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From Thurii to Quayside

Creating Inclusive Blended Spaces in Digital Communities

Richard Whitt

We can be controlled from the outside not simply by having our choice bypassed but by someone controlling the world we perceive. (Brincker 2017, 13)

INTRODUCTION

The modern-day digital community provides an opportunity to follow the unifying threads of governance, physical spaces, and technologies, as played out through the deployment of local software-based sensors and gateways. As we will see, the now-defunct Sidewalk Labs project in Toronto highlights the challenges, and limitations, of developing such a comprehensive system of interfaces, in the absence of sufficiently inclusive and holistic mechanisms to govern their use.

This chapter presents a brief thought piece that frames several of the key governance challenges that cities face when approaching the Internet of Things (IoT) and other "smart" technologies. Those challenges in particular fall within two areas: human governance and technical interfaces. In the first section, we will look briefly at two planned cities – the ancient Greek city of Thurii and the modern cityscape of Quayside in Toronto, Canada – as exemplifying the different layers of inclusivity that can and should work well together in communities of trust. One proposed takeaway raised in the second section is the desirability of planning digital communities that invite active human participation in the blended spaces between the self and the world, the private and the public, and the physical and the virtual. As it turns out, this takeaway is entirely consistent with the notions of participatory community governance at the heart of the Governing Knowledge Commons (GKC) framework (Frischmann, Madison, and Strandburg 2014), summarized in Chapter 1, and elsewhere in this book.

For the Quayside cityscape, the third section of this chapter focuses on two particular layers. First, it introduces *inclusive governance*, which in Quayside

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spanned proposals from civic data trusts to urban trusts. That exploration includes consideration of the knowledge commons, and by extension the ancient Greek agora, as useful framing references. The digital fiduciary is offered up as another governance model worth exploring. In particular, such entities could employ a virtual trust layer, an encapsulation of fiduciary-based obligations within the entity's data flows and algorithmic decision points.

It then digs into *inclusive interfaces*, using as an exemplar the evolving and still-incomplete work of the Sidewalk Labs' design engineering team, the Digital Transparency in the Public Realm (DTPR) project. More human-agential versions of these interfaces exemplify what are introduced here as *edgetech* systems, as opposed to the *cloudtech* systems that dominate the Web today. The chapter establishes *edgetech* capabilities as incorporating three key elements: (1) the *edge-to-any/all* (e2a) design principle, (2) multiple end-user-facing modalities of data, computation, and interfaces, and (3) a mix of *edge-pushing* and *edge-pulling* functionalities that empower the end user (Whitt 2021a, 191–207).

The fourth section observes how the digital fiduciary, paired with a personal AI, could help the individual successfully navigate the inclusive new blends of physical and virtual spaces in their digital communities (Whitt 2021a, 193–97). Finally, in the fifth section, certain government policies are identified that would enable these more participatory governance and edgetech opportunities (Whitt 2021a, 209–15).

TWO CITIES, TWO GOVERNANCE CHALLENGES

Considering the Open Streets of Thurii

In 444 BC, Pericles of Athens directed that a small group of Athenian citizens converge on the remains of the small settlement of Sybaris, on the coast of the Italian peninsula. There, according to the historian Diodorus Siculus, was founded a Pan-Hellenic colony called Thurii (in modern-day Calabria), presided over by representatives from ten tribes from all over Greece. Aspirationally at least, Thurii was the first planned city to be truly owned by the world.

Author David Fleming has developed an interesting twist on the story of Thurii. His concern is "not so much the facts surrounding the town as the idea behind it, the vision of a good society that seems to have motivated it" (Fleming 2002, 5). In Fleming's telling, the town was planned as a model city incorporating three core design principles:

- a democratic constitution (governance);
- an "open," orthogonal street layout (architecture); and
- a rhetorically designed educational system (information flows).

Fleming argues that Pericles the political leader, Hippodamus the city architect, and Protagoras the lawmaker shared a common image for Thurii: "an autonomous

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community of free and equal citizens who would govern themselves through their own practical human capabilities – that is, through speaking, writing, and debating with one another" (Fleming 2002, 6). This image would play out in crafting the new city's constitution, forming its educational system, and designing its built space. To Fleming, Thurii stands for the proposition that "a free, open, and well-functioning democracy depend[s] on those interconnections" (Fleming 2002, 27).

The goal of the Thurian enterprise was simple yet profound: to establish an inclusive global city, based on the best political, architectural, and educational precepts of that time. Of course, we should keep in mind that democracy in those days ran both relatively narrow (limited to free adult males) and deep (direct civic participation).

Per Fleming's suggestion, however, we should focus more on what Thurii can represent for modern sensibilities. To Pericles, for example, Fleming ascribes a rare understanding of how political community can "imply a particular configuration of civic space as well," an image of "political and spatial equality." Periclean oration paints a picture of Athens as a polis "where people can come and go as they please without surveillance from an inaccessible and mysterious hilltop." A place "where the gaze of the many is directed to only a few" (Fleming 2002, 12).

A "valid urban plan" was designed by Hippodamus of Miletus, said to be the originator of planned cities. In Thurii, he organized a carefully laid-out network of main roads (*plateiai*) and secondary orthogonal roads (*stenopoi*). Two separate, open-air *agoras* for collective gathering presumably anchored the layout (Brioschi and Marino 2018). Viewed recently as "more of a philosopher than architect" (Kirkpatrick 2015), Hippodamus was led to theorize concerning the ideal community, and its political, social, and judicial organizations (Burns 1976). The "emphasis of his innovations was directed towards the over-all functional plan of the city rather than the details of street lay-out." Among other attributed elements expressive of a democracy were land allocation criteria of "absolute equality among residential blocks." As Fleming puts it, Hippodamus' design "demonstrates remarkable faith in ordinary people, their practices and capabilities" (Fleming 2002, 18).

Finally, the sophist philosopher Protagoras of Abdera was asked to establish the laws of a sophisticated and inclusive participatory democracy. Noted Greek historian Guthrie speaks of Protagoras' "invincible respect for the democratic virtues of justice, respect for other men's opinion and the processes of peaceful persuasion as the basis of communal life" (in Rutter 1973, 165 n. 61). To which Rutter (1973) adds, "Thurii was a tough assignment." Nonetheless, the city consequently became known for having a well-ordered system of laws.

Thus, Thurii in its idealized form can be held up as a type of model community, one that sought to merge considerations of inclusive physical spaces with "virtual" environments of open political governance and communal public discourse. In other words, a holistic blending of inviting spaces, participatory public life, and an equality of gaze.

Considering the Smart Streets of Quayside

Digital Communities on the Rise

Planned communities became prevalent in the United States beginning in the 1950s. It is with the so-called smart city, however, that the technology of the Internet of Things is expected to bring the planned community to an entirely new level.

By one definition, smart cities use a mix of connected technology and data to "(1) improve the efficiency of city service delivery (2) enhance quality of life for all, and (3) increase equity and prosperity for residents and businesses" (Digi.city 2021). Prominent smart cities such as Barcelona, Amsterdam, and Helsinki are premised on harnessing connected technologies to help manage common areas, particularly in larger municipalities. Examples of popular use cases include automotive traffic control, air quality sensing, streetlight controls, waste management, and noise detection (Marr 2020).

For many, the smart city has a particular connotation: it is presumed to be organized and run by a local municipal government, limited to public land, and dedicated to expressly civic purposes. While that may well the case for a number of these projects, that description does not nearly exhaust the possibilities. In fact, the governance structures, objectives, and functions of these sensor-equipped physical spaces run along a more expansive continuum.

- First, where connected infrastructure is brought into an outdoors space, the governing entity can be purely public (a government body), purely private (a corporation), some mix of the two (a public–private partnership), or something else altogether.
- Second, the physical area need not be publicly owned land, but also extends to private lands and spaces. Indeed, the local shopping mall, the popular restaurant, the neighbor's front door, the airspace by one's bedroom window – each of these is an example of a physical space hosting IoT devices and interfaces.
- Third, the primary purpose can be to enhance existing government roles – traffic control, energy and waste management, policing, and so on – or it can accommodate many other "smart" intentions, including deriving pecuniary value for the surveilling entity.
- Fourth, the data collected can be purely "environmental" – the air quality – or purely "personal" – recognizable human faces. Some have suggested a new category of nonpersonal data (NPD), such as the movements and flows of pseudonymous human bodies (Gopalakrishnan 2020).
- Fifth, as recent speculations about the "metaverse" demonstrate, the physical environment can be further enhanced by a blend of virtual technologies – such as augmented reality (AR), mixed reality (MR), and extended reality (XR). These still-developing digital overlays only

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present additional legal, policy, and ethical complications to an already challenging mix of data governance-related scenarios (Norton Rose Fulbright 2021).

Given this broad range of users and use cases, we will refer here to *digital communities*. These will be defined as those physical spaces and their accompanying public/private institutions employing digital technologies to surveil, extract, and analyze personal and environmental data, and utilize for various behavioral manipulations. The smart city is but one particular use case for that broader category.

Sidewalk Labs in Toronto

An early pioneer of the smart city concept was Alphabet's Sidewalk Labs project in the Quayside neighborhood of Toronto, Canada. As first announced publicly in October 2017, the project carried the potential to provide benefits to citizens and visitors that included enhanced security, environmental monitoring, and more efficient deployment of government resources (Lu 2019).

As the project unfolded over two and a half years, questions arose about its intentions and impact. Two considerations attracted considerable attention: the project's ever-shifting governance structure, and its use of IoT technologies to gather and analyze what was termed "urban data."

In May 2020, citing economic conditions arising from the Covid-19 pandemic, project director Daniel Doctoroff announced that Sidewalk Labs was shutting down its Toronto project (Doctoroff 2020). While the City of Toronto continues with its own plans for the space, Sidewalk Labs would no longer be a partner.

The Sidewalk Labs project in Quayside leaves both some open issues to explore and some useful insights to be gleaned. In the next section, we first will review the unique challenges for human agency in a digital community environment. We then will focus on the untapped potential from the Sidewalk Labs experience in Quayside, in terms of both human governance model and virtual interfaces.

VIRTUAL GATEWAYS: LACK OF INCLUSION, LACK OF BALANCE

As natural beings in the world, humans inhabit an environment of mediation. Many modern scientists and philosophers agree that the human mind is not a mere mirror reflecting its surroundings. Instead, our bodily attributes of somatic, sensory, emotional and mental systems interact constantly, helping us to define reality and act accordingly (Whitt 2021a, 160–62).

Technology too mediates between human beings and our experiences, often via software-based interfaces (Whitt 2021a, 162–64). These amount to different kinds of points of presence – physical, virtual, or conceptual – at boundaries where information signals flow between systems. As but one example, Luciano Floridi recently has observed how marketing entities use people as interfaces, to be

exploited by commercial and political players for our data, our money, and our votes (Floridi 2019).

In Web-based technologies, an interface is "the way in which one glob of code can interact with another" (Galloway 2012, 31). Over time, Web interfaces have been developed to provide a user experience (UX), typically by pushing that experience in the user's direction. Representative examples of these "cloud-push" gateways include graphical user interfaces (GUIs), voice-controlled interfaces, gesture-based interfaces, and public forms of application programming interfaces (APIs). These choices typically are made on the user's behalf, without their participation, feedback, or consent. In other words, these interfaces are not particularly *inclusive* (Whitt 2021a, 195).

Cloudtech Systems in Our Lives: "Screens, Scenes, and Unseens"

Every day we interact with computational systems via three kinds of interface, envisioned here as digital "screens, scenes, and unseens" (Whitt 2021a, 144–45). These cloud-based interfaces can be considered their sensory subsystems – to watch, to listen, and to speak.

- Online *screens* on our various devices lead us to the search engines and social media platforms, and countless other Web portals in our lives. Institutional AIs render recommendation engines that guide us to places to shop, or videos to watch, or news content to read.
- Environmental *scenes* (sensors) are the "smart" devices – cameras, speakers, microphones, sensors, beacons, actuators – scattered throughout our homes, offices, streets, and neighborhoods. These computational systems gather from these gateways a mix of personal (human) and environmental (rest of world) data. They are the "eyes and ears" of increasingly complex monitoring and analysis systems. The Ring doorbell placed by your neighbor across the street is but one example.
- Bureaucratic "*unseens*" are computational systems hidden behind the walls of governments and companies. These systems can render hugely life-altering judgments about our basic necessities, and personal interests – including who gets a job or gets fired, who is granted or denied a loan, and who receives what form of healthcare.

In the digital community context, all three types of systems and their interfaces come into play: our mobile device screens, the environmental scenes all around us, and the unseen actors that actually set the rules of engagement (Whitt 2020b, 2020c). Figure 9.1 shows these three types of systems.

In all three instances, numerous decisions are being made and policies are being carried out by algorithms – but is the decision-making process equitable, and is the handling of the personal data accountable?

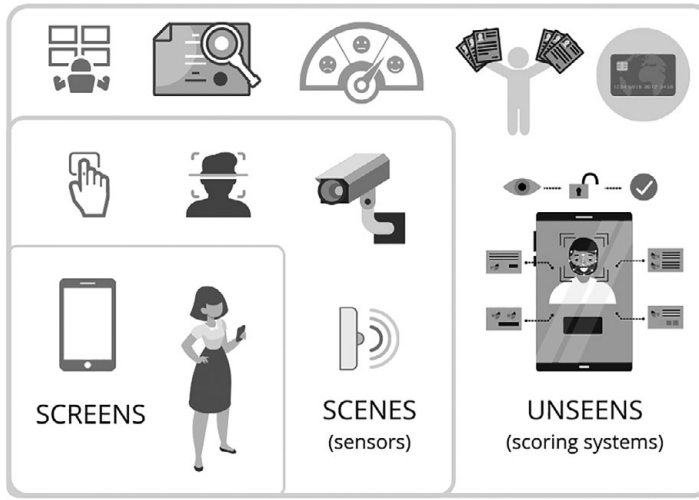

FIGURE 9.1. Screens, scenes, and unseens, GLIA Foundation

Bringing Cloudy SEAMs

To software designers, robust feedback between people is supposed to be "the keystone of the user-friendly world" (Kuang and Fabricant 2019, 32). Problems emerge, however, when one or both sides of the equation lack feedback, so they are "not feeling the stakes" (Kuang and Fabricant 2019, 34). Unfortunately, these issues of imbalanced information flows are pervasive on the Web, and in particular among those who employ so-called cloudtech software applications.

A term I have employed to describe these interrelated activities is the "SEAMs cycle" (Whitt 2021a, 148–53). Cloudtech computational systems require fuel – steady streams of data that in turn render compensation to players in the Web platforms ecosystem. At the direction of platform companies and others, the SEAMs cycle has become the "action verb" of these computational systems.

The SEAMs paradigm is instantiated in exploitative feedback cycles, which harness four interlocking control points of the computational action verb. S is for "surveilling," via devices in the end user's physical environment. E is for "extracting" the personal and environmental data encased as digital flows. A is for "analyzing," using advanced algorithmic systems to turn bits of data into inference and information. And M is for "manipulating," influencing outward physical behaviors by users and others (Whitt 2021a, 148–51).

A core concept is that cloudtech computational systems deploying SEAMs cycles seek to maximize extraction of data and user engagement – but on their terms. Thus, through institutional control over these data gateways, most derived value from data and content typically flows in one direction – the "SEA" of the SEAM cycles. Figure 9.2 shows these flows.

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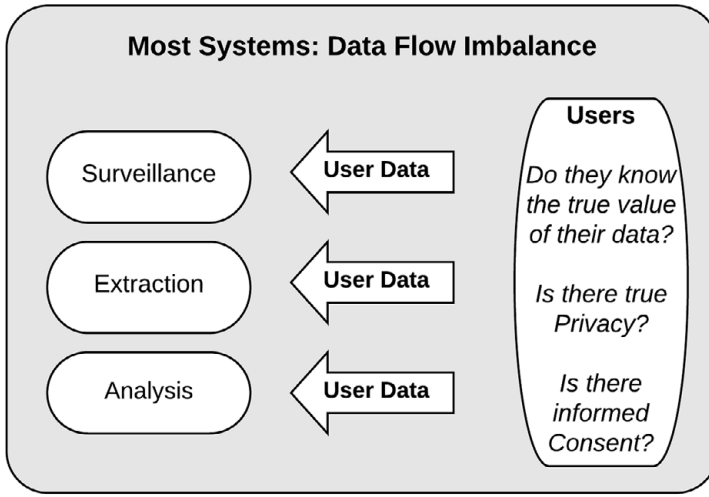

FIGURE 9.2. "SEA" cycle flows, GLIA Foundation

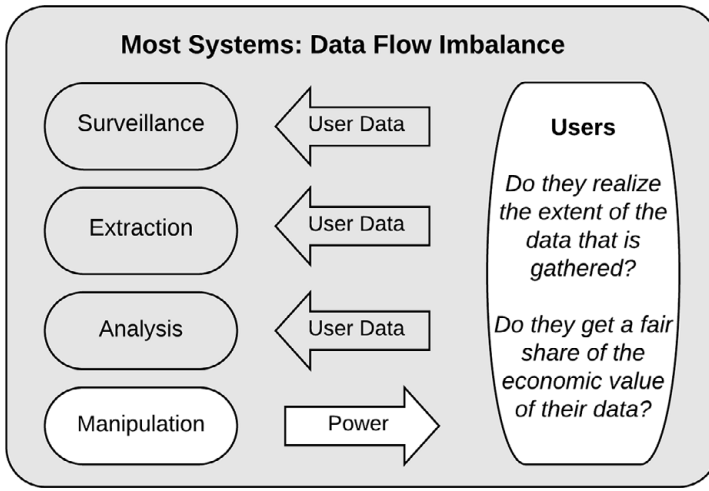

FIGURE 9.3. "SEAMs" cycle flows, GLIA Foundation

And in the other direction flows the shaping influences – the "M" of manipulation. The placement of intelligence and control technologies within infrastructure systems allows companies and governments alike to wield significant power (Frischmann and Selinger 2018, 134–42). Figure 9.3 adds that crucial element of manipulation.

This pronounced interfacial one-sidedness makes many of the computational systems that we use every day unbalanced. As individuals interact with the Web

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over their device interfaces, we stand on many entities' virtual borders, without even realizing it. One key way to achieve greater balance is to design more inclusive computational systems.

Receding Interfaces, Hidden Power

The issue, of course, is that those with the power can use it to establish interfaces as "control regimes" (Galloway 2012, 90–94). Not merely technical portals; "in the user-friendly world, interfaces make empires" (Kuang and Fabricant 2019, 145). They also provide, or withhold, those digital affordances with which humans can exercise their full autonomous powers (Whitt 2021a, 198–99).

As it turns out, over time interface technologies tend to evolve from the more to the less visible (or even hidden) forms. What once was an obvious part of the user's interactions with a system, gradually becomes embedded in local environments, and even vanishes altogether. As computer scientist Mark Weiser put it some thirty years ago: "the most profound technologies are those that disappear. They weave themselves into the fabric of everyday life until they are indistinguishable from it" (Weiser 1991, 94).

With those "cloudtech" interfaces, the trade-off for humans is straightforward: exchanging control for more simplicity and ease. In these contexts, technology moves from being a tool to becoming its own agent of the underlying system. While interfaces can remove friction, at the same time they can foreclose thoughtful engagement (Frischmann and Selinger 2018, 142–46). When you reduce participation, you reduce involvement in decision-making. While this progression in itself may well bring many benefits, it also renders more muddled the motivations of the system operating silently from a distance.

Human engagement with these receding interfaces also becomes less substantive. From typing on keyboards, to swiping on screens, to voicing word commands, the interface context shapes the mode and manner of the interaction. At the same time, these systems can conjure the illusion that they still support human agency (Frischmann and Selinger 2018, 124–36). From the perspective of the average person, interfaces to these systems can seem deceptively controllable – local, physical, and interactive – even as the mediating processes themselves are far removed, virtual, and unidirectional.

Getting Lost in the Digital Scenes

As we move from the "screens" of our personal devices to the "scenes" of digital communities, the lack of symmetry and inclusion in our cloudtech interfaces becomes all the more acute. As has been pointed out elsewhere, concepts like self and world, the inner and the outer, inhabit more a continuum than a duality (Whitt 2021a, 161–63). Relational boundaries have been called "the space of the self . . . the

open-ended space in which we continually monitor and transform ourselves over time" (Couldry and Mejias 2019, 161). This circle of inner and outer spaces never-endingly turns in on itself, as "a materially grounded domain of possibility that the self has as its horizon of action and imagination" (Couldry and Mejias 2019, 156). As Brincker (2017, 85) puts it:

> As perspectivally situated agents, we are able to fluidly shift our framework of action judgment and act with constantly changing outlooks depending on the needs and opportunities we perceive in ourselves and our near surroundings in the broader world . . . We continuously co-construct and shape our environments and ourselves as agents.

If we follow the "4e" school of cognition, the role of natural and technological mediation processes becomes even more important. It turns out that the scope of human cognition is extracranial, constituted by bodily processes (embodied), and dependent on environmental affordances (embedded and extended) (Newen, De Bruin, and Gallagher 2014; Spivery and Huette 2014, 306). If the self and its environment essentially create each other, whether and how other people and entities seek to control those processes becomes paramount (Frischmann and Selinger 2018, 81–101).

The implications are significant for those now living their lives in the "scenes" of our digital communities environment. These include:

- The individual's persona is already comprised of a blend of private, collective, shared, and public data – which includes what some are now calling "non-personal" data (NPD) (Whitt 2021a, 162–63).
- The individual's environment is a constantly shifting panorama of the public (the city courthouse), the private (the grocery store), and the in-between (the connecting sidewalks). Architect Stavros Stavrides challenges us to look behind the cityscapes, to perceive the space-as-commons, expressing and exemplifying novel forms of social relations (Stavrides 2020).
- The systems are owned and controlled by one or more entities, each with different incentives for employing SEAMs cycles.

Further, the advanced technology systems being deployed in these environments can register and collect a vast range of biometric information about the self – from one's geolocation, facial expressions, voice patterns, even walking gait (Thales Group 2021). And yet merely by traversing a sensor-laden physical space, an individual is assumed to accept their presence and operation – with no realistic opt-out.

In the shift to a "scenes"-dominated environment, it seems we are expected to remain the largely passive user of the Web's "screens" environment. As one European report has amply detailed, the user's loss of control in digital public spaces is manifold – including the inability to consent, or object, to data surveillance,

collection, and processing (Christofi and Verdoodt 2019). In systems parlance, the feedback loops of these physical spaces become even more attenuated, and can disappear altogether. Traditional accountability concepts, such as notice and choice, can become meaningless in these environments.

Nor is there an actual living entity with which to engage. In the typical digital community, drivers, pedestrians, and others at most may receive some transparency in how systems make use of data, and some accountability in how systems safeguard such data. And yet the individual has no place in that decision tree. There is no obvious opportunity to engage, to question, to negotiate, to challenge, to object, to seek recourse – in other words, to exercise one's personal agency.

Without such a mediating process in place with the underlying "rules of the road," and interfaces unable to accept and act upon such mediations, there is no viable way to opt out of the system's prevailing SEAMs control cycles. Stavrides for one argues that the "governing elites" intentionally seek to embed in cityscapes ways of continuing to define individuals as "economic subjects … whose behavior and motives can be analyzed, channeled, predicted upon, and, ultimately controlled by the use of economic parameters and measures only" (Stavrides 2020, 160). Such population "governance" also seeks to "ensure that people continue to act and to dream without any form of connectedness and coordination with others" (Stavrides 2020, 160). Fleming (2009) puts it well:

> New technologies have not made place irrelevant in our lives or fundamentally altered our embeddedness in the physical world. If anything, they have made place more important. Despite our fractured subjectivity, our insistently networked existence, and our hybrid culture, the ground under our feet remains surprisingly important to us and desperately in need of our care.

SIDEWALK LABS: UNTAPPED POTENTIAL

As we consider the potential of modern smart city experiments such as Sidewalk Labs, we can look to ancient precedents for insight. As we have seen in ancient Thurii, observes one scholar, "the act of writing a constitution and tracing a grid … are symmetrical concepts," because they invite broad participation for citizens (Kirkpatrick 2015). That same kind of balance from the old world of architecture and city planning can also be achieved in digital connections and the exchange of data.

What useful takeaways can be derived from the Sidewalk Labs project in Toronto? At least two interrelated conversations are worth continuing: first, opening up the back end of the project governance and, second, opening up the front end of the software interfaces. Optimally, providing balanced processes of interactions within these two forms of human-to-system interfaces can be devised and implemented in concert.

Designing Inclusive Governance

The Quayside project's ultimate demise was unfortunate in at least one respect. It precluded a more open conversation about the precise mechanisms and processes that could comprise a successful governance mechanism. As we will explore below, while community data trusts are one potential form of inclusive governance, the knowledge commons and digital fiduciary offer other models worth exploring.

Community Data Trusts

The *data trust* offers one particular governance model to engender greater trust and accountability. Here, the data trust concept can be adapted to apply to the technology overlays in a civic or community setting.

An early proponent of the "civic trust," Sean McDonald (2015), has explained how the model uses trust law to build public participation spaces. Specifically, the civic trust embeds network considerations into the way that technology products evolve. The public is the trust, the technology company is the licensee, and stakeholders can include users, investors, and the public at large. An independent organization would own the code and data resources, which third parties in turn could use and adapt. The civic trustee would ensure that the public has a meaningful voice, as well as foster the integrity of decision-making processes (McDonald 2015).

There are few and limited examples globally of civic trusts (MaRS 2021). As McDonald (2018) observes, the Toronto project was to have been the world's largest-scale proposed civic data trust. The project's publicly stated goal matched that lofty scale: its "proposed approach to digital governance aims to serve as a model for cities around the world" (Sidewalk Labs 2018).

Sidewalk Labs began exploring the creation of what it first labeled a "data trust," and then a "civic data trust," before settling on the nomenclature of an "urban data trust" (UDT). Sidewalk Labs itself made clear that the UDT model would not be a trust in a legal sense – meaning, among other changes, no adoption of express fiduciary duties to trustors (Sidewalk Labs 2018). Not surprisingly, the shifting approaches attracted public resistance, including from some associated with Waterfront Toronto itself (Vincent 2019).

While Sidewalk Labs garnered praise in some quarters for making its proposals public, others deemed the proposals themselves "riddled with contradictions," including conflicting theories of control over data (McDonald 2018). In an early critique, Ellen Goodman and Julia Powles (2019) pointed out the project's lack of meaningful transparency and public accountability for proposed data practices, while raising questions about the notion of private uses of public spaces. Others decried the "neoliberal" and "post-political" governance model (Carr and Hesse 2020). The novel concept of "urban data" – data that is collected in public spaces and treated as a type of "public asset" for sharing – also drew criticism.

Element AI (2019) further critiqued the proffered top-down governance model, centered on a private company acting as a data trust settlor. Element AI saw this approach as introducing power imbalances that otherwise would be avoided in the more bottom-up model, championed by Sylvie Delacroix and Neil Lawrence (2018), of users collectively pooling their own data. As a matter of process, Sidewalk Labs' seemingly reactive alterations to the trusts-based governance models likely were also unhelpful to the public deliberations.

Anna Artyushina (2020) has conducted an in-depth analysis of the governance angles of the Sidewalk Labs project in Toronto. Her particular theoretical lens is a technoscientific/platform capitalism framework. Her argument is that the civic data trust model (later the urban data trust) proposed by Sidewalk Labs "appeals to and sustains a political-economic regime governed by the logic of rent-seeking, which aims to entrench the economic dominance of technological monopolies" (Artyushina 2020, 1). She points to key factors such as the drive to collect and control user data, and resulting information asymmetries between platform companies and users (Artyushina 2020, 19).

Artyushina's conclusion is that Sidewalk Labs sought to treat its new governance model for the smart city environment as tantamount to the Web model already entrenched by platform companies, with a single entity controlling the market, the data, and the technology. As she puts it succinctly: "The real purpose of the Urban Data Trust was to assetize residents' information and make it sufficiently easier for technology companies to access, reuse, and profit from the data" (Artyushina 2020, 23).

Artyushina's analysis exposes the real dangers from the approach that Sidewalks Labs chose to adopt. Whatever the company's motivations, its top-down approach to devising and implementing the governance structure was bound to invite suspicion, perhaps well-placed. While the civic data trust concept was created as a way to avoid that kind of outcome, how such a governance model is actually established makes a significant difference. In brief, inclusive process matters. This perspective is consistent with the knowledge commons model, described further below.

Another Form of Trust: The Knowledge Commons

An especially intriguing governance option to consider is the *knowledge commons*. First championed by Elinor Ostrom, the commons was proposed as a means of governing natural resource commons (Frischmann, Madison, and Strandburg 2014). As other chapters in this book attest, some are already exploring viewing the city as a commons. The smart city environment could provide a test case for collecting and sharing personal and environmental data as a form of knowledge production.

Traditional economics offers some support for viewing data as a commons resource. While market mechanisms generally are the most efficient means for allocating rivalrous goods, scholars have found that traditional property rights could unnecessarily constrain beneficial sharing arrangements (Stavrides 2020).

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The nonrivalrous nature of most forms of data suggests it could be governed instead as a "commons" (New America 2019).

Importantly, a commons management strategy can be implemented in a variety of institutional forms (Frischmann 2012, 8). Part of Elinor Ostrom's genius was perceiving the commons as occupying a space between the two governance poles of government and market – what she labeled the "monocentric hierarchies" (Whitt 2013, 747–48). Her conception of "polycentric governance" by a like-minded community was intended to address the collective-action challenges stemming from a need to manage common pool resources (Whitt 2013, 747).

Data can be likened to other intangibles, such as ideas. New-growth economist Paul Romer found ideas to be both nonrivalrous (readily shared for reuse) and at least partially excludable (sharing can be limited) (Whitt and Schultze 2007, 264–67). Data also can be said to constitute part of an "intellectual infrastructure" (Frischmann 2012, 253–314). Frischmann notes the difficulty of applying infrastructure concepts to "the fluid, continuous, and dynamic nature of cultural intellectual systems" (Frischmann 2012, 253). The related concept of a "knowledge commons" would govern the management and production of intellectual and cultural resources (Frischmann 2012, 253).

Here, the institutional sharing of resources could occur among the members of a particular community (Hess 2012). The resources would be intellectual and cultural – including information, science, creative works, and even ideas. Many types of data management arrangements could also qualify as "knowledge" for these purposes.

The history of the commons, and subsequent enclosures by political and commercial interests, may provide a suitable framing for ongoing debates about treating data as private property (or "enclosing" it). Scholars have explored various forms of opposition throughout history to market enclosures of shared resources, and sapping the generative power of the commons (Bollier and Helfrich 2012). To some, data may represent the ultimate global enclosure opportunity, beyond the land and labor resources of the past.

Application of Theory: The GKC Framework

Earlier chapters in this book lay out the GKC framework in the specific context of smart cities. Sanfilippo and Frischmann, for example, render a proposal for what they term "intelligent governance" (Chapter 10 in this volume). They posit that such a proposal requires "comprehensive public knowledge," derived in part from a series of provisional questions to ask throughout the smart city development, procurement, implementation, and management processes. The authors also challenge the supposed downside trade-offs of infeasibility and reduced innovation as part of instituting a GKC framework (Chapter 10 in this volume).

Using the prism of the GKC framework, Teresa Scassa (2020) provided a thoughtful analysis of the Sidewalk Labs project. In analyzing the rationale for adopting the civic data trust in Quayside, Scassa posits that the combination of shared resources

and collective governance is a good fit. Her article utilizes the four key elements of the knowledge commons framework: (1) the background environment and context, (2) the resources to be pooled, (3) the governance mechanism itself, and (4) the costs and benefits of the approach.

Among other findings, Scassa notes that the final chosen governance model of the urban data trust was developed in a top-down and reactive manner, "by a single stakeholder in a complex environment with multiple participants and diverse interests in the data" (Scassa 2020, 56). Further, the novel category of "urban data," created by Sidewalks Labs to denote the pooled resource, was both unwieldy and uncertain. Scassa believes urban data was defined unhelpfully as a "combination of physical geography and uncertain notions of public and private space" (Scassa 2020, 56). She concludes that the knowledge commons concept is a useful and instructive one to consider in devising data governance models.

The Digital Fiduciary, Employing a Virtual Trust Layer

A final model to consider for smart cities governance is the *digital fiduciary*. Similar to a civic data trust, this entity would manage data flows within a community in ways that best represent the interests of its citizens. The primary difference is that a digital fiduciary need not be limited to a legal trust arrangement, but instead could govern itself through other types of accountability measures. These could include bilateral or multilateral contracts (including smart contracts on a blockchain), government procurement requirements, self-certifications, professional accreditation bodies, codes of conduct, and/or best practices (Whitt 2021a, 211–12). While a promising governance model, a number of open questions remain to validate the viability and scalability of such an approach (Whitt 2021c).

One way to facilitate the digital fiduciary within a smart cities context is to devise a *virtual trust layer*. As envisioned by the author's company, Deeper Edge LLC, this "Trust as a Service" approach would incorporate separate but interrelated conceptual modules that collectively form its reference architecture (Deeper Edge 2021). In essence, this open source model entails mapping end user data streams to and from the cityscape environment, and assigning express duties to each mediating juncture point.

The interoperable modules of a virtual trust layer would include:

- *Network stacks*: where data packets travel through layers of information systems;
- *Data lifecycles*: where data resides in servers, routers, algorithms, and applications;
- *Algorithmic tussle zones*: recognizing external interfaces (screens and scenes) and intra-network mediation points (unseens) where competing interests "tussle for control" over data access; and
- *Duties*: operationalizing applicable obligations, based on extant fiduciary/trusts/bailment laws (Deeper Edge 2021).

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Importantly, as laid out in the fourth section, the digital fiduciary could operate on either side of the smart city platform – representing the digital community itself, and/or serving as an individualized agent of the local citizen (Whitt 2021c). In turn, the virtual trust layer could inform each entity's internal decisions, as well as provide an agential form of connectivity linking the two sides (Deeper Edge 2021).

Early adoption of a form of virtual trust layer in a smart city context appears in the World Economic Forum's ongoing partnership with Helsinki, Finland (WEF 2021a). The resulting WEF white paper adopts a similar conceptual blending of stacks, lifecycles, tussle zones, and duties, applying it as a "human-centric approach to data relationships" to benefit the citizens of Helsinki (WEF 2021b).

Bringing us full circle, Helsinki's holistic, multilayered approach echoes the model of the ancient Greek agora, as exemplified in the founding of Thurii. For many Greek cities, the agora was far more than a marketplace – it was the center of civic life. People freely mingled and participated in all forms of social interaction, including commercial dealings, political and legal activities, and philosophic discourse. This blending of human engagement led to tremendous creativity, and a number of ideas and institutions that have stood the test of time (Whipps 2008). Perhaps the agora as human trust layer can provide another useful way to conceive of governing the blended public spaces of the digital community.

Designing Inclusive Interfaces

The DTPR Project and Personal Software Agents

In 2019, Sidewalk Labs publicly launched the DTPR project – "Digital Transparency in the Public Realm." The DTPR team was tasked with creating icons and signage that would allow pedestrians to understand what kind of function was being employed by a particular environmental device (Sidewalk Labs 2018).

As the project heads acknowledged, cities like Boston and London "have already taken important first steps by posting clear signage whenever they employ digital technologies in the public realm" (Lu 2019). One early component proposed by the DTPR team, the "consent through signage" principle, used a comprehensive system of colorful symbols to inform citizens about data collection practices. Citizens then faced a decision: remain on the scene, which indicates consent, or withdraw consent by departing the scene (Artyushina 2020, 29). Needless to say, such a faux choice grants ordinary citizens little recourse: how can one gain the benefits of belonging to a digital community without giving up control over one's personal data?

DTPR's initial focus on transparency – informing pedestrians about the "what" of a sensor's activity – shifted quickly to a phase two. This phase was devoted to engendering greater accountability for the underlying system's actions (Sidewalk Labs 2020a). As part of this phase, the DTPR project team gave a concerted outreach to designers and others to "advance digital transparency and enable agency."

In the last few months before the Quayside project was terminated, the DTPR team went further still. Using co-design sessions, charrettes, small-group discussions, and prototyping, the team sought to investigate opportunities for actual human agency – in particular, direct human-to-interface interactions within the local sensor system (Sidewalk Labs 2020b). Intriguingly, prototypes for conversational chatbots and personal AIs were introduced, discussed, and tested for feasibility (Sidewalk Labs 2020c). As the team summarized:

> The chatbot supports visual, auditory, and tactile modalities, makes it easy to find different kinds of information, provides links, schematics, or documentation, and can adapt to the user's level of interest in detail . . . We asked charrette participants to imagine that five years in the future, they have a personal digital assistant provided by an organization they trust (such as a bank), that provides automated data/privacy information tailored to an individual's preferences. We also shared the results from our GRIT [GRIT Toronto, a civic testing service] user tests on how research participants responded to that concept. We explored how that digital personal assistant, in the form of a chatbot, could provide answers about systems and places in a standardized manner, using the DTPR taxonomy. We wanted to see how this concept could encourage users to develop expectations around transparency and accountability of spaces, provide a flexible way for users to interact with a physical space and the digital technology within it, and adapt and learn as users asked new questions. (Sidewalk Labs 2020b)

The DTPR team also shared out the insights they gleaned from their research on the feasibility of personal digital assistants:

- "Concept feedback sessions showed the desirability of a trusted digital assistant to help with daily tasks."
- "People want to ask questions at a time and context that is convenient to them, not be interrupted mid-flow."
- "Trust varies person by person, case by case; there is no 'one size fits all' approach." (Sidewalk Labs 2020d)

The "agency" phase of the aborted DTPR project offers some fascinating prospects. If successfully pursued, creating these kinds of interactive, two-way IoT systems could open up real opportunities for humans to engage on their own terms as they go about their lives in digital communities.

New Edge-Outward Interfaces: Edgetech

Along with the governance institutions, we can in parallel put in place agential technologies such as DTPR that invite our participation, rather than shunt it aside. Refashioning IoT network gateways and applications so that they reflect more control by humans at the edge of the Web can be thought of as "*edgetech*" capabilities. These new interfaces essentially reverse the unilateral nature of the *cloudtech* interfaces that facilitate SEAMs control flows for government agencies

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and platform providers (Whitt 2021a). In essence, while cloudtech-based entities import personal data and export content and influence, edgetech-based entities export personal intentionality and import sought information.

The edgetech concept incorporates three elements: (1) a new *edge-to-any/all* (e2a) design principle, (2) end-user-facing modalities of data, computation, and interfaces that instantiate the new principle, and (3) one or both of "edge-pushing" and "edge-pulling" functionalities that empower end users (Whitt 2021a, 199–201). Each element is briefly described below.

The "Edge-to-Any" Design Principle

The initial step is to recognize the opportunity to conceptually reset the Web's current power asymmetries through an entirely new design principle. This approach has the makings of fashioning an edge-based online environment.

Through the revolutionary design attributes of the end-to-end (e2e) principle, functional modularity, global interoperability, and IP as agnostic bearer protocol, the Internet over several decades became a "network of networks." Its unique decentralized, peer-to-peer configuration enabled participants to interact from "the edge" – symmetrically, equipotentially, with little need for intermediaries. The end-to-end principle in particular promised originally to put end users in charge of their online activities (Whitt 2013, 717–29).

As it turns out, however, first the client–server arrangement of Web 1.0 and then the multisided platforms ecosystems of Web 2.0 ended up reducing the ability of end users at the edge to control their digital selves. Instead, the cloud-based "end" of platforms operating on the other side of the connection exerted increasing control over Web-based interactions. Ordinary people had fewer means to limit unwanted access to data. Beyond even the notion of basic control, individuals gradually lost the ability to engage in mutual value exchange with peers and partners, and otherwise assert their full human rights in digital form.

Where the original Internet architecture included the then-revolutionary concept of the e2e principle, the notion here is to deploy as a Web overlay a new edge-to-any/all principle. Much as the e2e principle first established at least the possibility of connecting true peers, an e2a principle would be instantiated in technologies that deliberately shift power from the Web and its platform overlays to ordinary "end users" at the network's edge. As a result, the computational core of clouds and algorithms would give way to more distributed networking and decentralized applications. One can think of adopting this principle as a means of reversing the current cloud-centric SEAMs data flows on the Web (Whitt 2021a, 199–201).

Multiple Edge-Based Modalities

Systems designers utilizing an edge-outward design principle like e2a can change the current one-sided dynamic of the Web. The opportunity is two-fold: (1) modifying existing interfaces so that the human being has a viable means of engaging

directly with computational systems and (2) designing new interfaces to maximize the human's ability to shape their own "user" experiences. The emphasis should be on interfaces that promote autonomy (freedom of thought) and agency (freedom of action) (Whitt 2021a, 153–63).

The e2a design principle can be instantiated in any type of digital technology that grants the "end user" more control over their engagement with Web-based systems. These can include the algorithmic element, decentralized Web platforms, interfaces, and of course the data itself (Whitt 2021a, 199). For example:

- A personal AI acts on behalf of the individual in interactions with institutional AIs.
- A personal data pod effectively stores the individual's data and information in a localized (non-cloud) environment, complete with end-to-end encryption.
- An identity layer provides a one-way screen to shape what information about an individual is provided online, and to curtail the unwanted incursions of third-party agents.
- A blockchain-based non-fungible token (NFT) encapsulates data in ways that make it far easier for individuals to create, manage, and share access on their own terms.

Edge-Push and Edge-Pull Functions

Various edgetech modalities, operating under the e2a design principle, can empower the individual. There are broadly two types of functions that are enabled (Whitt 2021a, 200):

- "*Edge-pull*" configurations allow the individual to bring the Web's computational systems and other resources directly to them. One example is creating one's own news feeds from disparate sources; another is directing credit-scoring companies to access (but not acquire) personal data that resides locally.
- "*Edge-push*" configurations allow the individual to send their own commands and requests to designated sites on the Web. Examples include broadcasting one's own terms of service, and operating one's own virtual shopping cart.

Each of these two functions has its notable champion (Whitt 2021a, 200–01). The OPAL (open algorithm) project launched by Sandy Petland and others at MIT enables *edge-pull* functionality, by "pulling" the Web's computation to the personal data – rather than the other way around (OPAL Project 2021). One early company moving forward with a business model premised on OPAL's edge-pull functionality is FortifID. The company's website indicates that its platform is "designed to reduce the raw data footprint across a company's ecosystem," because the "algorithms travel

to the data and produce insights that are shipped back for use instead of raw data" (FortifID 2021).

The VRM (Vendor Relations Management) project launched by Doc Searls at Harvard University is a well-known leader for *edge-push* thinking (Project VRM 2021). As one example, Searls has explained how each of us should want to be the first party in a relationship with the operators of websites and apps (the primary and active instigator), rather than the second party (the passive recipient) (Searls 2018). In the digital community context, the entity operating on the other side of the interface could be required to accept *our* terms of service, abide by *our* privacy policy, and consent to *our* preferred ways of interacting. Searls uses the term "intentcasting" to describe this new dynamic. In proffering edge-push requests, an active first-party role allows us to engage in a true conversation – question, object, negotiate, and ideally reach a mutual agreement.

With both edge-push and edge-pull functionality, the current Web client–server paradigm is flipped on its head. Among other benefits, by utilizing the appropriate online interfaces, an individual can set their own identity screen to establish protective virtual boundaries.

In the digital community context, e2a design principles would enable the individual to project themself into the physical platform, opening up new points of bilateral interaction and negotiation. A healthy mix of edge-pull and edge-push interfaces then would create "mini" positive feedback loops between the individual and the platform. System designers know that such positive feedback loops have a highly agential impact: "to perturb systems to change" (Lidwell, Holden, and Butler 2003, 92–93). And in the process, the person on the physical scene can define and operate their own two-way "UX."

COMPLEMENTARY ROLES FOR DIGITAL FIDUCIARIES AND PERSONAL AIS

A digital community could be devised so that a citizen's digital agent would be able to interact directly, on their behalf, with the community's computational systems. In the case of Sidewalk Labs Toronto, these interactions could have been facilitated through the very chatbots and personal AIs that were being explored in parallel via the project's DTPR process. The back-end of trust governance could have benefited from more fruitful connections with the front-end of sensor interface technologies.

In essence, each smart city and other digital community is its own website, or social media platform, or mobile application. As with these better-known digital experiences, the digital community is in a position to adopt and apply its own terms of service, its own privacy policy, its own data protection practices, and its own authorized use policy. As with the World Wide Web, this panoply of overlapping and likely inconsistent policies would overwhelm most typical participants. In essence, the cognitive overload of the Web would become extended and embedded

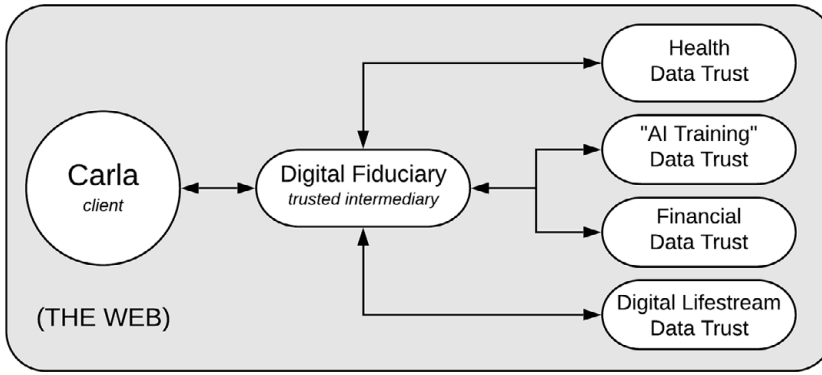

FIGURE 9.4. Digital fiduciary and data trusts, GLIA Foundation

in the physical spaces all around us. At present, there is no obvious recourse to deal with this pervasive problem.

Having one's own personal agent, such as a digital fiduciary, could help the average person to cope with, and even manage, this brave new world of digital communities (Whitt 2020c). As an individual goes about their daily activities in their local city, a personal digital fiduciary can provide the means of interacting in real time with the digital community – including the civic data trust, and other entities that the individual may encounter in their travels. These interactions would be enabled via the software interfaces embedded all around (Figure 9.4).

As the DTPR project team recognized, a personal AI or other virtual agent could be an important complementary tool for utilizing one's edgetech applications (Sidewalk Labs 2020b, 2020c, 2020d). The personal AI could provide forms of "digital pushback" to challenge a digital community's existing SEAMs cycles, by:

- blocking the automatic "surveillance" and "extraction" modes;
- disrupting consent-less operation of the community's "analysis" mode; and
- thwarting attempts to "manipulate" the individual's autonomy in their physical environment.

A LIKELY ROLE FOR GOVERNMENT

A more inclusive and symmetrical interface is only as good as the interoperability behind it – the two-way means of interacting with other underlying networks. Interop constitutes the somewhat unfashionable network plumbing of software standards and protocols. As one example, for a personal AI to "talk" directly with an institutional AI, there must be an accepted means of communication, and an agreement to act upon it.

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The basic interop fabric is already there to support robust two-way interfaces. After all, the Internet is a splendid example of an interconnected "network of networks." Symmetrical interfaces using the e2a design principle can mirror that same peer-to-peer architecture: my system speaking on equal terms with your system, in a reciprocal manner. What would change is the current overlay of unidirectional interfaces leading to tightly controlled platforms.

Voluntary agreement on the operative protocols and standards would be optimal. However, there may well be a role for governments to play in smoothing the path for such agreement. Regulators could introduce a mix of tailored market inputs and incentives that would open up portions of underlying platform resources. These might include system-to-system interconnection, robust interoperability (at the different layers of data, computational, identity, and mixed/augmented reality), and data delegability and mobility (from platforms to selected mediators) (Whitt 2018, 45–65). Many of these "functional openness" concepts – such as network interconnection, services interoperability, and resource portability – are rooted in regulatory policies developed in the 1980s and 1990s by the US Federal Communications Commission (FCC) and other national regulators, as a way to facilitate more competitive communications services markets (Whitt 2018, 45–65).

Some in the US Congress have not overlooked this particular option. As a salient example, the proposed "ACCESS Act" incorporates key functional openness measures aimed at large platform companies (Warner 2019). Introduced in the US Senate in October 2019, the bill encompasses two agency-bolstering elements. First, the bill would require the platforms to provide interoperability and data portability, via transparent and accessible interfaces suited for both users and third parties. Second, the bill would allow users to delegate their digital rights to "third party custodians," operating under a duty of care (Warner 2019).

That right of delegation could well prove crucial to enabling individuals and communities to fully exercise whatever statutory rights are granted to them (Whitt 2021b). Indeed, Nobel prize winning economist Paul Romer observed in his statement supporting the original 2019 version of the bill: "By giving consumers the ability to delegate decisions to organizations working on their behalf, the ACCESS Act gives consumers some hope that they can understand what they are giving up and getting in the opaque world that the tech firms have created" (Warner 2019). As noted, such asymmetrical opacity is even more pervasive and insidious in the smart cities context.

CONCLUSION: ADAPTING ANCIENT LESSONS FOR MODERN COMMUNITIES

"Places matter!" (Fleming 2009, 32)

Against a backdrop of widespread governance failures worldwide in our economic, political, and social systems, the near-term opportunity is apparent (Whitt 2020a).

As the city of Thurii attempted some 2,500 years ago, today we can craft governance structures and spatial processes that work together to ensure inclusive and supportive physical environments for real people.

Our digital communities should embrace the active participation of citizens and visitors alike in the increasingly blended spaces that constitute the self and world, the private and public, and the physical and virtual. Insights gleaned from the GKC framework, fiduciary-based governance models, and technologies utilizing edge-to-any/all design principles, can form a powerfully inclusive combination. Also, the digital fiduciary and personal AI could be a complementary means to help ensure that ordinary people can readily explore and participate in the brave new world of their digitally equipped communities.

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