

Dear Author,

Please, note that changes made to the HTML content will be added to the article before publication, but are not reflected in this PDF.

Note also that this file should not be used for submitting corrections.



Contents lists available at ScienceDirect

## Government Information Quarterly

journal homepage: [www.elsevier.com/locate/govinf](http://www.elsevier.com/locate/govinf)

## Q2 Civic open data at a crossroads: Dominant models and current challenges

Q3 Renee E. Sieber<sup>a,b,c</sup>, Peter A. Johnson<sup>d,\*</sup>Q5 Q4 <sup>a</sup> Department of Geography, McGill University, 805 Sherbrooke Ave. West, Montreal, Quebec H3A 0B9, Canada4 <sup>b</sup> School of Environment, McGill University, 805 Sherbrooke Ave. West, Montreal, Quebec H3A 0B9, Canada5 <sup>c</sup> School of Computer Science, McGill University, 805 Sherbrooke Ave. West, Montreal, Quebec H3A 0B9, Canada6 <sup>d</sup> Department of Geography and Environmental Management, University of Waterloo, 200 University Avenue West, Waterloo, Ontario N2L 3G1, Canada

## 7 A R T I C L E I N F O

## A B S T R A C T

## 8 Article history:

9 Received 24 November 2014

10 Received in revised form 16 May 2015

11 Accepted 21 May 2015

12 Available online xxxx

## 13 Keywords:

14 Open data

15 Open government

16 Data sharing

17 Participatory

18 Data provision

As open data becomes more widely provided by government, it is important to ask questions about the future possibilities and forms that government open data may take. We present four models of open data as they relate to changing relations between citizens and government. These models include; a status quo 'data over the wall' form of government data publishing, a form of 'code exchange', with government acting as an open data activist, open data as a civic issue tracker, and participatory open data. These models represent multiple end points that can be currently viewed from the unfolding landscape of government open data. We position open data at a crossroads, with significant concerns of the conflicting motivations driving open data, the shifting role of government as a service provider, and the fragile nature of open data within the government space. We emphasize that the future of open data will be driven by the negotiation of the ethical-economic tension that exists between provisioning governments, citizens, and private sector data users.

© 2015 Published by Elsevier Inc.

## 30 1. Introduction

Many argue that citizen–government interactions are facilitated through, and indeed depend upon, the opening up of data generated by government and by governments' willingness to accept citizen feedback in the context of service provision (e.g., Goldstein, Dyson, & Nemani, 2013; Nath, 2011). For example, through the provision of real-time transit and route schedules delivered through an open interface and with non-restrictive licenses, governments have enabled the production of consumer-oriented applications that seek to improve service to citizens. Open data provision also provides a conduit through which citizen feedback can be used to improve service delivery as well as constitute a form of citizen participation (Johnson & Robinson, 2014).

Understanding the ways that governments provide open data is a rapidly emerging area of research, with direct implications for the relationship between government and citizen. Governments have long collected information, including geospatial data, with which to support planning, decision-making, and service provision (Janssen, Charalabidis, & Zuiderwijk, 2012; Tinati, Carr, Halford, & Pope, 2012). Traditionally this data was kept internal to the organization and only made public in a distilled, generalized format, if at all. The widespread availability of public sector data on the Internet represents a shift towards opening and distributing datasets for general public and private sector use (Yu & Robinson, 2012). More fundamentally, it represents a transformation

over time in the value of government data, from a means to an end in policy deliberations, to an end in itself (Onsrud, 1992), and even as an exercise in state power (Bates, 2014). Open data is argued to facilitate access to government data and improve service delivery but we argue that, through provision of data, increased participation in government functioning and decision-support can result.

Open data is fuelled by Internet technology that allows for easy sharing and use of data (Linders, 2012). A typical approach has been to release data for download or access via a web portal (Halonen, 2012; Tinati et al., 2012). Indeed, most open data provision focuses on "just getting the data out there," that is, surmounting the technical, legal, and organizational barriers to placing data on a website. There also are more proactive and interactive approaches, such as government hosting or sponsoring of civic hackathons – user/developer events designed to drive use of open data with a focus on return benefit to government and citizens (Johnson & Robinson, 2014; Longo, 2011). These two forms of open data provision represent the current state of open data and narrow the view of open data to a commodity and provision of data as an end unto itself, as opposed to data provision as an end to improving citizen engagement, government transparency, and improving decision-making around government services. We argue that this customer-centric view of open data is unidirectional and transactional, missing much of the potential for data to act as a conduit for citizen engagement with government and direct input to decision-making.

Preliminary research with open data innovators in Canada suggests that open data stands at a crossroads (Johnson & Robinson, 2014), with the focus on the innovators—the original adopters of open data.

\* Corresponding author.

E-mail addresses: [Renee.sieber@mcgill.ca](mailto:Renee.sieber@mcgill.ca) (R.E. Sieber), [peter.johnson@uwaterloo.ca](mailto:peter.johnson@uwaterloo.ca) (P.A. Johnson).

Additional studies point to a continuum of adoption by government of open government, including capabilities to provide open data and to accept direct public feedback whether from social media or other conduits (Lee & Kwak, 2012). We follow Rogers (2003) here in our choice of the term ‘innovator’, the earliest adopting organizations that are willing to take risks and can tolerate the failure of initiatives. Open data now is positioned at the next phase—the early adopter stage. Even as open data moves to more widespread provision, early adopters must contend with continuing innovations in civic technology.

This paper outlines four conceptual models for open data that can occur at the early adopter stage. We describe what has become a traditional model of open data, which is the simple provision of data. Open data will likely move on from this first model, but how will it evolve? How will governments at various levels (municipal, state/provincial, federal) challenge, combine, extend, or dissolve aspects of each model? We propose conceptual models, such as government as open data advocate; civic issue tracker; and open data as a participatory realization of open government principles, present divergent models from the current open data publishing paradigm. We argue that the provision of open data requires a transformation from treating open data as an end in itself—openness for the sake of openness—towards open data as a means for accomplishing a broader open government agenda of citizen inclusion and participation in decision-making. These conceptual models are presented as a framework for the open data research community to consider, challenge with empirical results, and use as a way to continue tracking how open data provision unfolds in ‘real time’.

## 2. Origins of open data

Government collects data for program and service development, provision, evaluation, and justification (Gurstein, 2011; Meijer, Curtin, & Hillebrandt, 2012). Historically, this data was maintained by governments for internal use and only shared with citizens in heavily digested forms. The freedom of information (FOI) movement of the 1960s began to make a compelling case for public disclosure of government data, leading to the passage in the United States of several key FOI bills (Jaeger, 2005; Relly & Sabharwal, 2009). Open data also draws from the concept of e-government, which seeks to make government documents and services widely available online (Bertot, Jaeger, & Grimes, 2010; Piotrowski & Van Ryzin, 2007). In the modern era, FOI and e-government are partially re-envisioned as open data, with governments publishing datasets online for public access. Here, raw government data placed online, typically for free download and use according to a permissible license (Janssen et al., 2012). Open data differs from e-government in that open data is expected to enable a variety of uses, as opposed to how e-government provides specific information or services for broad citizen access. The Open Knowledge Foundation provides a general definition of open data: it should be freely available to everyone to use, re-purposable and re-publishable as users wish, and absent mechanisms of control like restrictive licenses, with the key aspect to this definition is the reusability of data (Open Knowledge Foundation, 2014).

We underpin our conceptual models of open data provision with recent literature that presents the main motivations that drive government provision of open data: ethics (i.e., a collection of democratic enhancements that are dominated by calls for transparency and increased citizen participation in decision making), efficiency, effectiveness, and economic development (Zuiderwijk & Janssen, 2014). The ethical motivation for the release of open data aligns with what have long been considered essential elements in a democracy: broadened citizen participation, social inclusion in governance, and citizen empowerment. Pateman (1970) stresses the importance of civil society in a participatory democracy to perform an essential check on government activities. The motivation here is that government has a desire and a responsibility in a democracy to be transparent about its data and that the public has a basic competence to use that data to make government

accountable. We group the normative goals of citizen participation, data transparency and government accountability together into ethics.

Ethics have emerged recently in the concept of open government as a guiding and continuously evolving set of principles for governance (Ganapati & Reddick, 2012; McDermott, 2010; Meijer et al., 2012). Open government is not an endpoint or singular achievement, but rather should encompass a process that includes open data as only one component. For example, open government could include open information (e.g., procedural information about government), and open dialogue (i.e., two-way public consultation). Open data has typically been seen as both a product of, and a way to achieve the open government goals of transparency and accountability, though this relationship is ambiguous at times (Florini, 2008; Willinsky, 2005; Yu & Robinson, 2012). A government can release many different types of data on service provision or indicators but this data does not necessarily ensure transparency or citizen inclusion. The hope is that with open data, via open government, civil society can monitor government activities, assessing accuracy in expenditures or sourcing data that underlies decision-making (Bates, 2012; McClean, 2011). Advancing a transparency agenda is one way that open data may achieve civic participatory goals of open government, with the hope it leads to continuous invigoration of democratic governance.

Government data providers may be motivated by arguments that open data offers efficiencies, for example, the act of submitting data to a portal potentially revealing overlaps, thus eliminating redundancies and paperwork in data delivery and collection. Sharing of government data as a form of collaboration between levels or government departments is shown to decrease human resource and time costs associated with, for example, filling freedom of information requests from citizens (Janssen et al., 2012; Nam, 2012). It also may simply lower the cost of service provision; for example, having individuals utilize smartphones and text messaging systems for notification of the next bus instead of electronic signage atop each bus stop (Nath, 2011). Budgetary pressures often drive calls for efficiency; governments may no longer be able to afford certain kinds of service provision and therefore look to citizens to assume the costs of those services. For example, pothole reporting could reduce the need for public works employees; a report from the EU (Linders, 2012) mentions car-pooling as a way to reduce the need for transit. The efficiency motive for open data is well-publicized (Gurstein, 2011; Halonen, 2012), though the exact metrics underpinning these ‘value’ propositions are often contingent on assumptions made by the data providers (Harrison et al., 2012).

Associated with efficiency is the effectiveness motivation for the development and delivery of open data. Similar to the early years of GIS implementation in local governments (Budic, 1994), the promise of open data is in improving decision making as both citizens and policy makers, for example in other units of government, can access a wider range of information. Here open data can standardize the way staff collect and publish data. Open data functions as an in-house data warehouse and its users include the government’s own employees who use it to provide business intelligence. Past empirical work has found that new digital technologies allow for decisions that policy makers could not even anticipate when the technology was first introduced (e.g., the comparison of road networks to wildlife movements in assessing habitat impacts) (*ibid.*).

A final motivation for the delivery of open data is to spur innovation-driven economic development. This potential of open data is often touted by politicians, for example, senior Canadian cabinet minister The Honourable Tony Clement likens government data to a natural resource, which can and should be exploited (Treasury Board of Canada, 2013). The economic benefit derived from open data results from the development of systems and standards for access and exploitation of open data. Much like third party mapping services (e.g., MapQuest) arising from the development and release of US Census Bureau data (Haklay, Singleton, & Parker, 2008), the release of various public data presumably should encourage small and large entrepreneurs to develop

215 Web 2.0 applications. The General Transit Feed Specification (GTFS),  
 216 used for public transit open data provides a model example (Nath,  
 217 2011). GTFS began as a partnership between the City of Portland,  
 218 Oregon and Google, to determine a transmission standard (metadata)  
 219 for data that Google would display on its mapping platform. This stan-  
 220 dard is now used by private sector transit app firms (e.g., nextbus)  
 221 and other cities around the world. The hope is that this openness creates  
 222 value-added opportunities for new firms, with the assumption that  
 223 these firms generate economic benefits within the jurisdiction of the  
 224 same government that provides open data.

225 **3. Models of open data provision**

226 We argue that open data provision can be enacted in several ways,  
 227 and that the nature of this delivery shapes the way the data is used,  
 228 either as an end in itself (simple provision) or as a means to advance  
 229 the goals of open government. We define four non-mutually exclusive,  
 230 and non-sequential models of open data. These models consider how  
 231 the level of government involvement with end users of open data can  
 232 vary from: 1) a unidirectional provisioning of data (traditional data  
 233 portal or government as platform view); 2) government as data activist,  
 234 where government supports creative reuse of data and aims to directly  
 235 extract or create value from its offering, for example through app devel-  
 236 opment contests; 3) government as civic issue tracking and sensing,  
 237 where data comes from the citizen in a crowdsourcing paradigm, and  
 238 data may or may not also come from government; and 4) a participatory  
 239 view, where open data becomes an explicit conduit between citizen and  
 240 government, where citizen contributions are dynamic, and government  
 241 becomes responsive to demand-side requests for data. It is important to  
 242 consider that it is not the sole domain of government and citizens to  
 243 realize these models, but rather a shifting combination of various public,  
 244 private, non-profit, and community-based actors. Fig. 1 shows the direc-  
 245 tionality of our models in terms of data flows, with Table 1 synthesizing  
 246 the main benefits and challenges of our models. We describe these  
 247 models, after which we consider the main challenges presented in  
 248 their realization that may guide the future of open data provision.

249 **3.1. Data over the wall: Government publishing of open data**

250 Government-run online open data portals are a model of open  
 251 data provision that acts as a unidirectional conduit from data owner/  
 252 collector (typically a government, but also potentially a non-profit or  
 253 community organization) to the end user or developer (citizen, com-  
 254 munity organization, or private sector). This model of open data takes  
 255 formerly closed or internal-to-government data and exposes it through  
 256 a publicly accessible interface, with minimal restrictions governing  
 257 data use and sharing (Open Knowledge Foundation, 2014). The open  
 258 data interface provides access via direct downloads of complete  
 259 data sets provided in popular formats or through establishing

260 programmatic access via a software-to-software interface (i.e., an appli-  
 261 cation programming interface or API that facilitates access to data  
 262 provided as a service). The data may be offered most simply as a list of  
 263 files or a portal that may offer various tools, for example, to visualize,  
 264 map, or filter data (Alexopoulos et al., 2013; Charalabidis et al., 2014).  
 265 We note that there is limited feedback from citizens, mostly limited to  
 266 bug reports.

267 This particular model of open data parallels the ideology of ‘govern-  
 268 ment as a platform’, espoused by O’Reilly (2011). Here government  
 269 becomes a supplier of open data that others use, in the same way that  
 270 government provides physical infrastructure, such as roads. Govern-  
 271 ment provides and maintains data availability and streamlines access,  
 272 allowing various stakeholders to build applications and infuse open  
 273 data into their products without direct return benefit to government  
 274 (Linders, 2012). Government as platform is libertarian in its approach,  
 275 envisioning a role for government limited to that of infrastructure  
 276 provider, with data use, application, and value to be largely defined  
 277 and created by the private sector (Bates, 2014; Linders, 2012). The  
 278 presumption is that ‘data-driven innovation’, where open data is an  
 279 accessible source of data for exploitation by social entrepreneurs, will  
 280 create value for individuals from public data (O’Reilly, 2011). At the  
 281 current stage of development and exploitation of open data resources,  
 282 there is mixed evidence that these third-party applications deliver  
 283 concrete value to citizens, or can effectively replace government service  
 284 provision (Janssen et al., 2012; Longo, 2011).

285 **3.2. Code exchange: Government as open data activist**

286 Compared to the platform model, government can take a more  
 287 promotional position in the delivery and use of open data. Here, govern-  
 288 ment produces open data as an end (i.e., to deliver data) and also directs  
 289 the use of data for the benefit of citizens, the private sector, or govern-  
 290 ment itself (Johnson & Robinson, 2014; Linders, 2012). In this model,  
 291 a government explicitly encourages the development of saleable or inter-  
 292 nally useful products based on its provision of open data. In an evalua-  
 293 tion of five countries open data programs, Huijboom and van den  
 294 Broek (2011) note that this rationale of supporting service and product  
 295 innovation is a key motivation for the development of open data at a  
 296 national level. This contrasts with the government as platform model,  
 297 where government involvement ends with data provision. Indeed, this  
 298 model could be viewed as a way to move beyond the hype of open  
 299 data, which too often emphasizes supply-side issues to the exclusion  
 300 of data use after it is published. The model is frequently accompanied  
 301 by promotional or other forms of supportive activity and is often framed  
 302 in the context of an application “app” contest. Washington, DC held one  
 303 of the first and most often cited app contests, ‘Apps4democracy’, which  
 304 claimed a \$2.3 million added value for the city based on an outlay of  
 305 \$50,000 in prize money (www.appsfordemocracy.org). The motive for  
 306 holding these events, contests, and conferences include the develop-  
 307 ment of government-related applications, promotion of open data  
 308 resources, and creation of a ‘civic entrepreneur’ community interested  
 309 in providing citizen-facing services and products on behalf of the  
 310 government (Johnson & Robinson, 2014). This creates a dynamic  
 311 where government support of private sector developers potentially  
 312 outsources government service provision to the private sector via app  
 313 development.

314 The code exchange model of open data sees government soliciting  
 315 end-user participation in data use, not the simple bug or error reporting  
 316 of the data publishing model. End-users in this model refers to the  
 317 developer community, whether in the private sector or civil society,  
 318 for instance, social entrepreneurs, or civic/citizen hackers, who create  
 319 applications based on government data and frameworks. This is a spec-  
 320 ific form of participation, where engagement shifts to an “infomediary”  
 321 who may or may not connect the data via an application to citizens, or  
 322 may do so while advancing a particular agenda (Janssen & Zuidervijk,  
 323 2014; McClean, 2011). Additionally, this participation is limited to the

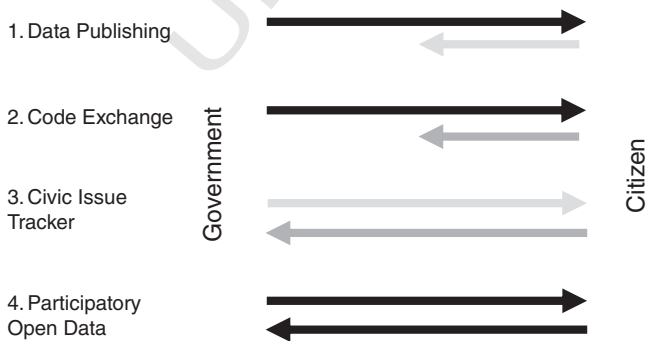


Fig. 1. Directionality (government to citizen and citizen to government) of the four models.



**Table 1**  
Benefits and challenges of four models.

Model	Benefits	Costs	Key references
Data over the wall: Government publishing of open data via an online portal	Standardize organizational data and realize other efficiencies; reduce requests for data; promote economic development; increase transparency and trust; limit role of government to open data provision	Technical maintenance; licensing, confidentiality; release of easiest data only; vulnerable to neoliberalism; difficulty in development of metrics and no guarantees for realizing value	O'Reilly (2011), Linders (2012), Alexopoulos, Spiliotopoulou, and Charalabidis (2013), Charalabidis, Loukis, and Alexopoulos (2014)
Code exchange: Government supports use of open data to fill needs	Actively engage in local economic development; reduce costs of app development; reduce/shift service delivery; benefit from customized innovation	Possible misappropriation; privatization; increased difficulty for analytics; data flows aligned with private interests; participation re-envisioned as consumption and limited to entrepreneurs; duplication of services where citizen reports do not flow to government	Huijboom and van den Broek (2011), Linders (2012), Janssen and Zuiderwijk (2014), Johnson and Robinson (2014)
Civic issue tracker: Government accepts direct feedback from citizens on limited range of issues	Obtain more immediate data and citizen feedback from citizen sensors; ease citizen reporting; promote social networking	Reliance upon data of suspect accuracy and provenance; loss of expert staff; increased requests for services; increase digital inequity; disrupt organizational routines	King and Brown (2007), Brabham (2009), Dawes and Helbig (2010), Nath (2011), Linders (2012), Nam and Pardo (2014), Offenhuber (2015)
Participatory open data: Government–citizen co-production of data	Explicitly promote transparency, rights and democratic objectives; increase trust with civil society; provide check on government; promote social connectedness	Exposure of government errors or malfeasance; declining public trust; participation reduced to image management, public venting or public consultation	Linders (2012), Zuiderwijk, Janssen, Choenni, Meijer, and Alibaks (2012)

few that have appropriate technical expertise and support, either through a developer community or private enterprise, to access and exploit government open data. Direct participation in this sense occurs via a government contract with the private sector, or government host of a contest, with an ultimate goal to provide services or use data to create value for citizens.

### 3.3. Civic issue tracker: Data from citizen to government

The first two models of open data presented have focused on government opening up existing internal data to potential users in one of two ways: first, as a portal for the download of data and, second, as an invitation to developers to work with government data with the potential for commercialization. Both models of open data present a directional transfer of information from government to stakeholder or developer, with little to no data or information (save bug or error reports) returning. Our third model of presents the participatory potential of open data, with government opening itself to citizen contributions of data, and the acknowledgement by government of this contribution. This includes citizen reporting of problems (e.g., potholes and noise complaints) and crises (e.g., floods or fires), in the style of 'municipal 311' issue reporting or service monitoring (Linders, 2012; Nam & Pardo, 2014). These systems are implemented to allow residents to dial the reserved three-digit number, 311, and reach a call center to report on non-emergency situations like potholes, non-working streetlights and sanitation (Nath, 2011). The digital evolution of the telephone-based 311 system has taken the form of online reporting systems, such as See, Click, Fix, and custom solutions built on the Open311 toolkit (Offenhuber, 2015), that may or may not be provided by the government itself. We include this as a model of open data as it reveals a government's willingness to open itself up to direct feedback of citizen-generated data, in the form of issues reporting (Lee & Kwak, 2012). Dawes and Helbig (2010), and Alexopoulos, Loukis, and Charalabidis (2014), propose that this type of feedback from data users can be used to help government maintain and improve on the quality of the data that they offer. Open data as an issue-tracker need not be coupled with the delivery of open data, as suggested in the previous two models of open data. Rather, open data as issue tracker operates distinct from, although it can have links back to, improving or suggesting changes to existing government open data. Government feedback in this instance could resemble an acknowledgement to data contributors of receipt of data, or that an issue reported has been resolved.

This type of approach to access and participation in government mirrors the concept of crowdsourcing, where a collective of individuals, with little formal coordination, contribute towards a shared goal or cause, in this case, improved government services and infrastructure (Brabham, 2009). Here crowdsourcing tends to be quite structured in terms of what is allowed on a reporting form. In this model of open data citizen participation is limited to issue reporting and represents a transactional way for citizens to interact with government, with little to no effect on government actions or policies. The civic issues tracker also takes advantage of citizens as sensors of their environment. The citizens as sensors concept sees citizens being physically close to phenomenon; they know the phenomenon intimately; and they can respond more quickly to a phenomenon than government (Goodchild, 2007). Coleman (2013) demonstrates this approach, where citizens can improve government data, for example fix errors in street files, with evidence suggesting that data submissions can actually exceed the accuracy of current government data holdings (Haklay, 2010). The civic issues tracker aims to increase ease of reporting for citizens (King & Brown, 2007) and exploit their potential as 'citizen sensors' (Goodchild, 2007). From a more critical perspective, this model of open data, when enacted in a downsizing government environment, can represent efforts to crowd/outsource reporting to citizens, where citizen reports fill in for government when government longer have the staff to respond to crises.

### 3.4. Participatory open data: Open data as open government

We have presented three divergent open data models for government; government as simple data provider, government as open data activist or application development sponsor, and government as recipient of information from citizens, in the form of crowdsourced issue tracking. In this fourth model, the government enters into a participatory two-way exchange with citizens. Here open data is reciprocal, both a data provision from authoritative sources and a request for new, citizen-generated data that can support service delivery and open a new channel for discussions about policy (Alexopoulos et al., 2014; Bartenberger & Grubmüller, 2014). A participatory model presents open data as a formalized conduit between citizen and government, where citizen contributions are integrated into decision-making, with government required to fill demand-side requests for not only existing data, but for structuring the why, when, and how of future data collection. This bi-directional linkage can also take the form of a co-management framework, with the end goals to encourage the stable provision of open data, improve quality and utility of datasets, and to

highlight areas for expanded data collection to support community or private sector needs. This can be considered a participatory model, in that open data, though initially constructed by government, is then co-constructed, revised, and edited by citizens (Alexopoulos et al., 2014; Zuidervijk et al., 2012). Participatory open data therefore opens up spaces for contributions as well as contestations, becoming a possible realization of the democratic and open government principles of transparency and participation. Participatory open data is the on-going co-creation of raw data between both governments and governed, with open data providing value in how it is used to achieve other policies and outcomes, not through its simple existence, accessibility, or promotion as a private sector commodity.

Linders (2012) calls a model like this citizen co-production, where government and citizen move beyond passive consumers of services to a partnership based on active collaboration that solves mutually identified problems. In the resulting joint production, citizens contribute “time, expertise, and effort” to achieve “an outcome, share more responsibility, and manage more risk in return for much greater control over resources and decisions” (Horne & Shirley, 2009, as appearing in Linders, 2012). We call the model ‘participatory’ because the objective is no longer solely data provision, irrespective of source (i.e., participating is not the same as contributing data). Here we differ from Linders in that we see data co-production embedded in a larger participatory process in which citizens have standing to engage in policy matters as well as contribute data. The objective of participatory open data is the process of broadening engagement, even if it lessens the efficiency in updating, editing, and altering government data sources. The process of participatory open data, through its enactment, would be a key contributor to realizing participatory and transparency goals that frame open government. This makes the citizen co-production of data to be just one type of citizen–government co-production (potentially extended to other actors, including private sector, non-profits, etc.).

### 3.5. Application and utility of models of open data provision

We propose these four conceptual models of open data provision as a way to aggregate or bring together much of the current work being done on defining and understanding how government provides open data. This conceptual model building is an act in theory building, in that it seeks to codify the current landscape of open data provision, and to propose future-orientated models. We aim for these models to inform the discussion of how governments provide open data, and more importantly, how governments could be providing open data with respect to moving towards a more complete realization of open government principles, for example through a participatory open data model. In this way, we aim to provide value for government employees developing open data and open government policies, and implementing or evaluating open data provision programs. For practitioners, these models could provide key guideposts for self-reflection of current or proposed open data provision strategies. Lastly, these four conceptual models provide a jumping off point for considering some of the current and future challenges to open data provision that spring from the conflicting motivations and tensions that define open data provision. It is to this state of open data at a crossroads between competing motivations of increasing economic development and innovation, and transparency and citizen engagement that we now turn.

## 4. Open data at the crossroads

We have presented four different models that are driven by various government motivations for opening up data. Open data is at a crossroads because these motivations may conflict and also because open data potentially creates a corresponding shift in the role(s) of government. For example, business intelligence and economic development uses of open data are generally uni-directional and targeted towards

linking government data with end users, rather than a deep consideration of citizen participation or government transparency that come from ethical motivations for the provision of open data. We present three main challenges that can impact the realization of each of the four conceptual models presented here. These include the conflicting motivations driving the provision of open data, the shift in role of government that may be driving a particular open data model, and lastly, the fragility of any model of open data provision, noting the possibility for government retrenchment and even abandonment of open data. For use, these are the key challenges in the further development of the open data provision space, particularly as governments negotiate and potentially move between the four models that we have identified.

### 4.1. Conflicting motivations for open data

Model choice is driven by motivations or justifications for opening up data, which may conflict with one another. Bates (2012, 2014) argues that, instead of neutral origins or exhortations about its automatic benefits of efficiency or economic development, open data was in part driven by tension between neoliberal policies that restricted data sharing, and the increasing potential of technology to support data sharing. We believe that this disagreement over core justifications emanates in part, from the source of a given open data initiative. When calls for open data originate from government, the literature has economic justification predominating. When the impetus derives from civil society, justifications center on anti-corruption and government accountability. For the latter impetus, open data becomes a rights and access to information issue. The reason is not simply that open data is good because it enables transparency but that citizens have a right to government data and documents (Yu & Robinson, 2012).

Bates's argument points to a tension between the ethical imperatives of open data—transparency, accountability and civic participation—and the technical delivery of internal government information and documents to citizenry (a data publishing model). Mirroring this tension are the terms that are applied to the end beneficiary of open data, whether that is the ‘citizen’ (transparency motivations) or the ‘data user’, inclusive of private sector corporations (business model motivations). Yu and Robinson (2012), underline this tension as a step towards the achievement of open government, suggesting that open data provision can be realized in many ways that may not contribute to the participatory and inclusivity motivations underlying open government, but rather serve a community of data users with varying motivations. Yu and Robinson (2012) even suggest that the model of open data has largely failed to advance beyond the more technocratic aspects of simple service delivery due to conflicts in motives.

Other motivations can run contrary to government transparency goals. For example, business intelligence, which exploits open data for in-house government use, is often cited as one outcome of the use of open data. This form of effectiveness-driven open data seeks to effect internal transparency but there need be no corresponding external transparency direct towards citizens. Bates (2012, 2014) argues that the open data movement can actually jeopardize citizen access to policy, because it displaces traditional civil society actors in favor of technical elites, like economically-motivated civic entrepreneurs. Morozov (2013) puts it bluntly “This tendency to view questions of freedom primarily through the lens of economic competition, to focus on the producer and the entrepreneur at the expense of everyone else, shaped [the concept of Government as platform]”. This view is supported by Code for America, who exhorts social entrepreneurship and civic hackathons: “But you shouldn't do this [build apps based on open data] just for fun, or even out of a sense of civic duty: you should do it because there's money there — lots of it” (Nemani, 2012; also Johnson & Robinson, 2014). With effectiveness or economic development as motives, there may be no need to justify open data as civil society transparency. If this is the case then we need to question whether data truly

533 is open, or rather that it is open only to select data users. At minimum  
534 we should match the rhetoric of open data's adoption by end users  
535 with the reality of its deployment by government.

#### 536 4.2. Shifting role of government

537 Robinson, Yu, Zeller, and Felten (2009) argue that government  
538 should focus less on the portal development and more on open data  
539 reusability, simply opening up the raw data and then letting the private  
540 sector handle delivery to the end user. Following this argument, govern-  
541 ment's role becomes reduced to a data platform for the private sector  
542 and civil society (O'Reilly, 2011). In turn, opening up data, whether sim-  
543 ple service provision or via open government, may pressure democratic  
544 governments to further downsize and shift service provision from  
545 the domain of government towards public-private partnership of app  
546 development (Bates, 2014; Johnson & Robinson, 2014). Challenges  
547 emerge when third parties become the source of go-to applications,  
548 creating a bifurcated market for citizen access to government services.  
549 King and Brown (2007, 72) illustrate the problem with FixMyStreets  
550 (later called SeeClickFix): "Local government officers voice a number  
551 of concerns: the site duplicates their own websites; they cannot report  
552 fixes directly to ensure the information is up-to-date; nor can they  
553 manage user expectations regarding service performance." The most  
554 popular of these third party apps is the public transit functionality  
555 built into Google Maps direction routing engine. This service accepts  
556 transit schedules from public sector transit providers, formalized  
557 according to a Google-developed standard, and delivers transit sched-  
558 ules across the suite of Google services. Though undoubtedly conve-  
559 nient for users, there is a downside to using Google as the data broker  
560 to deliver transit, compared to pulling schedules directly from the  
561 transit agency. When we no longer think government should be provid-  
562 ing valuable services then we rob government of its responsibility and  
563 justifications for taxation.

564 Dimaio (2009) penned a trenchant critique of government as a plat-  
565 form and the underlying neoliberal ideal of government remade into  
566 the 'efficient' image of the private sector. It is unlikely for government  
567 to provide services that are less expensive than the private sector, con-  
568 sidering that government functions amidst more regulations than the  
569 private sectors and must guard individuals' privacy and achieve broader  
570 societal accountability for their activities. Dimaio argues that govern-  
571 ment should not be expected to mirror efficiencies in less regulated  
572 firms, particularly emergent sectors for which regulations may not  
573 exist. Indeed, governments must be a payer of last resort, resulting in  
574 provision of services that may never be cost-competitive, but that fill a  
575 critical societal role. Governments also must establish numerous layers  
576 of accountability (*ibid.*):

577 if something goes wrong with a mashup or "app-for-democracy"  
578 using government data that got a prize or some form or recognition  
579 by government, be assured that government will be criticized. So,  
580 will governments find themselves thoroughly testing and certifying  
581 third party applications?

582  
583 A shifting role for government has implications for the way that  
584 open data is provided. In the first two models, data over the wall and  
585 code exchange, the private sector may begin dictating the type and  
586 frequency of datasets to be released, thus influencing the release of  
587 data to that which is most marketable. Any data publishing incurs  
588 costs; providing a service for private corporations may generate benefits  
589 that are not returned to government or civil society. As a result, govern-  
590 ments may choose a model of open data that pushes them to function as  
591 data broker favoring business over citizens. For most data, government  
592 is the provider of last resort for services; whereas, the private sector can  
593 focus on the most profitable segments of city services (Linders, 2012;  
594 Robinson et al., 2009).

For the second two models, civic issue tracking and participatory  
open data, the shifting role of government demands reflection on trust  
between government and citizens. In accessing open data, citizens  
have expectations that data provided by government is complete and  
accurate. Also, citizens expect that government will be receptive to  
their contributions or requests for change and act on them (Johnson &  
Sieber, 2012, 2013). These expectations are built on trust between  
citizen and government – a level of trust that may vary between and  
within jurisdictions. Governments engaging in a participatory open  
data model will have expectations for their citizens, both in using the  
government data in appropriate ways and in contributing back informa-  
tion that is reflective of the citizen reality. Governments must trust that  
citizens can provide real value and must value citizen perspectives  
and participation, even though it may be contrary or otherwise incom-  
patible with government policies and procedures. Accepting citizen  
input may require government to move outside of strongly regulated  
and entrenched procedures. Governments may need to adapt their  
approaches and support citizens in participatory open data develop-  
ment. There is a need on both sides to move towards a shared approach  
that acknowledges the constraints and challenges of both user and  
developer. For example, is there an adequate level of trust so a citizen  
contribution can be adapted to fit in a government hierarchy? Is this  
adaptation preferable to no citizen contribution at all, or is the nature  
and value of a citizen contribution lost when it is forced into existing  
(and potentially limiting) structures? These questions surround the  
development and implementation of participatory open data when  
considering the shifting ways that citizens and governments interact.

#### 4.3. Fragility of mission accomplished

Many governments appear to begin and end with the simple  
provision of open data, which to them has become standard operating  
procedure. We challenge this seeming 'mission complete' perspective  
on open data. Not only have the models for open data delivery expand-  
ed beyond simple data provision but this provision is not static but  
instead embedded in a broader discourse of open government. We  
argue that the conversion of open data initiatives to standard operating  
procedure is premature because both organizational and technical  
issues still constrain the provision of open data by government.  
Martin, Foulonneau, Turki, and Ihadjadene (2013) conducted extensive  
interviews with European Union representatives of open data initiatives  
to identify the barriers to the traditional open data publishing model.  
The authors identified seven factors that impede governments in open-  
ing up data: access (e.g., adding requirements for user identification to  
access data), governance (i.e., lack of awareness, inconsistent policies  
around open data), costs (e.g., pricing of data to cover portal implemen-  
tation), data (e.g., incompleteness or incompatibility of datasets), legal  
(e.g., conflicts over intellectual property, need to scrub data to protect  
personal privacy), metadata (e.g., unstructured formats, undocumented  
content) and skills (e.g., digital divides, language barriers, misinterpre-  
tations of data). Barriers have not disappeared and their durability has  
implications for all models of open data. For instance, government  
must update and maintain, at some cost, the data and the infrastructure  
that supports open data delivery. A standard approach to open data  
publishing is through outsourcing, in which a third party maintains  
the portal or manages the data. Outsourcing open data management  
can have unanticipated consequences for realizing transparency. For  
example, Philadelphia, US outsourced its traffic court data to Xerox  
(Reyes, 2014). The firm retains rights to set rules for access. This data  
cannot be published or repurposed; it cannot, for example, form part  
of an Open 311 system. That is why many current open data programs  
can be seen as fragile; a movement to a non-open state in response to  
organizational and technical constraints are real possibilities.

The content of cities' current open data catalogues reveals why  
standard operating procedure appears to be achieved. Catalogs are full  
of essentially the 'low hanging fruit' data that is the easiest to open up,



for example geographic data that is already in machine-readable form and presents the fewest legal restrictions to overcome in terms of publishing. Currie (2013) found that across a range of open data catalogues, the two largest categories of datasets were planning and development (e.g., jurisdictional boundaries, heritage data, community plans, and building outlines) and infrastructure (e.g., physical equipment, waste and water facilities locations). These are largely static datasets that require very little updating. It is one thing for an open data initiative to result in the uploading of numerous data sets and quite another to ensure that updated versions of those data sets are published in a timely manner. Mission accomplished may be proclaimed because all the easy data has already been made available, yet this type of data provision is an ongoing process, and one that should extend beyond the token easy to manage data sets.

There is an assumption that once a government initiates an open data model then it will continue as-is, or potentially advance along a trajectory towards participatory open data. This idea of a trajectory ignores the potential for a retrenchment. A city may pull its data from sites or abandon an open data initiative entirely. Many reasons may drive retrenchment, including lack of use (or measurement of use) of open data, inability to adequately update open data, dissatisfaction of the part of citizens with how open data is being provided, failure of open data to advance beyond the 'beta', potential value in commercializing certain datasets, and increasing concern about impacts of data mining and protection of individual privacy. These two latter points are critical. Resource-strapped governments may implement cost-recovery schemes to ensure the continued collection or even improvement of open data for private-sector data users. Without the revenue, there will be little incentive or ability for government to maintain high-quality data offerings, whether open or not. Legal and privacy issues demonstrate the tension between potentially hyperlocal data and privacy, with accordingly higher demand from open data users for higher and higher resolution data. Bound by regulation and mindful of greater social benefit and protection of individual confidentiality, government may pull back from providing high-value datasets, resting instead with highly aggregated data or potentially no public access to data at all.

## 5. Conclusion: The trajectory of open data

Government, citizens, private sector, and open data are in a rapidly evolving relationship, one where the type, degree, and directionality of data sharing will determine how data is used and exploited for private and/or public benefit. In the drive for efficiency in operations, government should not relinquish a focus on effectiveness or improvements to government–citizen relations. If the popular model of open data stagnates with the data over the wall model, government must ensure that value for citizens and government are being attained compared to value exclusively for corporations. This ethical-economic tension will drive the future of open data, as manifest through the search for efficiency in government operation, the desire for increased transparency, and the purported economic value of open data as a resource to support commercialization.

Developing these conceptual models of open data has led us to consider if open data is simply an extension of the neoliberal agenda, cloaked in rhetoric of democracy and service to citizens? Is government data collected to be used to support service delivery and decision-making (the main functional properties of government)? What are the implications of government data being fine-tuned for commercial or other uses, by a variety of third parties? There is little doubt that sharing this data has the potential to increase the transparency of government. From an efficiency perspective, open data becomes a cost savings through two outcomes. The first is decreasing the administrative overhead in distributing data to those who already are requesting 'closed' data and, second, the potential for government to reduce costs via subcontracting or outsourcing application development and service

provision to non-profits, individual citizens, or to private developers. A city may be able to crowdsource an application to a social entrepreneur only to be unable to sustain that application over time. The public may cease to think of a public service like transit schedules as the province of government and may cease to see transit as the domain of the public sector (Warner & Hefetz, 2012). This is the slippery slope of open data, that data collected for the provision of services or decision-making by government then, once shared, allows for others to fill the role of government—perhaps more efficiently (from a cost perspective, at least). This downloading and privatizing of service provision exhibits a trade-off between efficiency, quality, and equity. Future implications of the rise of open data are yet to be widely explored, but should be placed within the context of a decreasing role of the state in one's everyday life. To put it bluntly, we must ask if by providing open data, is government potentially outsourcing itself? Each of these questions raise the possibility of future empirical work, further defining and challenging the conceptual models that we propose here, using direct data collection from government employees and other open data stakeholders to continue advancing the state of the art in understanding open data provision, and the implications of open data across various levels of government.

Other alternatives exist for the future of open data. Using open data as a bridge to realize open government principles, such as increased transparency of government actions requires a fundamental shift in the way that open data is currently delivered. Reaching beyond the government as platform model towards participatory open data will require resolving the ethical-economic tension that drives opening data. How government balances the ethical (democratic in broadening participation, empowering with the inclusion of new voices) versus economic (a new source of monetization, crowdsourcing as outsourcing to volunteers as a way to reduce costs) will shape the way that government data is used to interact with citizens and the private sector. In addition, the flexible integration of closed, partly open, and open data across government scales, and also from outside of government (academia, private sector, non-profits, and others) can create new possibilities for data sharing and co-production. We have presented the current state of open data and considered open data as a way to achieve the participatory and transparency goals of open government. With the increasing spread of open data portals, it is important to continue to reflect on various possibilities for open data, rather than settling for data provision as a simple end point or assuming all portals will move towards open government. There is potential for open data to contribute to the goals of open government, however the ethical-economic tension raises key challenges to the role of open data as a mediator of the complicated and ever-evolving relationship between government, citizens, and the private sector. If data and information are considered to relay power, it is important to consider when, to whom, and under what conditions this power is transmitted, and for what potential cost.

## 6. Uncited references

- Ahn, 2012 773  
Luna-Reyes and Chun, 2012 774

## Acknowledgments

This research was supported by the Social Sciences and Humanities Research Council of Canada. Q10

## References

- Ahn, Michael (2012). Whither e-government? Web 2.0 and the future of e-government. In C. G. Reddick, & S. K. Aikens (Eds.), *Web 2.0 technologies and democratic governance*. New York: Springer Science + Business Media. 778  
781



- Alexopoulos, C., Loukis, E., & Charalabidis, Y. (2014). A platform for closing the open data feedback loop based on Web2.0 functionality. *eJournal of eDemocracy & Open Government*, 6(1), 62–68.
- Alexopoulos, C., Spiliotopoulou, L., & Charalabidis, Y. (2013). Open data movement in Greece: A case study on open government data sources. Paper presented at the Proceedings of the 17th Panhellenic Conference on Informatics, Thessaloniki, Greece.
- Bartenberger, M., & Grubmüller, V. (2014). The enabling effects of open government data on collaborative governance in smart city contexts. *eJournal of eDemocracy & Open Government*, 6(1), 36–48.
- Bates, J. (2012). "This is what modern deregulation looks like": Co-optation and contestation in the shaping of the UK's Open Government Data Initiative. *The Journal of Community Informatics*, 8(2).
- Bates, J. (2014). The strategic importance of information policy for the contemporary neoliberal state: The case of Open Government Data in the United Kingdom. *Government Information Quarterly*, 31(3), 388–395.
- Bertot, J. C., Jaeger, P. T., & Grimes, J. M. (2010). Using ICTs to create a culture of transparency: E-government and social media as openness and anti-corruption tools for societies. *Government Information Quarterly*, 27(3), 264–271.
- Brabham, D. C. (2009). Crowdsourcing the public participation process for planning projects. *Planning Theory*, 8(3), 242–262.
- Budic, Z. D. (1994). Effectiveness of geographic information systems in local planning. *Journal of the American Planning Association*, 60(2), 244–263.
- Charalabidis, Y., Loukis, E., & Alexopoulos, C. (2014). Evaluating second generation open government data infrastructures using value models. *IEEE*, 2114–2126. <http://dx.doi.org/10.1109/HICSS.2014.267>.
- Coleman, D. (2013). Potential contributions and challenges of VGI for conventional topographic base-mapping programs. In D. Sui, S. Elwood, & M. Goodchild (Eds.), *Crowdsourcing geographic knowledge* (pp. 245–263). Dordrecht: Springer Netherlands.
- Currie, L. (2013). *The role of Canadian municipal open data initiatives: A multi-city evaluation* (2013). (Masters Thesis) Kingston, Canada: Queen's University.
- Dawes, S. S., & Helbig, N. (2010). Information strategies for open government: Challenges and prospects for deriving public value from government transparency. *Electronic government* (pp. 50–60). Springer. [http://dx.doi.org/10.1007/978-3-642-14799-9\\_5](http://dx.doi.org/10.1007/978-3-642-14799-9_5) (Retrieved from).
- Dimairo, A. (2009). *Why government is not a platform*. Gartner Research Blog ([http://blogs.gartner.com/andrea\\_dimairo/2009/09/08/why-government-is-not-a-platform/](http://blogs.gartner.com/andrea_dimairo/2009/09/08/why-government-is-not-a-platform/)) Last accessed July 22, 2014).
- Florini, A. (2008). Making transparency work. *Global Environmental Politics*, 8(2), 14–16.
- Ganapati, S., & Reddick, C. G. (2012). Open e-government in US state governments: Survey evidence from Chief Information Officers. *Government Information Quarterly*, 29(2), 115–122.
- Goldstein, B., Dyson, L., & Nemani, A. (2013). *Beyond transparency: Open data and the future of civic innovation*. San Francisco, Calif.: Code for America Press.
- Goodchild, Michael F. (2007). Citizens as voluntary sensors: Spatial data infrastructure in the world of Web 2.0. *International Journal of Spatial Data Infrastructures Research*, 2, 24–32.
- Gurstein, M. B. (2011). Open data: Empowering the empowered or effective data use for everyone? *First Monday*, 16(2).
- Haklay, M. (2010). How good is volunteered geographical information? A comparative study of OpenStreetMap and Ordnance Survey datasets. *Environment and Planning B: Planning and Design*, 37(4), 682–703.
- Haklay, M., Singleton, A., & Parker, C. (2008). Web Mapping 2.0: The Neogeography of the GeoWeb. *Geography Compass*, 2(6), 2011–2039.
- Halonen, A. (2012). Being open about data. Analysis of the UK open data policies and applicability of data. retrieved May 16, 2015 from <http://assets.finnishinstitute.studiocoucou.com/en/articles/48-reports>
- Harrison, T. M., Guerrero, S., Burke, B. G., Cook, M., Cresswell, A., Helbig, N., et al. (2012). Open government and e-government: Democratic challenges from a public value perspective. *Information Policy*, 17(2), 83–97.
- Huijboom, N., & van den Broek, T. (2011). Open data: An international comparison of strategies. *European Journal of ePractice*, 12(1), 4–16.
- Jaeger, P. (2005). Deliberative democracy and the conceptual foundations of electronic government. *Government Information Quarterly*, 22, 702–719.
- Janssen, M., Charalabidis, Y., & Zuiderwijk, A. (2012). Benefits, adoption barriers and myths of open data and open government. *Information Systems Management*, 29(4), 258–268.
- Janssen, M., & Zuiderwijk, A. (2014). Infomediary business models for connecting open data providers and users. *Social Science Computer Review*, 32(5), 694–711.
- Johnson, P. A., & Robinson, P. J. (2014). Civic hackathons: Innovation, procurement, or civic engagement? *Review of Policy Research*, 31(4), 349–357.
- Johnson, P. A., & Sieber, R. E. (2012). Motivations driving government adoption of the Geoweb. *GeoJournal*, 77(5), 667–680.
- Johnson, P. A., & Sieber, R. E. (2013). Situating the adoption of VGI by government. In D. Sui, S. Elwood, & M. Goodchild (Eds.), *Crowdsourcing geographic knowledge* (pp. 65–81). Dordrecht: Springer Netherlands.
- King, S. F., & Brown, P. (2007, December 10–13). Fix my street or else: Using the Internet to voice local public service concerns. *Proceedings of ICEGOV, Macao* (pp. 72–80).
- Lee, G., & Kwak, Y. H. (2012). An open government maturity model for social media-based public engagement. *Government Information Quarterly*, 29(4), 492–503.
- Linders, D. (2012). From e-government to we-government: Defining a typology for citizen coproduction in the age of social media. *Government Information Quarterly*, 29(4), 446–454.
- Longo, J. (2011, Spring). #Opendata: Digital-era governance thoroughbred or new public management Trojan horse? *Public Policy & Governance Review*, 2(2), 38.
- Luna-Reyes, L. F., & Chun, S. A. (2012). Open government and public participation: Issues and challenges in creating public value. *Information Policy – Special issue on Open Government and Public Participation: Issues and Challenges in Creating Public Value*, 17(2), 77–81.
- Martin, S., Foulonneau, M., Turki, S., & Ihdjadene, M. (2013). Open data: Barriers, risks, and opportunities. *Proceedings of the European Conference on e-Government 2013*, Como, Italy.
- McClean, T. (2011). *Not with a bang but a whimper: The politics of accountability and open data in the UK*. APSA 2011 Annual Meeting Paper (Available at SSRN: <http://ssrn.com/abstract=1899790>).
- McDermott, P. (2010). Building open government. *Government Information Quarterly*, 27(4), 401–413.
- Meijer, A. J., Curtin, D., & Hillebrandt, M. (2012). Open government: Connecting vision and voice. *International Review of Administrative Sciences*, 78(1), 10–29.
- Morozov, E. (2013). *To save everything, click here: The folly of technological solutionism*. Philadelphia, PA: PublicAffairs.
- Nam, T. (2012). Suggesting frameworks of citizen-sourcing via Government 2.0. *Government Information Quarterly*, 29(1), 12–20.
- Nam, T., & Pardo, T. A. (2014). The changing face of a city government: A case study of Philly311. *Government Information Quarterly*, 31, S1–S9.
- Nath, J. (2011). Reimagining government in the digital age. *National Civic Review*, 100, 19–23.
- Nemani, A. (2012). *How to cash in on government as a platform*. TechCrunch (<http://techcrunch.com/2012/06/02/how-to-cash-in-on-government-as-a-platform/>).
- Offenhuber, D. (2015). Infrastructure legibility—a comparative analysis of open311-based citizen feedback systems. *Cambridge Journal of Regions, Economy and Society*, 8(1), 93–112 <http://dx.doi.org/10.1093/cjres/rsu001>.
- Onsrud, H. J. (1992). In support of open access for publicly held geographic information. *GIS Law*, 1(1), 3–6.
- Open Knowledge Foundation (2014). What is open? Retrieved November 5, 2014 from <https://okfn.org/opendata/>
- O'Reilly, T. (2011). Government as a platform. *Innovations*, 6(1), 13–40.
- Pateman, C. (1970). *Participation and democratic theory*. Cambridge University Press.
- Piotrowski, S. J., & Van Ryzin, G. G. (2007). Citizen attitudes toward transparency in local government. *The American Review of Public Administration*, 37(3), 306–323.
- Relly, J. E., & Sabharwal, M. (2009). Perceptions of transparency of government policymaking: A cross-national study. *Government Information Quarterly*, 26(1), 148–157.
- Reyes, J. (2014). Why does this data from our troubled Philadelphia Traffic Court cost \$11 K? Jul. 11, 2014 11:00 am. Accessed May 16, 2015 at <http://technical.ly/philly/2014/07/11/traffic-court-data-expensive-william-entricken/>
- Robinson, D., Yu, H., Zeller, W., & Felten, E. (2009). Government data and the invisible hand. *Yale Journal of Law & Technology*, 11, 160.
- Rogers, E. M. (2003). *Diffusion of innovations* (5th ed.). New York, NY: Free Press.
- Tinati, R., Carr, L., Halford, S., & Pope, C. (2012). Exploring the impact of adopting open data in the UK government. *Digital Futures*, 2012, 3.
- Treasury Board of Canada (2013). Minister clement launches next generation open data portal. Ottawa, Canada. Accessed on May 16, 2015, at <http://www.tbs-sct.gc.ca/media/nr-cp/2013/0618-eng.asp>
- Warner, M., & Hefetz, A. (2012). In-sourcing and outsourcing: The dynamics of privatization among US municipalities 2002–2007. *Journal of the American Planning Association*, 78(3), 313–327.
- Willinsky, J. (2005). The unacknowledged convergence of open source, open access, and open science. *First Monday*, 10(8).
- Yu, H., & Robinson, D. (2012). The new ambiguity of "open government", 1–31. Retrieved from [http://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=2012489](http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2012489)
- Zuiderwijk, A., & Janssen, M. (2014). Open data policies, their implementation and impact: A framework for comparison. *Government Information Quarterly*, 31(1), 17–29.
- Zuiderwijk, A., Janssen, M., Choenni, S., Meijer, R., & Alibaks, R. S. (2012). Socio-technical impediments of open data. *Electronic Journal of eGovernment*, 10(2), 156–172.

**Dr. Renee E. Sieber** is an Associate Professor in the Department of Geography and School of the Environment, McGill University. Dr. Sieber is the Canadian leader and among world leaders in the use of geospatial technologies for Public Participation. Dr. Sieber is currently the PI of the SSHRC Partnership Grant "How the Geospatial Web is re-shaping government–citizen interactions" (geothink.ca), which brings together researchers from geography, law, communications, and planning, leveraging additional support from private, government, non-profit, and academic partners.

**Dr. Peter A. Johnson** is an Assistant Professor in the Department of Geography and Environmental Management at the University of Waterloo. His research expertise is in the application and evaluation of geospatial technologies, including open data, the geospatial web, mobile devices, crowdsourcing, participatory geomatics, and volunteered geographic information. He is currently the Open Data node leader for the SSHRC-funded Partnership Grant 'geothink.ca'.