsterdam hackathon in 2012 has announced the "Parkshark API" and "Bike like a Local" as winners of their contest. In the case of the Parkshark API, not only the city of Amsterdam can benefit from it, because less cars drive through the streets searching a parking slot which helps to reduce carbon emissions. The citizens are winners as well, since they now can find cheaper and faster parking slots nearby. But also the developers of the m-app benefit of this competition. Their product has become famous which has led to commercial orders.

Our investigation has brought to light that most hackathons address people who are programmers or designers, which is not in common with the cities open data vision. Thus, the majority of the citizens will not feel affiliated to join hackathons or app competitions. Acknowledging our prior study on m-apps built on open urban government data (Mainka et al. 2015a), m-apps developed by NGOs, private companies, or citizens have been produced in all three cities. In some cases, the cities' government emerged as the developer of some m-apps. Figure 2 illustrates
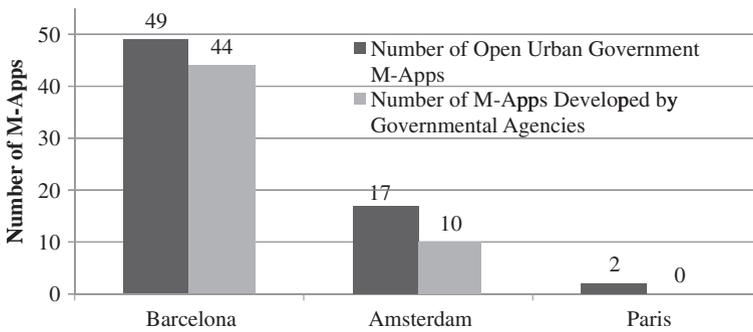
Fig. 2 M-apps found on governmental Web sites of Amsterdam, Barcelona, and Paris as well as amount of m-apps developed by governmental agencies

the total amount of m-apps which are based on open urban data and found on governmental Web sites as well as the amount of these m-apps developed by a governmental institution. However, in the case of Paris, most of the m-apps could not be identified as being based on open data, wherefore they had to be excluded.

5 Conclusion

Is the government able to transform data into value-added city services? Have we already arrived at an open government stage? As reviewed in the literature, the initiatives and ideas that governments should be more open and citizen oriented are not new. But a new development is the reuse of open urban data in mobile applications.

A lot of open data could be or already is available, such as sensor-based data in car parks or GPS information to locate traffic jams. That this data is reused is evidenced by the detected m-apps based on open urban government data and the burgeon hackathons around the world. Considering the challenges of opening data such as the governance challenge, IT budget and infrastructure challenge, or legal challenge, one could think that we are at the beginning of a new movement. However, the maturity of this development depends on the respective city. Barcelona, for example, has opened its data under creative commons licenses to the public. Now citizens, NGOs, and anybody else may use this data.

In some cases, we see that the initiatives of opening the data or initiating a hackathon may come from the government, in others from the community. As the first hackathons from San Francisco brought out some helpful applications, others started to adapt this idea. Today, we can find app challenges in almost every bigger city. This movement is developing and changing rapidly. Some m-apps do not exist anymore, others have been further developed and updated, and some others have not been changed or improved for a long time (e.g., Play Amsterdam: last update 06/06/11).

However, it still remains unclear whether hackathons are indeed able to make a difference and bring the citizens into the governmental processes. What we actually see is that people come together as a community and develop governmental services. This could help to make the whole city and its residents smarter.

Finally, comparing all analyzed cities, we see major differences in handling open urban government data. The hackathon movement and the availability of citizens' apps are common. There are many different kinds of hackathons and competitions, which are also co-operating with each other. Every day a new event could be hosted and others are not organized anymore. Of course, not all applications, projects, and ideas can achieve success, but more important than launching successful applications is to build a collective community that aims at solving problems together, regardless whether they are city officials or ordinary people. The main aim is to transform government, to reuse open data, and to open the data for

anybody. In fact, this can be achieved with the help of hackathons and app competitions. Above all, producing useful services from which everybody will benefit should be forwarded in future.

References

AngelHack. (2011). *What is AngelHack?* www.angelhack.com/about-us/. Accessed November 28, 2014.

Balch, O. (2013). *Can open data power a smart city revolution?* www.theguardian.com/sustainable-business/open-data-power-smart-city. Accessed June 2, 2015.

Baraniuk, C. (2013). The civic hackers reshaping your government. *New Scientist, 218*(2923), 36–39. doi:10.1016/S0262-4079(13)61625-5.

Belanger, F., Carter, K. D., & Schaupp, L. C. (2005). U government: A framework for the evolution of e government. *Electronic Government: An International Journal, 2*(4), 426–445.

Bellone, C., & Goerl, G. F. (1992). Entrepreneurship democracy. *Public Administration Review, 52*(2), 130–134.

Bettencourt, L. M. A. (2014). The uses of big data in cities. *Big Data, 2*(1), 12–22. doi:10.1089/big.2013.0042.

Briscoe, G., & Mulligan, C. (2014). *Digital innovation: The Hackathon phenomenon.* CreativeWorks London Working Paper No. 6. London: CreativeWorks.

Carroll, J. M., & Ganoe, C. H. (2009). Supporting community with location-sensitive mobile applications. In M. Foth (Ed.), *Handbook of research on urban informatics: The practice and promise of the real-time city* (pp. 339–352). Hershey: IGI Global.

Charalabidis, Y., Loukis, E., & Alexopoulos, C. (2014). Evaluating second generation open government data infra-structures using value models. In *Proceedings of the 47th Hawaii International Conference on System Sciences, IEEE Computer Society, Washington* (pp. 2114–2126).

Cisco. (2011). *Press release.* newsroom.cisco.com/press-release-content;jsessionid=01230049AD3CA4E7D7A1C6438DD16818?type=webcontent&articleId=5918850. Accessed June 2, 2015.

Creswell, J. W. (2012). *Qualitative inquiry and research design: Choosing among five approaches.* Thousand Oaks: Sage.

Dawes, S. S., & Helbig, N. (2010). Information strategies for open government: Challenges and prospects for deriving public value from government transparency. In M. A. Wimmer, et al. (Eds.), *EGOV 2010, electronic government. Lecture notes in computer science* (pp. 50–60). Berlin: Spinger.

Desouza, K. C., & Bhagwatwar, A. (2012). Citizen apps to solve complex urban problems. *Journal of Urban Technology, 19*(3), 107–136. doi:10.1080/10630732.2012.673056.

Flick, U. (2009). *An introduction to qualitative research.* Thousand Oaks: Sage.

Gurstein, M. B. (2011). Open data: Empowering the empowered or effective data use for everyone? *First Monday, 16.*

Headd, M. (2011). *Open government hackathons matter.* govfresh.com/2011/08/open-government-hackathons-matter/. Accessed November 28, 2014.

Huijboom, N., & Van Den Broek, T. (2011). Open data: An international comparison of strategies. *European Journal of ePractice, 12*(1–13), 4–16.

Hung, S.-Y., Chang, C.-M., & Kuo, S. R. (2013). User acceptance of mobile e-government services: An empirical study. *Government Information Quarterly, 30*(1), 33–44. doi:10.1016/j.giq.2012.07.008.

Hunter, F. (2013). *The civic innovation ecosystem blooms in 2012. What's next?* innovatesf.com/category/open-data/. Accessed November 28, 2014.

IBM. (2015). *Press release* https://www-03.ibm.com/press/us/en/pressrelease/46566.wss. Accessed June 2, 2015.

Immonen, A., Palviainen, M., & Ovaska, E. (2014). Requirements of an open data based business ecosystem. *IEEE Access, 2*, 88–103. doi:10.1109/ACCESS.2014.2302872.

Janssen, K. (2011). The influence of the PSI directive on open government data: An overview of recent developments. *Government Information Quarterly, 28*(4), 446–456. doi:10.1016/j.giq.2011.01.004.

Jetzek, T., Avital, M., & Bjørn-Andersen, N. (2013). Generating value from open government data. In *Thirty Fourth International Conference on Information Systems, Milan* (20 pp.).

Johnson, P., & Robinson, P. (2014). Civic Hackathons: Innovation, procurement, or civic engagement? *Review of Policy Research, 4*(31). doi:10.1111/ropr.12074.

Kitchin, R. (2014). The real-time city? Big data and smart urbanism. *GeoJournal, 79*(1), 1–14. doi:10.1007/s10708-013-9516-8.

Kuhn, K. (2011). Open government data and public transportation. *Journal of Public Transportation, 14*(1), 83–97.

Lathrop, D., & Ruma, L. (2010). *Open government: Collaboration, transparency, and participation in practice*. California: O'Reilly Media.

Liu, Y., Li, H., Kostakos, V., Goncalves, J., Hosio, S., & Hu, F. (2014). An empirical investigation of mobile government adoption in rural China: A case study in Zhejiang province. *Government Information Quarterly, 31*(3), 432–442.

Mainka, A., Hartmann, S., Meschede, C., Stock, W. G. (2015a). Mobile application services based upon open urban government data. In *Proceedings of the iConference 2015: Create, Collaborate, Celebrate*, *Newport Beach, California, USA*, March 24–27, 2015. University of Illinois at Urbana-Champaign: iSchools, IDEALS.

Mainka, A., Hartmann, S., Stock, W. G., & Peters, I. (2015b). Looking for friends and followers: A global investigation of governmental social media use. *Transforming Government: People, Process and Policy, 9*(2), 237–254. doi:10.1108/TG-09-2014-0041.

McDermott, P. (2010). Building open government. *Government Information Quarterly, 27*(4), 401–413. doi:10.1016/j.giq.2010.07.002.

Mergel, I. (2013). Social media adoption and resulting tactics in the U.S. federal government. *Government Information Quarterly, 30*(2), 123–130. doi:10.1016/j.giq.2012.12.004.

Microsoft. (2014). *Costumer storie*. https://customers.microsoft.com/Pages/CustomerStory.aspx?recid=270. Accessed June 2, 2015.

Millard, J. (2010). Government 1.5: Is the bottle half full or half empty? *European Journal of ePractice, 9*, 1–16.

Moro, G. (2005). Citizens` evaluation of public participation. In OECD (Ed.), *Evaluating public participation in policy making* (pp. 109–125). Paris: OECD.

OECD/ITU. (2011). *M-Government. Mobile technologies for responsive governments and connected societies*. Organisation for Economic Co-operation and Development (OECD)/International Telecommunications Union (ITU), 2011.

OKF. (date unknown). *Open data handbook documentation/open knowledge foundation (OKF)*. Online: opendata-handbook.org/pdf/OpenDataHandbook.pdf.

Reddick, C. G. (2014). Citizens and mobile government adoption: A comparison of activities and uses. *International Journal of Civic Engagement and Social Change, 1*(1), 13–26. doi:10.4018/ijcesc.2014010102.

Scholl, H. J. (2012). Five trends that matter: Challenges to 21st century electronic government. *Information Polity, 17*(3–4), 317–327. doi:10.3233/IP-2012-0280.

Scholl, H. J., & Scholl, M. C. (2014). Smart governance: A roadmap for research and practice. In *Proceedings of iConference 2014* (pp. 163–176).

van der Waal, S., Węcel, K., Ermilov, I., Janev, V., Milošević, U., & Wainwright, M. (2014). Lifting open data portals to the data web. In S. Auer, V. Bryl, & S. Tramp (Eds.), *Linked open data—Creating knowledge out of interlinked data* (pp. 175–195). Berlin: Springer. doi:10.1007/978-3-319-09846-3_9.

Venkatesh, V., Sykes, T. A., & Venkatraman, S. (2014). Understanding e-Government portal use in rural India: Role of demographic and personality characteristics. *Information Systems Journal, 24*(3), 249–269.

Wien.at. (2014). *Nutzungsbedingungen*. https://open.wien.at/site/open-data/nutzungsbedingun gen/. Accessed November 28, 2014.

Appendix: List of Hackathons Mentioned in this Chapter

Apps for Amsterdam. (2012). *Second Apps for Amsterdam contest: Smart apps awarded*. www.a ppsforamsterdam.nl. Accessed November 28, 2014.

Apps for Europe. (n.d.). *About us.* www.appsforeurope.eu/about-us. Accessed November 28, 2014.

Apps for Smart Cities. (2012). *The apps for smart cities manifesto*. Online: www.appsforsmartcit ies.com/?q=manifesto

Apps4Finland. (November 08, 2012) *Open data innovation contest Apps4Finland boots the clock speed of the finish society*. www.apps4finland.fi/en/. Accessed November 28, 2014.

Barcamp. (2013). *OpenDataHackathon 2011*. www.barcamp.at/OpenDataHackathon_2011. Accessed November 28, 2014.

Cleanweb Worldwide. (2012). *About*. nyc.cleanweb.co/about/. Accessed November 28, 2014.

Digitales Österreich. (n.d.). *Teilnahmebedingungen zum Wettbewerb apps4austria*. www.digitales. oesterreich.gv.at/site/7772/default.aspx. Accessed November 28, 2014.

Studentcompetitions. (2012). *Open stockholm award winners bring stockholm closer towards vision 2030*. studentcompetitions.com/posts/open-stockholm-award-winners-bring-stock-holm-closer-towards-vision-2030. Accessed November 28, 2014.