Introduction

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Smart is in. The latest buzzword in the technology industry and policy circles is smart. We've built massive networked surveillance systems with the rise of the Internet that seem poised to inject intelligence into every aspect of our lives. Proponents of the Internet of Things, big data, sensors, algorithms, artificial intelligence and various related technologies make seductive promises, including that increased intelligence – "smart" phones, grids, cars, homes, classrooms, clothing, and so on – will minimize transaction costs, maximize productivity, and make us perfectly happy.

Yet society isn't really structured to optimize social institutions and systems to maximize efficiency, productivity, or happiness. It may sound counterintuitive, but we usually take the opposite approach. We don't optimize. The social value of leaving a wide range of opportunities open for the future generally exceeds the value that society could realize by trying to optimize its systems in the present. At least in the United States, Europe, and most liberal democracies, the default operating principle of social governance of people and shared resources is to leave things open and underdetermined; this principle allows individuals and groups to engage in self-determination with different outcomes, depending on the context and changing conditions. As law professor Julie Cohen (2012) succinctly put it, we need ample room for play. We should expect locally appropriate and responsive governance, and are better when cities can experiment.

Can playfulness or experimentation in governance coexist with smart systems? Regardless of the empirical answer, the seductive promises of intelligent optimization are difficult to resist, with adoption often preceding the necessary policy evaluation. Smart cities are exemplary. Around the world, cities have jumped aboard the smart tech bandwagon; others race to catch up, as public officials worry about falling behind. But whenever one sees "smart" in tech discussions, insert "supposedly" in front of "smart" and then ask a series of questions: Who gets

smarter? How? With respect to what and whom? Who gains what power? These and many other important questions need to be asked prior to investment or deployment.

Smart cities require trusted governance and engaged citizens, especially governance of intelligence and intelligence-enabled control. In some very important respects, smart cities should remain dumb, and that will take governance. One way to quickly see the point is by way of analogy to the Internet and the decades-long and still ongoing debate about network neutrality. When an ISP knows who is doing what online, the ISP gains power that can be exercised in various ways, such as price discrimination or prioritization. Network neutrality regulation aims to constrain intelligence-enabled control by infrastructure owners so that users retain their freedom. Cities face very similar challenges for many different infrastructures and services as they pursue smart solutions and innovation. In both cases, new smart systems transform control and influence, enhancing the power of decision-makers, while individuals and grassroots-level communities lose capabilities.

Integrating surveillance, AI, automation, and smart tech within basic infrastructure as well as public and private services and spaces raises a complex set of ethical, economic, political, social, and technological questions that requires systematic study and careful deliberation. The Governing Knowledge Commons (GKC) framework provides a descriptive lens through which to structure case studies examining smart tech deployment and commons governance in different cities. This book presents a series of interdisciplinary social science case studies, deepening understanding of community governance institutions, the social dilemmas communities face, and the dynamic relationships between data, technology, and human lives. It also serves as guidance for communities deploying smart tech. The GKC provides a series of questions that any community should be able to answer prior to or at least during deployment of supposedly smart tech. Using the GKC framework to study smart cities also allows researchers to focus on different resource-user-technology systems within a smart city – e.g., transportation, health, education, and so on.

Chapter 1 of this volume applies the conceptual framework to the context of and governance challenges faced by smart cities. Drawing on the amended GKC framework, as augmented in the conclusion of *Governing Privacy in Knowledge Commons* (2021), this chapter articulates research questions that can guide inquiries to support both improved understanding of the datafied city as a knowledge commons and empirically grounded public policy-making. Drawing on insights from Chapter 1, chapters in Part I explore the nature of social dilemmas around urban data, highlighting two distinct structural frames: polycentricity (addressed in depth in Part II) and the dominance of private actors over public data (explored in Part III). The book concludes in Part IV with lessons for smart cities.

Part I, the Social Dilemmas around Urban Data, explores some of the collective action problems, action arenas, and complexity of urban data resources in the

context of smart cities. In Chapter 2, "The Challenge for Cities of Governing Spatial Data Privacy," Feiyang Sun and Jan Whittington explore the collective action problems associated with urban data governance in the city of Seattle, highlighting specific transaction costs and externalities associated with different departments and data resources. They argue that longitudinal governance and coordination efforts to prevent weak links from undermining citizens' privacy are necessary investments and priorities for municipal governance.

In Chapter 3, "Open Governments, Open Data," Anjanette Raymond and Inna Kouper analyze the Bloomington Open Data Portal as a case study on co-production of participatory digital commons resources and governance in Bloomington, Indiana. They address the conceptual mapping of open data onto the GKC framework, as well as the coordination challenges posed as local governments attempt to work with other types of stakeholders. While these chapters address very different contexts and challenges, they importantly suggest the impact of decision-making structures on outcomes, highlighting the split between polycentric public arrangements and public decision-making arenas dominated by private actors.

Part II, Polycentricity and Urban Data, highlights the impacts of coordination and centralization among the polycentric decision-making authorities among metropolitan agencies and services. In Chapter 4, "Community Land Trusts as a Knowledge Commons: Challenges and Opportunities," using cases of community land trusts (CLTs) in DC, Boston, and San Francisco, Natalie Chyi and Dan Wu address the challenges associated with CLTs as the community of owners must coordinate to manage physical and informational resources and practice mutually appropriate stewardship. They find that interorganizational information flows increase governance efficiency and make a case for functional polycentricity.

In Chapter 5, "Smart Tech Deployment and Governance in Philadelphia," Brett Frischmann and Marsha Tonkovitch examine two action arenas: the macro-level action arena, which concerns city-wide governance of smart tech deployment as reflected in a set of smart city initiatives, and which concerns city-wide governance of vacant land management and the various roles smart tech plays. They highlight a series of governance challenges, including around crime, safety, and trash, that intersect multiple decision-making authorities and necessitate involvement of community groups. They also identify some fundamental limitations on what smart tech can do to resolve the vacant land crisis.

In Chapter 6, "The Kind of Solution a Smart City Is," Michael Madison addresses smart modernization in postindustrial Pittsburgh, exploring present efforts to benefit from data collection and analytics, relative to the complex history of urban technology in the region. In addition to highlighting remarkably salient properties around boundaries and expertise in smart cities, this chapter

explores the material and immaterial layers of data and governance. It notably maps the challenges from historic polycentricity cases concerning physical resources and services onto the modern, digital concerns present in smart cities today.

Part III, Private Influence on Decision-Making, moves beyond the coordination and collective action challenges in the public sector to address the impact of industry on public data collection and decision-making. In Chapter 7, "Technofuturism in Play," Madelyn Sanfilippo and Yan Shvartzshanider address the case of Disney World as a quasi-public recreational space in which highly concentrated, ubiquitous, and invisible data collection drives numerous services and innovation. They find that while many data practices are contentious and would not be appropriate for other contexts, the trust consumers have in Disney and their history of responsive governance meets local expectations.

Chapters 8 and 9 both address the case of the Sidewalk Toronto/Quayside smart city project, highlighting the impact of Alphabet on governance approaches. In "Can a Smart City Exist as Commons?" Anna Artyushina explores the action arenas of data-driven planning and data trusts, arguing that the private sector can only manage public infrastructure when public administrators take on intermediary roles between companies and state regulators. This has significant implications for efforts to privatize or outsource public administration in smart cities. In "From Thurii to Quayside," Richard Whitt explores a historical comparison to Thurii with respect to democratic ownership and city planning, highlighting the ways in which private decision-makers fail to meet the public's inclusion, balance, and transparency expectations. He builds on this analysis to offer innovative suggestions for designing more inclusive interfaces.

Part IV, Lessons for Smart Cities, synthesizes these cases and the broader literature on smart cities to think through what good governance for public data resources might look like and what we can learn from GKC structured case studies. In Chapter 10, "A Proposal for Principled Decision-Making," Madelyn Sanfilippo and Brett Frischmann suggest a list of conceptually motivated but practically relevant questions that can guide principled decision-making in smart cities, rejecting a single set of design principles as a one-size fits-all approach. This book ends in the GKC framework tradition, with a concluding chapter reflecting on patterns and insights across cases to both understand how commons arrangements best support smart cities and what new questions future GKC studies ought to address. While the GKC framework does not serve as a normative benchmark or a functional panacea for smart cities, it provides a descriptive framework to support comparison, helping cities to learn from one another, and to structure analysis and decision-making. Smart cities are knowledge commons in which data resources generated with new and existing services must be co-produced with appropriate governance.

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Smart Cities and Knowledge Commons

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introduction and overview

Why wonder about "smart" technologies and systems? The rhetoric of intelligence is seductive. With the rise of the Internet over the last twenty-five years, massive networked information systems are injecting ever more "intelligence" into the devices that surround us and even, it seems, into every aspect of our lives. If the evidence from broad acceptance of "smart" televisions and "smart" phones is to be credited, on a broad scale people like their "smart" lives. Adding "intelligence" via the Internet of Things, big data, sensors, algorithms, artificial intelligence, automation, and related technologies seems to minimize burdens, maximize productivity, and make us perfectly happy as both citizens and consumers. Smart technology promises to help us and, in the hands of public authorities, to help the government. It seems to anticipate our needs and desires; it seems to make government flexible, responsible, and error-free.

To invert a line from a classic rock song, sometimes you get what you want but can't always get what you need. What's convenient or productive for one person may be harmful for society as a whole. "Smart" technology raises important questions and potential conflicts about individual and collective good that may make us rethink whether "smart" things are so good for the individual, after all. The smart city, the subject of this book, puts those conflicts in stark relief. City life, and the study of city life, is all about the place of individual welfare in a complex social setting.

We'll remove the quotation marks from "smart" from here on, recognizing that the word is a metaphor and that it conceals as much as it reveals. What it conceals is the fact that devices and social systems are rarely structured to optimize efficiency, productivity, or happiness. They aren't smart, even if it's possible to call a device, rather than a living being, smart or dumb. They have functions and meanings; they enable human beings to do certain things and to do them more or less easily or expensively. But optimizing their functions and clarifying their meanings isn't the

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only goal for their designers or for society. Calling something smart conceals the fact that in any given context, including cities (and perhaps especially in cities), we're accustomed to, and expect, significant opportunities to choose and to act however we wish. We can use devices not only as they're intended and designed to be used but also in other ways. And we can behave in ways that we choose and that no one else can see. At least in the United States, Europe, and most liberal democracies, the default operating principle of social governance of people and the resources they share is to leave things largely open, underdetermined, and unmonitored. That enables individuals and groups to develop their own visions for their futures and to engage in self-determination with different outcomes, depending on the context and changing conditions. Calling something smart distracts us from wondering not only about what opportunities to choose and what we might be losing but also about who is making those choices for us, and where, how, and why.

This volume argues for getting past the rhetoric of smart technology and intelligence and for pursuing a different approach. Using the smart city as its focus, it offers a simple thesis: the knowledge, information, and data that constitute smart cities require governance, especially governance of data-focused intelligence and intelligence-enabled control.

Smart city technology has its value and its place; it isn't automatically or universally harmful. Urban challenges and opportunities addressed via smart technology demand systematic study, examining general patterns and local variations as smart city practices unfold around the world. Smart cities are complex blends of community governance institutions, social dilemmas that cities face, and dynamic relationships among information and data, technology, and human lives. Some of those blends are more typical and common. Some are more nuanced in specific contexts. This volume uses the Governing Knowledge Commons (GKC) framework to sort out relevant and important distinctions. The framework grounds a series of case studies examining smart technology deployment and use in different cities. This chapter briefly explains what that framework is, why and how it is a critical and useful tool for studying smart city practices, and what the key elements of the framework are. The GKC framework is useful here and can also be used in additional smart city case studies in the future.

Because the GKC framework for studying resource governance relies on the premise that information, knowledge, and data are key shared resources in a given institutional setting, it's important to set up the usefulness of the GKC framework for smart cities by briefly reviewing relevant perspectives on cities and urbanism generally. That material takes up the next section. The smart city is new because of its reliance on twenty-first-century sociotechnical arrangements and cutting-edge information technology to bring attention to the long-standing informational aspects of the city. A brief summary of the critical changes wrought by the smart city follows the history of research on the city. The chapter concludes by presenting the GKC framework itself, the foundation for the case studies that follow.

FRAMING THE CITY

Studying the "smart" city has to start with understanding the city itself. Research on smart cities characteristically focuses on nuances of the sociotechnical "smart" (Goldsmith and Crawford 2014) and pays less attention to the details of the material "city." But research and writing about smart cities necessarily build on generations of practice and critique with respect to cities generally. Several frames emerge from that literature and inform both smart city research generally and the case studies that appear in this book.

Cities from the Bottom Up and the Top Down

One frame is how the city adopts, extends, and refracts bottom-up and top-down governance perspectives. Cities are people in places, evolving over time, managing resources at various scales and in various combinations (Cronon 1992; Rybczynski 1996). Who makes those decisions? Who guides the city? Intuitively, we think of political leaders and the experts they hire. The most celebrated urbanist of the latter part of the twentieth century, Jane Jacobs, pointed out the risks of concentrating too much credit and power for urban success in the hands and offices of political and technocratic elites (Jacobs 1961).

Jacobs' vision of reform, which is still influential today, saw the city not as a machine engineered from above but instead as a complex adaptive system emerging from below, drawing on the wisdom of people experiencing the city in their daily lives, at ground level. Jacobs acknowledged that people in cities often behave selfishly and stupidly. She accounted for diversity in experience and attitude by envisioning the city as a system that is capable of generating and regenerating itself. People in cities could organize themselves via a kind of collective social intelligence, if urban planners and municipal governments would, in effect, allow the city to be as smart as it might be. Jacobs stood up for this vision in opposition to the top-down centralized control exercised by her urban planning adversaries, including most notoriously New York's Robert Moses, who aimed to govern the city in the name of rationality, efficiency, and order.

Top-down and bottom-up perspectives are rarely either/or. People in cities often fail to realize their collective capabilities. Cities become vehicles for oppression and worse; they fail to provide education, health, wealth, and security as they should. Bottom-up governance strategies need to be married productively and fairly to top-down central, perhaps even technocratic management. Does the smart city do that? If so, how, and with what consequences?

Cities as Surveillance

Smart cities today are often critiqued for injecting technologies of citizen surveillance into all manner of practice and places that should remain free of state

intrusion (Sadowski and Pasquale 2015). Asking where and how contemporary information collection is justified lines up with broader, independent histories and critiques of cities as instruments of surveillance and information collection. James Scott provocatively argues that the history of cities can be traced back to the premise that surveilling city residents and collecting information about them, especially for tax purposes, explains the origins of cities in the first place (Scott 2017). That work suggests that certain state-based surveillance functions might be essentially integral to the urban form, rather than contradictory to the aspects of cities that we imagine promote individual freedom and autonomy. It raises a key question: Can cities sustain themselves as institutions without relying in part on technologies of information collection?

The smart city takes this tradition and that question to a technological extreme. If the surveillant city may be, in effect, inescapable, then looking at smart cities as sophisticated surveillance institutions provokes questions about the premises and purposes of different surveillance systems and various urban contexts; about concepts of privacy and private information; about the design and oversight of surveillance instruments; and about relations of trust and authority among urban residents and urban planners and other authorities. Perhaps cities can thrive without deep reliance on surveillance practices. If that's the case, what does a non-surveillant city look like? How does it succeed, and how might it fail?

Cities as Expertise

Since at least the late nineteenth century and the rise of industrial cities, the history of urbanism and urban planning has been a history of expertise – political, administrative, and technocratic. Cities came to be seen as solutions to demands for wealth, health, safety, opportunity, and personal development, as society grew more economically, socially, and politically complex. Cities also came to be seen as posing new problems, often caused by their successes in meeting earlier social demands. Both fueled by and fueling that problem/solution framework, the Progressive political movement of the early twentieth century relied heavily on trained and trusted experts, especially economists and other social scientists (Leonard 2015). Those experts were often educated in newly formed occupational disciplines and professional schools. Degrees in hand, they were primed to lead both governments and businesses away from the era of laissez-faire and toward better outcomes for themselves and for workers and citizens. That meant safer food; safer water; better working conditions; safer and less expensive automobiles; expanded opportunities for education, leisure, and personal fulfillment; and so on.

In significant respects, the smart city today is the apotheosis of this tradition of expert-led governance, promoting the good life. Its proponents inherit expectations that experts trained in design are and ought to be trusted by citizens as the city is planned and built (Knox 2020). Critics of the smart city sometimes focus attention

precisely on ways in which smart city practice reinforces the authority of techno-cratic expertise (Cardullo and Kitchin 2019). Unsurprisingly, today as in the past, the role of trusted and trained experts calls into question the sources and uses of the trust and power that they have acquired.

The Political Economy of Cities

Cities are far from immune to influence by interests associated with wealth and power. In many respects, cities are particularly effective expressions of those forces of political economy: Who is in charge, why, and how that changes through time. In the United States, for example, industrial and financial interests underwrote the expansion and governance of major cities and related regions during the twentieth century from New York to Chicago to San Francisco to Los Angeles (Cronon 1992; O'Mara 2019). In the twenty-first century, those firms have yielded in part to heavy influence by the pillars of the knowledge sector, which include not only the information technology firms that now dominate the economies of many US cities but also the research universities that rival or even exceed tech firms in their economic and political influence (Baldwin 2017). The relationship between the public sector and industry can go both ways. Public funding and related public policy have been key contributors to the growth of the contemporary technology industry (O'Mara 2020). In many respects, smart city governance allows public authorities to follow historical patterns of private sector subsidization with outright privatization of public functions, in everything from data storage to traffic manage-ment to certain public safety and policing functions. Cities are wealth and power generators, refractors, and accelerators.

Translated into practice on the ground, the political economy of cities deals in resource management. "Resources" include both tangible resources (food, water, physical infrastructures), intangibles (space, mobility, time, labor, trust, security, political influence, happiness), and blends of these that both constitute and shape resources of all sorts and that are simultaneously independent of them, such as knowledge and information (Glaeser 2012) and, of course, money. In different respects, sustaining and governing the city means that those things have to be produced, stored, distributed, and exchanged. The explicit and implicit governance logics of cities are inevitably tied to stories about economic development (Bairoch 1988).

The smart city appears to be a technology-driven opportunity to extend that economic development narrative. Installing smart systems offers opportunities not only for efficient public administration but also for showcasing a city's productive engagement with the forces of private productivity, profit, and employment. The question is whether that equation adds up. Does the smart city promise economic returns above and beyond the benefits of good governance? If so, at what cost?