5 Cybernetic Urbanism: Tracing the Development of the Responsibilized Subject and Self-Organizing Communities in Smart Cities

GÜNEŞ TAVMEN

In 2013 a UK based think tank, Future Everything, released a publication with contributions from well-known smart city critics, including Dan Hill, Anthony Townsend, Martijn de Waal, and Adam Greenfield. Titled *Smart Citizens*, this collection of essays aimed at shifting the focus from the large technology companies and governments that are fostering innovation and efficiency in cities towards the aspirations and abilities of individuals and social businesses in smart cities. With this, the overall aim of the publication was to discuss the ways in which a more participatory and innovative society could be engendered. Most of the essays in the collection encapsulated the issue of citizenship and participation in the smart city as a matter of top-to-bottom versus bottom-up decision-making, and in pursuit of the latter, the discussion is geared towards creating self-organizing communities. For instance, in his essay, Greenfield (2013) says that, while the everyday struggles of city dwellers are largely unrecognized in the smart city literature, if we build technological frameworks that support the processes of self-organization through adaptive and dynamic, real-time local intelligence, then there could be an urban order that is bottom-up. Another common thread in these essays is that a smart citizen is an active citizen who, for example, makes use of open data to participate in the management of their city. Maltby (2013) writes that open-data initiatives provide "a raw material for citizen-led innovation in communities" and, therefore, to benefit from this raw material, citizens should be provided with opportunities to develop further skills in making use of it. Similarly, de Waal (2013) points out a few critical issues regarding open data such as the fact that most citizens might not have the necessary technical skills to make use of data. Subsequently, he argues that open-data platforms need to be paired with online tools and intuitive interfaces to enable effective participation by citizens. Consequently, all these writers agree that citizens should be the active constituents of smart cities by claiming

data-driven innovation instead of leaving it solely to a few selective companies. Thus, they celebrate a vision of decentralized and adaptive technologies to foster responsible and self-organizing community groups.

As I will show in this chapter, smart citizenship in such formulations is envisioned as a subjectivity at the intersection of cybernetic urbanism and the responsibilized individual in neoliberal forms of governance. This means that, although the writers of these essays are critical of corporate visions of smart cities, the views they establish about the smart citizen are not a critique of the way smart cities work. As Vanolo (2014) observes, for instance, smart city discourses describe the urban as a site of responsibilization where the smart citizen is in production together with the smart city. As such, despite the attention to how smart cities perpetuate a top-to-bottom form of governance, smart cities are indeed developed through the very participation of their citizens in various ways. The "2.0 version of urban citizenship" is embedded in a participatory, open-source, and DIY digital urbanism whereby citizens are mainly environmentally distributed unwitting data agents (Gabrys 2014). Furthermore, hackathons, which are based on the voluntary work of participants with technical, design, and business skills, have also been essential to exploiting open data with an entrepreneurial drive that is essential to smart cities (Perng, Kitchin, and Mac Donncha 2018). Subsequently, the articulation of the ideal smart citizen as tech-savvy, responsible, and active meant a lack of critical understanding of the body-subjects that are involved in the (re)production of the smart city through participation and that operate within existing power structures relying on unpaid or low-paid care work (Burns and Andrucki 2021). Therefore, although citizens have indeed been active (and passive) participants in the making of smart cities, participation does not necessarily facilitate a more just city. What these forms of participation mean for (in)justice in the smart city needs more detailed attention to who is empowered to what ends, instead of a binary discussion of top-to-bottom and bottom-to-top. This chapter aims to do this by providing a historical background to cybernetic and neoliberal forms of governance in the urban environment.

I am not alone in suggesting that the construction of the smart citizen embeds a cybernetic vision. For example, Zandbergen and Uitermark (2020) observe that, in Amsterdam, citizen participation in air-pollution sensing is articulated within a *republican* and *cybernetic* framework. By *republican*, they mean informed citizens who use data to leverage their participation in decisionmaking, whereas *cybernetic* citizenship refers to project participants' contribution and immersion in the sensing activities. Similarly, Gillian Rose (2020) makes a case for understanding forms of sociality proposed in smart city planning in three groupings: *sociological, neoliberal,* and *cybernetic*. She observes that *neoliberal* accounts refer to the characterization of social groups as "autonomous," "self-directing," and "self-improving," while a *cybernetic* form of

sociality emphasizes "informational feedback loops" created by enhanced data flows at the service of citizens. In that vision, whether through data or not, the main pursuit is to create unimpeded information flows to and from citizens. In her conclusion, Rose argues that the cybernetic form is distinct from the neoliberal form due to its lack of attention to "self-improving autonomy."

Departing from the suggestion that cybernetic sociality or citizenship is distinct from neoliberal or republican views, in this chapter I argue that a cybernetic form of citizenship has always been articulated in entanglement with neoliberal aspirations in which citizens are imagined as self-organizing and autonomous. By tracing a historical lineage to the implementation of cybernetics on urbanism – especially following later developments in cybernetics (i.e., second-order cybernetics and the emergence of autopoiesis) – I will show that city managers have long sought to build self-organizing, decentralized, autonomous, and responsibilized communities that overlap purviews of both cybernetics and neoliberalism. To do this, I provide an example from the late 1960s to elaborate on an example of cybernetics in action in the design of New York City's governance, together with Jay Forrester's pioneering work that applied cybernetics on urban planning. Through these examples, I intend to show the ramifications of cybernetic urbanism when it is put into action in pursuit of neoliberal governance, and discuss what this means for (in)justice in the smart city.

Cybernetic Urbanism and Self-Governance

IBM's smart city technologies and marketing plans have attracted critical scholarly attention; the cybernetic disposition of these technologies and plans has also been part of these critiques. For example, Söderström, Paasche, and Klauser (2014) note that IBM resurrected the urban cybernetics of the 1970s by "travelling back to the heroic times of post-war cybernetics." Similarly, Goodspeed (2015) starts his analysis of IBM's Urban Operation Centre in Rio de Janeiro by drawing a brief historical lineage between corporate smart city initiatives and urban cybernetics, and argues that corporate definitions of the smart city are the equivalent of the *failed* urban cybernetics of the 1960s and 1970s. As an antidote to this, he proposes a strategy of collaborative and participatory planning by using information technologies, which, according to Goodspeed, is not a cybernetic approach. This is because, for him, cybernetic thinking has been found to be incompatible with urban planning since the 1960s. As this chapter shows, however, most of these suggestions that are given as counter to smart cities indeed overlap with ideas rooted within cybernetics such as decentralization, horizontal decisionmaking (e.g., community networks), adaptivity, and self-organizing systems.

Although these scholars have rushed to dismiss the urban application of cybernetics, the field has had long and intricate relationships with urban planning, architecture, space, media technologies, and design (see, for example, Halpern

2015; Krivý 2016; Martin 2003). Furthermore, cybernetics has involved a great variety of disciplines, making it a highly complex area of thinking. Although it was established as a universal field, the ideas in the early days of cybernetics (i.e. first-order cybernetics) were later challenged in the 1960s, when many fundamental theories within the field were contested (i.e. second-order cybernetics). Initially developed by a mathematician, Norbert Wiener, in the late 1940s, cybernetics aimed at presenting a new paradigm in information and communications with an emphasis on informational and spatial decentralization. This first wave studied how to maintain stability through feedback loops in machines in the same way as living organisms that regulate themselves so as to maintain a steady state (homeostasis) (Hayles 1999). With the involvement of many social scientists, there have been efforts to apply these theories to societal relations and processes, although Wiener was not blind to the drawbacks of translating biological systems to social systems. According to Medina (2011, 37), for example, for Wiener, cybernetics was "ill-suited for the study of social systems because they could not generate the long-term datasets under the constant conditions that his statistical prediction techniques required."

Emerging during the 1960s, second-order cybernetics redefined systems by locating the observer within the system, rather than outside, in contrast to first-order cybernetics. This meant an epistemological shift in the field that brought the observer's "objectivity" into question. Humberto Maturana, a biologist and a pioneering thinker in second-order cybernetics, defined the observer's inference as the individual's own interpretation – in other words, as an "embodied action" (Wolfe 1995) – and suggested a different understanding of how systems are organized. According to this idea, "a living system is not a goal-directed system" (Maturana, cited in Hayles 1999, 139); therefore, it would always function insofar as its organizational capacity allows, but always in relation and in reference to structurally coupled outsiders (i.e., observers), meaning that systems respond to their environment in ways determined by their internal self-organization. As Hayles (1999) argues, substituting homeostasis with autopoietic systems put an emphasis on the *process*, which makes it readily adaptable to the analysis of social systems. This meant that the application of these ideas to governance occurred around the same period as the emergence of second-order cybernetics, although the conceptual relationships among architecture, urban planning, and cybernetics was present from the very beginning. This is partly due to the convenience of autopoietic theory's adaptability to social systems, since the idea of self-organizing systems was not particular to cybernetics but had been a feature of urban studies for a while. As Krivý (in this volume) argues, urbanists have enthusiastically embraced the idea that cities are complex and self-organizing systems, and have offered urban governance models that address these characteristics, often in a way that is auxiliary to the way (smart) urbanism is imagined by capitalistic objectives.

Urban Cybernetics and Self-Organizing Community Visions

In 1968, in a paper delivered at the Annual Symposium of the American Society for Cybernetics, the First Deputy City Administrator at the Office of the Mayor, City of New York, Steve Savas, expounded on the nexus of cybernetics and urban government. Savas, manager of urban systems at IBM before moving to the New York City mayor's office, was one of the "analytically trained administrators" who was hired to carry out governmental reform in order to tackle the high levels of social unrest at the time (Green and Kolesar 2004). In the revised version of his paper entitled "Cybernetics in City Hall" (1970), Savas answers the question as to what one could tell if one were to apply the principles of cybernetics to cities. Although Goodspeed (2015) suggests that Savas's paper is a "pessimistic prognosis for the political feasibility of urban cybernetics," Savas was indeed embracing cybernetic principles as an antidote to political and systemic shortcomings together with a short account of the possible challenges. For instance, in Savas's view, local government employees are "mediocre" and "inadequate" due to the current political system; however, their incompetency could be overcome by using a "systems analysis" approach in the urban management model. In fulfilment of his duty to reform government, Savas sought to introduce the principles of "management science" to city government, an idea arguably shaped during his time at IBM. To make up for the failings of political institutions, Savas suggested implementing cybernetics-informed systems to address New York's structural problems in a technocratic manner.

Savas was critical of first-order cybernetics due to its linear assumptions, which tend to simplify the complexities of urban life. His assertion, however, did not dismiss the use of cybernetic principles in governance; rather, it was about praising the novelties anticipated by second-order cybernetics. For instance, expanding on the time constraints that an elected administration faces, Savas proposed a cybernetics-inspired participatory democracy model based on a decentralized feedback control function realized by using minor-loop controls. By means of such controls, "[g]etting decision-making down into the community offers hope of getting more rapid response and more effective performance of the system" (Savas 1970, 1067). He also drew attention to the complications of complete decentralization by referring to a current "school turmoil" in New York City that stemmed from failing to handle the high-level regulative diversity of decentralized decisionmaking. He therefore suggested a "cascade control" type of administration: a terminology and technique borrowed from systems engineering in order to coordinate independent minor-loop controllers. According to this model, the high-level controller sets the goals, yet the means to achieve these goals are determined by local action. Subsequently, the means to the end may be diverse and designed hyperlocally – or "crowdsourced," to use a current term – whereas the end is determined by the central

authority. Thus, participatory practices through decentralized cybernetic systems are envisioned as those where participation becomes an instrument to fix problems that are identified in a top-to-bottom fashion. In other words, participation is not envisioned as an act for citizens to contest the governance of their urban environments; rather, it is imagined as turning citizens into agents who maintain the city's operation *efficiently*. Thus, his vision is about enabling a pragmatic urban management system that would make up for the shortcomings of public administration, instead of finding ways to build a more just city by inviting citizens to voice their priorities and everyday struggles.

Furthermore, Savas pointed out a problem regarding the information systems that are available to a city mayor. Using a cybernetic lexicon, he identified possible information channels: members of the mayor's party, bureaucrats at city hall, civil disorder, and elections. He then noted that these channels are of "high-impedance." For this reason, he suggested, "[t]he cyberneticist can immediately identify ways to improve the quality, quantity, and flow of usable information to the mayor: increase the sampling rate, open more feedback channels, increase the bandwidth, enhance weak signals, match impedances, suppress noise, and correct biased signals" (Savas 1970, 1068). He said this was the sort of innovation New York City was undertaking by building up "Neighbourhood City Halls" to open up more information channels and increase sample sizes until the day when the computer became the "electronic equivalent" of the mobile neighbourhood hall. And when this happens, he added, it would be much more convenient to decentralize data acquisition and service delivery, while also maintaining centralized coordination and control – a vision that is perpetuated by today's smart cities.

Predictably, Savas's paper contains several references to Jay Forrester. A computer engineer who later turned into a "systems scientist" at MIT, Forrester applied his dynamic systems theories to cities in his highly influential book *Urban Dynamics* (1969). One of Forrester's influential projects was to build systems by mathematical modelling that focused on avoiding time delays by feedback loops – one of the urban management problems Savas mentions. For this project, Forrester first analysed a General Electric plant and subsequently wrote *Industrial Dynamics* in 1961. Later, in search of another complex system on which to apply his "cybernetic tool kit" that he called "system dynamics," his path coincidentally crossed with that of a former Boston mayor at MIT (Townsend 2013). Inspired by this collaboration, Forrester looked into housing and labour markets, and consequently created computer simulations to abstract a generic system that explained how cities worked. Highly criticized for his lack of reference to the research carried out in urban studies at the time, his response was that it would be a time-consuming and a separate set of work to go through relevant studies on urban behaviour and dynamics. According to Townsend (2013), instead of studying relevant research on urban studies,

Forrester merely relied on his computer simulation to propose the demolition of slums and subsidized social housing, describing these systems as "poverty traps." He also concluded that job training and job creation resulted in higher levels of unemployment because urban systems demonstrated "counterintuitive behaviour" due to their self-organizing nature, just like an autopoietic organization (Savas 1970). Thus, Forrester demonstrates that problems such as unemployment and house shortages are the yields of the system's internal forces and cannot be dealt with by acting upon the external symptoms (Birch 1970). In other words, because they are self-organizing (i.e., autopoietic), urban systems are structurally open to policy intervention, but are organizationally closed to changes resulting from them.

In addition to his lack of reference to current research on urban studies, Forrester was also attacked for simplifying urban systems and jumping to quick conclusions despite his claim that urban systems were complex organizations that had an intrinsic logic. Birch, who was working on economic development in cities and suburbs at Harvard University, writes in his book review that "Forrester's model is dangerous," since "a man with a good will" but lacking in technical knowledge could take the book seriously by ignoring the fact that Forrester constructed a model "which will make *any* set of policy recommendations winners" (Birch 1970, 69). Reminding readers that such a model had never been tested in an actual city, but rather consisted of the speculative ideas of a few technicians sitting in a room, Birch believed the validity of the model's assumptions was highly questionable. In another review of the book, James Hester (1970), a researcher at the Joint Center for Urban Studies at MIT and Harvard University, says that *Urban Dynamics*, whose primary authors are "Jay Forrester and an IBM 360/67 computer," is essentially about a computer simulation model and not the urban reality itself. Although Forrester (1970) believed his computer modelling was inclusive of humans – unlike engineers' approaches to the city – his critics argued that his computerized methodology to understand city dynamics was based on observations detached from the city itself.

Paradoxically, in effect, Forrester (1970) argued that many urban policies were designed to attack symptoms, but not the causes, of problems due to the technocratic and linear tendencies of urban regulations designed to give results in the short term, although causalities require long-term solutions. He further stated that engineers tend to favour economic and technological improvements and to ignore intangible factors such as social values and quality of life; they therefore create stagnation and decline in urban areas. This is especially remarkable given that Forrester was (and has since been) criticized for simplifying cities with his mathematical modelling, although, in theory, he believed that cities and their problems were much too complex to solve with short-term technocratic solutions. Moreover, according to him, since engineers had long

been interested in their systems and technologies without enough consideration of people, only cybernetics could solve the problem of human interaction. Strikingly similar to why smart cities are criticized, Forrester also blamed technocratic urban management systems that overlook causalities and focus on symptoms.

On the other hand, what is profound in Forrester's work is his application of self-organizing systems approach to urban dynamics, together with his dismissal of contingency and the embodiment of observations that were fundamental to second-order cybernetics. By employing the view of self-organization in this manner, he was able to suggest a set of essential attributions to slums and social housing as "poverty traps," as if these were closed systems that exist outside any social or political context. Although he acknowledged that short-term technological solutions would not solve structural problems, and that the cause of these problems should be addressed instead of the symptoms, he also suggested cutting off policy interventions designed to eradicate these problems. This was because, in his formulation, political interventions emerge outside the system in which slums and social housing emerge. The ideas of decentralization and self-organization do not necessarily indicate a progressive governing system – quite the opposite: instead of tackling the major problem of social inequality, they entrench it by implying that it is a natural phenomenon due to the autopoietic nature of urban systems. This is mainly why the "systems approach" fails to address "wicked problems" of cities, which are malignant, tricky, and malicious, as opposed to the benign and tame problems that engineers choose to deal with, as Rittel and Webber (1973) argue.

As a result of developing housing projects inspired by Forrester and his computer-simulated housing modelling, Savas was later appointed assistant secretary of the US Department of Housing and Urban Development by President Ronald Reagan. According to his profile page on the website of Baruch College, City University of New York, where he is currently a professor, Savas "is an internationally known pioneer in, and authority on, privatization."[1] Indeed, he is the writer of many books, including *Privatization: The Key to Better Government* (1987) and *Teaching Children to Use Computers* (1985). His book on privatization has been translated into twelve languages, from Spanish to Korean, Turkish to Polish. A former IBM manager of urban systems, throughout his time in various managerial roles in the public sector, Savas has played an important role in transforming New York City's and, indeed, America's housing, welfare, and public service systems. As Martin (2003) puts it, "[c]orporations like IBM linked modulated flexibility with organicist notions of open-ended yet controlled growth, correlated with pseudo-freedoms of self-realization within a flexible framework" (159). Pseudo freedoms and self-realization were consequences of the convergence of the cybernetic and neoliberal agendas of the era: defining urban realms as self-organizing, thereby suggesting inequality

and other structural problems were inevitable by keeping politics out of the equation. Savas's appointment to the New York City mayor's office was already within the scope of a "governmental reform" that was essentially prompted by the neoliberal agenda of the era. Embracing and adapting a selective set of cybernetic principles to urban management, he then became an internationally renowned expert in the privatization of public services.

Smart Citizenship in Open-Data-Driven Smart Cities

Cyberneticians were not oblivious to the potential of adverse social consequences of the systems they designed and materialized. Those especially who were involved in establishing second-order cybernetics thought of their main principles outside the paradigm of efficiency and optimization. With the emergence of unintentional adverse effects over time, however, this did not result in an overall critical understanding of cybernetic thinking. Instead, these were addressed as "flaws" to be overcome through *technical progress*. This meant a lack of critical overview of the application of cybernetics to social systems, including urban governance. In a recursive system of its own creation, built on validation from multiple disciplines, cyberneticians and administrators who adhered to their principles therefore ended up entrenching these flaws deeper within the mechanisms they designed through cybernetic principles (see, for example, Turner 2006, 24–6).

Similarly, in smart citizen visions, policymakers and even some critical writers continue to frame the lack of equitable participation in (smart or otherwise) urban planning as a technical issue, whereby the decentralization of data collection, access, and use is the main goal. This is reflected particularly in open-data-driven smart city discourses, since the main idea here is that citizens inexorably would be empowered once they had free access to data about their city. Although it has been argued that open data in smart city panning are mobilized towards an entrepreneurial agenda (see Barns 2016), there is a lack of critique that it is also geared towards a cybernetic urban vision coupled with neoliberal tendencies. In addition to the pressing question of who will be able to use the open data, we should also think critically about the responsibilization of citizens and the narrative of self-organizing groups in an environment characterized by stark inequality. Otherwise, our understanding and formulation of the empowerment and participation of citizens will be highly limited and eventually will perpetuate social and digital injustice in open-data-driven smart cities. Decentralization, horizontalization, and self-organization do not inexorably pave the way to an equitable society in a world of inequalities. Cyberneticians have failed to acknowledge this fundamental issue by taking politics out of the equation in their application of cybernetics to social systems, as we have seen with the example of Forrester's urban dynamics. Despite his effort to go

beyond technocratic management models and his neglect of conclusions from urban studies and reliance instead on mathematical models, Forrester's work has been instrumental in infusing efficiency and productivity into the equation, instead of empowering citizens towards progressive ends, such as eradicating inequality. I argue that, since open-data-driven smart cities tend to propagate a similar approach, we need more critical outlook that goes beyond the entrepreneurial dimension to take the perils of self-organization into account.

NOTE

1 See the website at http://www.baruch.cuny.edu/mspia/faculty-and-staff/full-time-faculty/es-savas.html

REFERENCES

Barns, S. 2016. "Mine Your Data: Open Data, Digital Strategies and Entrepreneurial Governance by Code." *Urban Geography* 37 (4): 55–71. https://doi.org/10.1080/02723638.2016.1139876

Birch, D. 1970. "Urban Dynamics-Forrester, JW." *Sloan Management Review*: 67–9.

Burns, R., and M. Andrucki. 2021. "Smart Cities: Who Cares?" *Environment and Planning A: Economy and Space* 53 (1): 12–30. https://doi.org/10.1177%2F0308518X20941516

de Waal, M. 2013. "Open Data: From 'Platform' to 'Program.'" In *Smart Citizens*, ed. D. Hemment and A. Townsend, 79–82. Manchester: Future Everything.

Forrester, J. 1969. *Urban Dynamics*. Cambridge, MA: MIT Press.

Forrester, J. 1970. "Systems Analysis as a Tool for Urban Planning." *IEEE Transactions on Systems Science and Cybernetics* 6 (4): 258–65. https://doi.org/10.1109/TSSC.1970.300299

Gabrys, J. 2014. "Programming Environments: Environmentality and Citizen Sensing in the Smart City." *Environment and Planning D: Society and Space* 32 (1): 30–48. https://doi.org/10.1068/d16812

Goodspeed, R. 2015. Smart Cities: Moving beyond Urban Cybernetics to Tackle Wicked Problems." *Cambridge Journal of Regions, Economy and Society* 8((1): 79–92. https://doi.org/10.1093/cjres/rsu013

Green, L., and P. Kolesar. 2004. "Improving Emergency Responsiveness with Management Science." *Management Science* 50 (8): 1001–114. https://doi.org/10.1287/mnsc.1040.0253

Greenfield, A. 2013. "Recuperating the Smart City." In *Smart Citizens*, ed. D. Hemment and A. Townsend, 9–12. Manchester: Future Everything.

Halpern, O. 2015. *Beautiful Data: A History of Vision and Reason since 1945*. Durham, NC: Duke University Press.

Hayles, K. 1999. *How We Became Posthuman: Virtual Bodies in Cybernetics, Literature, and Informatics*. Chicago: University of Chicago Press.

Hemmett, D., and A. Townsend, eds. 2013. *Smart Citizens.* Manchester: Future Everything.
Hester, J. 1970. "Systems Analysis for Social Policies." *Science* 168 (3932): 653–4. https://doi.org/10.1126/science.168.3932.693
Krivý, M. 2016. "Towards a Critique of Cybernetic Urbanism: The Smart City and the Society of Control." *Planning Theory* 17 (1): 8–30. https://doi.org/10.1177/1473095216645631
Maltby, P. 2013. "Open Data and Beyond: How Government Can Support a Smarter Society." In *Smart Citizens*, ed. D. Hemment and A. Townsend, 59–62. Manchester: Future Everything.
Martin, R. 2003. *The Organizational Complex: Architecture, Media, and Corporate Space*. Cambridge, MA: MIT Press.
Medina, E. 2011. *Cybernetic Revolutionaries: Technology and Politics in Allende's Chile*. Cambridge, MA: MIT Press.
Perng, S., R. Kitchin, and D. Mac Donncha. 2018. "Hackathons, Entrepreneurial Life and the Making of Smart Cities." *Geoforum* 97 (December): 189–97. https://doi.org/10.1016/j.geoforum.2018.08.024
Rittel, H.W.J., and M. Webber. 1973. "Dilemmas in a General Theory of Planning." *Policy Sciences* 4: 155–69. https://doi.org/10.1007/BF01405730
Rose, G. 2020. "Actually-Existing Sociality in a Smart City." *City* 24 (3–4): 512–29. https://doi.org/10.1080/13604813.2020.1781412
Savas, E.S. 1970. "Cybernetics in City Hall." *Science* 168 (3935): 1066–71. https://doi.org/10.1126/science.168.3935.1066
Savas, E.S. 1985. *Teaching Children to Use Computers: A Friendly Guide*. New York: Teachers' College Press.
Savas, E.S. 1987. *Privatization: The Key to Better Government*. Chatham, UK: Chatham House.
Söderström, O., T. Paasche, and F. Klauser. 2014. "Smart Cities as Corporate Storytelling." *City* 18 (3): 307–20. https://doi.org/10.1080/13604813.2014.906716
Townsend, A. 2013. *Smart Cities: Big Data, Civic Hackers and the Quest for a New Utopia*. New York: Norton.
Turner, F. 2006. *From Counterculture to Cyberculture: Stewart Brand, the Whole Earth Network, and the Rise of Digital Utopianism*. Chicago: University of Chicago Press.
Vanolo, A. 2014. "Smartmentality: The Smart City as Disciplinary Strategy." *Urban Studies* 51 (5): 883–98. https://doi.org/10.1177/0042098013494427
Wolfe, C. 1995. "In Search of Post-Humanist Theory: The Second-Order Cybernetics of Maturana and Varela." *Cultural Critique* 30 (Spring): 33–70. https://doi.org/10.2307/1354432
Zandbergen, D., and J. Uitermark. 2020. "In Search of the Smart Citizen: Republican and Cybernetic Citizenship in the Smart City." *Urban Studies* 57 (8): 1733–48. https://doi.org/10.1177/0042098019847410