Unlocking the Potential of Civic Technology

2018 Chicago Forum on Global Cities Workshop Report

Kris Hartley, Nonresident Fellow, Chicago Council on Global Affairs

May 2019

According to IDC Research, aggregate worldwide investment in technology programs for cities reached $80 billion in 2018 and will reach $135 billion by 2021[i]. The rise of information and communications technologies (ICT) has generated unprecedented opportunities for public engagement in urban policy and service delivery. Through a set of applications collectively known as civic technology (hereafter "civic tech"), increased public participation has the potential to deepen the democratization of urban governance and improve its responsiveness and accountability.

As the digital revolution enables initiatives like smart cities and e-governance, safeguarding methods of democratic influence is a core strategic mandate for city governments wishing to politically legitimize technology. Pursuant to this issue, civic tech is distinguishable from smart cities and other urban technology programs in its focus on citizen empowerment. For this reason, it has the potential to go beyond the typical promises of efficiency gains – as peddled by standard technologies – and transform how citizens engage with policymakers.

Despite its vast potential, the civic tech phenomenon faces risks borne of the tension between public value and private profit. Viewed from the perspective of Harvard professor Mark H. Moore's (1995) public sector strategic management framework, civic tech can be evaluated on three key elements: public value, legitimacy, and operational capacity (Figure 1)[ii]. The public value of civic tech includes its ability to improve the quality of public goods and services and to meet a variety of citizen needs from universal to niche. The second two elements of the framework — legitimacy and capacity— raise broader questions that reflect the challenges and opportunities of civic tech.
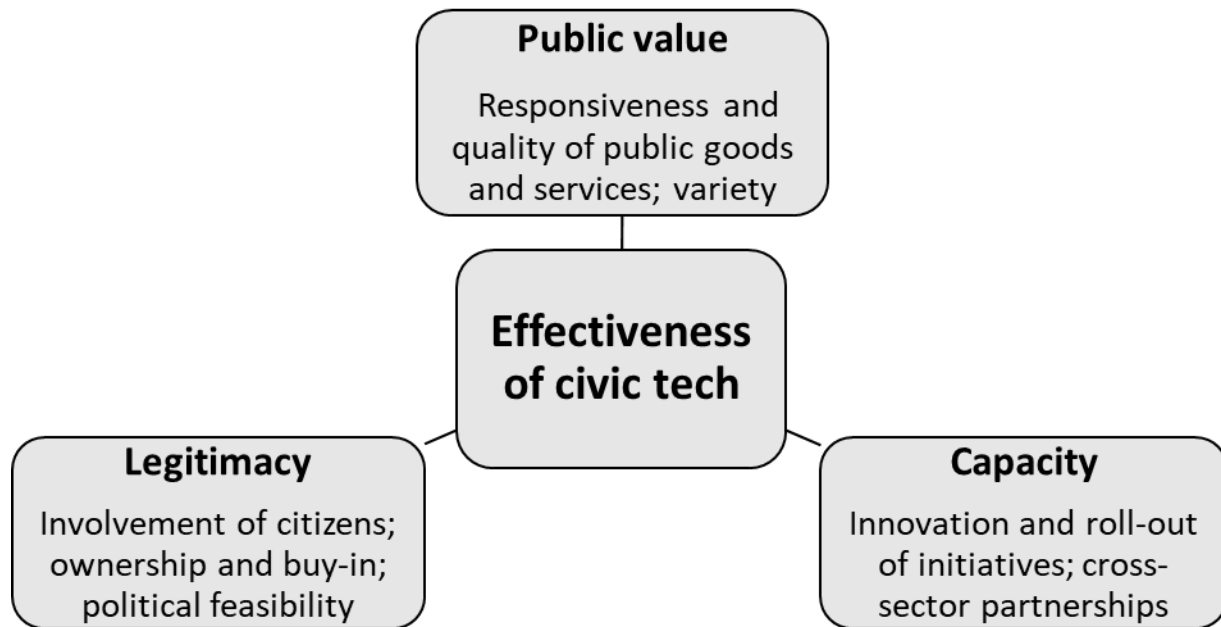
Figure 1: Evaluating civic tech (adapted from Moore (1995))

As innovation and implementation expertise lies almost exclusively with private firms, the civic tech vision risks being shaped by profit interest. Fostering public legitimacy requires civic tech to maintain democratic elements, not as a perfunctory exercise but as a substantive element informing policy design and implementation. This is a crucial step for ensuring buy-in among citizens and strengthening political feasibility. Analytical, managerial, and operational capacity within city governments must also be equipped to enable civic tech innovations, often but not exclusively through cross-sector partnerships.

The ability of technology to produce gains in efficiency, cost savings, and service quality risks excusing governments from the more tedious task of broader systemic transformation. However, civic tech has the potential to bring about such transformation by mobilizing the public interest. In view of this point, this report explores the opportunities and challenges of civic tech, beginning with a description of the concept and highlighting two examples of civic tech-style initiatives. The report then explores implementation challenges and proposals for ensuring successful civic tech platforms. The report concludes with broader implications and a call for deeper interest in the democratizing potential of civic tech.

What is Civic Tech?

The label "civic tech" applies broadly to the application of technology for non-commercial interests that generate public value, with a process-based emphasis on citizen engagement and collaboration. Among numerous definitions in the existing literature are the following:

- "Technology projects involving intentional collaboration between technologists, bureaucrats, entrepreneurs and nonprofit employees to engage the public or solve civic problems." (Code for America[iii])
- "Technologies that are deployed to enhance the relationship between people and government, by giving people more of a voice to participate in public decision making and/or to improve the delivery of services." (Omidyar Network, in *Forbes*[iv])
- "The use of technology for the public good." (Microsoft[v])
- "Using technology in a creative way to help better the lives of individuals in our communities, whether that is through person-to-person interactions, or via person-to-government interactions." (Code for Boston[vi])
- "Technology that enables greater participation in government or otherwise assists government in delivering citizen services and strengthening ties with the public. Civic tech is where the public lends its talents, usually voluntarily, to help government do a better job." (Colin Wood, in Government Technology[vii])
- "Civic tech sits at the intersection of technology and community, improving lives by applying technical solutions to important civic challenges." (Soren Spicknall, for Microsoft[viii])
- "Civic tech aims increase citizen engagement using 21st century tools." (Jack Karsten, for Brookings[ix])
- "Civic technology is used to improve how citizens, businesses, and other groups engage and conduct business with governments." (Ayre and Craner, in Public Library Quarterly[x])

A meaningful exploration of civic tech, for the purpose of this report, requires a basic understanding about what civic tech includes and what it does not. This report defines civic tech as the technology-enabled engagement of civil society in urban governance. This definition encompasses systems across governance tasks (policy design, implementation, and evaluation, etc.) and operational areas (transport, safety, waste management, land use, economic development, etc.).

Civic tech does not include all technology applications related to the public sector, despite conceptual and operational overlaps with smart cities and e-governance initiatives. The distinguishing feature of civic tech is the "civic" – the institutionalized and meaningful engagement of non-government and non-commercial stakeholders in the design, execution, and evaluation of technology-based policy initiatives. As such, civic tech is uniquely poised to satisfy Moore's "legitimacy" criterion (Figure 1) in a way that other technology applications are unable.

Civic Tech in Action

Cities worldwide showcase numerous examples of how civic tech is being applied. From smartphone apps providing data about natural disasters to sensors monitoring the function and condition of urban infrastructure, the potential reach of civic tech is vast. The following cases highlight civic tech projects in Chicago and Singapore to illustrate how civic tech can be used to improve urban services through the involvement of a wide range of stakeholders.

Chicago: Array of Things

Launched in 2016, Chicago's Array of Things (AoT) initiative collects neighborhood-level environmental data through a network of sensors and nodes installed on streetlights throughout the city. According to Catlett et al. (2017)[xi], the project is analogous to an "array telescope" built around internet-of-things (IoT) technologies. Owned by the University of Chicago and publicly available online, AoT's real-time data is collected across several categories related to quality-of-life and public health, including air quality, weather conditions, road conditions (e.g. flooding), flows of traffic (automobiles, bicycles, and pedestrians), and physical vibrations and sound intensity (as from passing vehicles)[xii].

According to AoT's official website, the program acts as the city's metaphorical "fitness tracker" and aims to support the development of applications that help citizens understand their exposure to environmental pathogens – particularly in areas of the city with high potential for such risks[xiii]. Data are also expected to feed into planning and operations systems that would benefit from a dynamic understanding of the city's environmental conditions at a micro scale, and to support predictive analytical capabilities and evidence-based policymaking[xiv]. The AoT project also goes beyond gathering data and utilizes engagement programs that involve schools, community groups, businesses, and researchers[xv]. At the frontier of the AoT model's capabilities, Chicago has an opportunity to provide guidance for potential AoT projects discussed in cities like Chattanooga, Atlanta, and Austin[xvi].

Singapore: Virtual Singapore

As part of Singapore's ambitious "Smart Nation" initiative, Virtual Singapore is a government-backed project to develop a lidar-based 3D digital model of the city-state that acts as a collaborative space where users provide and utilize data[xvii]. Launched in 2018, the project aims to provide historical and real-time data for app developers and visualization and experimentation capabilities for planning and research. The technology is designed to eventually incorporate and synthesize information from government agencies, and in turn to assist agencies in developing and deploying smart city initiatives. According to Singapore's National Research Foundation, examples of Virtual Singapore's practical applications are visualizations of how automobile and pedestrian traffic adjusts to changes in access and the built environment, "greenprint" metrics around new energy sustainability programs implemented in existing buildings, and projections of how new buildings impact sunlight access and the functionality of solar energy systems. The model can also be applied to security and hazard risk identification and management[xviii].

Supporting government agencies in virtual experimentation and test-bedding for new public services, Virtual Singapore's stated goal is not only to strengthen data-informed policymaking but also to enable the development of new apps for use by the public[xix]. As a "digital twin" of Singapore[xx], the project is enabled by broader initiatives to deploy sensors for monitoring environment, health, and safety conditions similar to those utilized by Chicago's AoT. According to Virtual Singapore's official website, the project will engage the public by helping citizens

"connect and create awareness and services that enrich their community" and by helping businesses "tap on the wealth of data and information…for business analytics, resource planning and management." In a 2018 address, Deputy Prime Minister Tharman Shanmugaratnam stated, "beyond making the most of technology, it is also critical that we empower communities and develop the social capital that helps ensure that urban innovations have broadly felt benefits[xxi]."

Implementation Challenges for Cities

The benefits of civic tech in the provision of public goods and services include gains in efficiency and responsiveness attributable to citizen engagement. However, implementing civic tech also forces urban governments to confront some broader challenges defining modern society, namely democratic representation and accountability in policymaking, wicked social problems[xxii] (e.g. socio-economic inequality and crime) that elude technocratic solutions, and capacity constraints in the public sector and their remediation through cross-sector partnerships. Before expecting civic tech to transform urban livability, city governments should undertake a thorough and sincere accounting of the following constraints.

1) **Participatory constraints:** As technology innovation and broad-scale implementation remain largely the bailiwick of the private sector, it is fair to ask how technology can reflect the non-monetary interests of all stakeholders rather than the profit interests of investors alone. While a city's technology profile can be seen as a manifestation of the private sector's response to market signals, civic tech fundamentally transcends market interests, focusing not only on service delivery but also on participation and engagement. The inherent tension between market forces and public interest has no clear resolution and must be mediated through politics, policy, and regulation. Therefore, urban governments must adopt systems to ensure that public participation is institutionalized throughout the conceptualization, design, and implementation of civic tech. Heeding this imperative is central to realizing the vision of civic tech, as the role of private firms in delivering technology should not eclipse the value of citizen input.

2) **Structural constraints:** Given rising private sector involvement in the public sphere, efforts to preserve accountability and responsiveness are crucial. While civic tech provides the infrastructure to facilitate citizen engagement, its transformative potential should not be overestimated. Technology cannot overcome structural failings in governance such as corruption, impediments to citizen participation, and absence of accountability mechanisms. The potential of civic tech goes only as far as what is allowed by existing governance systems. Furthermore, many of the social, environmental, and economic challenges facing cities often elude technocratic solutions. Governments must recognize that while civic tech can fill important gaps in public service portfolios and can generate novel space for citizen engagement and quality-of-life enhancement, it is no substitute for systemic reform where needed[xxiii].

3) **Capacity constraints:** New features of urban governance – including analytical, managerial, and operational capacities[xxiv] – are needed to ensure that civic tech fulfills its potential. Such capacities should exist across governance units at the individual, organizational, and systemic levels. It is not enough for governments to simply ring-fence civic tech and remain peripherally involved while corporations define the field; public servants must be actively engaged as contributors and institutional referees, guaranteeing that resources are channeled in accordance with public value, accountability, and capacity. Furthermore, the potential by-products of civic tech processes, including data about residents' wide variety of daily experiences with city services and infrastructure, can be valuable inputs in planning and policymaking processes – but only if duly anonymized and responsibly utilized. Such data must be managed with appreciation for heightened public concerns about privacy and surveillance[xxv].

Ensuring Successful Civic Tech Platforms

The ability of citizens and small firms to develop technology applications has further stimulated the supply side of the civic tech market. While a free marketplace of technology ideas has arguably unlimited potential, the ability to launch applications at-scale often requires collaborative or commercial engagement to ensure needed platform capacity. Governments have the resources and legitimacy to provide application hosting platforms but may lack technological expertise and innovation capabilities. Bridging this gap requires governments to view hosting platforms not as private infrastructure but as a public good. The following are three principles that cities should embrace in providing civic tech platforms.

1) **Fair and open access:** The term "public good" refers to a good whose access by users cannot be prevented and whose usage is not zero-sum (that is, consumption by one user does not reduce the amount available to other users). Common examples are national-level military protection, public broadcasting, and information. A civic tech platform can be designed for access by a wide variety of user types, but in the presence of capacity constraints (e.g. limited monitoring coverage and data storage), such a platform less resembles a public good than it does a "common pool resource." The latter term is used by economists and ecologists to describe a good that is freely available to all users (difficult to exclude) while being limited in supply; environmental resources such as water and wild fish are typical examples. Civic tech platforms are conceptually analogous to common pool resources and should be treated as such by policy and regulation, particularly with regard to access and inclusion.

2) **Clear criteria for inclusion:** From a practical perspective, capacity and resource constraints prevent government-funded civic tech platforms from hosting every application developed by citizen-entrepreneurs and organizations. An allocative mechanism is needed to ensure fair and competitive access among application developers. This requires a form of market-making, such as government intervention to moderate access based

on clearly defined and communicated criteria. Trial criteria can include general measures of public value, alignment with particular civic objectives, and specific operating requirements such as open sourcing, data quality and sharing, spatial coverage, design process characteristics, and other measures of accessibility.

3) **Responsible cross-sector partnerships:** While a city government can assume primary sponsorship of and responsibility for a civic tech platform project, an NGO or NGO consortium may be contracted to administer the program, with resource support from philanthropic sources or newfound fiscal space. A similar project was introduced in Chicago in the late-2000s that included not only hosting services but also resources to support the development and continued viability of applications. While the civic tech market has created a commercial environment for start-ups to function, there remains a largely untapped opportunity for governments to support civic tech by sponsoring hosting infrastructure while drawing on external expertise for administering it.

Conclusion

Civic tech presents a unique opportunity for applying emerging innovation to citizen needs, many of which are poorly understood and inefficiently served. Technologies related to public services are often developed and implemented through cross-sector partnerships, in which large technology corporations with superior R&D and implementation capabilities provide the capacity that local governments lack. However, the proliferation of open-source applications and other software has democratized innovation in ways that undermine the singular dominance of such corporations. This trend has led to the development of civic tech applications for a variety of purposes, from emergency response and utilities management to voting and democratic participation[xxvi]. Governments should acknowledge and support this innovative ecology, which has arguably improved the scope and richness of urban services.

Given these benefits, governments have an opportunity and emerging mandate to support civic tech by providing hosting platforms. As argued in this report, such platforms should be seen as a public commons in which all application developers and related innovators have the opportunity to participate and benefit within legal and regulatory boundaries. As such, government does not assume the role of creating or endorsing specific initiatives, but merely facilitates their emergence by providing an essential piece of infrastructure that for many civic tech entrepreneurs is prohibitively expensive and complex to maintain. At a broader level, such an initiative would advance public value by validating civic tech as a public service tool with citizen engagement and cross-sector collaboration as core elements. In an era when technology is an increasingly contentious political issue[xxvii], democratizing public service provision through civic tech can give the ongoing digital revolution a much-needed legitimacy boost.

About the Chicago Council on Global Affairs

The Chicago Council on Global Affairs is an independent, nonpartisan membership organization that provides insight—and influences the public discourse—on critical global issues. We convene leading global voices, conduct independent research, and engage the public to explore ideas that will shape our global future. The Council is committed to bringing clarity and offering solutions to issues that transcend borders and transform how people, business, and governments engage the world. Learn more at thechicagocouncil.org and follow @ChicagoCouncil.

Endnotes

[i] *Investments in Technologies Enabling Smart Cities Initiatives Are Forecast to Reach $80 Billion in 2018* (https://www.idc.com/getdoc.jsp?containerId=prUS43576718)

[ii] Moore, M.H. (1995) Defining Public Value, in Moore, M. (1995) *Creating Public Value: Strategic Management in Government*, Harvard University Press, Cambridge, MA, pp. 27-56.

[iii] *About National Day of Civic Hacking* (https://www.codeforamerica.org/national-day-of-civic-hacking)

[iv] *What Is Civic Technology?* (https://www.forbes.com/sites/quora/2017/09/19/what-is-civic-technology/)

[v] *Towards a taxonomy of civic technology* (https://blogs.microsoft.com/on-the-issues/2016/04/27/towards-taxonomy-civic-technology/#sm.001mgvchcbkyetu118517xhz92c8f)

[vi] *About Code for Boston* (https://www.codeforboston.org/about/)

[vii] *What is Civic Tech?* (http://www.govtech.com/civic/What-is-Civic-Tech.html)

[viii] *A Chicagoan's Introduction to Civic Tech — 2018* (https://blogs.microsoft.com/chicago/2018/01/19/chicagoans-introduction-civic-tech-2018/)

[ix] *Women in civic technology show the benefits of a diverse workforce* (https://www.brookings.edu/blog/techtank/2018/06/29/women-in-civic-technology-show-the-benefits-of-a-diverse-workforce/)

[x] Ayre, L.B. and Craner, J., 2017. Technology column: public libraries as civic technology hubs. *Public Library Quarterly*, 36(4): 367-374.

[xi] Catlett, C., Beckman, P., Sankaran, R., and Galvin, K. 2017. *Array of things: a scientific research instrument in the public way: platform design and early lessons learned*. Proceedings of the 2nd International Workshop on Science of Smart City Operations and Platforms Engineering, Pages 26-33.

[xii] *Array of Things File Browser* (https://aot-file-browser.plenar.io/)

[xiii] *Array of Things* (https://arrayofthings.github.io/)

[xiv] *Chicago becomes first city to launch Array of Things* (https://news.uchicago.edu/story/chicago-becomes-first-city-launch-array-things)

[xv] *A Guide to Chicago's Array of Things Initiative* (https://datasmart.ash.harvard.edu/news/article/a-guide-to-chicagos-array-of-things-initiative-1190)

xvi *The City of Chicago and its Array of Things Project* (https://digit.hbs.org/submission/the-city-of-chicago-and-its-array-of-things-project/)

xvii *Virtual Singapore* (https://www.nrf.gov.sg/programmes/virtual-singapore)

xviii *Virtual Singapore project could be test bed for planners - and plotters* (https://www.reuters.com/article/us-singapore-technology/virtual-singapore-project-could-be-test-bed-for-planners-and-plotters-idUSKCN1M70U1)

xix *What is Virtual Singapore?* (https://www.smartnation.sg/what-is-smart-nation/initiatives/Urban-Living/virtual-singapore)

xx *Virtual cities: Designing the metropolises of the future* (https://www.bbc.com/news/business-46880468)

xxi *Virtual Singapore project to be ready by end-2018: Tharman* (https://www.businesstimes.com.sg/government-economy/virtual-singapore-project-to-be-ready-by-end-2018-tharman)

xxii *No Silver Bullet: The New Urban Agenda and Smart Cities* (https://www.fairobserver.com/more/global_change/new-urban-agenda-smart-cities-sustainable-development-climate-news-65431/)

xxiii Vu, K. and Hartley, K., 2017. Promoting smart cities in developing countries: Policy insights from Vietnam. *Telecommunications Policy*, 42(10): 845-859. (https://www.sciencedirect.com/science/article/abs/pii/S0308596117303373)

xxiv Wu, X., Ramesh, M. and Howlett, M., 2015. Policy capacity: A conceptual framework for understanding policy competences and capabilities. *Policy and Society*, 34(3-4): 165-171.

xxv *Will smart cities become the next populist scapegoat?* (https://www.policyforum.net/will-smart-cities-become-next-populist-scapegoat/)

xxvi *What is "Project PopVote"?* (https://popvote.hk/english/)

xxvii *The big tech backlash* (https://www.theguardian.com/technology/2018/jan/28/tech-backlash-facebook-google-fake-news-business-monopoly-regulation)