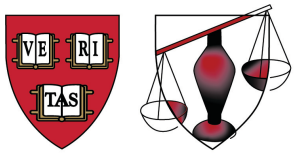

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From Crowdsourcing Potholes to Community Policing: Applying Interoperability Theory to Analyze the Expansion of "Open311"

Manik V. Suri

23 Everett Street • Second Floor • Cambridge, Massachusetts 02138
+1 617.495.7547 • +1 617.495.7641 (fax) • http://cyber.law.harvard.edu •
cyber@law.harvard.edu

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Manik V. Suri[1]

I. Introduction

A. Why civic technologies matter today

The tragic Boston Marathon bombing and hair-raising manhunt that ensued was a sobering event. It also served as a reminder that emerging "civic technologies" – platforms and applications that enable citizens to connect and collaborate with each other and with government – are more important today than ever before.[2] As commentators have noted, local police and federal agents utilized a range of technological platforms to tap the "wisdom of the crowd," relying on thousands of private citizens to develop a "hive mind" that identified two suspects within a record period of time.[3]

In the immediate wake of the devastating attack on April 15th, investigators had few leads. But within twenty-four hours, senior FBI officials, determined to seek "assistance from the public," called on everyone with information to submit all media, tips, and leads related to the Boston Marathon attack. This unusual request for help yielded thousands of images and videos from local Bostonians, tourists, and private companies through technological channels ranging from telephone calls and emails to Flickr posts and Twitter messages.[4] In mere hours, investigators were able to "crowdsource" a tremendous amount of data – including thousands of images from personal cameras, amateur videos from smart phones, and cell-tower information from private carriers. Combing through data from this massive network of "eyes and ears," law enforcement officials were quickly able to generate images of two lead suspects – enabling a "modern manhunt" to commence immediately.[5]

Technological innovations have transformed our commercial, political, and social realities. These advances include new approaches to how we generate knowledge, access information, and interact with one another, as well as new pathways for building social

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[1] A.B., Harvard College (2005); M.Phil., Cambridge University (2006); J.D. Candidate, Harvard Law School (expected 2013). This paper relies on research conducted by the author in conjunction with The Governance Lab, a non-profit organization that designs and implements new civic technologies, where he serves as Co-Founder and Chief Operating Officer. The author is especially grateful to Susan Crawford, Urs Gasser, Stephen Goldsmith, and Beth Noveck for key insights, material, and references that informed this analysis.

[2] *See, e.g.*, Emily Badger, "The Next Big Start-Up Wave: Civic Technology," *The Atlantic Cities*, June 13, 2012, *available at* http://www.theatlanticcities.com/technology/2012/06/next-big-start-wave-civic-technology/2265.

[3] Spencer Ackerman, "This is the Modern Manhunt: The FBI, the Hive Mind, and the Boston Bombers," *Wired.com*, April 19, 2013, *available at* http://www.wired.com/dangerroom/2013/04/boston-data-manhunt.

[4] Monica Hesse, "Boston bombing photos stir up amateur sleuths," *Washington Post*, April 17, 2013, *available at* http://articles.washingtonpost.com/2013-04-17/lifestyle/38616469_1_reddit-community-little-brothers-waldo.

[5] Ackerman, "This is the Modern Manhunt," *supra* note 3.

movements and catalyzing political change.[6] While a significant body of academic research has focused on the role of technology in transforming electoral politics and social movements, less attention has been paid to *how technological innovation can improve the process of governance itself*.

A growing number of platforms and applications lie at this intersection of technology and governance, in what might be termed the "civic technology*"* sector. Broadly speaking, this sector involves the application of new information and communication technologies – ranging from robust social media platforms to state-of-the-art big data analysis systems – to address public policy problems. Civic technologies encompass enterprises that "bring web technologies directly to government, build services on top of government data for citizens, and change the way citizens ask, get, or need services from government."[7] These technologies have the potential to transform governance by promoting greater transparency in policymaking, increasing government efficiency, and enhancing citizens' participation in public sector decision-making.

B. Applying interoperability theory to "Open311"

Although civic technologies have begun to receive considerable attention in the popular press, limited attention has been paid to the legal and policy issues raised by their proliferation. This paper aims to begin addressing this lacuna in the academic literature by focusing on a specific civic technology case study of particular relevance: *the emergence of the "Open311" platform.*

In this paper, I seek to analyze the expansion of Open311 in the United States by applying a theory of "interoperability" advanced by legal scholars John Palfrey and Urs Gasser in their book, *Interop: The Promise and Perils of Highly Interconnected Systems*. In this influential work, Palfrey and Gasser examine the nature of interoperability, considering its relationship to innovation and progress, as well as its relevance for actors ranging from consumers to policymakers.[8] Building on *Interop*, several affiliated researchers have subsequently undertaken a series of case studies focused on applying the broader theory of interoperability to sectors ranging from health care and the smart grid to cloud computing and bar codes.[9] This paper aims to follow in their stead.

In selecting "Open311" as the case study for this paper, I posit that interop theory will enable us to: (a) understand how this civic technology platform has evolved; (b) preserve key elements of diversity while ensuring that this platform works together in

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[6] The Arab Spring and Occupy Wall Street were just two of the more prominent examples around the world that reveal the disruptive (and constructive) effects that these new technologies can yield. *See, e.g.*, Adam Clark Estes, "How Occupy Influenced Egypt's Arab Spring (and Vice Versa)," *The Atlantic Wire*, December 16, 2011; Peter Apps, "Wall Street action part of global 'Arab Spring'?" *Reuters*, October 11, 2011; "Hundreds of Occupy Wall Street protesters arrested" *BBC News*, October 2, 2011; "Wall Street protests span continents, arrests climb," *Crain's New York Business*, October 17, 2011.

[7] Badger, "The Next Big Start-Up Wave: Civic Technology," *supra* note 2.

[8] As the authors note, "Some of the biggest challenges of the age are in fact interop problems. Consider health care reform, which relies upon getting interoperability right in the context of electronic health records, or climate change, which turns in part on the emergence of a next-generation energy delivery system, the smart grid." John Palfrey and Urs Gasser, *Interop: The Promise and Perils of Highly Interconnected Systems* (2012).

[9] *See, e.g.,* Matthew Becker, *Interoperability Case Study: The Bar Code/UPC* (March 1, 2012), Berkman Center Research Publication No. 2012-4, *available at* http://ssrn.com/abstract=2031107.

critically important ways; (c) lower transfer costs and thereby make this platform more efficient; and (d) create an innovation ecosystem in which private entrepreneurs can flourish as the platform expands. In short, I argue that interoperability theory will allow us to assess both the perils and the promises of Open311, enabling us to unlock the full potential of this civic technology platform in the future.

This analysis is not merely intended as an academic exercise. The successful "intelligence crowdsourcing" following the attack in Boston underscored civic technologies' potential to improve society. While the Open311 platform does not yet allow police and emergency services, it does not take a leap of the imagination to understand how Open311 could transform law enforcement in the future.

News reports indicate that the two primary suspects in the Boston bombing, the Tsarnaev brothers, were planning a second set of attacks in New York City.[10] If they had fled Massachusetts before getting caught in the dragnet, coordinating a nationwide search would have depended on effective law enforcement interop (across technological, data, human and institutional layers). In such a case, Open311 could have been an ideal platform for coordinating the crowdsourcing of images, tips, and leads – "community policing" – by citizens across multiple cities. Addressing interop issues in the Open311 platform is thus of critical importance given present-day realities.

C. Paper structure and argument

Following the four primary applications of interoperability theory laid out by Palfrey and Gasser, this paper is organized into five Parts: (1) Part One introduces the topic; (2) Part Two establishes interop as "high level theory," considering its utility both as a frame and an organizing principle; (3) Part Three utilizes interop as a descriptive lens to examine the emergence of 311 (a precursor platform) and Open311 in recent years; (4) Part Four applies interop as a predictive tool to consider emerging issues as Open311 expands; and (5) Part Five draws on interop as a normative device to conclude that while Open311 is moving toward optimal levels of *data* and *technological* interoperability, efforts must now be made to increase *human* and *institutional* interop; policymakers should employ both regulatory and non-regulatory mechanisms to do so.

II. Interop as High Level Theory

A. Unpacking "interoperability"

In order to apply "interoperability" theory to analyze the expansion of 311 and Open311, Part Two of this paper first aims to unpack the construct itself.[11] Despite broad interdisciplinary consensus that greater interoperability is generally a salutary feature of systems, scholars Palfrey and Gasser readily acknowledge that the term "interop" has

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[10] J. David Goodman, "2 Tied to Boston Bombings Talked of Times Sq. Attack, Officials Say," *The New York Times*, April 25, 2013, *available at* http://www.nytimes.com/2013/04/26/nyregion/new-york-was-boston-blast-suspects-next-target-officials-say.html.

[11] The discussion of "interop" theory in this section draws heavily on the introductory chapter in Palfrey and Gasser, *Interop*, *supra* note 4, at 1-18.

eluded a single definition, noting that, "there are many views about what interop is and how it should be achieved."[12] In simplified terms, the theory of interop might be seen as centering on "the art and science of working together."[13] Importantly, however, interop does not merely pertain to technical or technological features of a system; it implicates human, cultural, and institutional relationships as well.[14]

Broadly speaking, the concept of interoperability can be applied both as a lens (or analytical frame), and as a design principle (or organizing tool). More specifically, as developed by Palfrey and Gasser, interop relates to four "broad layers of complex systems:" (1) technological;[15] (2) data;[16] (3) human;[17] and (4) institutional.[18] It is both helpful and compelling to adopt a pragmatic "open working definition" across each of these layers. Doing so permits a more robust theoretical approach, in which we can analyze systems across a spectrum of types and degrees of interop.[19]

But the concept of interop is not merely a *descriptive* theory – it has a key *normative* component as well, drawing on the recognition that growing interconnectivity across human society can (and should) be managed to advance our shared conception of the good life. Perhaps the most important implication of interop theory is that "it can help us decide where we need interconnectedness in complex systems and at what level—and where we don't."[20] By enabling us to determine both the *optimal level* of interconnectedness and the most *appropriate mechanisms* (technical, organizational, legal) to achieve this, interop theory provides us with an organizing principle by which policymakers and private actors alike can better structure complex systems and platforms.

B. The perils of interconnectedness

Yet interoperability is no panacea. As Palfrey and Gasser note, "We do not always want things to interoperate completely."[21] The optimal level of interoperability often involves some measure of conditionality, where built-in limits are essential to achieve various ends – ranging from enhancing security to preserving diversity. Take, for example, the problem of *lock-in*, wherein "too much interop or the wrong kinds of interop, can caus[e] a highly interconnected system, such as the global system of air traffic control, to become locked in to the technology of a particular era."[22] Translated in

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[12] *Id*. at 5.
[13] *Id*. at 18.
[14] *Id*. at 5.
[15] "Interoperability at this layer means that, in the most basic sense, the systems can connect to one another, often through an explicit, agreed-upon interface." *Id*. at 5.
[16] "This layer is closely paired with the technology layer; indeed, the two are often inextricably linked." *Id*. at 6.
[17] "This layer is much more abstract than the technology and data layers, but it is very important to the success of interoperability…Interop often succeeds or fails based on whether we are willing to put effort into working together as human beings." *Id*. at 6.
[18] "At the highest and most abstract layer, we consider interoperability at the institutional layer. Just as it is essential that people work together, it is also frequently important that societal systems engage effectively. The legal system is one example of an institutional layer of interoperability (or its absence)." *Id*. at 6.
[19] *Id*. at 7.
[20] *Id*. at 6.
[21] *Id*. at 13.
[22] *Id*. at 17.

the context of American federalism, for example, we do not want to kill what Justice Brandeis famously referred to "laboratories of democracy" (the state governments), say by locking in federally mandated standards across each of the 50 states.[23] Interop theory can thus help us to mitigate the adverse effects of interoperability.

III. Interop as Descriptive Lens

In Part Three of the paper, I apply interoperability theory to develop a descriptive narrative that examines the historic emergence of "311" (a telephone-based precursor technology platform), and the more recent transition to the "Open311" platform. In doing so, I extend interop theory beyond an abstract high-level framework and use it to help provide a granular account of how this key civic technology platform emerged.

A. "Burning Question? Call 311"

The phrase "3-1-1" was first employed in October 1996 by the city of Baltimore, which launched a citizen services call center linked to the city's "9-1-1" platform; its purpose was to answer calls assigned a "secondary priority" when no 911 calls were waiting.[24] By dialing this alternate number, city residents were able to access non-emergency services and report civic issues of concern through a central, all-purpose call center.[25] This 311 system was designed to ensure that emergency calls would be handled immediately, while non-emergency queries were ported into a separate channel for de-prioritized handling.[26] Indeed, one of the main initial objectives of this telephone-based service was to reduce call volumes and wait times on emergency lines. In conjunction with 311, Baltimore eventually deployed a service known as CitiStat, a technology platform used to "record and re-direct the service request information received through the 311 system." These tools have been successful in lowering the cost of city services in Baltimore.[27]

Following its inception in Baltimore, 311 began spreading to numerous communities in the United States and abroad.[28] In 1999, the city of Chicago expanded

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[23] *New State Ice Co. V. Liebmann*, 285 U.S. 262 (1932), at 311 (J. Brandeis: "To stay experimentation in things social and economic is a grave responsibility. Denial of the right to experiment may be fraught with serious consequences to the nation. It is one of the happy incidents of the federal system that a single courageous state may, if its citizens choose, serve as a laboratory; and try novel social and economic experiments without risk to the rest of the country.").

[24] Philip Ashlock, "311 Pioneering Baltimore Continues to Lead the Way with Open311," *Civic Commons*, September 1, 2011, *available at* http://blog.civiccommons.org/2011/09/baltimore-open311.

[25] For example, relevant topics for 3-1-1 calls include reporting dead animal removal, roadway debris, illegal burning, non-working streetlamps, noise complaints, and potholes. City of New York, "About 311: Top Services," *available at* http://www.nyc.gov/apps/311/about.htm.

[26] Ashlock, *supra* note 24.

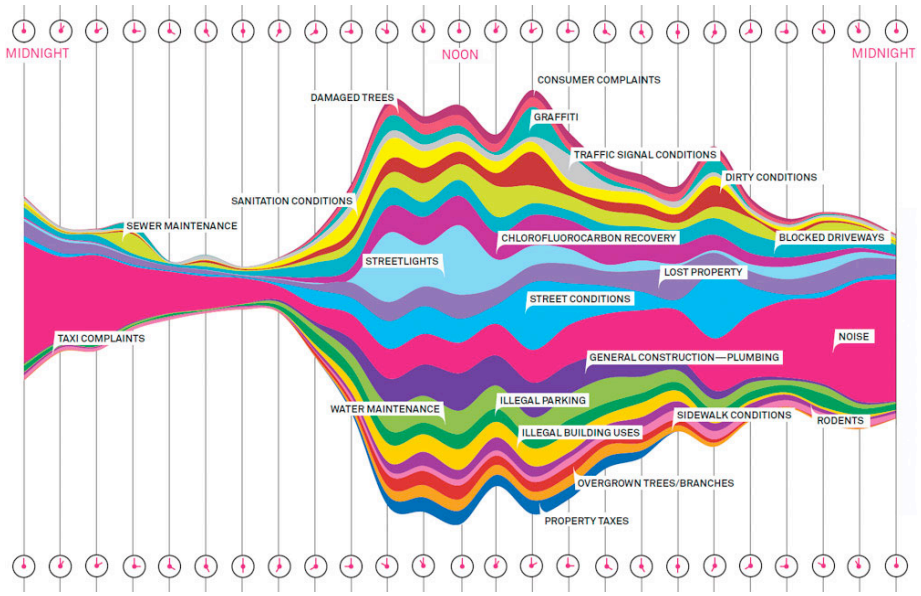
[27] Lorraine Mazerolle, Dennis Rogan, James Frank, Christine Famega, and John E. Eck, "Managing Citizen Calls to the Police: The Impact of Baltimore's 3-1-1 Call System," 2 *Criminology & Public Policy* 1 (Nov. 2002), at 119.

[28] The Canadian government, for example, formally established 3-1-1 as the dial-in for non-emergency municipal services nationwide in November 2004. "Assignment of 311 for non-emergency municipal

upon Baltimore's model to launch the first comprehensive 311 system, "providing information and tracking city services from intake to resolution," in addition to fielding non-emergency police calls.[29] The city of Akron, Ohio, for example, describes its dichotomous services as follows:[30]

Armed Stick Up .....Call 911	**Garbage Pick Up .....Call 311**
Burning Building .....Call 911	**Burning Question .....Call 311**
I Want to Confess .....Call 911	**I Want to Recycle .....Call 311**
Escaped Convict .....Call 911	**Escaped Poodle .....Call 311**
Major Emergency .....Call 911	**Minor Annoyance .....Call 311**

Throughout the 2000s, major metropolitan centers including New York City, San Francisco, and Philadelphia began to roll out their own 311 platforms. All of these has witnessed tremendous growth and today enjoy widespread usage. New York City, for instance, received its 100 *millionth* call in November 2010 – just seven years after the platform launched in March 2003.[31] What do all of these callers want? As a representative sample, the graphic below depicts the most common queries and complaints submitted to New York City's 311 service in a given week (September 8-15, 2010), plotted by time of day:[32]



government services," *Telecom Decision CRTC 2004-71*, November 5, 2004, *available at* http://www.crtc.gc.ca/eng/archive/2004/dt2004-71.htm.

[29] Chicago's 3-1-1 system won numerous national awards for innovation in governance and became a model for other major metropolitan platforms rolled out in ensuing years.

[30] City of Akron, Customer Service Contact Center, *available at* http://www.ci.akron.oh.us/311/index.htm

[31] Steven Johnson, "What a Hundred Million Calls to 311 Reveal About New York," *Wired.com*, November 1, 2010, *available at* http://www.wired.com/magazine/2010/11/ff_311_new_york.

[32] *Id*.

Similarly, San Francisco and Philadelphia both launched 311 services in 2007 and 2008, respectively, and have now crossed multi-million member usage annually.[33] Moreover, 311 platforms were by no means limited to major municipalities; a plethora of smaller towns and cities across the nation ranging from Charlotte, North Carolina to Orange County, Florida, began developing their own local platforms as well.

The first generation of 311 systems was entirely phone-based, but as these platforms grew in size and number, their interface and functionality began to grow increasingly robust. Many cities began taking 311 comments and inputs through web-enabled smart-phone interfaces – particularly following the invention of the iPhone in 2007.[34] A number of systems allowed citizens to upload photographs via smart devices using geo-tagging, generating a crowd-sourced map of user-generated issues across the city. This new web-based 311 functionality was further spurred by the entrance of new private and non-profit organizations like SeeClickFix (founded in 2008), Code for America (founded in 2009), and New Urban Mechanics (founded in 2010), amongst others. These civic technology startups began working closely with municipalities to develop more robust platforms for issue-reporting and citizen engagement.[35]

B. Critical interop challenges in the 311 approach

Throughout the 1990s and 2000s, many cities began implementing their own homegrown 311 systems to manage citizen engagement and issue-reporting around non-emergency services. Yet these efforts began to face serious *interoperability* challenges at various "layers" of interconnectedness – ultimately leading to the emergence of a new "Open311" platform. As traditional phone-based reporting increasingly gave way to a web-based model for 311 services, technologists were inspired to begin building dozens of particularized applications that were tailored for each city. Cities like Boston, New York, and Portland, for instance, began developing smart-phone applications to interact with their own local 311 platforms. But at the *technological* and *data* level, no attempt was made to establish common standards, protocols, or interfaces across these platforms. Because these applications were built on each city's unique municipal 311 system, they were not interoperable – applications built in Seattle could not be used in Baltimore.[36]

Moreover, even as various municipalities pursued their own 311 platforms in parallel, local officials across the country failed to engage in serious interoperability at the *human* or *institutional* layers.[37] There were few discussions around how to codify best practices or develop common functionalities based on mutually recognized needs. As a

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[33] Kate Belohlav, Cristian Crespo, Kody Kinsley, "Increasing Utilization of 311 among Limited English Proficient Speakers in San Francisco," UC Berkeley, May 2011, *available at* http://www.sf311.org/Modules/ShowDocument.aspx?documentid=560.

[34] Nigel Jacob (Co-Founder, New Urban Mechanics), interview by the author, February 11, 2013, Boston.

[35] *Id*. *See also* Badger, "The Next Big Start-Up Wave: Civic Technology," *supra* note 2.

[36] Philip Ashlock, "Intro to Open311," Speech delivered to the Association of Government Contact Center Professionals, May 2012, *available at* http://open311.org/2012/07/open311-at-the-association-of-government-contact-center-professionals.

[37] Zachary Townsend (former CIO, City of Newar), interview by the author, April 19, 2013, New York City.

result, failures of interoperability constrained end-users (citizens) and developers alike, hampering the effective expansion of existing 311 platforms.[38]

C. *Open interaction + open technology: the transition to "Open311"*

In response to these interop shortcomings, a group of technologists at a non-profit called OpenPlans came together in 2010 to create a uniform Application Programming Interface (API) for existing 311 services, which they termed "Open311."[39] The developers of this new platform sought to create more a robust and effective channel of communication between citizens and local government by establishing "a standardized protocol for location-based collaborative issue-tracking."[40] It would not be an understatement to say that the primary benefit of Open311 is better *interoperability*. As one developer put it, "By adopting the Open311 API for exposing civic data, cities are enabling civic developers like myself to build reusable tools and apps. To access data from 30 cities, [my app] doesn't need an adapter for each individual city, only a server URL that it can expect to interact and deliver data in the same way as described by the Open311 API documentation."[41]

As a "standardized protocol," the Open311 platform incorporates two key features: (1) *open interaction* and (2) *open technology*.[42] First, as a model of "open interaction," Open311 replaced the synchronous, one-to-one communication of traditional phone-based 311 call centers with an internet-based model that allows such interactions to be asynchronous and many-to-many.[43] While a traditional call center only permitted a single individual to provide information about a given issue, Open311 allows multiple citizens to openly exchange information centered on any issue. Furthermore, whereas a traditional 311 report was only accessible to the individual who filed the complaint, an Open311 report is visible for anyone to view, comment, or contribute additional information.[44] By enabling multiple individuals to aggregate actionable information, Open311 has encouraged new modes of civic deliberation and collaboration – while increasing transparency and accountability.[45]

A second key feature of the Open311 platform is that its underlying *technology base is itself open*. Open311 services and applications built in any location can be usable

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[38] Phil Ashlock (Open311 Developer and former Presidential Innovation Fellow), interview by the author, March 5, 2013, Washington, DC. *See also* "Open311 Dashboard," Code for America, *available at* http://codeforamerica.org/?cfa_project=open311-dashboard.

[39] Tom Steinberg, "Open 311 – What is it, and why is it good news for both governments and citizens?" January 10, 2013, *available at* http://www.mysociety.org/2013/01/10/open311-introduced.

[40] "What is Open311?" Open311.org, *available at* http://open311.org/learn.

[41] Ben Sheldon, "Hard Data on the Status of Open311," July 27, 2012, Code for America, *available at* http://codeforamerica.org/2012/07/27/hard-data-on-the-status-of-open311.

[42] For a helpful overview of how Open311 works, *see* Dave Whiteland, "Open311 Explained," January 17, 2013, *available at* http://www.mysociety.org/2013/01/17/open311-explained.

[43] Phil Ashlock (Open311 Developer and former Presidential Innovation Fellow), interview by the author, March 5, 2013, Washington, DC.

[44] *Id.*

[45] Numerous platforms have utilized this type of web-based "open interaction" functionality for issue tracking in other contexts as well. Pioneering crisis-information crowdsourcing platform Ushahidi, for instance, employs a similar model for real-time issue tracking during humanitarian crises. "About Us," Ushahidi, *available at* http://www.ushahidi.com/about-us.

everywhere else as well.[46] By adopting interoperable *technological* and *data* standards, Open311 web applications are designed "to seamlessly interact with 311 systems across the nation."[47] Hence, when U.S. Chief Information Officer Vivek Kundra announced the creation of the Open311 API in March 2010, he noted that, "Through [Open311], new web applications can mash publicly available, real-time data from the cities to allow people to track the status of repairs or improvements, while also allowing them to make new requests for services. For instance, I can use the same application to report a broken parking meter when I'm home in the District of Columbia or traveling to cities like Portland, Los Angeles, Boston, or San Francisco."[48] Indeed, interoperability is fundamental to the Open311 platform architecture, and is aimed at promoting what its developers term "sharable innovation."[49]

IV. Interop as Predictive Tool

In Part Four of this paper, I apply interop as a predictive tool to highlight trends that are likely to emerge as the Open311 platform expands. In particular, I advance two forward-looking claims. First, I posit that Open311 will evolve a "self-perpetuating" interoperability due to the combination of *open platform* and *open technology* underpinning its architecture. Second, I contend that Open311 will eventually be used for more complex and sensitive service delivery functions that go beyond non-emergency issue reporting – such as community policing.

A. Open311's "self-perpetuating interoperability"

In pursuing interoperability, the developers of Open311 sought to create a common language (i.e. a standard protocol) in order to encourage innovation and proliferation of future Open311 applications, while mitigating the risk of lock-in to a suboptimal system.[50] As one analyst puts it, Open311 promotes *data* and *technological* interop "so that 'pot hole' in Portland isn't 'pothole' in Washington DC."[51] This common data standard ensures that "people can use their favorite app in every city and developers can focus on new features rather than different requirements for each city…When a

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[46] Phil Ashlock (Open311 Co-Developer and former Presidential Innovation Fellow), interview by the author, March 5, 2013, Washington, DC.

[47] Michael Lawrence Evans, "Open311 at Code for America," Code for America, September 20, 2011, *available at* http://codeforamerica.org/?cfa_project=open311-dashboard.

[48] Vivek Kundra, "Open311," White House Open Government Initiative, March 3, 2010, *available at* http://www.whitehouse.gov/blog/2010/03/03/open-311. As one developer notes, "while there have been some minor interoperability issues – for instance, Toronto doesn't like date times submitted with milliseconds – these have been "minor speed bumps for development, not major deal breakers." Ben Sheldon, "Hard Data on the Status of Open311," July 27, 2012, Code for America, *available at* http://codeforamerica.org/2012/07/27/hard-data-on-the-status-of-open311.

[49] Phil Ashlock (Open311 Co-Developer and former Presidential Innovation Fellow), interview by the author, March 5, 2013, Washington, DC.

[50] *Id*.

[51] Nancy Scola, "With Open 311, the White House is Like That Friendly Guy at the Code Jam," *Tech President*, March 4, 2010, *available at* http://techpresident.com/blog-entry/open-311-white-house-friendly-guy-code-jam.

developer creates a new application to work with San Francisco's 311 system, it should also work for Washington D.C.'s system, but people shouldn't be forced to use any one application…you should be able to choose (or to create) the best application to interact with your city."[52]

This combination of standardization and flexibility has contributed to Open311's popularity amongst civic technologists.[53] Following its launch in 2010, Open311 was immediately adopted by the cities of San Francisco and Washington, D.C. Since then, it has expanded to more than 30 cities worldwide, generating a "burgeoning ecosystem of apps and services" that work with its standard protocol.[54] Some of these are commercial applications, while many are open source solutions created by governments and third-party developers.

In terms of the Open311 platform's *technological* and *data* layers, some interoperability challenges remain. For instance, the platform has a proliferation of "API keys." At present, 8 of the Open311 endpoints (Baltimore, Bloomington, Boston, Brookline, Grand Rapids, San Francisco, Toronto, Washington DC) each have distinct API key request mechanisms and key management solutions.[55] The rest of the platform's endpoints utilize a common solution developed by a private provider (SeeClickFix). Analysts have pointed out that it will become difficult for developers to manage a growing set of endpoint keys as more endpoints are added.[56] In addition, each endpoint also has different terms of service that developers must agree to independently; this, too, will raise the cost of doing business for developers in the long term.[57]

Despite these technological interop challenges, Open311 will almost certainly overcome such issues and continue to expand rapidly. A key reason why has to do with the creation of a set of tools that promote "self-perpetuating interoperability" across the platform. In particular, several leading civic technologists have utilized the Open311 API to build a series of systems-level tools that are intended to *help increase the Open311 platform's interoperability itself*.[58] These include:

- Open311 Dashboard: a site that helps cities visualize and analyze 311 data on a clean, interactive dashboard, permitting trend analysis at the block- and neighborhood-level[59]
- 311Labs: a site where developers can interact with 311 data and explore possible future uses[60]

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[52] "What is Open311?" Open311.org, *available at* http://open311.org/learn.
[53] Nick Grossman (former Director, OpenPlans Labs), interview by the author, March 12, 2013, New York.
[54] *Id*.
[55] Philip Ashlock, "Tackling the Long Term Strategy of Open311." Open311.org, February 1, 2012, *available at* http://open311.org/2012/02/tackling-the-long-term-strategy-of-open311.
[56] *Id*.
[57] *Id*.
[58] Phil Ashlock (Open311 Developer and former Presidential Innovation Fellow), interview by the author, March 5, 2013, Washington, DC; Nick Grossman (former Director, OpenPlans Labs), interview by the author, March 12, 2013, New York.
[59] "Open311 Dashboard," Code for America, *available at* http://codeforamerica.org/?cfa_project=open311-dashboard.
[60] "311 Labs: About," *available at* http://311labs.org/about.

- Open311 Status: a site that shows when Open311 APIs are down or have performance issues, and provides Public APIs uptime, comprehensiveness and citizen utilization[61]
- Civiz: a polyglot "Platform as a Service" civic application[62]
- Civics Garden: A site that allows individuals to reflect and record their civic deeds and contributions[63]

By creating these and other similar sites, I posit that these developers have generated a self-perpetuating force that will ensure Open311's continued expansion – by producing a feedback mechanism to continuously help improve interoperability at various layers (especially technological and data) across the platform.

B. The future of Open311: community policing?

Over the past two decades, the transition from a phone-based 311 call center in a single city (Baltimore) to a massive, web-based Open311 platform with tens of millions of citizen-users and thousands of applications represents a remarkable development in civic technology. At the same time, applying an interop lens, I would agree with analysts who suggest that, "we are only scratching the surface of the level of civic engagement that Open311 technologies could facilitate."[64] Below, I explore several ways in which the Open311 platform may push its existing boundaries and expand to include new government services.

For one, in the future "it should be possible to renew parking licenses, pay local taxes and do other complex transactions via Open311."[65] FixMySociety founder Tom Steinberg notes that his issue-identification platform will eventually use Open311 for services like "Please send me a new recycling bin," "Please tell me what jobs you have open" and "Please answer this FOI request."[66] In the future, Open311 technologies could be used not just to report specific issues, but rather to promote sustained dialogue around broader civic issues, say around living conditions, neighborhood safety, or employment opportunities.

Similarly, Open311 could be deployed to empower citizens to participate not only in identifying the problem – but in shaping the solution as well. For example, cities could expand on the idea that drives civic crowdfunding site Brickstarter, which allows citizens to raise private pools of capital to support civic projects around issues they self-identify, such as raising funds to fill a pothole, pave over a lot, or clean up graffiti on their block.[67]

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[61] "Open311 Status," *available at* http://311labs.org/experiments/open311status.
[62] "Civiz," *available at* http://civiz.herokuapp.com.
[63] "Civics Garden," *available at* http://civicsgarden.herokuapp.com.
[64] "What is Open311?" Open311.org, *available at* http://open311.org/learn.
[65] Steinberg, "Open 311 – What is it, and why is it good news for both governments and citizens?," *supra* note 28.
[66] *Id*.
[67] Brickstarter is a prototype for a web service that provides a shared platform for citizens to suggest and build possibilities into proposals into projects. Brickstarter is a: forum for citizens to articulate possibilities, and start aggregating attention; public story-telling platform, capturing the ebb and flow of debate around proposals; community fundraising tool for shared initiatives; and 'real-time dashboard' displaying the collective desires of a community that can be mapped against institutional strategies and legislative

In a related vein, Open311 technology could be linked to platforms such as IdeaScale, which utilizes cloud-based network to collect input and ideas from diverse communities; this could enable novel forms of citizen-driven urban planning and community resource management.[68]

Finally, I contend that Open311 will eventually be used for more complex and sensitive service delivery functions that go beyond non-emergency issue reporting – such as community policing. In 1996, the original 311 system implemented by Baltimore only permitted non-emergency issue reporting; in 2010, the creators of Open311 continued with this approach. Their decision was intentional: they wanted to avoid raising political or policy objections that could prevent the new Open311 platform's launch.[69] However, as the technological and data layers of the platform grow increasingly interoperable with cities across the country, we can expect hundreds of cities and literally millions of users on Open311. At that point, once the platform has matured, it seems highly plausible that its robust functionality would be leveraged for more sensitive services – to crowdsource crime-prevention and healthcare as well as to identify graffiti and potholes.

V. Interop as Normative Device

In Part Five, I conclude this paper by applying interop theory to assess both what the optimal level of interoperability ought to be in the Open311 context, and how best to achieve it. While significant progress has been made toward reaching optimal levels of *data* and *technological* interoperability, I argue that significant efforts must now be made to increase the *human* and *institutional* layers of interop. To this end, policymakers should employ both "regulatory" and "nonregulatory" mechanisms to enhance interoperability along these layers and effectively catalyze Open311's future expansion.

A. Assessing the optimal level of interop for Open311

As a normative device, interop can help guide policymakers in making decisions to advance our collective vision of the good society. Palfrey and Gasser note that, "The problems of legacy and path dependency are a reminder that it is essential to think about interoperability in a proactive, strategic fashion."[70] We can utilize interop theory to help preserve diversity of options, but to do so, we must first identify the level of interoperability desired. What, then, is the optimal level of interoperability for Open311?

Previous sections of this paper have detailed the significant progress that has been made to increase interop across the *technological* and *data* layers of the Open311 platform. These efforts have lowered usage costs for governments and citizens, prevented lock-in to any single municipal 311 system, and encouraged a plethora of innovation amongst civic hackers.[71] Yet the Open311 platform has not achieved an optimal level of

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frameworks, enabling bureaucracy to work more effectively. "Brickstarter: An Introduction," *available at* http://brickstarter.org/an-introduction-to-brickstarter.

[68] "About IdeaScale," IdeaScale, *available at* http://ideascale.com/aboutus/story.

[69] Phil Ashlock (Open311 Developer and former Presidential Innovation Fellow), interview by the author, March 5, 2013, Washington, DC.

[70] Palfrey and Gasser, *Interop*, *supra* note 4, at 258.

[71] *See* notes 39-69 and accompanying text.

interoperability at the *human* and *institutional* layers.

Consider, for instance, the City of Chicago, which launched its public Open311 API in October 2012.[72] Chicago residents can now bypass the original phone-based 311 system the city launched in 1997, saving them an average of 4 minutes to reach an operator, and an additional 2 minutes to check on the status of a service request; the new Open311 portal allows them to log and check service requests in a fraction of that time.[73]

However, Chicago's Open311 platform still faces several key limitations. For one, it only allows citizens to check on the status of 14 service request types.[74] Residents of Chicago very likely want to be able to report issues that fall outside these categories. Moreover, the number and type of service requests available through Chicago's Open311 API don't match those offered by other cities. Washington DC's Open311 API, for instance, currently offers 83 categories of service requests, while Boston's only offers 6.[75] This is a major limitation. Unless cities coordinate their Open311 configurations, it will be impossible for policymakers to aggregate and analyze data across multiple geographies. Developers will also be hamstrung in building applications: "dashboards," for example, require a comprehensive set of service requests offered by *all* Open311 APIs in every city where the platform exists.[76]

Another key limitation in the current Open311 platform is the fact that it is currently designed based on a "one-customer-to-one-provider model."[77] Namely, an individual citizen can only petition one government (e.g. the City of Boston or the City of New York) about one request (e.g. a pothole) at a time. In reality, however, there are many issues for which jurisdictions overlap. For instance, you might want to complain to both the cities of San Francisco and Oakland about trash floating in the Bay near Alcatraz Island. On such issues, it would be ideal to allow a citizen to petition multiple governments at the same time. Indeed, there are issues – like toxic waste perhaps – on which a citizen may want to petition *different levels of government at the same time* (say, the city, state, and national government). Extending the Open311 platform to enable citizens to petition multiple governments concurrently will require significantly greater interoperability.

Importantly, the limitations in Open311 noted above are not due to inadequate *technological* or *data* interop. Instead, these limitations reflect a lack of interop at the *human* and *institutional* layers. Even as Open311's standard protocol is being accepted by a growing number of localities nationwide, limited dialogue is taking place amongst local officials in cities across the United States. Coordinated conversations and policies are necessary to achieve the higher degree of *human* and *institutional* interop that is preventing the Open311 platform from expanding in ways highlighted above.

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[72] Steven Vance, "Open 311 technology now implemented in Chicago with apps to help speed up reporting," *Grid Chicago*, November 5, 2012, *available at* http://gridchicago.com/2012/open-311-technology-now-implemented-in-chicago-with-apps-to-help-speed-up-reporting.

[73] *Id*.

[74] These 14 currently permissible service requests are: Building Violation; Restaurant Complaint; Abandoned Vehicle; Graffiti Removal; Rat Complaint; Sanitation Code Violation; Tree Debris; Alley Light Out; Pavement Cave-In Survey; Pothole in Street; Street Cut Complaints; Street Light 1 / Out; Street Lights All / Out; Traffic Signal Out. *Id*.

[75] Sheldon, "Hard Data on the Status of Open311," *supra* note 41.

[76] *Id*.

[77] Ashlock, "Tackling the Long Term Strategy of Open311," *supra* note 55.

B. Achieving the optimal level of interop for Open311

Interop theory provides insights into the mechanisms by which we can achieve optimal interoperability in complex systems. Palfrey and Gasser suggest that these mechanisms broadly fall along two broad spectrums: (1) between private sector-led "cyberlibertarian" measures and government-driven "interventionist" measures; and (2) between unilateral and collaborative approaches.[78]

In the case of Open311, policymakers have primarily relied upon non-regulatory, market-driven approaches to achieve *data* and *technological* interoperability thus far. For example, private technology company FixMyStreet works with government clients to enhance the functionality available in standard issue-reporting platforms. FixMyStreet offers lower packages prices to city governments that use Open311 versus those that do not. The company does this because working with clients that use the free Open311 technology base actually reduces their own service delivery cost; they pass part of this cost saving on to their clients, creating an economic incentive for city governments to migrate to the Open311 platform.[79] Such market-based approaches appear to have worked well, particularly in disseminating Open311's technology base.

However, policymakers should consider pursuing additional measures to increase *human* and *institutional* interop across the Open311 platform. One policy mechanism that is both collaborative and minimally interventionist would be the creation of a regular convening of local officials, civic technologists, and community leaders from major cities across the United States to coordinate deeper Open311 interop in municipal governments nationwide.[80] As a related policy mechanism, the White House should use its "bully pulpit" to institutionalize a series of working groups that bring together CIOs, CTOs, and elected officials from leading municipal governments to work through key interop issues at the institutional layer.[81] A third policy mechanism to spur private entrepreneurship would be to launch a series of civic hackathons[82] and datapaloozas[83] focused on the

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[78] Interventionist measures available to governments, for instance, run the gamut from state-imposed licenses, standards, and modes of communication, to convening efforts across new industries and procurement-based incentives that seek to shift the demand curve to generate greater interoperability (see chart below). *Blended* approaches are typically the most common mechanism by which optimal levels of interop are achieved. Palfrey and Gasser, *Interop*, *supra* note 4, at 15.

[79] Steinberg, "Open 311 – What is it, and why is it good news for both governments and citizens?," *supra* note 28.

[80] The "City Innovators Conference" held at Harvard Law School in November 2012 brought together CIOs, CTOs, federal government officials, community leaders, and scholars to discuss strategies to enhance interoperability across the Open311 platform. As the convener, Professor Susan Crawford, noted, "The meeting's aim was to identify opportunities for specific cross-city action, collaboration, development, and ongoing exchange in areas of urban need, such as education, healthcare, and economic development. Meeting participants explored how to create new standards, increase interoperability among existing datasets and information systems, and improve analytics and service delivery. They also considered how to leverage growing interest in civic engagement, existing city networks, and the added value of a new, complementary forum for facilitating collaboration."

[81] *See, e.g.*, Scola, "With Open 311, the White House is Like That Friendly Guy at the Code Jam," *supra* note 51 (suggesting that "It seems entirely possible that Open 311's eventual success is more benefited by a thumbs up by Obama – with the White House acting as convener and cheerleader on occasion – than it would be by getting stuck inside the bureaucracy somewhere.")

[82] *See, e.g.*, "Hack for Change," National Day of Civic Hacking, http://hackforchange.org.

Open311 API, promoted by influential local leaders like Mayors Michael Bloomberg and Cory Booker.

In the future, policymakers should also consider pursuing more interventionist regulatory measures, such as passing national legislation to set U.S. open data standards.[84] While this may eventually be necessary in order to achieve optimal levels of interop across the burgeoning Open311 platform, the convening and cheerleading measures noted above will be effective as a first step toward enhancing *human* and *institutional* interop across the platform.

In recent years, Open311 has made significant strides over legacy 311 systems and today represents one of the most promising examples of civic technology. But there remains room to improve. As Open311 expands, we should remember to keep in mind the optimal level of interoperability to which we aspire. Recall that the "modern manhunt" for the Boston Marathon bombers was driven by crowdsourced images, tips, and leads.[85] If the suspects had escaped to New York City, it would have taken a highly sophisticated technology platform to track citizen-generated input at the multi-city level. While Open311 could be ideally suited for such a purpose in the future, we will need greater *human* and *institutional* interoperability as well as more robust *data* and *technological* interop to reach that point.[86] Thus, rather than rest on their laurels, technologists and policymakers alike should utilize interoperability theory as both a descriptive and prescriptive tool to inform Open311's expansion well into the future.

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[83] *See, e.g.*, "Health DataPalooza IV," http://healthdatapalooza.org.

[84] Hudson Hollister, "Creating a Legislative Agenda for Open Data," *Transparency Camp*, April 5, 2013, *available at* http://transparencycamp.org/ideas/22.

[85] Ackerman, "This is the Modern Manhunt," *supra* note 3.

[86] Even with Open311's existing open-source technological base, coordinating analysis and decision-making across local law enforcement in multiple cities and federal agencies like the FBI using an online platform would present massive new interop challenges at the *human* and *institutional* layers.

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