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A Proposal for Principled Decision-Making

Beyond Design Principles

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INTRODUCTION

Despite substantial investment, innovation, and optimism, smart cities rarely match expectations. It is easy to criticize the hyperbolic and often self-serving claims of smart tech proponents, but it is more difficult to explain why communities accept and act upon promises of data-driven efficiencies and technological solutions. Smart cities are not easily disposable gadgets for the home or wearable fitness trackers. Smart cities are infrastructural systems for entire domains – transportation, education, or healthcare – as well as complex meta-systems for entire communities, given interoperability and interdependencies (Cavalcante et al. 2016). These systems shape and effectively govern important aspects of our lives.

Intelligent governance of complex systems presents real challenges. Many pertain to conceptualization. Some cities frame "smartness" as a core objective, appealing to public values around economic growth, efficiency, and sustainability. In such cases, identifying, evaluating, and communicating knowledge about the complex relationships between supposedly smart tech (as means) and heralded public values (as ends) is a significant challenge. It is often lacking among the most vocal proponents, including so-called futurists/influencers, vendors, and even government officials. Public accountability is also a major challenge. Citizens often have little real say about the means or ends when the entire package is wrapped up in the concept of "smartness." That conflicts may arise among professed values (economic growth, efficiency, and sustainability) and also with other implicit values (public health, distributive justice, among others) is absent from public conversations, when such conversation even occurs.

In other cities, evolution into a smart city is not a priority, but rather may be an emergent description as a series of pragmatic projects coalesce in an assemblage. One emerging management strategy is implementation of siloed smart solutions that are magically decoupled from governance, as with blockchain solutions for public utilities and transportation (e.g., Ibba et al. 2017). Smart tech may be deployed

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discretely as means to solve a specific problem – e.g., to reduce congestion on roads. In such cases, a different set of governance challenges may arise. For example, an incremental approach focused on specific problem–solution pairs may lead to the mistaken view that smart technologies are discrete, special-purpose (or single-use), and independent, rather than general-purpose (or multi-use) components of complex, networked systems. This approach can lead to a form of myopia that ignores interdependencies and externalities. For example, smart traffic cameras deployed to enable real-time congestion pricing might effectively reduce congestion *and* generate unintended external effects, such as an erosion of obscurity in public spaces, *and* be used for other purposes, such as surveillance by police or others. So much depends, of course, on whether, how, and by whom smart tech is governed. Finally, the pragmatic, transactional view can also hide who gains (and loses) intelligence and power, as the previous example illustrated.

In this chapter, we outline a forward-looking, intelligent approach to thinking through and evaluating supposedly smart systems. First, we clarify that it is not the city that is smart. Rather, smartness is better understood and evaluated in terms of affordances supposedly smart tools provide actual people. Who gains what kinds of intelligence? For what purposes? Subject to what governance? Second, we identify and address key challenges to intelligent governance in smart city projects. Cities must move beyond a transactional mindset, appreciate how smart systems become an integral part of the built environment, and develop appropriate governance. Third, we propose an approach to smart city governance grounded in local, contextual norms and scaffolded by key questions to ask throughout smart city planning, procurement, implementation, and management processes. This approach is importantly *not* oriented around Elinor Ostrom's famous design principles, but rather a shared set of evaluative questions to guide decision-making. We have a few reasons for this departure. First, despite many attempts, the Ostrom principles do not simply map over to smart tech/cities, for many reasons detailed in Governing Knowledge Commons, including the unique nature of data as a resource. Second, it is too early to formulate new design principles; the social scientific evidence is still being gathered and is often context specific. Third, for the sake of expediency and convenience as well as (manufactured) optimism about smart tech, dialogue around smart tech too often leaves governance questions unasked and thus unanswered, as if appropriate governance structures already exist and remain stable and unaffected by the smart tech. Finally, we must recognize local and contextual complexities in order to ground adoption and uses of smart technology in relevant norms, as well as to govern sociotechnical systems in public spaces in a principled manner.

SMART CITIES IN CONTEXT

What makes a city smart? What are the objectives and values driving adoption of smart systems in urban environments? What social dilemmas do smart systems

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address within cities? How do we evaluate success and/or failure in smart cities or relative to their integrated digital systems? What are the objectives of a smart city or system, and what deliverables, timelines, or metrics indicate their attainment? Further, how do we evaluate investments, expectations, and use of these systems? What concerns, including opposition, are relevant or legitimate? Throughout this book, authors have asked these questions and explored answers in different contexts.

In this chapter, we use the phrase "smart city" only as needed to fit within the discourse and engage in conversation with industry, policymakers, and communities. Like many other catchy metaphors, "smart city" induces myopia:

> The problem with digital-tech metaphors is that what's left out is usually what's most important. They obscure more than they reveal and generate power by distorting conversations, expectations and understanding of the relationships between technology and humanity. . . .
>
> "Smart" conflates different forms of intelligence and makes it harder to evaluate differences in degree and kind. Smart for toaster is radically different than smart for [city], yet as a metaphorical meme, smart is enough to preempt nuanced evaluation. This is a powerful way to attract investors, sell products, and smooth the path for rapid technological adoption. . . .
>
> Evaluation of "smartness" is almost always a matter of degree that depends on the technology, people involve[d], and context.
>
> Insert "supposedly" in front of "smart" whenever the word is used. . . . Break open the black box and think critically about who gets smarter, how and for what purpose. (Frischmann 2018)

Simply put, cities aren't smart, but people living and working in cities might be. Frankly, as many others have demonstrated (e.g., Frischmann and Selinger 2018; O'Niel 2016), the presence of lots of sophisticated AI and digital networked tech does not guarantee that people are or will be smart(er) or live better.

Smartness is better understood and evaluated in terms of people using specific tools within environments (systems, contexts) to achieve outcomes. Which people? Which tools? Which contexts? Which outcomes? These questions require attention and deserve elaboration at all stages of smart tech adoption and deployment. Attending to these and other details ultimately presents a rather basic governance dilemma: Who decides and how? What formal and informal policies and practices govern decision-making?

Our focus is thus on *community governance* of supposedly smart techno-social systems. Though it can also be an ambiguous and contested term, "community" may be defined geographically, politically, or by some other means or measure. We use cities as a rough but widely used conception of community (set of communities) of people that share resources, interdependent relations, goals and dilemmas. Nonetheless, everything we have to say is easily extended to other communities.

Supposedly smart tools typically integrate and rely on networked sensors, data, intelligence-generating systems (including AI, machine learning, algorithms, and other data processing/analytics tools), and automation/control actuators. While some tools sometimes work independently in particular contexts, these tools often are and will be components of complex, interconnected systems that architect, manage, and even constitute our built lived-in and experienced environments (Frischmann and Selinger 2018, 126). The added complexity only heightens demand for intelligent governance, which we elaborate on later. Of course, there is an important trade-off between simplicity and complexity in any form of analysis. Our claim is that intelligent governance of smart infrastructural systems in cities requires more attention be given to the complexities, even if that means slowing things down to enable more informed deliberation. That ultimately may be what makes a city truly smart.

Datafication of city infrastructure and the adoption of systems that process, share, and perform based on data-driven insights are intended to address a variety of dilemmas in urban and metropolitan administration (Heeks and Shekar 2019). These systems are not inherently good or bad; many seek to achieve socially desirable ends, ranging from concerns about security to environmental sustainability to efficiency. However, many cities implement new digital technologies, adding sensors and integrating systems without fully considering governance questions. Such implementations may aim to solve an immediate problem or optimize for a single objective, such as "efficiency," and fail to consider other plausible and often predictable outcomes. A variety of consequences may result, in ways that may overwhelm any benefit and ultimately lead to failure, as well as angering the general public along the way (e.g., Goodman and Powles 2019).

For example, the city of Songdo, South Korea exemplifies problems associated with letting technological innovation lead development, without consideration of governance questions. After $40 billion in investments to build a smart city from scratch, few residents have been attracted and many have returned to other cities, given that the promised high standard of living comes with a high cost of living, as well as an "oppressive" emptiness and control. Residents, past residents, and businesses recognize that technology is not culture or history; the technology does not address actual needs (Vaqar 2018). In this case, the technology is constraining people and impeding social aims; unintended governance via architecture and markets dominates Songdo, rather than thoughtful, constructive governance to support a functional sociotechnical system.

Adoption of many systems and technologies is also often driven by preferences to be early adopters or to compare favorably to peer municipalities. Such adoption decisions may focus on procuring the best available technologies (Paroutis, Bennett, and Heracleous 2014), rather than choosing systems that are the best local fit or that best address specific needs or problems (Barth et al. 2006; Cottrill et al. 2020). What is appropriate for a given city or community, in a normative sense, is contextual and

does not necessarily correspond with what is best suited for other cities. Unfortunately, the race to be a smart city proceeds without any apparent finish line, and the racing behavior is not always conducive to deliberation or meaningful participation by community members. City officials, tech vendors and other enthusiasts may justify participation in the race on the grounds that participation itself attracts tech investment and encourages innovation, but those ambitious claims are hardly, if ever, tested. Further, early adoption in and of itself is often the objective, more so than addressing a specific need (Gunawan 2018).

The Governing Knowledge Commons (GKC) framework provides a rigorous approach that is primarily descriptive in nature to accommodate and ascertain what is best for the people and systems within a given city or with respect to a particular challenge, as well as to ensure governance is complete and addresses all relevant parameters around the technology, data, knowledge, and services associated with smart systems (Frischmann, Madison, and Strandburg 2014). The GKC framework is useful to help us understand how communities reconfigure their environment via governance within complex sociotechnical systems. In this chapter, we argue that we need to take a systems approach, not a discrete approach to exploring patterns/outcomes, as well as social concerns. To achieve better outcomes, we must also explore aspects of interoperability and understand how different facets interact, in order to develop sound, comprehensive, contextual governance.

CHALLENGES TO INTELLIGENT GOVERNANCE IN SMART CITIES

Intelligent governance of supposedly smart systems presents real challenges. Many have to do with conceptualization. In some cities, an overarching objective is to become a smart city. This can mean many things. The ambition might be ambiguous, but city officials may explain and even justify it with appeals to economic growth, efficiency, sustainability, and other public values. From a governance perspective, as we shall discuss later, one must ask who decides on whether and how to set and pursue such an objective.

In other cities, the quest to become a smart city is not a clear priority. Instead, it might be an expression one finds in marketing materials of one form or another or an emergent description as a series of projects coalesce in an assemblage. For many cities, a more pragmatic approach governs. Smart tech is simply a means, not an end in itself. (See, e.g., the Philadelphia case study in Chapter 5 of this volume, which highlights both the ambitious drive to become a smart city and the emergence of a more pragmatic approach.) Smart tech is often deployed discretely to solve a specific problem – e.g., to reduce congestion, improve security, or personalize learning. A specific-use case may justify collecting and using data to drive a smart tech solution, even though a range of other known or yet to emerge uses ultimately may undermine the justification. Decision-making infected by myopic

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incrementalism or siloed evaluation can lead to failures manifest in incomplete and ineffective procurement, data protection, and other governance policies and practices.

To illustrate some of these issues, consider an example of widely deployed smart tech, an automatic door. A simple optical device surveils the physical space leading to an entrance and, upon sensing a person, the system activates a mechanism to open the door. It addresses a discrete problem (accessibility) and doesn't (need to) connect to other systems. One might wonder what governance issues are raised when a city decides to invest in automatic doors for its buildings. It seems reasonable to view this as a conventional transaction for which city procurement policies and practices apply. The smart tech is discrete and would not impact other systems or trigger other governance concerns.

The automatic door can be even smarter. It can address other problems, such as authentication and security. For example, what if the automatic door could have a more sophisticated optical device, such as a camera that could record audio and video? What if the automatic door could identify people prior to opening the door? What if the automatic door could send an alert when an unauthorized person attempts to enter the building? We have obviously complicated the example by adding new problems to solve – providing secure access, identifying visitors, sending security alerts. This requires new sensors, intelligence-generating tools and processes (identification), and automated actions. It also requires new governance and coordination. The smart tech is no longer discrete; it is a system, and likely one that would be connected to and integrated with other systems. Thus, it can no longer be viewed as a conventional transaction. The procurement policy is not enough. Ideally, a decision-maker contemplating whether to deploy this smart automatic door system would consult a wider range of people in the community (than those typically involved with procurement) as well as the privacy and other relevant governance policies.

Another example to consider is smart parking systems. Many cities struggle with managing scarce parking spots. Most smart parking systems rely on some means for collecting data to generate intelligence about capacity (how many parking spots are occupied/available), and complementary systems to manage access and in some cases adjust prices. Many smart parking systems rely on cameras to monitor capacity. Others, such as an innovative system at Disney, rely on weight sensors in each spot. The approach that relies on cameras collects much more sensitive and potentially useful/harmful data about people. The weight sensor approach minimizes the data collected, only collecting what is necessary to manage lot capacity. This example highlights a fundamental governance dilemma. When evaluating these systems as discrete solutions to a specific problem, they seem equivalent. Both are capable of providing a smart, efficient solution to the resource allocation problem. Yet the camera-based system collects much more data than is needed, creating privacy risks that are easily overlooked or underestimated but also creating potential opportunities

for the entity collecting the data. That entity may or may not consider those opportunities when deciding what system to deploy. Whether or not they do is only the beginning of the governance inquiry. Is it a public or private entity? How can they use the data or the intelligence generated by processing the data? To whom are they accountable? Who are they permitted to share data with? And so on.

This relatively simple example highlights some of the governance dilemmas present for many congestible infrastructures. To demonstrate how, consider one contentious use of the data. Suppose the operator of the camera-based system could differentiate between rich and poor people based on their automobile and could adjust prices accordingly. On one hand, price discrimination of this sort might seem attractive. The rich person would have to pay more for a spot, and perhaps that would mean that the poorer person could pay less. On the other hand, given scarce parking spots, efficiency would suggest that priority might be given to the person willing and able to pay the most. If the problem justifying resort to a smart parking system is scarcity, then either of the two systems described above would provide the means for solving that problem. The weight-based sensor system enables efficient resource allocation and even cost-based differential pricing (e.g., prices could increase as the number of parking spots decreases), but it disables value-based differential pricing (price discrimination). The governance issues raised by this example could be addressed in different ways, depending on the context and community. Procurement policies might take into account the trade-offs among options. Privacy policies might regulate collection and use of data. Nondiscrimination rules might prohibit using data or intelligence to price discriminate or prioritize access to spots.

We often seek technological solutions to quickly solve problems or make improvements, without thinking them through or considering the full range of consequences. Streamlining processes for quick adoption often results in oversimplification of governance, which perpetuates myths of discreteness. We need more nuanced, detailed, and slower governance processes for these systems precisely because, in reality, they connect, collect and share data, and influence one another by design. In this sense, discreteness is problematic along three key dimensions: evaluation, interdependence, and impact.

In terms of *evaluation*, cities may fall short of expectations in the delivery of enhanced services and systems, in part because expectations may be hyped and the smart tech may fail to deliver, and in part because evaluations made during planning fail to adequately address privacy, transparency, and value-based expectations. Organizations, such as the World Economic Forum and AI Now, advocate for privacy and algorithmic impact assessments to provide transparency about and evaluation tools for supposedly smart systems in cities. Impact assessments might be necessary but are typically insufficient for at least two reasons. First, impact assessments usually focus on discrete functions, facets, and technologies, rather than the sociotechnical system at large, as it exists and operates in public spaces. Second,

impact assessments usually do not explore who makes decisions, whether choices represent public interests, or the legitimacy of governance around technologies. As a result, substantive evaluation falls short. When we depend on impact assessments alone to understand costs and benefits, we inherently privilege individual values, needs, or requirements over others, not only implying false trade-offs, but also ignoring many social norms and expectations. Just as none of these supposedly smart systems exist in a vacuum, but rather are highly interconnected in complex, polycentric, sociotechnical systems, we cannot evaluate smart tech discretely, as we miss how smart technologies and the systems within which they are embedded influence each other, sometimes working together, other times undermining one another, but certainly contributing to joint outcomes.

Interdependencies and interactions between systems are important to consider independent of evaluation. Datasets and technological systems are interoperable, interacting, and highly interdependent in broader sociotechnical systems. If we consider schools, businesses, or individual government agencies, they generally have individual, general privacy policies, unconnected to technological adoption. Different stakeholders write those policies, make decisions about procurement, and use those technologies, yet they are all contributing to governance of technology, whether intentionally or unintentionally, formally or informally at different stages from planning to procurement to implementation to management to use. We must consider all of these stakeholders, systems, and data resources together as one interconnected sociotechnical system; some governance assemblages represent functional approaches, motivated by common or shared values, while others embody dysfunctional polycentricity. For example, automated toll plazas, wherein state and federal Departments of Transportation, Bureau/Department of Motor Vehicles, various law enforcement agencies, the E-Z Pass Group, and private toll-way administrators often make uncoordinated decisions, reflect dysfunctional polycentricity at the expense of drivers who struggle to understand policies and changes, or even what stakeholder to ask.

In terms of *impact*, understanding the consequences of discrete, independent deployments are complex challenges in their own rights. Outcomes associated with any individual smart system are often unexpected and sometimes obscure harms and externalities with significant impacts. Citizens may have a superficial impression of impact, if only one type of impact is assessed or monitored. When resource requirements and data flows are hidden, important governance questions are left unanswered, and different people are responsible for different stages or systems that are interdependent, the resulting polycentric systems can be unpredictable, difficult to control, and often include competing outcomes.

The significant challenge of discreteness also connects to other problems, such as the issues associated with obscurity and superficiality of public understanding of consequences. This is as related to issues of legitimacy and transparency as it is to discreteness. For example, privacy policies and terms and conditions for public

services or systems are often incomprehensible to many community members, fail to convey meaningful information about actual practices, and diverge from local norms, community expectations, or any meaningful semblance of governance. As a result, there are serious problems for impacted stakeholders, including members of the public without opportunity for exit or voice from systems in public spaces or around public services.

A PROPOSAL FOR INTELLIGENT GOVERNANCE

Supposedly smart sociotechnical systems require *intelligent governance*. This means that the sociotechnical systems, including the corresponding governance systems, should be contextually appropriate, justified, and fit for legitimate purposes. Governance requires a combination of policy, regulation, and management. This perspective is especially important, given the weight of impact and interdependence between each of these actions. Institutional governance reflects a hierarchy of strategies, norms, and rules, with both informal and formal institutions impacting outcomes in smart cities and in public administration more broadly (Crawford and Ostrom 1995). Assemblages of governing institutions, sociotechnical systems, and regulatory arrangements spanning agencies and levels of government comprise smart cities as complex, dynamic, polycentric systems that are highly localized and not generalizable.

We do not advocate for best practices or advance generalizable principles for all smart city projects. To do so would be presumptuous and premature, to say the least. Instead, we explore an approach to informed decision-making that benefits from institutional analysis as well as careful consideration of how smart tech reengineers systems, environments, and people (Frischmann and Selinger 2018).

The GKC framework provides a structured and rigorous approach to understanding and evaluating community governance of the data, technology, and other resources within smart systems (Frischmann, Madison, and Strandburg 2014). The descriptive approach enables examination of collaborative governance arrangements, both regarding shared knowledge resources and the data and knowledge resources around other shared physical and infrastructural resources (Frischmann, Madison, and Strandburg 2014). It allows researchers and practitioners to structure and compare detailed information about the complex reality of their background and context; attributes, including of participants and resources; governance processes, institutions, and issues; and patterns and outcomes (Frischmann, Madison, and Strandburg 2014; Sanfilippo, Frischmann, and Strandburg 2018). This is highly valuable in understanding unresolved data governance issues, as well as what facets of governance might be undermining key policy objectives or missing, thus leading to unexpected or undesirable outcomes.

Consideration of the complexity of polycentric urban environments is necessary to avoid the failures of reductionist and technologically deterministic approaches to

urban planning. In addition to considering the action arenas around knowledge governance in this context, cities need to consider technology and infrastructure governance structures and institutions, including the implications of public–private partnerships and the extent centralization of decision-making impacts outcomes (e.g., Sanfilippo 2016).

In essence, our approach to intelligent governance requires *comprehensive public knowledge*. For the purpose of this chapter, we articulate a series of questions to ask throughout processes of smart city planning, procurement, implementation, and management. These questions should be answered *prior* to investing in or deploying supposedly smart tech. We draw on interdisciplinary, empirical research projects, reflecting insights both from institutional analysis and commons governance arrangements of natural resources, and from cases specifically pertaining to data and knowledge resources. The questions are broad enough to be possible to answer in every case, yet specific enough to ensure that all relevant variables are considered in advance; further, the set has the capacity to evolve over time, just as the questions within the GKC, and its inspiration, the Institutional Analysis and Development (IAD) framework, have evolved.

Cities should be able to answer these questions, and crucially, need not answer them in a particular way, in order for them to be of use in selecting, implementing, using, and governing smart systems in intelligent ways. By employing a structured, institutional approach to understand context – including the actors, resources, challenges, objectives, planned approaches, and likely outcomes – before investing in and deploying new systems, better and more intentional choices and investments will be made.

For example, Oakland, CA and Memphis, TN took very different approaches to smart urban development, with Oakland implementing smart solutions to address specific projects and challenges (e.g., paving and transportation issues), while Memphis aimed broadly for sustainability and urban renewal. Yet both approached these projects via long-term planning and incremental adoption, based on iterated analysis over multiple years. Further, the use of public comment periods in Seattle, WA ensure that thoughtful, intentional planning will be well received and responsive to community expectations.

Based on the GKC framework, the research tradition considering polycentric governance of metropolitan systems, and recent scholarship on the complex relationships between supposedly smart systems and humanity, we propose a preliminary set of questions with the understanding that these are a conversation starter and will be revised, augmented, and contextually refined:

Is there a genuine community problem in need of a solution?
Is the proposed tool a proven solution?
Will the tool actually deliver what is promised? Or is hype and tech solutionism reducing the burden of persuasion we ordinarily would demand during procurement?

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What are the alternative solutions? How do they compare along relevant dimensions?
Besides delivering promised solutions, are there harms, risks, or negative externalities to consider? Who bears those burdens?
What interoperable functions should we consider? How does the technology relate to other technologies and other sociotechnical systems?
If justified with support, is function creep likely? If so, what can we anticipate?
What data is generated?
Who has access to this data?
Who are the impacted stakeholders?
Who is gaining what intelligence and for what purpose?
How is the general public impacted by this smart system?
What specific community goals and objectives will be met by this smart system?
What problems, challenges, or social dilemmas are being addressed by this smart system?
What are the relevant strategies, norms, and rules governing this smart system and its participants?
Who are the decision-makers, and how are they selected?
What infrastructure will support this system and who controls that?
What are the benefits of or opportunities for this smart system?
What are the costs and risks of this smart system?
How do we evaluate success and/or failure in smart cities or relative to their integrated digital systems?
What are the objectives of a smart city or system and what deliverables, timelines, or metrics indicate their attainment?
Further, how do we evaluate investments, expectations, and use of these systems?
What concerns, among opposition are relevant or legitimate?

Some of these questions are pragmatic and only seek to impose the same kind of rigor one would expect in most non-smart-tech scenarios. Others are motivated by the complex challenges discussed in the previous section.

Notably, many, if not all, of these questions can be decomposed into a subsidiary set of questions that explore contextual details. For example, when considering who is gaining what intelligence and for what purpose, a series of questions concerning what is meant by intelligence, what types of intelligence are made possible by the proposed smart technology, how intelligence is generated, who is participating in the intelligence-generating processes, and so on. Recall the automated door and smart parking management technologies discussed earlier. Our brief exploration revealed how different smart tech systems would lead to different answers to these and various other questions.

The GKC framework and research tradition inspired this proposed approach to community decision-making. The basic idea is that asking a series of questions concerning governance should drive meaningful community engagement though conversation, explanation, deliberation, and justification. The set of relevant questions will vary, of course, and continued research and experience may lead to the development of institutional design principles.

Two key arguments are often made counter to assertions that technological adoption decisions by cities ought to be made more deliberately with consideration for privacy, transparency, and other local contextual norms or social values. These arguments can be differentiated as being about: (1) feasibility and (2) impeding innovation.

First, there are those who argue that thorough governance is impossible. This argument fails to understand the nuance and pragmatism of a descriptive knowledge commons governance approach. The GKC framework, guiding this approach and the specific questions, recognizes that knowledge resources have different values to different stakeholders and incorporate information rules that often address issues of information overload or asymmetry (Bushouse 2011). In the case of smart cities, we should not try to know everything, but rather want to avoid asymmetries due to ignorance or oversight by identifying all relevant variables, if not all attributes of those variables (e.g., Sanfilippo, Frischmann, and Strandburg 2018). This governance perspective is premised upon the idea that you have to have a strong foundation before making decisions; we cannot use technology intelligently or employ governance structures successfully or functionally with inadequate information. The set of questions, based in the GKC approach, allows cities to build foundations for good governance and intelligent use of systems for connected communities and enhanced services.

Second, there are those who argue that governance of this sort will slow things down unnecessarily and impede innovation. This argument is both inherently flawed, given research that demonstrates the false trade-off between privacy regulation and innovation (Lev-Aretz and Strandburg 2020), focuses too much on the near term, and mistakenly assumes all friction is problematic. We argue that we should slow down some decision-making processes in order to question what cities are being sold and for what purpose, as well as to ensure that we are making optimal choices for all stakeholder interests, needs, and values. Further, while making slower decisions affects adoption timelines, assessing and describing action arenas and governance structures in a smart city will streamline governance of new systems in the long term, eliminating duplication of questions to be answered and depending on strong existing infrastructure for support of new systems.

Our arguments and suggestions also correspond with recent developments in actual smart cities. Cities are learning the complexity and dynamics of these highly interdependent smart sociotechnical systems; even the Toronto Sidewalk Labs project helps illuminate what does and does not work, highlighting the importance

of deliberative and participatory governance approaches (Goodman and Powles 2019). Other cities, like Seattle, illustrate that a set of more inclusive, representative, and intelligent governing institutions are possible and useful, as with their robust regulation and participatory strategies for decision-making (e.g., Armbruster 2018), though they might be slower to adopt. Further, the answers to these questions are necessarily different for different cities, reflecting local norms and needs.

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