The Aspen Institute Communications and Society Program

THE CITY AS PLATFORM

How Digital Networks Are Changing Urban Life and Governance

David Bollier, Rapporteur

THE ASPEN INSTITUTE

The City as Platform:
How Digital Networks Are Changing Urban Life and Governance

David Bollier
Rapporteur

THE ASPEN INSTITUTE

Communications and Society Program
Charles M. Firestone
Executive Director
Washington, D.C.
2016

To purchase additional copies of this report, please contact:

The Aspen Institute
Publications Office
P.O. Box 222
2014 Carmichael Road
Queenstown, Maryland 21658
Phone: (410) 820-5326
Fax: (410) 827-9174
E-mail: publications@aspeninstitute.org

For all other inquiries, please contact:

The Aspen Institute
Communications and Society Program
One Dupont Circle, NW
Suite 700
Washington, DC 20036
Phone: (202) 736-5818
Fax: (202) 467-0790

Charles M. Firestone
Executive Director

Patricia K. Kelly
Assistant Director

The Aspen Institute
One Dupont Circle, NW
Suite 700
Washington, DC 20036

Published in the United States of America in 2016
by The Aspen Institute

Printed in the United States of America

ISBN: 0-89843-633-8

16/001

2044CSP/16-BK

Contents

This report is written from the perspective of an informed observer at the Aspen Institute Roundtable on Information Technology. Unless attributed to a particular person, none of the comments or ideas contained in this report should be taken as embodying the views or carrying the endorsement of any specific participant at the Roundtable.

Foreword

Each year the Aspen Institute Communications and Society Program convenes a roundtable to consider the impact of information and communications technologies on some aspect of our social landscape. In 2015, the Roundtable on Information Technology met in San Francisco to consider the impact of networks and networking on cities. Thirty leaders and experts from local and the federal governments, businesses, non-profits, academia and philanthropy met for an intensive two days to address the topic from technological, economic, social, cultural and policy viewpoints.

In the resultant report, "The City as Platform: How Digital Networks Are Changing Urban Life and Governance," author David Bollier captures the essence and nuances of the group's discussions. Just as businesses are finding that the rapidly changing digital environment pushes them to become or use platforms in their various ecosystems, the Roundtable found that the best way for cities to think of themselves going forward in this atmosphere is as a platform. That is, cities can leverage digital and network technologies, tapping the expertise of its many citizens and stakeholders, to work for solutions to urban problems, co-create new activities, and engage citizens more directly in the city's work and play. They can use open data, crowdsourcing and urban prototyping to enhance both government services and enjoyment of local life in the city.

The movement to networks, digital technologies and the gig economy has created problems, though, as well as solutions. Most significant of those is the rising inequality among citizens, and the impact of automation and artificial intelligence on jobs now and into the future. The Roundtable and the report tackles some of these issues, at least highlighting some approaches that governments might take to promote safety nets for those "left behind."

Finally, the report sets out a way of thinking about how governments should react by adopting policies in four asset areas: infrastructure, people, technology and data. While specific policy proposals are not offered, there are a number of topic areas where thoughtful local policy-makers might start.

We thank David Bollier, our rapporteur, for pulling together various strains of dialogue into a coherent treatise on the City as Platform. We also want to acknowledge McKinsey & Company, our senior sponsor, and other attendees who have contributed as corporate partners to the Communications and Society Program, making the roundtable possible: Microsoft, the Markle Foundation, and the Kunzweiler Family Foundation. Finally, I want to thank Rachel Pohl, Project Manager, and Tricia Kelly, Assistant Director, for their work on the conference and bringing this report to fruition.

Charles M. Firestone
Executive Director
Communications and Society Program
The Aspen Institute
Washington, D.C.
January 2016

The City as Platform:
How Digital Networks Are Changing Urban Life and Governance

David Bollier

The City as Platform:

How Digital Networks Are Changing Urban Life and Governance

David Bollier

Introduction

In the age of ubiquitous Internet connections, smartphones and data, the future vitality of cities is increasingly based on their ability to use digital networks in intelligent, strategic ways. While we are accustomed to thinking of cities as geophysical places governed by mayors, conventional political structures and bureaucracies, this template of city governance is under great pressure to evolve. Urban dwellers now live their lives in all sorts of hyper-connected virtual spaces, pulsating with real-time information, intelligent devices, remote-access databases and participatory crowdsourcing. Expertise is distributed, not centralized. Governance is not just a matter of winning elections and assigning tasks to bureaucracies; it is about the skillful collection and curation of information as a way to create new affordances for commerce and social life.

Except among a small class of vanguard cities, however, the far-reaching implications of the "networked city" for economic development, urban planning, social life and democracy, have not been explored in depth. The Aspen Institute Communications and Society Program thus convened an eclectic group of thirty experts to explore how networking technologies are rapidly changing the urban landscape in nearly every dimension. The goal was to learn how open networks, online cooperation and open data can enhance urban planning and administration, and more broadly, how they might improve economic opportunity and civic engagement. The conference, the 24th Annual Aspen Roundtable on Information Technology, also addressed the implications of new digital technologies for urban transportation, public health and safety, and socio-economic inequality.

The two-day gathering on July 16 and 17, 2015 at the Cavallo Point Lodge in Sausalito, California, brought together a formidable group

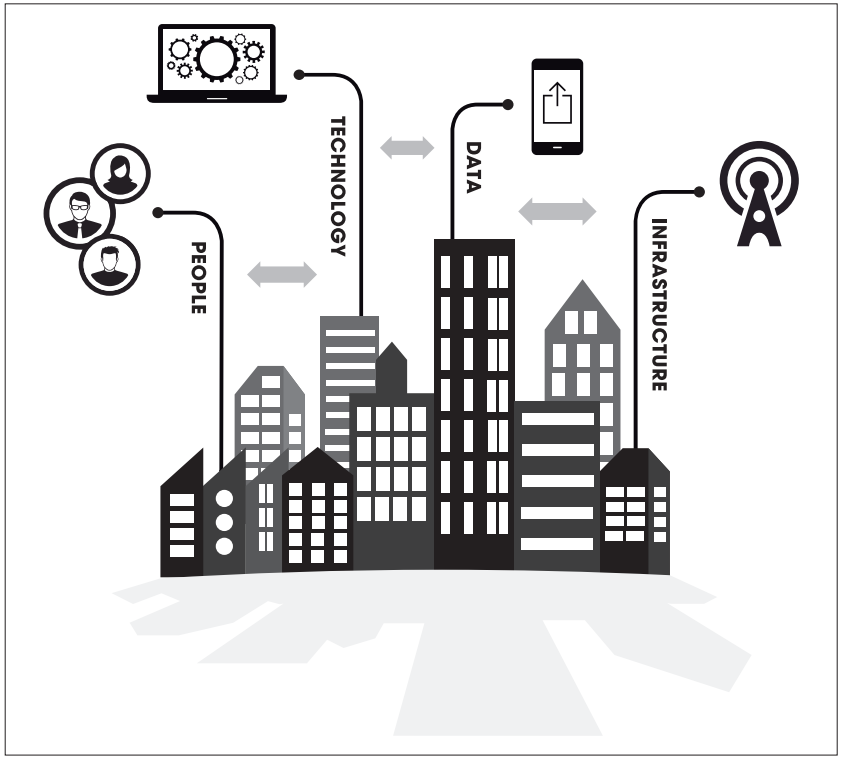
consisting of top technologists, urban planners, policy experts, economic analysts, entrepreneurs, social justice advocates, an architect, educator and librarian, and foundation officials (see Appendix for a list of participants.) Charles M. Firestone, Executive Director of the Communications and Society Program, moderated the six sessions of discussion. David Bollier, the conference rapporteur, prepared the following report as an interpretive synthesis of the salient topics discussed.

The Rise of the "City as Platform"

The idea that computers and digital technologies can help improve cities in diverse ways is not new. IBM helped popularize the concept in an advertising campaign for "Smarter Cities," which sought to boost sales of enterprise software to city governments as tools for urban planning and administration. However, "smart cities" has no specific, recognized meaning within urban planning circles, and indeed, it has been accused of functioning as a Rorschach test upon which people project many different meanings.

That said, it is abundantly clear that the explosion of digital technologies over the past generation and their impact on cities has been significant. The proliferation of Internet access, mobile devices and big data is changing the fundamental character of everyday life in cities, at least for businesses and most individuals. It is less clear that city governments are adapting well to the new landscape, let alone showing creative leadership in deploying new tech infrastructures to foster economic development and citizen participation and improve bureaucratic processes.

"Four big changes are coming together that are suddenly providing the capacity to make cities 'smarter' than they were before," said Stefaan Verhulst, Co-founder and Chief Research and Development Officer at the GovLab at New York University. Cities can now use four asset classes, or tools—people, data, infrastructure and technologies—which can each interact in more fluid, synergistic ways than before, Verhulst explained. For example, individuals can more easily connect their skill-sets with jobs and their social preferences with like-minded cohorts than ever before. Data is far more abundant and shareable, especially as new infrastructures such as broadband, cloud computing and Wi-Fi have become ubiquitous. These developments in turn have inaugurated many new types of communications, "gig economy" markets and social habits.



Cities can now use four asset classes, or tools—people, data, infrastructure and technologies—which can each interact in more fluid, synergistic ways than before

The convergence of these factors, among others, is prompting many people to begin to think about cities not just as places, but as platforms. Historically, cities have been governed through nineteenth and twentieth-century ideas of civic organization and social norms. Much revolves around representative governance and centrally directed bureaucracies overseen by experts using strict, formal rules of procedure. Conceiving of cities as platforms represents a significant shift in how cities might function. An open platform honors self-organized, bottom-up participation in the style of open source software, for example. It regards rigid and complex rule-sets and non-transparency as irksome impediments.

The vision of cities as platforms was the focus of a major conference, the City Innovate Summit, hosted by the City of San Francisco in June 2015.[1] The event brought together delegations from fifteen interna-

tional and U.S. cities to speak about civic innovations in eight different tracks, ranging from mobility and economic development to ecological sustainability, maker cities and urban manufacturing. Sessions explored how cities could develop policies that foster inclusiveness, such as helping working women with children, catalyzing business development in less privileged areas of cities, and encouraging the deployment of broadband to spur social and commercial opportunities.

Peter Hirshberg, Chairman of the City Innovate Foundation and organizer of the event, explained that a networked city is not just a grid of communications and sensors. It is a vision of city governments "engaging with citizens in acts of co-creation. It is about acts of democracy, care and ownership of the city, and even acts of collaboration amongst different cities: How do you network and get smart together? How do we learn and build as a network?"

…a networked city is not just a grid of communications and sensors. It is a vision of city governments "engaging with citizens in acts of co-creation." ***–Peter Hirshberg***

Steven Adler, Chief Information Strategist at IBM, said that when IBM created the idea of smart cities, "our definition was a city that is self-aware." In the beginning, this was a matter of making a city administration more instrumented and intelligent from the point of view of top-down control. "But increasingly," said Adler, "we have seen that we need to help citizens participate in the self-awareness of a city. In New York City, there are about eight million residents and 300,000 city employees, and there is no possible way that 300,000 people can know as much about the law, architecture, design, sanitation and other facets of the city as eight million citizens. So how do we get the eight million experts in our city to participate in governing decisions?"

In networked cities, added Marianne Wu, Managing Director of GE Ventures, a division of General Electric, there is increasingly a focus

on "purpose-built infrastructure. The resident, the citizen, the user is intrinsically part of the value equation," especially as costs for information technology infrastructure have fallen dramatically, facilitating wider participation. The organizational self-interests of service-delivery systems and vendors are starting to be subsumed and adapted to the needs of users.

The shift in mindset to "the city as platform" is having profound repercussions that radiate into nearly every corner of city administration, governance, urban planning, commerce, transportation, public health and safety, social and cultural life, and democratic citizenship. This report will review some of the most exciting civic innovations in the U.S., including the myriad uses of open data systems, "push" notifications to citizens, and crowdsourcing of distributed information. It will also describe the use of rapid open-source prototyping as a tool for urban planning, and institutional transformations that seek to leverage citizen participation via networks, minimizing bureaucracy. We will conclude with an assessment of the sweeping shifts of power, wealth and voice that the networked city is catalyzing, and how policy can facilitate a smoother transition to new forms of open-platform governance and administration.

Reimagining the Governance of Cities

What does it mean to re-imagine urban governance and administration as functions performed on network platforms? It means many things, including new types of municipal institutions, new attitudes about the government's proper role, and political leadership that aims to facilitate and empower, not dictate and control. A different worldview and culture must emerge.

"We have to provide new opportunities for people to create the government that they deserve," said Jennifer Pahlka of Code for America. "Part of this means not distinguishing between service delivery and citizen engagement as if they are two different things. IT systems have been built up around a lot of institutional dysfunctions," she noted. "Instead we have to start with users and their needs," not with the priorities of city agencies and service delivery systems.

…the networked city sees citizens as "co-designers, co-producers and co-learners," with government. *– Stefaan Verhulst*

There is a natural disinclination to move to a user-centric model because city officials typically see themselves as more directly answerable to politicians and city councils than to individual citizens. In a networked environment, however, this mentality can not only lead to poorer service, it can sabotage the city's "brand"—its image, goodwill and culture—and fuel citizen frustration, anger and cynicism. The best way to address this problem is for governments to focus on users and make interactions more convenient and seamless, said Pahlka. The length and complexity of official hearings could be made more citizen-friendly, for example. The process for obtaining city permits could be streamlined by putting it online. People with special interests in traffic or city parks could be offered periodic text notifications on their smartphones.

While such examples are fairly basic forms of "citizen service," the more significant opportunities for city governments lie in leveraging the energies and imaginations of citizens. Of course, this is a very different vision of the role citizens can and should play in a city. Instead of simply voting every few years and leaving city administration to elected officials and expert bureaucrats, the networked city sees citizens as "co-designers, co-producers and co-learners," with government in developing better city services and processes, Stefaan Verhulst of GovLab noted.

This vision of citizen/government collaboration also challenges the familiar "private sector, good; public sector, bad" narrative of contemporary political life. "Private is held up as the panacea of wonderfulness and innovation," said Peter Marx, Chief Technology Officer for the City of Los Angeles, "and government is cast as an old, gray, stodgy, never-changing bureaucracy. That's the running vernacular. I think the reality, like all such stereotypes, is rather different. We all know that private [sector] is not a panacea and that government is changing con-

tinuously." We need to get beyond this simplistic narrative, he asserted, and recognize that self-organized citizen engagement as a third force—neither public nor private—holds great promise.

The idea of "city as platform" is about developing the infrastructures and policies that enable citizens, businesses and other civic constituencies to play a greater direct role in the city's life. With open spaces for people to contribute and take responsibility, cities can become "governance experiments" in which ordinary people and city agencies can explore different and better ways of meeting needs and enlivening public life. "Give people some space and let them engage constructively on their own without excessive supervision," advised Steve Adler, Chief Information Strategist of IBM. "There are lots of things that are happening in our lives and our cities that the government can't track and manage—and there are lots of ways in which citizens want to engage, but government doesn't let them." Giving people spaces to experiment and contribute may be one of the best ways to surface new ideas and develop innovative projects, Adler suggested.

Municipal Government as an Archaic Legacy System

Re-imagining the city-as-platform can be difficult, however, because so many traditional systems of city governance, service-delivery and management have a very different logic and culture than those spawned by network platforms. Traditional modes of representative politics and bureaucratic administration have been around for decades, even centuries, and are generally designed to exercise strict control. They have produced a well-developed worldview and professional culture that prizes fixed rules and regularities. Can these perspectives and practices be harmonized with the emerging network culture of constant disruptive innovation driven from the edge? Can new sorts of institutions be invented that leverage, rather than resist, the affordance of new technologies?

Most conference participants agreed that the challenge is finding new ways for city governments to navigate a transition to "platform governance"—network-based modes of interacting with citizens and co-producing services. Such a pathway has many upsides, but it is also fraught with complicated political, economic, technical and cultural obstacles.

The inadequacies of current systems are well-illustrated by city government websites. "In many cities, we're not even getting the basics right," said Jennifer Pahlka, Founder and Executive Director of Code for America, an organization of volunteer coders who help governments reimagine and rebuild information and administrative systems. Pahlka, who lives in Oakland, complained that her city's website consists of "34,000 PDFs tied together by some content that is completely unintelligible." Because paper documents are merely scanned and posted on the Web as PDFs, they are not searchable or amenable to cross-links. The poor navigation means that users searching for a particular bit of information will be frustrated if not stymied entirely. "That's what most city websites are," said Pahlka. "The problem is that cities are in fact very smart, but most city governments aren't very smart right now. Many citizens may wonder why a four-person consultancy on the corner can have a responsive, clear website, but their city government doesn't," Pahlka said.

Of course, far-sighted cities are not only Web-savvy in how they communicate with citizens, but keenly aware that many people, especially poorer citizens, rely on smartphones more than computers to interact with government. The more astute politicians and city managers also realize that the tech experiences that citizens have with city government will greatly affect a city's "brand reputation" and perceived personality.

A city's challenges go deeper than specific tech platforms. Entrenched institutional structures must be scrutinized and revamped: "We have political and institutional structures in cities that go back 150 years or more," said Robert Pepper, Vice President of Global Technology Policy for Cisco. As a result, many cities have entrenched fiefdoms of political power and bureaucratic authority that function as independent silos; collaboration across silos is minimal to nonexistent. As a result, said Luis Herrera, City Librarian of the San Francisco Public Library, "there are often knots within the city structure that need to be unraveled in order to leverage collaboration. To make things worse, many cities have limited resources." This can lead to serious inequalities for the citizens of a state as the more affluent cities become more networked and grow "smarter" (as in the Bay Area), while the poorer cities fall behind (as in the Central Valley of California).

While observers love to praise the agility and innovation of the corporate sector compared to the slow-footed, less strategic choices of government, the truth is that governments are very different sorts of organizations serving very different functions. "Most governments see the necessity to adapt," said Pepper, "but it's more difficult for them because there are all sorts of constituencies in the political world who must negotiate agreements among themselves. You have certain service structures, departments and embedded civil servants who may take a passive-aggressive approach—whereas in the private sector, if you don't get it right, you die."

…as the more affluent cities become more networked and grow "smarter,"… the poorer cities fall behind…. *– Luis Herrera*

Businesses that fail can declare bankruptcy and liquidate their assets, but that is not really a viable option for city governments. As Charlie Firestone of the Aspen Institute pointed out, "governments don't feel that they can fail"—which naturally leads them to act in a more conservative, cautious manner. It can be difficult for governments to innovate when their roles are so indispensable and so many different constituencies depend on them. For all of these reasons, noted Stefaan Verhulst of the GovLab at NYU, "one of the biggest challenges is actually facilitating change within government."

So the challenges within city governments are not just technological (better websites, more broadband, more mobile-phone interfaces), but institutional and cultural: How can old-style organizational structures be jettisoned or revamped in order to exploit the enormous potential of open networks? "This is not just a problem of the wrong vendors or staff," said Pahlka. "Cities have the wrong organizational structures [for leveraging networks]."

Benjamin de la Peña, Director of Community and National Strategy for the John S. and James L. Knight Foundation, suggested, "If we started thinking about managing transportation not in terms of managing motor vehicles—which is what most transportation agencies do—

but in terms of *managing information*, we would make more progress. Many cities have Chief Information Officers and Chief Technology Officers, and that is great, but the question is: How does a city government manage flows of information?"

…challenges within city governments are not just technological…but institutional and cultural….

Once you ask that question, you begin to open up questions about collaboration among city departments. Peter Hirshberg of the City Innovate Foundation noted that the City of San Francisco gets hundreds of requests for city data, but it is impossible to respond to many of them without first "moving that data out of proprietary systems and making them available at a 'higher abstraction layer' [i.e., based on open, interoperable standards] so that the data can support future services."

Apart from these familiar problems of city administration, many larger metropolitan regions have the problem of fragmented and multiple jurisdictions. In Marin County, a region with 250,000 residents, there are about 15 different police chiefs and fire chiefs, and numerous independent water districts. Los Angeles County consists of 88 different incorporated cities and 120 different government agencies. St. Louis County, which does not even include the City of St. Louis, has 99 different jurisdictions and 60 different police departments, many of which have been self-financed through the aggressive handing out of speeding tickets. Not surprisingly, coordination among jurisdictions in managing shared infrastructure, programs and policies can be next to impossible.

Transparency about city government would presumably help address some of the problems described above. But transparency does not necessarily spur the kinds of change imagined, several participants pointed out. The threat of transparency can be inhibiting if disclosures are politically damaging (a failed information technology experiment, data revelations about unequal services in different neighborhoods, etc.). The easier choice is for many politicians to avoid risky experiments

in the first place. Why embrace open data systems and open network platforms that are likely to showcase administrative failures or embarrassing political choices?

Yet a lack of transparency is obviously a problem, too, because it means that the performance of information systems and city agencies remain politically moot. Blair Levin, Senior Fellow at the Metropolitan Policy Program at Brookings Institution, noted that many structural problems of city administration "do not really translate into what we might think of as a political discussion." Levin sees only two ways to break the inertia: opportunities or crises. When Google offered to help the City of Kansas City with next-generation deployments of network technology, it was an opportunity for the city—but one that required that it first streamline its regulatory and decision-making processes. As for crises—infrastructure failures, poor agency coordination, etc.—they provide their own political justifications for action.

Robert Pepper of Cisco believes that the challenges of building networked cities could be given political relevance by creating a ranking system. The World Economic Forum (WEF) has developed a "Network Readiness Index" that ranks every country in the world on its "net readiness." This index is similar to another WEF ranking system, for global competitiveness. Pepper reports that such annual, published rankings help focus the attention of government officials and stimulate action. Why not establish some appropriate metrics for ranking city governments on their performance in network-based administration and governance?

Building New Affordances for Citizen Engagement

To properly understand the role that city governments might play in the future, John Seely Brown, Independent Co-Chairman of the Deloitte Center for the Edge and Visiting Scholar at the University of Southern California, suggested that we "reconceive the city as a *learning platform*." By this, he means that cities should attempt to use information technologies to create tools and spaces that "enable a fundamentally new set of social practices having to do with learning for the 21st century." People and governments can join together to co-design, co-learn and co-produce civic infrastructures, public spaces, new forms of education, transportation, public safety and other services. A city

that sees itself as a learning platform can open itself up to some very new "ways of being and living," said Brown, citing the civic cultures of Barcelona and Copenhagen, which are pioneering new forms of citizen/government collaboration.

The essential point is for city governments to regard their resources as flexible, open platforms that welcome citizen-led innovation, rather than government clinging to brittle systems of centralized, rule-driven control. Brown said this mentality can help municipal governments reimagine city resources so that they can provide new *affordances*—that is, a richer set of capacities for new and different uses: the city as platform.

"We tend to think of government as doing things…but we should also think of government as a platform that lets things happen."
-Tim O'Reilly

"One thing we're working on at the Knight Foundation," said Benjamin de la Peña, Director of Community and National Strategy, "is the idea of civic commons." In the face of budget cutbacks, fragmented bureaucratic authority and growing public needs, he said, "we want cities to start thinking about how to build new affordances for their civic infrastructure. Every time someone goes to a park, there should be some 'thin layer' of information technology that invites people to help keep up the park. And every time there is a bill that comes up in the city council, there should be a way to encourage people to get involved."

Tim O'Reilly, Founder and Chief Executive Officer of O'Reilly Media, Inc., agreed: "One of the features of a smart city is that it has many new kinds of affordances for engagement. Think how libraries can be used for meet-ups. You could imagine a tool shed in a park where there's equipment for people to help clean up the park—as opposed to a National Day of Service where everyone cleans up once a year." Post offices offer other affordances for engagement, said O'Reilly, lamenting the U.S. Postal Service's unfortunate failure to reinvent its affordances in the 1990s in response to the emerging on-demand economy.

"We tend to think of government as doing things," O'Reilly continued, "but we should also think of government as a platform that lets

things happen. A city is a space where, when everything is operating well, government's role is just a tiny piece of what the entire city does. But it is a critical piece."

"There are whole sets of policies and practices that have to be unlocked so that we can enable communities to co-design things and be a part of a larger 'we.'" ***–Connie Yowell***

Steven Adler of IBM said he once spent some time in Stone Town, Zanzibar, where governance is weak-to-nonexistent and yet people routinely spend time in coffee shops to talk politics. He realized that "civic engagement is a natural human activity that we may *inhibit* with government." If sociality is a "default behavior" of human beings, as seems likely, said Adler, then we should find a way for government to "get out of the way to give people some space and let them engage constructively on their own, without much supervision." Connie Yowell, the former Director of Education at the MacArthur Foundation, agreed, saying: "There are whole sets of policies and practices that have to be unlocked so that we can enable communities to co-design things and be a part of a larger 'we.'"

The Joy of Participation

There is a wide spectrum of ways that city governments can use their resources to develop new affordances for participation. Their basic goal should be to imagine opportunities, often facilitated by information technologies, to invite citizens to bring their talents and imagination to the table. For example, when Code for America realized that it did not have the time to fix the City of Honolulu's poorly designed website, it decided that the city website really needed better content, especially answers to frequently asked questions. So Code for America hosted a "write-a-thon" that attracted 65 volunteers, some of them city employees. The task for the day was to write clearer, more succinct answers to the top fifty topics that people normally searched for on the city website.

"You saw people having an amazing time building community," said Jennifer Pahlka of Code for America. "They were loving what they were doing. They realized that instead of complaining about their government not working, they were actually doing the work to make it work for them and their fellow citizens. What tied everyone together was joy."

City governments around the world have invented a variety of new affordances to engage their citizens:

- The city of Melbourne, Australia realized that street art contributes a lot to the vitality of urban spaces, so the city grants permits to artists to put up murals, stencils and paste-ups (but no graffiti or tagging) on buildings on Collins Street, a major thoroughfare, if building owners give permission.

- The City of Los Angeles, working with the Getty Museum, invited people to provide geo-references to historic photos through its city data portal, DataLA.[2] The project is called HistoricPlacesLA, an "open-source, web-based, geospatial information system for cultural heritage inventory and management."[3]

- When the San Francisco Library set about designing a new "digital media lab" for youth between 13 and 18 years old, it made sure that young people worked side-by-side with architects in designing the space from the beginning. This not only helped give the young people a sense of ownership of the space, but it resulted in a more user-focused design that supports connected learning. This included a separate "maker space," a state-of-the-art audio and video production studio and even a restroom, which the youth insisted upon. City Librarian Luis Herrera said, "The architects actually came back and told me that that was a new model for them in terms of learning different approaches to design and engagement."

- The City of Rio De Janeiro built 32 separate training facilities for digital technology, and is training 69,000 people on how to use this technology in municipal environments, noted Patrick McGovern, Chief Growth Officer of Aura Inc., a hyper-local

mobile startup that uses big data to categorize the world's art. Smart cities not only need to generate good data, but devise better ways to take advantage of it.

- The city government of Bologna, Italy, initiated an innovative Bologna Regulation for the Care and Regeneration of Urban Commons,[4] which invites citizen groups to propose their own ideas for improving and managing public spaces, community gardens, abandoned buildings and other urban resources. The government is not trying to off-load responsibilities, but rather to enter into a co-design process with citizens who wish to improve their neighborhoods and exercise genuine responsibility. Dozens of other Italian cities are now emulating this idea, which is part of a larger surge of urban commons initiatives led by activist groups like Shareable.net and the Commons Network (Berlin) and social scientists with the International Association for the Study of Commons.

IT systems are not only stimulating new forms of citizen engagement; they are changing how people learn. In a highly connected technological environment, the processes of learning are changing dramatically. A growing movement in this new environment supports a user-centric experience where people learn independently—as well as from experts and communities in formal and information settings. This "connected learning" makes learning accessible to all populations and provides greater opportunity to meet the demands of work in the digital world.

One way to validate new forms of learning—beyond that offered by the traditional school experience—is through "digital badging" that recognizes specific skills and knowledge acquired through online participation. Smart cities can lead and support this new platform for learning by encouraging partnerships with and among school districts, the nonprofit sector and public agencies to design badging programs that incentivize learning. Public libraries and museums are at the forefront of this movement by creating connected learning collaboratives for youth; the idea is to showcase their success in gaining new skills to potential employers, teachers and peer networks. These systems can also help address the inequity in access to information and technology, and provide new opportunities to help bridge the student achievement gap.

Open Data as a Transformative Affordance

Open data may be one of the most powerful new affordances that cities can provide to its citizens. It invites all sorts of positive changes—participatory crowdsourcing, interactive collaborations and augmentations of municipal services. One can trace this logic and working ethic to open-source hackers, whose systems are becoming deeply insinuated into the civic administration and urban culture of cities like San Francisco and Los Angeles.

"I think open data was the first affordance," said Peter Hirshberg of City Innovate Foundation. "When we first opened the data from city systems," he said, "lots of people began to see the city as something they could mess with. This was the founding moment of Code for America. People would show up at hackathons and begin to play with the crime data and tell a story, or play with transportation data and add their own data to the system. Data was a kind of affordance." In San Francisco, which is so immersed in tech culture, the idea of "hacking this city" was a natural extension of hacker sensibilities.

It stemmed, also, from the experiences of many Bay Area hackers who attend Burning Man, the annual week-long festival in the Nevada desert in which 60,000 people actually build their own "pop-up city."[5] "We have a whole group of people who go out and make art and build stuff at Burning Man," said Hirshberg, "and then that mentality comes spilling back to the Bay Area everywhere."

Data can serve as an affordance for citizen participation because it can make myriad city systems function as an open platform. "Data is a medium for making government more porous," said Jay Nath, Chief Innovation Officer in the Office of San Francisco Mayor Edwin M. Lee. This is so beneficial precisely because open data invites cross-sector, trans-departmental participation and cooperation. It allows citizens to engage more seriously with city government, not just in offering comments and critiques, but in providing their own data and innovative ideas. Or as Story Bellows, Director of the Philadelphia Mayor's Office of New Urban Mechanics, put it, "Data is critical in giving us a shared bottom line. Data is seen as what we really care about as a city; it is that which we are managing to." Seen from this perspective, data is something that can set and drive a city's agenda, Bellows explained.

This is exactly why many cities such as Los Angeles and San Francisco have established their own open data portals. They realize that top-down processes of acquiring and analyzing data will privilege macro-level considerations, and not necessarily serve "end-users"—the citizens of the city. At the same time, open source software and open networks have already demonstrated the practicality and power of bottom-up collaboration on networks.

"Data is a medium for making government more porous." ***–Jay Nath***

The Los Angeles open data portal, DataLA, went public in May 2014 and is now rated number one in the country on the Open Data Census.[6] The site offers data for everything from the city budget and the regional economy to crime locations, building inspections, property foreclosures, parking citations and even checks written by the city government. Peter Marx, the city's Chief Technology Officer, reports that the data portal is quite useful in measuring the effectiveness of government and in enabling economic development. By providing transparency on government performance, it also gives journalists ideas for worthwhile stories and builds public trust in government.

Precisely because open data can be used by anyone without permission, all sorts of unanticipated ideas and innovations emerge. After New Jersey Transit released open data on passenger flows in 2012, said Michel Chui, Partner at McKinsey Global Institute, various third parties analyzed the data and pinpointed underutilized rail stops. In response, the transit authority changed the number of express trains at different times and saved six minutes per commuter along that route. The websites of Los Angeles city governments now receive more than 7.8 million visitors per month. All of the city's websites are tracked with data analytics.

City planners and tech analysts envision a wide variety of innovative uses of data to improve cities. Many of them are based upon geographic information systems, or GIS, especially when used in tandem with smartphones. The systems can be used to address everything from air

quality to public safety to traffic. The City has also initiated automatic text notifications to registered smartphone users who have an interest in street closures, seismic activity and traffic, among other things. Peter Marx explained, "We do not want to put the information in the hands of the few; we want to give it out to everybody—and oh, by the way, have two-way communication."

In a city where 40 percent of its land mass is dedicated to vehicles, Los Angeles has a keen interest in using digital networks to ameliorate chronic traffic problems. Some experts have suggested that Uber and Uber-like systems have great potential for reducing traffic and freeing up streets. On the other hand, Benjamin de la Peña of the Knight Foundation warned of the dangers of a future with "zero-occupancy vehicles," in which people might tell their cars, "I am going to pick up my dry cleaning—just drive around the block," or "Drop me off here and then go back home for an hour to pick up the kids and bring them here." Could driverless cars make traffic worse?

A more promising yet neglected field of possibilities lies with "informal transportation" such as jitneys, suggested de la Peña. However, officialdom often has trouble recognizing the value that informal economies provide. As Jennifer Bradley, Director of the Aspen Institute Center for Urban Innovation, sardonically noted, "When people from low-income neighborhoods informally share cars, we call them jitneys and try to regulate them out of existence. When they do sharing economy things, we call it the black market. But when people like us do it, we think, 'This is so cool!'" Can cities find data-driven ways to embrace the power, flexibility and conviviality of the informal economy?

One innovation that San Francisco has already embraced is data-driven parking. Many parking meters have sensors that monitor usage, which, when combined with data-driven analysis, can be used to enable real-time pricing for parking.[7] (In practice, the city changes parking rates only on a monthly basis, not daily or in real-time.) In Los Angeles, 25,000 parking meters are connected to the Internet and generate dynamic pricing based on various algorithms. Many drivers are willing to pay higher prices for parking simply to avoid circling around looking for an open parking space. San Francisco's answer to this problem is SFpark, a program that uses sensors embedded in roads and data-driven analysis to use real-time pricing for parking. The system has proven to be "very effective," said Jay Nath, the city's Chief Innovation Officer.

One data-gathering system that is quite intriguing is Placemeter, a system that automatically counts the number of people in public spaces—as well as the gender and general age of people—based on video camera feeds. To date, the system has been used primarily by retailers wanting to learn more about potential customer traffic in front of their stores. Mindful of the ethical and social risks, the New York City company that operates Placemeter has tried to assure proper usage of its system. But Placemeter could conceivably be used by police or other city departments to monitor public spaces. One could also imagine use of the technology in combination with facial recognition software, license plate recognition and surveillance of private spaces or only certain neighborhoods and zip codes. All of these uses would likely trigger serious legal and policy controversies.

The imagined applications for open data are now soaring. Some data experts speculate that open data could be used to help bridge the affordable housing gap by identifying mismatched needs among city residents—e.g., elderly people who may be ready to move to smaller homes, and young families that need more space. Others have suggested that the 3-1-1 telephone number, which is used by many cities to provide access to non-emergency municipal services, could be used as a more versatile platform for citizen engagement.

Jay Nath of the Mayor's office in San Francisco envisions new forms of mass notifications of seismic activity based on sensors on fault lines throughout the Bay Area. It is apparently possible to know up to two minutes in advance that an earthquake will strike; prompt mass alerts could help save untold numbers of lives. "Imagine if we had a standardized Application Program Interface (API) for an earthquake early notification system!" said Nath. San Francisco is also exploring the idea of giving indoor air pollution sensors to low-income residents of buildings in zones with poor air quality; the city is legally required to improve ventilation systems in such buildings.

Yet another new frontier for municipal data collection and management is the video records of tens of thousands of police bodycams. The City of Los Angeles is in the process of putting 7,000 of these devices onto uniformed police officers, which will constitute about 20 percent of the total number of bodycams in the world, said Peter Marx. This will have an enormous impact on policing and on citizen complaints, he predicted, because currently about 86 percent of citizen complaints

against police are dropped based upon video evidence. Prosecutors find that bodycam videos provide one more piece of valuable evidence, however limited it may sometimes be.

The growing overlay of networked information on city life is altering our sense of ourselves and our social and civic interactions.

Some scholars are now studying the videos to learn how police can use body language to de-escalate tense encounters. However, there are also many legal and ethical issues that remain to be fully addressed, such as the privacy of innocent citizens who are videotaped without consent in private circumstances. (One possible solution is a software system that can blur faces of innocent third parties and children who are recorded by police bodycams.) Another vexing challenge is devising appropriate archiving and public access policies for bodycam videos.

As the many examples above suggest, digital technologies and data-streams are becoming intimately integrated into new corners of everyday urban life. We explore some of the policy implications in subsequent chapters, but for now, let us just note that the growing overlay of networked information on city life is altering our sense of ourselves and our social and civic interactions. In his 2013 book, *Ambient Commons: Attention in the Age of Embodied Information,* Malcolm McCullough, a University of Michigan architectural professor, observes:

> We move around [the city] with and among displays. Global rectangles have become part of the scene; screens, large and small, appear everywhere. Physical locations are increasingly tagged and digitally augmented. Sensors, processes and memory are found not only in chic smartphones but also into everyday objects.

McCullough notes that human cognition, memory and thought are not computer-like, however; we are embodied creatures who literally "think with the objects" that constitute a city. The spaces, artworks and buildings help us orient ourselves, remember things and assess situations. Thus our consciousness is shaped not just by what we choose to

pay attention to, i.e.: the explicit data streams and information, but by all sorts of embedded designs and stimuli that are precognitive and even atmospheric. A networked city is not just about content, but also context.

Barriers to Better Use of Data

There is a dawning awareness, then, that deploying new data systems is not a straight-forward matter. There are many barriers to overcome. All sorts of social, ethical and policy complexities need to be navigated. New ways must be found to collect more and better types of data, and then to interpret and make sense of that data. Policy must address legitimate security, privacy and reliability concerns; citizens must be engaged as collaborators with city government in providing, using and acting upon data.

Steven Adler of IBM worries that city governments do not have as much data as they truly need: "They do not know enough about transactions that are happening, businesses in the city, why different neighborhoods are growing and dying. They do not know why some communities like Watts and Compton in Los Angeles are locked out and do not ever seem to improve." Yet at the same time, there is often plenty of appropriate data, but no way to find significance in them. Adler, while arguing for more data, agrees that "the more data we collect, the more we need forums like this one to talk about what the data mean. There are many ambiguities and confusions, and that requires human interaction and dialogue to figure out what the data really mean."

Another problem is connecting data with decision makers and citizens. That requires leadership and institutional change, said Story Bellows of the Philadelphia Mayor's Office of New Urban Mechanics. "It is a real challenge sometimes to get the people who make decisions to respond to data that is right in front of us. We need to figure out how to have a better understanding, capacity and literacy around what we need to interpret data and use it for much better decision making." San Francisco City Librarian Luis Herrera agreed: "We must figure out how data can make a difference in people's lives, and break down silos within departments." One approach: the City of Rio de Janeiro has built 32 separate training facilities for digital technology, said Patrick McGovern of Aura Inc. Rio is training 69,000 people in how to use the technology so that the city can affirmatively take advantage of its data resources and network systems.

Tim O'Reilly, the tech publisher, suggested that cities might want to begin wrapping their minds about big data and networks by developing "an inventory of the kinds of assets that cities should be collecting, and to make sure that there is an open data interface for them. The data really has to be available to third parties so that they can do interesting things with them, such as build mapping apps."

Open Application Program Interfaces (APIs) for data would be one way to assure open access to data and thus enable innovative third-party uses of them. This would help break down some of the inter-departmental barriers and resistance to using databases from within a city government. Open APIs would also help bridge the misunderstandings and tension between public and private actors. The system would invite closer scrutiny of government performance, and citizens would be able to contribute their own data into the system, for the benefit of all.

One example of using open data to surmount departmental silos and address a serious urban problem is Vision Zero, a traffic safety initiative that seeks to eliminate all traffic deaths and injuries. The project, which originated in Europe, uses data to help identify hazardous intersections and design problems (among other things) as a way to develop more effective strategic responses. It is a highly data-driven approach. But as Peter Marx, Chief Technology Officer of Los Angeles noted, "Vision Zero requires that the police, libraries, education system, firefighters, transportation officials and others actually work together." Crowdsourcing of traffic data via networks is one way to help develop holistic information and cross-departmental collaboration (see following section for more detail).

A recurrent challenge in exploiting data more effectively is figuring out how to take a system to a larger scale and take account of the fluidity of geographic movements (of drivers, businesses, crime, homeowners, etc.). A municipal open data portal with open APIs is an excellent framework, but it is also important to spark genuine interest and motivation in using data. To this end, Allen Blue, Vice President of Product Management and Co-founder of LinkedIn, commends thinking about what he calls the "nice/want/need" value proposition. If you have a value proposition that is merely "nice"—that is, pleasant but does not fill a real need or want—said Blue, "then no one will come and actually

do anything based on it. But if you have a 'want-to-have' or 'need-to-have' proposition, those are things that you can build real strategies on top of. You need to engage people about things they want and need, and use that as a mechanism to involve them."

Blue suggested that data systems could be used to identify wants and needs that the city government is not solving, which constitute opportunities that entrepreneurs could reasonably address instead. But Blair Levin of the Brookings Institution is troubled by this "bounty hunter model" in which "somebody else can step in and get paid to do that which the government should otherwise do. Something is amiss with such a scheme," he said. "We should try to figure out how to address these problems within the government's spectrum."

Ryan Panchadsaram, the Deputy U.S. Chief Technology Officer at the White House, suggested that governments need to find an improved way to surface better, more effective design ideas. Governments may not be able to engage in the same dynamics of market competition, but state and local governments could share their most successful projects. Panchadsaram also suggested that design should take account of different levels of citizen engagement. Just as only one percent of all Yelp users may write reviews, and ten percent may register "likes," the great bulk of users, perhaps 90 percent, are simply users. Similarly, the design of data systems should probably take account of the differential motivations and interests of super-users and frequent users versus those of relatively light users.

City governments should preserve some humility about their capacity to design data systems to solve problems, warned Benjamin de la Peña of Knight Foundation. He recalled how, following the successful moon shot, the U.S. Department of Housing and Urban Development (HUD) hired hundreds of NASA scientists to use data-based algorithms to solve various city problems. But by putting so much stock in over-designed single solutions, HUD produced some expensive, colossal failures. When the City of New York emulated this approach, hiring the RAND Corporation to redistribute its fire stations to produce more efficient responses to fires, the reductions in fire stations in the Bronx and outer boroughs later meant that the city did not have enough fire-fighting capacity, as more fires broke out.

Notwithstanding its limitations, city governments can and must use big data to improve its engagement with changing urban realities. Some of the most notable examples may be the new business models being launched by the gig economy, as exemplified by Uber and Airbnb. These ubiquitous, disruptive, network-based businesses defy the premises of existing regulatory regimes, yet it is not obvious how municipal laws and regulation should respond.

"How can we take what's valuable in the informal sector and make it supported and legitimate?"
–Jennifer Bradley

Blair Levin, believes that a dual-track system of regulation could be one solution: "In one system, the government certifies the legitimacy of something; the second lets customers legitimate it by virtue of the data they generate. That's the reason why Uber and Airbnb work. So you can create a kind of dual regulatory scheme." One could imagine direct feeds of customer data to a government API serving as a kind of regulatory oversight node relying on real-time data feeds.

Regulatory systems should strive to take better account of the valuable work done by the informal economy, said Jennifer Bradley of the Aspen Institute Center for Urban Innovation. As noted in her comments about jitneys and other informal services that serve lower-income people, Bradley asked: "How can we take what's valuable in the informal sector and make it supported and legitimate? How do we come to terms with new American entrepreneurs who are starting businesses in their kitchens, who may not have access to commercial kitchen spaces? How do we think about regulation for people who run informal hair salons?"

One basic thing that municipal governments can do is to make online interactions with government simpler and more Web-friendly. Permitting and license renewals should be more easily transacted online, and regulatory processes should be accelerated so that unnecessary delays do not occur, which can be a serious frustration and impediment to economic activity. Jennifer Pahlka of Code for America

described how food stamp applications can be absurdly long and complicated, something that she worked to simplify and shorten.

The larger challenge for city government may be…developing systems and a culture that can constantly learn and evolve.

The larger challenge for city government may be more open-ended: developing systems and a culture that can constantly learn and evolve. Some important tools for doing this include data analytics of in-the-field results and user feedback. But some even more powerful feedback loops for better learning, described in the next section, include the crowdfunding of data from ordinary citizens and "urban prototyping" experiments.

Crowdsourcing Data

A handful of cities are in the vanguard of exploiting the use of smartphones and other "Internet of Things" devices—parking meters, road sensors and air quality sensors—to gather on-the-ground information more efficiently and improve city services. The classic instance of this paradigm may be the pothole app, which allows people to report potholes to public works departments, and to review citywide maps of potholes. Chicago released a pothole tracker app in January 2014 that may be representative of similar systems in other cities. Chicago's system, however, includes a metric of how rapidly city workers respond.

Mobilizing peer sentiment and making it visible to everyone can be particularly effective in changing behavior. One conference participant told the story of the former Mayor of Bogotá, Colombia, Antanas Mockus, who gave drivers hundreds of thousands of "citizen's cards" bearing a thumbs-up image on one side and a thumbs-down image on the other. People were encouraged to flash the appropriate image to courteous drivers and reckless drivers, as needed; traffic fatalities fell by more than half within a decade.[8] Such minor forms of peer "nudging" behaviors—such as utilities informing customers how their electricity usage compares to their neighbors—can have an outsized impact.

Peter Marx of Los Angeles described how the fire chief of San Ramon, California had the epiphany that he could potentially use people's smartphones as a way to mobilize off-duty paramedics and ordinary citizens trained in CPR to come to the aid of people experiencing cardiac arrests in public places. This led to the creation of the PulsePoint app on smartphones, which allows 911 to alert CPR-trained individuals about a patient's location while giving CPR guidance as paramedic units race to the scene. The app also notifies users of the closest available Automatic External Defibrillator (AED). The Los Angeles Fire Department inaugurated this system in March 2015.[9] The PulsePoint app suggests that mobilizing "supply" and "demand" instantly via smartphones to address needs may be a versatile new model of the future.

Los Angeles has also embraced the huge popularity of Waze, a traffic and navigation smartphone app purchased by Google that lets drivers share real-time traffic and road information. An estimated 30 percent of Los Angeles drivers use Waze (the tagline is "Outsmarting traffic, together") to learn about traffic accidents, police traps, alternative routes and other road situations. The app's massive usage in L.A. makes it a de facto infrastructure tool that the city's transportation and data managers have piggybacked through a symbiotic partnership with Waze. The City shares its data about active road construction projects with Waze in order to alert drivers about potential or actual traffic delays. Waze, for its part, reports its traffic data to city transportation officials every two minutes, providing the transportation department with a snapshot of traffic all across the city. Waze does not report, and the L.A. transportation officials do not receive, any personally identifiable information from the data, but its data-feed does include every reported pothole, traffic accident, police activity and other information, all of it crowdsourced by Waze drivers.

The City of Los Angeles has taken its partnership with Waze to a new level. After an epidemic of hit-and-run accidents, Marx entered into a "non-binding, non-exclusive, no-money, data-as-is deal" with Waze, asking it to post a notification on its app whenever a hit-and-run occurred. Drivers are asked in effect, "Did you see something?"

The frontier of potential uses of crowdsourcing apps remains wide open. Marx reported that a city investigator who works with the foster

care system has developed an app that seeks to crowdsource reports of sex trafficking. The focus is on at-risk youth who are caught up in trafficking. One roundtable participant told of a local public health official and data enthusiast who shared city health data with Yelp in an effort to stimulate change—an effort that arguably improved public health but raised questions about the proper government procedures and policies for managing open data. Still, as Peter Hirshberg noted, "Through such experiments of pushing and innovating, the city eventually learns. And when the government actually learns to do this stuff, it's kind of beautiful."

Urban Prototyping

One of the great virtues of crowdsourced data is its ability to identify patterns of individual behaviors, preferences and social trends with great precision and speed, which can be of immense help in city planning and intervention. The new capabilities have led to the idea of *urban prototyping*—rapid iterations of possible scenarios for a city space to which anyone can contribute, open-source style.

…city governments can facilitate this effort of inventing "new narratives" about their cities [and] selling their unique histories, character and attitudes. ***–Flint Dille***

A bit of activist performance art in San Francisco unwittingly helped catalyze urban prototyping. A scrappy arts collective known as Rebar, which blends art, design and activism in all sorts of provocative ways, decided to stage what it called "PARK(ing) Day" by creating a "pop-up park" in a street parking space. The activists fed money into the meter while putting grass sod and lawn chairs over the asphalt and voila, a temporary park in the middle of the city! The stunt was intended to get the point across that 70 percent of downtown San Francisco is designed for the exclusive use of vehicles, not people. The PARK(ing) project inspired many larger, more ambitious public events that took over

city streets and spaces, in which event organizers paid the city to shut down streets and re-route bus lines for short periods. Later the Hearst Corporation and Forest Cities, a private developer of the four-acre $5 million project in downtown San Francisco teamed with Gray Area Foundation for the Arts and scores of citizens to prototype possible uses of that large urban site.

What emerged from these experiments was the idea that the city could try out new visions of the future for itself through temporary installation projects and computer visualizations. By using open-source participation and multiple iterations, citizens and city planners could together imagine socially appealing transformations of city spaces. An early tool in this process, introduced in 2012, was a location-aware virtual reality device known as OWL, which resembles the swiveling pay-binocular viewfinders often found in tourist spots. OWL lets users look at visualizations of an imagined future or historical view of a location, which in turn allows planners to probe likes, dislikes and feelings about different scenarios.

This history recently spawned a new iteration of data-driven urban prototyping, the Market Street Prototyping Festival.[10] Many city planners regard Market Street, a highly commercial district in San Francisco, as not particularly engaging or sociable. They aspire to transform it into a more pedestrian-friendly, private traffic-free promenade by 2017. To help ascertain what might appeal to ordinary city residents—and not just the hipsters and urban planners who pay attention to such things—the city issued an open call for proposed street installations: artworks performance spaces, relaxation zones, a six-sided ping pong table and many other clever ideas. City planners chose fifty of the projects for a real-world experiment on two miles of Market Street to see how people would engage with them. On the weekend of April 9-11, 2015, the city closed down Market Street and set up fifty temporary installations. Peter Hirshberg, who helped oversee the entire experiment, said, "We wanted to open source the whole project and incubate those things that work."

Jay Nath, the Chief Innovation Officer for the Mayor's office, explained how this "rapid prototyping" is a way to apply scientific methodologies and empirical testing to urban planning. Nath was interested in learning "how do we do temporary interventions through

A-B tests and see actual outcomes, and measure those outcomes?" The Market Street prototyping offered a rare opportunity to use new processes to generate outcomes that might otherwise seem too daring or unusual. It is not yet known which prototype projects will be selected and developed for the final redesign of the boulevard, but the city considered the festival a big success.

In many respects, the Market Street prototyping is an extension and systematization of earlier collaborations that bridged enterprising artists with city government. Years earlier, Leo Villareal, a light artist who often built artworks for Burning Man, and entrepreneur Ben Davis successfully negotiated with the city's Public Works and Planning Departments to install the largest LED installation in the world, "Illuminate the Arts," on the Bay Bridge. It is a much celebrated, beloved piece of civic art. One could say that the Market Street Prototyping project seeks to achieve something similar on a more diversified scale. It wants to build a bridge between creative artists, entrepreneurs and citizens, with the labyrinthine, little-understood city bureaucracy: a way of opening up city planning to bring in as much innovation and experimentation and diversity as possible. "Our ultimate plan," said Peter Hirshberg, "is to make that portion of Market Street work like a LEGO set, so that you can constantly update, manage and engage people in the co-creation of the street."

The Market Street project bears a strong kinship not just with open source projects, but with the gaming world, or at least, one very popular geo-mobile alternative reality game known as Ingress. Game designer Flint Dille is the creative lead for this Google game, which requires people to roam urban spaces with their smartphones. The phone screens and geo-location capacities superimpose a game narrative on public landmarks, buildings, art installations and other sites ("portals") around the world. The game, which is played in real-time by millions of people around the world, invests the physical structures of cities with rich emotional meanings that make sense in the context of the game. In this way, Ingress functions as "a fictional overlay" on the city's public spaces and creates new meanings for actual city spaces via the shared virtual reality. In any given city with cell phone service, there are likely to be self-organized teams of Ingress players who create their own team logos and t-shirts—a testament to the "irrepressible social instinct of humans."

Dille said that a key lesson to be learned from Ingress is the ability to "change people's attitudes and perceptions of what they're doing in public spaces." He compared it to Dashiell Hammett's fictional portrayals of San Francisco, A. Conan Doyle's London and Raymond Chandler's Los Angeles. Dille said that one of the most powerful augmented reality experiences that he had was taking the so-called Grave Line Tour in Los Angeles that drives people in a hearse to the sites where famous people have died—John Belushi's drug overdose, the Manson murders, and the spot where Superman killed himself. "I never looked at the city the same way again!" said Dille.

The point is that our perceptions of cities are based in part on such narratives. "You do not start a movie without a script or a game without a vision of what the game is." A lot of the challenge facing cities in a networked culture, said Dille, "is figuring out what a city wants to be." What is the narrative? Dille explained the importance of creating a city's narrative. "Our cities have unique histories, areas, attitudes and living people. It doesn't have to be a boastful thing, but a city should be more than a bunch of cement." The problem is that "nobody has ever sold the city," said Dille. The surprising thing, he added, is that "you do not have to sell it with reality. You can sell it with fiction!" He cited how Ingress players often express surprise at discovering what cool stuff exists in their own cities. "Ninety percent of the challenge is won by getting people to look at things in a new way," he said. "We've probably delivered more mind-share to public artworks than many museums." Dille said that the Ingress game designers are "thinking about adding a new app to the game that will invite people to propose what they would like to see—a coffee shop, a dry cleaners, a bench—in certain empty spaces."

Smartphone apps and games: it is fascinating to consider that the Waze smartphone app resembles an alternative reality such as the Ingress game. In both instances, there are immense possibilities for reinventing the consensual realities that people experience and self-organizing vast quantities of on-the-ground data. But to go a step further, Dille believes that city governments can facilitate this effort of inventing "new narratives" about their cities. They need to do a better job of "selling" their unique histories, character and attitudes.

These points prompted Benjamin de la Peña of the Knight Foundation to reflect that while it is very difficult to develop reliable metrics for measuring civic participation, it is much easier to develop a proxy metric: the use of public spaces for public life. There is a pleasure and vitality that comes with such public activity—a feeling that we once associated with voting, said de la Peña, citing a March 2015 article, "The Joy of Voting" in *The Atlantic*.[11] So much of the challenge is finding ways to make public spaces more useful, interesting and filled with human interaction.

Shifts of Power, Wealth and Voice

The arrival of networking technologies in urban life has been alarming to many Mayors, political parties and city officials because these systems tend to disrupt the status quo and at times ignore city protections for their citizens. Familiar governmental procedures, stable political arrangements and insular institutional cultures can all be put at risk by open data systems and tech-empowered citizen participation. Treating the "city as platform" can catalyze structural shifts of power, wealth and voice within an urban region.

…in coming decades…"local networks will be telling government what they want. That is democracy."-*Benjamin de la Peña*

"The ownership of civic conversations is changing," said Ryan Panchadsaram, the Deputy U.S. Chief Technology Officer. "That is disrupting things, making many folks feel uncomfortable. I think that's actually a really good thing." One reason that it is good, he explained, is that it opens the door for healthy new forms of citizen engagement. Network-based systems are more hospitable to citizen participation, said Panchadsaram, because the "architecture of participation"[12]—to use Tim O'Reilly's term—is open and modular. This may be one of the key drivers of structural change.

As O'Reilly explained in a 2014 blog post on this topic, open source software projects have been able to build large development communi-

ties because "they have a modular architecture that allows easy participation by independent or loosely coordinated developers…. The Web, however, took the idea of participation to a new level because it opened that participation, not just to software developers, but to all users of the system."

Following this logic, city governments can leverage the power of open participation as seen on the Web and in open source communities by devising standard, interoperable systems that enable sufficiently small and accessible "units of participation." O'Reilly writes, "Modularity depends on standards—formal or informal expectations about behavior and interfaces—and interoperability. To take an example that is not from software, consider that our most competitive, participatory industries all feature devices made from standardized parts. Whether you are talking automobiles, personal computers or cell phones, a rich ecosystem of suppliers is possible only because we agreed that the threads on bolts and nuts should be a certain size that electronic parts should be interchangeable, and that complex, custom assemblies should be kept to a minimum.

This is precisely why so many aspects of government remain inaccessible to ordinary citizens—and detrimental to democracy: the "units of participation" are too large and complex. O'Reilly writes: "When a bill is tens of pages long (consider, for example, the Federal Aid Highway Act of 1956, which established the U.S. interstate highway system, at 29 pages) anyone can read and understand it. When it is 906 pages long (like the Affordable Care Act), few people—including the legislators who vote on it—are likely to fully grasp it, and it ends up being shaped by a small cadre of very knowledgeable insiders and lobbyists who have strong economic interests in the outcome."

Jennifer Pahlka of Code for America told a story of how the City of Philadelphia took steps to make it more feasible for people in housing projects to participate in policy dialogues about housing programs, and how this opened up a new dialogue. Lower-income citizens were thrilled to have their opinions heard, but many homeowners were distressed that their voices no longer dominated the political agenda. Similar shifts are likely, as network systems bring new voices into public life.

The city as an open-source platform may be disruptive in the short-term, and it will certainly entail new complexities. But it is also a force

for rejuvenating civic life and democratic participation, and ultimately, spurring better, more equitable government performance. Instead of connected insiders driving the priorities of city programs, said Benjamin de la Peña, in coming decades we are likely to see the rise of social movements whose "local networks will be telling government what they want. That is democracy."

The Role of Technology in Economic Inequality

One of the most important purposes of treating a city-as-platform is to spur economic growth, productivity and jobs. But an abiding question is whether tech systems indeed have a deleterious opposite effect, at least on substantial segments of the urban population. Do new digital technologies foster greater *inequality*? If so, how might tech policies be changed to foster greater opportunity and more equal outcomes?

"…data driven smart cities, in the name of efficiency, have the potential to widen the [inequality] gap." ***–Tessie Guillermo***

This topic was addressed in a short presentation by Tessie Guillermo, President and Chief Executive Officer of ZeroDivide, a San Francisco advocacy group that leverages technology to accelerate social change in underserved communities. She started by noting that the "social contract" that has given middle class Americans job and income security is being shattered by a confluence of factors. These include the "sharing economy, the increasing numbers of non-employee contracted outsourced workers, the gap between business and asset owners and operators, the cult of big data, and the technologies that enable this confluence."

This topic was extensively covered by a 2013 Aspen Institute report, "The Power Curve Society: The Future of Innovation, Opportunity and Society Equity in the Emerging Networked Economy."[13] The report notes:

> Although the new technologies are clearly driving economic growth and higher productivity, the distribution of these ben-

> efits is skewed in worrisome ways. Wealth and income distribution no longer resemble a familiar "bell curve" in which the bulk of the wealth accrue to a large middle class. Instead, the networked economy seems to be producing a "power-curve" distribution, sometimes known as a "winner-take-all" economy. A relative few players tend to excel and reap disproportionate benefits while the great mass of the population scrambles for lower-paid, lower-skilled jobs, if they can be found at all. Economic and social insecurity is widespread.

To give this trend a personal dimension, Guillermo gave a personal history:

> My immigrant, working-poor parents became property owners and raised seven children in the 1960s in San Francisco, but fifty years later their third-generation grandchildren, my daughter, and her partner, live in a one-bedroom apartment while raising two of their own children. They pay in real terms anywhere from five to ten times what my parents paid on their 30-year monthly mortgage, and cannot afford or find a private alternative to one of the lowest-performing urban public school systems in the country, even though both of them are college educated and employed, one in the tech sector, ironically, and the other owning her own small business.

In trying to explain this social reality, Guillermo noted that "income inequality is fueled by disparities in skills and education, many of which in today's economy are explicitly tech-related. The people and institutions who benefit the most are those with the expertise and creativity to adopt and use technological innovations—and that drives income inequality. The demand for highly skilled workers rises, while workers with less education and expertise fall behind."

The inequality gap can be self-reinforcing, especially among those who cannot afford access to the Internet and smartphones. Guillermo continued, "Twenty percent of Black adults, 17 percent of Hispanic adults and 25 percent of households making less than $30,000 do not use the Internet. So data-driven smart cities, in the name of efficiency, have the potential to widen the gap between the haves and have-nots."

A key issue, then, is "who owns, collects, analyzes and productizes the data to support and lift these [lower-income] people up," said

Guillermo. Much of the data generated by people using the Internet and smartphones accrues to private companies for private gain and not for the general good.

…markets left to their own devices are not likely to address the problems of job loss, inequality and insecurity. For that, government and policy will be indispensable.

From a jobs perspective, we are experiencing a shift—due to sensors, cloud technology and digital social networks—from a situation in which people were once paid for their labor and productivity, to a product development process that is now done with free and willing labor participation. The sharing economy is making it so that the employer/platform owners have no obligation to provide the benefits, safety and longevity that traditional employment once did.

This is where policy comes in. The issue of jobs and work cannot be solved in the marketplace alone. How can cities "realize the promise of inclusive innovation?" asked Guillermo. She noted that her organization, ZeroDivide, which has dealt with digital equity issues for 17 years, is shifting its focus from technology demand and adoption to basic Internet access, content creation, data tools and product development. She cited the many nonprofits and social enterprises that are actually developing the capacity to collect, analyze and own their own data from the services that they deliver. Developing greater digital literacy among disadvantaged groups of citizens is a key challenge, Guillermo said.

New Frontiers of Automation and Its Impact on Jobs

Conference participants agreed that there are many troubling, inexorable structural changes in the economy, many of them driven by new technologies. The changing nature of work is well-illustrated by the comment made by entrepreneur Robin Chase who, in a prior Aspen Institute conference, noted that a friend's father had one job in his life; she would have seven jobs in her life; and her child will have seven jobs

at one time. An economy that increasingly relies upon huge pools of freelance workers with multiple jobs and multitasking workdays is raising profound new questions for government and policy. How should social services should be structured? How should job-creation and inequality be addressed?

Stefaan Verhulst, Cofounder of the GovLab at NYU, suggested that we may need "a wholesale rethinking of what a job might be, and explore to what extent a minimum income is needed." There are many ways that this might be addressed, he said, ranging from the kinds of basic income ideas often proposed in European countries to apps such as one called Even, which helps individual freelance workers with irregular paychecks to smooth out volatile swings in their income.[14]

Another approach is for cities to develop new sorts of economic development models that can generate more jobs. Verhulst suggested two interesting ideas: an open-data system that could provide market intelligence to small and medium-sized enterprises (SMEs) and micro-enterprises, helping them to compete against larger corporations. Another idea is for cities to provide a "co-location model" that provides SMEs with a kind of headquarters that can help them develop export markets for their products and services.

However beneficial such approaches, the larger secular trends in the economy may simply swamp such strategies, suggested Benjamin de la Pena of the Knight Foundation. He cited a recent article journalist Scott Santens on the website *Medium*, which assesses the likely economic impact of self-driving vehicle technologies.[15] The first fully autonomous self-driving truck was successfully tested in Nevada in May 2015, and analysts such as Morgan Stanley predict that there will be completely autonomous truck capability by 2022 followed by massive market penetration by 2026. This development could have a devastating impact on the estimated 3.5 million truck drivers in the U.S. and another 5.2 million non-drivers who are employed by the trucking industry. Combined with the hotels, restaurants and other businesses that depend upon truck drivers, journalist Santens concludes that, "we are facing the decimation of entire small town economies, a disruption the likes of which we haven't seen since the construction of the interstate highway system itself bypassed entire towns.

This general automation trend is playing out in many new frontiers

today, from the outsourcing of white-collar work to cheaper labor in India, to the automation of supermarket cashiers and flight check-in. "The Port of Norfolk, Virginia, used to employ 3,000 people," said Steven Adler of IBM. "Today the whole port is run by 100 people. Distribution centers around the country are run by just ten people. Robots move pallets around, with the whole warehouse run by a computer screen and a mouse. We are on the verge of eliminating huge numbers of blue-collar jobs that will never come back."

The Indispensable Role of Government and Policy

There was general agreement among participants that markets left to their own devices are not likely to address the problems of job loss, inequality and insecurity. For that, government and policy will be indispensable. "There are many things that only government is going to provide over the long term," said Susan Crawford, a law professor at Harvard Law School and a co-director of the Berkman Center for Internet & Society, "and in order to be effective, government must be visibly doing a good job." She added that government stands alone in its capacity to assure that everyone's baseline needs for education, health, transport, clean water, electricity and social insurance are met, "I think we can stipulate that the market will not provide these," Crawford said. "Government is essential for providing the basic, long-term things that no private sector actors want to provide." Or as one participant noted, "There's really no market for taking care of poor people's children."

But however useful this line of thinking, it is also true that government cannot meet these needs alone; increasingly, cross-sector partnerships are needed, said Jay Nath of the Office of San Francisco's Mayor Edwin M. Lee. This will require a new sort of leadership to mobilize diverse factions to rally behind a new vision. Or as business columnist Eduardo Porter wrote in *The New York Times*: "Success won't hinge on a list of proposals. It will require reshaping entrenched political positions, and convincing solid majorities of voters of the vital role of government in their lives."[16]

Government will face another tension—how to deal effectively with inequality and social needs without jettisoning its traditional economic development goals. Can this be achieved? Some conference participants

hailed the capacity of current markets to provide greater job flexibility and choice, while others regard that as a race to the bottom that threatens people's basic needs and desire for security.

"The power curve exists in pretty much every domain of the economy, and as such, I don't think we can complain about it," said Jacques Bughin of McKinsey & Company. "It's a fact of life." In Europe and Asia, he said, smart cities are actually driving the inequalities of the power-curve by creating more white-collar and service jobs, and not blue-collar, manufacturing jobs.

Many conference participants agreed that social equity and income security will only grow more important in coming years, and that some forms of redistribution may be necessary. "This is ultimately a question of what kind of culture and society do we want to live in," said Sara Horowitz, Founder and Executive Director of the Freelance Union. "We really need to have that kind of conversation. We keep expecting everything, including nonprofits, to function like free markets, as if aligning supply and demand and reaching some optimum will solve the problem. We know that that just isn't true because we're seeing all of these market choices being made in the midst of massive income inequality." Horowitz called for the creation of "a social sector" that could have new sources of capitalization and support—a role that other participants suggested could be significantly augmented by philanthropy.

So much of the distortion of market outcomes stem from the "financialization of markets," said Tim O'Reilly, in which hedge funds, speculators and other capital investors interfere with the "real economy" of production and services. The solution, he suggested, will come from policy interventions, particularly in changing how government taxes labor more than capital. We do not need tax breaks for financial deals that serve only to drive up stock prices without improving corporate performance.

A number of participants noted that many successful companies in the gig economy are in effect free riders who are shirking the historic "social provisioning" obligations of employers. Jennifer Bradley of the Aspen Institute Center for Urban Innovation said that "Uber's business model is based on free-riding because it does not necessarily pay for the benefits of its drivers by making them employees.[17] If such companies had to pay their share of the public provision," she said, "we

could capture some of that value and put it back into social systems like health insurance and vacation benefits. There is unquestionably a role for government here, and I think that we need a new sort of regulatory framework to get there."

…the larger question: How to provide reliable, universal social benefits at a time when employers are shedding that historic role? *-Sara Horowitz*

Conceptually, many participants agreed that new sorts of pooled mutualization of benefits, perhaps under the auspices of government, could work. The trick would be to meet both the legitimate social needs of individual workers while respecting the economic and innovative virtues of the gig economy. Tim O'Reilly cautioned against "throwing away all the things that are positive" with Uber and other network-based enterprises. There was agreement with this, but also a response: So how, then, do we provide social benefits such as health insurance, vacation time and unemployment compensation? How do we deal with (what some regard as) the free-rider problem?

This remains an unanswered question, but Sara Horowitz of the Freelancers Union believes that we should move away from a conversation about specific companies to the larger question: How to provide reliable, universal social benefits at a time when employers are shedding that historic role?

Horowitz suggested that the social sector could become a "holding vessel" for social benefits, perhaps in collaboration with government. Instead of traditional New Deal approaches, one could devise massive open platforms and APIs as a vehicle for mutualizing social benefits in decentralized ways, without benefits being tethered to a single employer.

This is more or less how the Danish social welfare system functions, said Steven Adler of IBM. He explained that Demark has taken all social benefit payments from employers off the government balance sheet. All employers pay a wide array of social benefits (health insurance, unemployment, vacation benefits, maternity leave, even severance pay)

into the universal system. Funds are administered by a publicly listed, privately owned insurance company, ATP, which is 49 percent owned by the Danish government. Because workers have no fears about losing social benefits, Denmark has the highest labor mobility rates in Europe, said Adler. "It is a remarkable country that has figured out how to balance a socialistic economy with a free market system."

Adler proposed that cities consider trying to devise social support systems on their own. After all, they already provide a wide variety of social services. Why not unemployment insurance or maternity leave? But others were skeptical. "Quite frankly, cities don't have the tax base for something like this," said Peter Marx of the City of Los Angeles. It was pointed out, as well, that even large cities like L.A. do not have a large enough risk pool to develop such forms of social insurance.

Yet there are things that cities could experiment with, said Benjamin de la Peña. To challenge large employers who deliberately take six months to pay freelancers for their work, for example, cities could require that contractors be paid within thirty days. The social sector itself has extensive expertise that could be used in partnerships with city governments to come up with better, financially feasible approaches, said Tessie Guillermo of ZeroDivide. Yet another source of help could be the maker movement, said Peter Hirshberg, which has plenty of civic commitment and innovative ideas.

Horowitz believes that the real force for galvanizing action against inequality will be moral opinion. Citing Pope Francis' encyclical on climate change as a model, she thinks that a new politics will emerge from new moral framings of issues that focus on elemental human realities like "love and work." Just as fights against child labor were not merely economic or practical issues, she said, "The new political realignments are really going to revolve around questions of morality. I do not think this is a crisis of creativity."

Recommendations for Government Policy

An inevitable question, after a conference discussion of the sort experienced, is how can government begin to help move some of the more promising ideas forward? What changes in institutional structures, public policies and civic practices can prove catalytic?

Stefaan Verhulst of the GovLab at NYU offered a provisional template for how governments might approach the development of networked cities. He did not offer any specific policy recommendations, but rather a series of broad principles and primary policy "buckets." Alluding to his earlier remarks, Verhulst observed that networked cities consist of four key asset classes or elements: infrastructure, people, technology and data. Governance and policy should focus on these four assets and try to develop better synergies among them to solve problems in better ways, serve the public interest and/or provide the best value.

The first question that government policymakers must ask of a new proposal is: What is the value proposition and vision? This is often assumed, Verhulst said, but it needs to be made explicit so that it can be properly assessed. In addition, the "risk proposition"—the likely costs, possible harm to citizens, reputational effects for the city—must be made manifest. For both costs and risks, metrics must be devised for monitoring the progress, success and failures or a new idea. Such metrics should also be used to develop rankings and benchmarks.

A second step for policymakers is to consider the design and governance principles that will be used to achieve the goals of a networked city. Verhulst identified the following principles: openness and principles of iteration and experimentation; user focus and engagement; permission-less innovation; and social equity and inclusiveness. The institutional process hosted by cities must use open, collaborative platforms, not quasi-secretive public/private partnerships that are not openly scrutinized, he urged, and it must enable co-design and open innovation. To ensure that governance and policy development remains agile, the process requires open, robust feedback loops and metrics that can properly measure the results being sought. And finally, the process must be seen as democratically legitimate and effective.

The third aspect of Verhulst's overarching framework—in addition to the value proposition and governance principles—are the major policy buckets to address. Verhulst named six major concerns that cities should address:

1. Broad and equitable access to infrastructure;
2. Public trust, which includes issues of cybersecurity and privacy;
3. Ethics in the use of data to prevent data-profiling discrimination or predictive inference;

4. Openness by default—while allowing limitations on certain datasets, a topic that needs more attention;
5. Interoperability and open standards across different technologies; and
6. Procurement and R&D investment, a subject that requires fresh thinking to avoid tech lock-ins.

There was wide agreement that Verhulst's framework helps systematize a rather sprawling set of concerns in how to understand and advance the idea of city-as-platform. One concern raised, however, was that the framework does not take adequate account of people, and the messy, unpredictable aspects of social interaction and culture in changing things, whether it is city bureaucracy, political leadership or crowdsourcing new data projects.

Several conference participants offered additional suggestions for how government must change in order to leverage the benefits of municipal networking:

Break down departmental silos in city government. This was a recurrent concern, understandably, because open networks are precisely about creating cross-boundary participation and collaboration.

Use government to advance government-specific goals and improve connectivity of people and information. Given budget constraints, government should spend its money only on those things that government can do, and not try to duplicate what others can and are doing, said Tim O'Reilly. This includes using government to leverage private apps such as Waze and information economy services such as Craigslist, Freecycle and Nextdoor.

Improve government procurement policies. Instead of using the standard Request for Proposal system in procurement, Jay Nath of the Mayor's office in San Francisco suggested that government request small-scale pilot projects that can serve as learning platforms for what ought to be purchased. He also suggested putting procurement on transparent, open platforms so that peers can suggest attractive alternatives or twists to the government-stipulated framing of a procurement contract.

Use principles of gaming to tap into people's intrinsic and extrinsic motivations. Just as networked games like Ingress have mobilized people to do all sorts of challenging, interesting things for fun, cities could use gaming principles to engage with citizens and motivate them to do things for the public good. Flint Dille, the creative lead for Ingress, suggested that a badge system that rewards citizens for certain pro-city behaviors could serve as a kind of city currency that could give discounts or free access to certain city venues. The efficacy and a badge system has been demonstrated as well by such innovations as the Cities of Learning project in Chicago, which incentivizes youth learning and engagement in ways that traditional education does not. In the city context, it is a matter of promoting the idea of being a "prominent citizen," said Dille. "Right now, these roles are limited to people with titles or a lot of money, which shuts ordinary people out. Let's think of ways to get them back in, and reward good citizens—with access to museums, or free public transport."

Promote co-learning opportunities. The open-source ethic of learning by doing in collaboration with others is an ethic that cities should be promoting, not just within city government but in the city at large. John Seely Brown, Independent Co-Chairman of the Deloitte Center for the Edge and Visiting Scholar at the University of Southern California, said that there are some new ways emerging for how to "architect a system of learning," most notably some tests that have used complexity theory principles to listen to village sentiment in Afghanistan and craft appropriate systems in response.

Explore how philanthropy can support civic empowerment and individual agency. Philanthropy can help support experiments for new types of civic engagement. Susan Crawford of Harvard Law School suggested loan forgiveness programs as one way to promote graduate student involvement in this area.

Develop an R&D lab to foster collaboration among cities on networking practices. The scale of the challenge is universal, but innovative experiments remain largely isolated and one-off. Blair Levin of the Brookings Institution believes that it would be tremendously helpful if ten cities were to come together around a shared problem and work out creative solutions using data and networking systems.

Conclusion

Many scholars of urban life agree that cities are at the frontlines of many difficult economic and social issues, ranging from income inequality and transportation woes to a lack of affordable housing and declining democratic participation. The great appeal of the city-as-platform is that it can begin to offer some fresh and imaginative approaches for ameliorating such problems, or even change the terms of engagement so that new fields of possibility can be opened. Digital technologies are not a panacea by any means, but at a time of intense political polarization and economic challenge, civic networks that emulate the open-source ethic and practice are extremely attractive. More than a niche solution or easy talking point, they offer the mid-term possibility of transformative system change without necessarily hitting ideological tripwires or inducing political paralysis. After all, who can object to the idea of bringing more people into the process of city management and enhancing civic deliberation, transparency and democracy?

…civic networks that emulate the open source ethic and practice…offer…transformative system change without…hitting ideological tripwires or inducing political paralysis.

Of course, reconceptualizing cities as platforms is not easily achieved, and it remains potentially disruptive, at least in the short term, because it challenges some deeply entrenched systems and norms about how cities can and should be run. Yet the shift to open civic networks is also potentially liberating. The intelligence, imagination and commitment of an entire city can be brought to bear on problems; reliance on political elites and government experts does not go away, but it is certainly tempered by new feedback loops and opportunities for participation. Figuring out the new archetypes for civic governance and management, and nourishing a participatory civic culture that empowers citizens in meaningful ways, will not happen overnight. But the stories told during this conference offer some genuine cause for optimism.

Endnotes

1. See http://summit.cityinnovate.org/san-francisco.php

2. See https://data.lacity.org

3. See http://www.historicplacesla.org

4. Elena De Nictolis, "Bologna Regulation on public collaboration for urban commons," December 18, 2014. Available online at http://www.labgov.it/bologna-regulation-on-public-collaboration-for-urban-commons.

5. Peter Hirshberg, "Burning Man: The Pop-Up City of Self-Governing Individualists," in John H. Clippinger and David Bollier, *From Bitcoin to Burning Man and Beyond* (ID3, 2015). Available online at https://idcubed.org/chapter-5-burning-man-pop-city-self-governing-individualists.

6. Open Knowledge Foundation, "US City Open Data Census." Available online at http://us-city.census.okfn.org.

7. See http://sfpark.org

8. Antanas Mockus, "The Art of Changing a City," *The New York Times*, July 16, 2015. Available online at http://www.nytimes.com/2015/07/17/opinion/the-art-of-changing-a-city.html?_r=0.

9. "Los Angeles Department Partners with Pulsepoint Foundation," March 4, 2015. Available online at http://www.pulsepoint.org/2015/03/04/los-angeles-fire-department-partners-with-pulsepoint-foundation.

10. See http://marketstreetprototyping.org

11. Eric Lui, "The Joy of Voting" in *The Atlantic*, March 22, 2015. Available online at http://www.theatlantic.com/politics/archive/2015/03/the-joy-of-voting/388291.

12. See http://archive.oreilly.com/pub/a/oreilly/tim/articles/architecture_of_participation.html and http://radar.oreilly.com/2015/03/socialcivics-and-the-architecture-of-participation.html.

13. David Bollier, "The Power-Curve Society: The Future of Innovation, Opportunity and Social Equity in the Emerging Networked Economy," The Aspen Institute, 2014. Available online at http://www.aspeninstitute.org/policy-work/communications-society/power-curve-society-future-innovation-opportunity-social-equity.

14. See https://even.me

15. Scott Santens, "Self-Driving Trucks Are Going to Hit Us Like a Human-Driven Truck: The imminent need for basic income in recognition of our machine-driven future," May 14, 2015. Available online at https://medium.com/basic-income/self-driving-trucks-are-going-to-hit-us-like-a-human-driven-truck-b8507d9c5961.

16. Eduardo Porter, "Sizing Up Hilary Clinton's Plans to Help the Middle Class," July 14, 2015. Available online at http://www.nytimes.com/2015/07/15/business/sizing-up-hillary-clintons-plans-to-help-the-middle-class.html?ref=topics.

17. See http://www.nolo.com/legal-encyclopedia/california-labor-commissioner-rules-uber-driver-employee-not-independent-contractor.html for findings regarding employee/independent contractor status as per the California Labor Commission.

APPENDIX

The Twenty-Fourth Annual Aspen Institute
Roundtable on Information Technology

The City as Platform: How Digital Networks Are Changing Urban Life and Governance

July 15-17, 2015
Cavallo Point in Sausalito, California

Roundtable Participants

Steven Adler
Chief Information Strategist
IBM

Story Bellows
Director, Mayor's Office of New Urban Mechanics
City of Philadelphia

Allen Blue
Vice President Product Management and Co-Founder
LinkedIn

David Bollier ***(rapporteur)***
Author, Editor, Blogger

Jennifer Bradley
Director
Center for Urban Innovation
The Aspen Institute

John Seely Brown, PhD
Independent Co-Chairman
Deloitte Center for the Edge
and Visiting Scholar
University of Southern California

Jacques Bughin, PhD
Director
McKinsey & Company, Belgium

Michael Chui, PhD
Partner
McKinsey Global Institute

Susan Crawford
John A. Reilly Professor
Harvard Law School
and Co-Director
Berkman Center for Internet & Society

Note: Titles and affiliations are as of the date of the conference.

Flint Dille
Designer
Ground Zero Productions

Michael Fertik
Founder and Chief Executive Officer
Reputation.com

Charles M. Firestone
Executive Director
Communications and Society Program
The Aspen Institute

Tessie Guillermo
President and Chief Executive Officer
ZeroDivide

Luis Herrera
City Librarian
San Francisco Public Library

Peter Hirshberg
Chairman
The City Innovate Foundation

Sara Horowitz
Founder and Executive Director
Freelancers Union

John Kunzweiler
Board Member
SolomonEdwards

Blair Levin
Senior Fellow, Metropolitan Policy Program
Brookings Institute

Dan'l Lewin
Corporate Vice President for Technology and Civic Engagement
Microsoft

Qingyun Ma
Dean
School of Architecture
University of Southern California

Peter Marx
Chief Technology Officer
City of Los Angeles

Patrick McGovern
Chief Growth Officer
Aura Inc.

Jay Nath
Chief Innovation Officer
Office of Mayor Edwin M. Lee

Tim O'Reilly
Founder and Chief Executive Officer
O'Reilly Media, Inc.

Jennifer Pahlka
Founder and Executive Director
Code for America

Ryan Panchadsaram
Deputy U.S. Chief Technology Officer
The White House, Office of Science and Technology Policy

Note: Titles and affiliations are as of the date of the conference.

Benjamin de la Peña
Director, Community and National Strategy
The John S. and James L. Knight Foundation

Robert Pepper, PhD
Vice President, Global Technology Policy
Cisco

Stefaan Verhulst
Co-Founder and Chief Research and Development Officer
The GovLab
New York University

Marianne Wu, PhD
Managing Director, GE Ventures
General Electric

Connie Yowell, PhD
Former Director of Education
The MacArthur Foundation

Staff:

Rachel Pohl
Project Manager
Communications & Society Program
The Aspen Institute

Note: Titles and affiliations are as of the date of the conference.

About the Author

David Bollier is an author, activist, independent scholar and blogger well-known for his work on the commons as a new paradigm of economics, politics and culture. He pursues this scholarship and activism as co-founder of the Commons Strategies Group, an advocacy/consulting project that assists the international commons movement. Bollier has written or edited seven books on the commons, including *Patterns of Commoning* (2015), co-edited with Silke Helfrich; *Think Like a Commoner: A Short Introduction to the Life of the Commons* (2014); *Green Governance: Ecological Survival, Human Rights and the Commons* (2013), co-authored with Burns Weston; and an anthology of essays, *The Wealth of the Commons: A World Beyond Market and State* (2012), co-edited with Silke Helfrich.

Bollier spent many years in various policy jobs in Washington, D.C.–in Congress, the auto safety agency, with Ralph Nader and others–in the 1970s and 1980s. In 2001 Bollier co-founded Public Knowledge, a Washington advocacy organization for the public's stake in the Internet, telecom and copyright policy. For twenty-five years, until 2010, Bollier collaborated with television producer, writer and activist Norman Lear on a wide variety of non-television public affairs and political projects. Bollier blogs at Bollier.org; lives in Amherst, Massachusetts.

About the Communications and Society Program

www.aspeninstitute.org/c&s

The Communications and Society Program is an active venue for framing policies and developing recommendations in the information and communications fields. We provide a multi-disciplinary space where veteran and emerging decision-makers can develop new approaches and suggestions for communications policy. The Program enables global leaders and experts to explore new concepts, exchange insights, develop meaningful networks, and find personal growth, all for the betterment of society.

The Program's projects range across many areas of information, communications and media policy. Our activities focus on issues of open and innovative governance, public diplomacy, institutional innovation, broadband and spectrum management, as well as the future of content, issues of race and diversity, and the free flow of digital goods, services and ideas across borders.

Most conferences employ the signature Aspen Institute seminar format: approximately 25 leaders from diverse disciplines and perspectives engaged in roundtable dialogue, moderated with the goal of driving the agenda to specific conclusions and recommendations. The program distributes our conference reports and other materials to key policymakers, opinion leaders and the public in the United States and around the world. We also use the internet and social media to inform and ignite broader conversations that foster greater participation in the democratic process.

The Program's Executive Director is Charles M. Firestone. He has served in this capacity since 1989 and also as Executive Vice President of the Aspen Institute. Prior to joining the Aspen Institute, Mr. Firestone was a communications attorney and law professor who has argued cases before the United States Supreme Court. He is a former director of the UCLA Communications Law Program, first president of the Los Angeles Board of Telecommunications Commissioners, and an appellate attorney for the U.S. Federal Communications Commission.

Select Publications from the Aspen Institute Roundtable on Information Technology

Managing Digital Assets: The Challenge of Creating and Sustaining Intangible Value in a Data-Driven Economy (2014)

David Bollier, rapporteur

Managing Digital Assets looks at developing effective ways to use data assets to engender new insights, digital products and services. With the advances in information and communications technologies, there has been exponential growth of intangible digital assets and the proliferation of peer-to-peer platforms that empower consumers. This report describes these developments and then explores, particularly, the implications of open platforms and how data shapes opportunities. It considers the hidden liabilities of digital assets and the role of government in overseeing and managing data in the digital age. *Managing Digital Assets* is the Report of the Twenty-Third Annual Roundtable on Information Technology, a dialogue convened by the Communications and Society Program. 2015, 56 pages, ISBN Paper 0-89843-616-8; $12 per copy, free download at www.csreports.aspeninstitute.org.

The Weightless Marketplace: Coming to Terms with Innovative Payment Systems, Digital Currencies and Online Labor Markets (2013)

David Bollier, rapporteur

This report examines a rapidly changing global marketplace. Due to the proliferation of the World Wide Web and mobile devices, as well as changing relationships between producers and consumers, friction is being drastically reduced in commerce. There is more direct contact between buyer and seller, geographical barriers are being broken down, competition is improving and the cost of doing business is decreasing. Commerce not only has the ability to be targeted and instantaneous, it has essentially become "weightless." *The Weightless Marketplace* is the Report of the Twenty-Second Annual Roundtable on Information Technology, a dialogue convened by the Communications and Society Program. 2014, 43 pages, ISBN Paper 0-89843-600-1; $12 per copy, free download at www.aspeninstitute.org.

Power-Curve Society: The Future of Innovation, Opportunity and Social Equity in the Emerging Networked Economy (2012)

David Bollier, rapporteur

Power-Curve Society, written by David Bollier, examines how technological innovation is restructuring productivity and the social and economic impact resulting from these changes. It addresses the growing concern about the technological displacement of jobs, stagnant middle class income, and wealth disparities in an emerging "winner-take-all" economy. It also examines cutting-edge innovations in personal data ecosystems that could potentially unlock a revolutionary wave of individual economic empowerment. *Power-Curve Society* is the Report of the Twenty-First Annual Roundtable on Information Technology, a dialogue convened by the Communications and Society Program. 2013, 61 pages, ISBN Paper 0-89843-582-X, $12 per copy, free download at www.aspeninstitute.org.

The Future of Work: What It Means for Individuals, Businesses, Markets and Governments (2010)

David Bollier, rapporteur

New digital technologies and trends are challenging conventional notions of work and organization. As the velocity of change increases, institutions and individuals must adapt. Yet many structures, including those in education, government, business and the economy, often remain rooted in the past. The report captures the insights of the Nineteenth Annual Aspen Institute Roundtable on Information Technology, where business leaders, technologists, international politicians, academics and innovators explored how global structures and institutions are being confronted by the 21st century realities of distributed knowledge, crowdsourcing, open platforms and networked environments. The report shares the solutions these leaders proposed for preserving individual well-being and defining a future world of work that benefits everyone involved. 2011, 60 pages, ISBN Paper 0-89843-543-9, $12 per copy, free download at www.aspeninstitute.org.

The Promise and Peril of Big Data (2009)

David Bollier, rapporteur

Ever-rising floods of data are being generated by mobile networking, cloud computing and other new technologies. At the same time, continued innovations use advanced correlation techniques to analyze them, and the process and payoff can be both encouraging and alarming. The Eighteenth Annual Roundtable on Information Technology sought to understand the implications of the emergence of "Big Data" and new techniques of inferential analysis. Roundtable participants explored ways these inferential technologies can positively affect medicine, business and government, and they examined the social perils they pose. The report of the 2009 Roundtable, written by David Bollier, summarizes the insights of the Roundtable and concludes with its analysis of the financial sector from the perspective of Big Data, particularly how massive transparency, common reporting languages and open source analytics might greatly relieve the problems of systemic risk. 2010, 56 pages, ISBN Paper 0-89843-516-1, $12 per copy, Free download at www.aspeninstitute.org.

Identity in the Age of Cloud Computing: The next-generation Internet's impact on business, governance and social-interaction (2008)

J.D. Lasica, rapporteur

The Seventeenth Annual Roundtable on Information Technology brought together 28 leaders and experts from the ICT, financial, government, academic, and public policy sectors to better understand the implications of cloud computing and, where appropriate, to suggest policies for the betterment of society. Participants discussed the migration of information, software and identity into the Cloud and explored the transformative possibilities of this new computing paradigm for culture, business and personal interaction. The report of the roundtable, written by J.D. Lasica, offers insights from the roundtable and includes a set of policy recommendations and advice for the new presidential administration. 2009, 98 pages, ISBN Paper 0-89843-505-6, $12 per copy.

Beyond the Edge: Decentralized Co-creation of Value (2007)

David Bollier, rapporteur

The 2007 Roundtable convened 27 leaders to analyze the current and future social and economic impacts the co-creation of knowledge across networks made possible with new communications and information technologies. While collaborative engagement encourages increased productivity and creativity, it can also lead to mass chaos from the co-creation process. The roundtable participants discussed what separates successes from failures in the new collaborative era by reviewing business and organizational models and the implications of new models. 2007, 64 pages, ISBN Paper 0-89843-481-5, $12.00 per copy.

The Mobile Generation: Global Transformations at the Cellular Level (2006)

J.D. Lasica, rapporteur

The 2006 Roundtable examined the profound changes ahead as a result of the convergence of wireless technologies and the Internet. The Roundtable addressed the technological and behavioral changes already taking place in the United States and other parts of the world as a result of widespread and innovative uses of wireless devices; the trends in these behaviors, especially with the younger generation; and what this could mean for life values in the coming decade. The Roundtable tackled new economic and business models for communications entities, social and political ramifications, and the implications for leaders in all parts of the world. 66 pages, ISBN Paper 0-89843-466-1, $12.00 per copy.

Reports can be ordered online at *www.aspeninstitute.org* or by sending an email request to *publications@aspeninstitute.org.*