Tarzan vs. IBM: Value Paradigms of Urban Technologies


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Abstract

The urban planning discourse is increasingly shaped by technological concepts such as Smart Cities, the Open Data movement, or the Internet of Things. Technologies deployed at the urban scale by well-funded tech companies are already reshaping urban environments; ride-sharing platforms or the gig economy are leaving traces on the socio-economic fabric of many cities. Both proponents and critics often ascribe these changes to inherently disruptive effects of technology. Yet, such an essentialist focus on the nature of technological change distracts from the wide range of different cultures, values, and ideologies these technologies are entangled with. Using recent examples of data-driven urbanism, this chapter will describe the differences between various urban technologies and techno-cultures based on the goals and value propositions of their supporters. The chapter describes four value paradigms derived from recurring themes in the techno-urbanistic discourse--"seamless efficiency," "responsive transparency," "empowering devolution," and "shared stewardship" -- and discusses their similarities and differences, their goals and critiques.

Introduction

The notion of the smart city remains stubbornly persistent in the urban planning and policy discourse. Its longevity is partly due to its ambiguity: the smart city is not a consistent concept, but a metaphor with many facets and variations. Far from a new idea, the city as an intelligent machine is a classic science fiction trope, treated in films such as Jean Luc Godard’s 1965 film Alphaville, which the director provisionally entitled "Tarzan versus IBM." Yet, the words intelligent and smart have different meanings. While Godard’s city exhibits human-like intelligence and the ability to engage in philosophical dialogue, technological smartness, as envisioned by architect Bill Mitchell, does not require such advanced mental capacities (Mitchell 1995, 2000). Perhaps Mitchell preferred the word “smart” because it means accomplishing much with little effort: being efficient by taking shortcuts, utilizing available resources and connections rather than mobilizing brute-force computational power.

After the 2008 recession in the U.S., and in anticipation of infrastructure stimulus programs, IT companies such as IBM embraced the smart city concept, promoting technological solutions to manage urban systems--including transportation, energy, water, sanitation, and healthcare--more efficiently with the help of distributed sensor networks and predictive data analytics. As federal funds, however, failed to materialize and cities turned out to be complicated customers, IBM reduced its “Smarter City” activities. The term, however, did not disappear. The European Union continued to use the smart city label in its funding frameworks but framed it as a broader approach to regional development and innovation policy. In the Global South, smart city initiatives acquired yet another flavor: here, beyond their typical application to infrastructure modernization, the term is often used in the context of large-scale real-estate development projects. Indicative of the most recent redefinition of the term, the Obama administration launched a nationwide smart city initiative in 2015 that aimed to combine civic media, transparency initiatives and neighborhood projects with technical infrastructure goals (Correa 2015). The initiative was based on the premise that smart urban technologies are not rocket science: many cities and civic initiatives have already developed an array of tools and practices to support planning, deliberation, and participation.
Value-oriented Paradigms of Urban Technologies

The most tangible impacts of digital technologies on urban space are, however, rarely connected to smart city initiatives, but are the result of new services deployed by Silicon valley giants such as Amazon, Uber, or AirBnB, often bypassing local administrations and regulations. Ride-sharing and social navigation apps such as Waze have changed traffic patterns and pose challenges to public transportation authorities (Foderaro 2017; Alemi et al. 2017). Dockless rental bikes and scooters appeared on sidewalks across the US seemingly out of nowhere. The gig economy has changed the demographic and economic landscape of cities. The places where the new informalized workforce of Uber drivers, Task Rabbit\(^1\) handymen, or Alfred\(^2\) domestic workers prefer to operate are usually not the same where they can afford to live. Peer-to-peer rental services such as Airbnb are under scrutiny for their suspected impact on the availability of affordable housing in many cities. Social media spaces are fragmented into multiple parochial domains (aka filter bubbles), and as spatial behavior is increasingly shaped by social platforms, this fragmentation seeps into physical space (de Waal 2014; Ito, Okabe, and Matsuda 2006). Far from their alleged equalizing effect on geography, digital communication technologies have introduced new spatial inequalities.

These earlier examples illustrate that many traditional models about the spatiality of digital media technologies need to be revised. For a long time, many architects, designers, and planners were guided by an idea of cyberspace as an abstract domain of information that augments the physical space of the city. Augmentation, however, is no longer an apt description: the built environment and spatial practices are not just complemented, but increasingly regulated by media technologies. Digital networks and physical spaces become contingent upon each other; many physical infrastructures no longer function without digital networks (Kitchin and Dodge 2011). The idea of “cyberspace” itself, a consistent space that follows its own laws and principles, implies a determinism that is often found in technological narratives. In the words of futurologist Kevin Kelly, “by following what technology wants, we can be more ready to capture its full gifts (2010, 175).” But not only techno-enthusiasts, but also critics frequently take a deterministic stance, understanding technology as something ontologically stable and inherently destructive.

On closer scrutiny, however, current examples of urban technologies do not support such sweeping characterizations. Each platform, tool, and project introduces its own spatialities, shaped by values, design decisions and power dynamics rather than inherent technological principles. As critic Evgeni Morozov points out, the Internet is a heterogeneous assemblage of different protocols and infrastructures — some centralized, others distributed — rather than a consistent object with essential qualities. In other words, the Internet does not have an inherent logic that would determine its social effects, let alone possess agency and “wants” (Morozov 2014). This does, however, not imply a social determinism— that technologies are merely a representation of social forces and their effects are only a matter of how they are used. The reality is more complicated: technologies such as ridesharing apps, the Internet of Things, predictive analytics, or blockchains are deeply intertwined with social practices, power relationships, values, and ideologies. Their mutual relationships are rarely deterministic and could be better described through the metaphor of resonance. Emerging techno-cultures resonate with more established ideas and values of how cities and society should be organized and improved.

This chapter will attempt to disentangle urban technologies and techno-cultures and group them based on the goals and values articulated by their proponents. In this respect, techno-cultures cannot be treated as monolithic systems: the Open Source movement, for example, encompasses a range of diverse and sometimes contradictory values and beliefs. In the remaining

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\(^1\) Task Rabbit is online marketplace for freelance labor, mostly used for tasks such as assembling furniture, see [http://www.taskrabbit.com](http://www.taskrabbit.com)

\(^2\) Alfred is an online marketplace for domestic workers and their clients, see [http://www.helloalfred.com](http://www.helloalfred.com)
sections, I will identify four different value paradigms for urban technologies, discuss examples, their associated value propositions, and critiques. The value perspective reveals differences between apparently similar approaches, but also surprising alignments between seemingly opposed views. The following table provides an overview of the four value paradigms (Table 1).

**Table 1 Urban technologies by value paradigm.**

<table>
<thead>
<tr>
<th>Value Paradigm</th>
<th>Examples</th>
<th>Goals</th>
<th>Critiques</th>
<th>Further reading</th>
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<tbody>
<tr>
<td>Seamless efficiency</td>
<td>corporate smart city, data-driven urbanism, cybernetics and systems theory</td>
<td>Using economies of scale, legibility, control (top-down), autonomy, convenience.</td>
<td>technocratic (not people centric), surveillance, not resilient, not attainable</td>
<td>(Goodspeed 2014; Greenfield 2013; Mayer-Schönberger and Cukier 2013; Gordon and Walter 2016)</td>
</tr>
<tr>
<td>Responsive transparency</td>
<td>New Public Management, KPIs, Open Data Movement, Civic Technologies, accountability technologies</td>
<td>Freedom of information, control (bottom-up), outcomes over process, participation, generative value of data</td>
<td>perverse incentives, political misuse, overestimating transparency</td>
<td>(Lathrop and Ruma 2010; Goldsmith and Crawford 2014)</td>
</tr>
<tr>
<td>Empowering devolution</td>
<td>Maker culture and DIY, tactical urbanism, pop-up urbanism</td>
<td>decentralization, participation, democratization of technology</td>
<td>privatization, favoring the retreat of the state (big society)</td>
<td>(Ratto, Boles, and Deibert 2014; Egyedi and Mehos 2012)</td>
</tr>
<tr>
<td>Shared stewardship</td>
<td>Digital communities of practice, cooperative movement, blockchain / smart contracts,inverse infrastructures</td>
<td>Good governance, inclusion</td>
<td>gaps in capacity, access, (digital divide), depoliticising / trivializing politics (bitcoin example), hyperformalization of interactions.</td>
<td>(Greenfield 2017)</td>
</tr>
</tbody>
</table>

**Seamless Efficiency — the Smart City and Cybernetic Feedback Systems**

Embodied in the image of the smart city, the paradigm of seamless efficiency is based on the notion that certain urban problems can only be addressed on the systemic scale. The paradigm is rooted in the urban cybernetics discourse of the 1960s, which conceptualized the city as a complex, dynamic, and self-regulating feedback system (Goodspeed 2014). As systems theorist Jay Forrester emphasizes, the behavior of such systems is often counter-intuitive. Since the system dynamically reacts and adapts to changes, policy interventions can have the opposite of the intended outcomes: for example, attempts to reduce traffic congestion can lead to even more congestion. As Forrester argues, policy makers can only succeed, if they consider the entire system and understand its dynamic behavior (1969; 1970). Unsurprisingly, Forrester’s pilot projects attempting to provide objective and apolitical simulations for shaping low-income housing policy in Boston and New York led to intense public controversies (Alfeld 1995).

But in the paradigm of seamless efficiency, most decisions are not made by planners, urban managers, or policy makers but by the system itself. Alluding to the cybernetic metaphor of the human brain as a feedback system, the concept of the smart city implies sentience and autonomy. To a certain extent, the smart city is meant to regulate itself; analyzing real-time data streams from the entire system and making autonomous decisions to optimize its performance. Such control systems are not new: since the 1980s, the city of Los Angeles has been operating the ATSAC system, a network of real-time traffic sensors connected to a computer system that controls the timing of traffic signals. What has changed, however, is the central role of data. While the ATSAC system does not keep records of historic sensor readings, big data repositories have become

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central elements of smart city projects, used as a resource for predictive analytics as well as a monetizable product.

[Figure 1]

**Implications for Urban Form**

To achieve a real-time data representation of the whole system, the smart city requires standardized infrastructure, sensor specifications and protocols (Figure 1). As a result, smart city thinking tend towards the monolithic rather than the heterogeneous. The most iconic examples of the first wave of smart cities are large-scale planned developments, including Masdar City in the United Arab Emirates or the Songdo International Business District in South Korea, both developed under heavy involvement of IT companies (Halpern et al. 2013, Townsend 2013). Masdar City is a planned city project in Abu Dhabi adjacent to its international airport, designed by Foster and partners. The city’s main theme is sustainability and energy efficiency, which is aimed for both through architectural and technical means. Its pilot stage banned cars and included a personal rapid transit system of pod-like electric vehicles. Masdar is monolithic not only in its shape—a compact block rising above the desert segmented by narrow streets—but also in its organization, infrastructure, and governance. Rather than a city in the traditional sense, it is in its current state more aptly described as a campus with residential facilities (Vignal 2014, Greenfield and Kim 2013). The Songdo International Business District is like Masdar located in close proximity to an international airport and targeted at a globally mobile elite. The city is built around the theme of ubiquitous computing, the integration of computation and broadband data networks into all aspects of the physical environment such as trash collection, traffic control, pedestrian information systems, and fully automated condos. As Halpern et al. note, Songdo is a conceptualized as a testbed for developing, perfecting, and showcasing urban technologies that can then be replicated elsewhere—a city as a physical representation of a consistent concept (Halpern et al. 2013).

Besides large-scale deployments, IT companies offer smart city solutions also for infrastructure upgrades in cities characterized by a heterogeneous assemblage of old infrastructure systems. Under the premise that data-driven urban management can increase the efficiency of existing systems, it is argued that more costly infrastructure upgrades can be avoided. However, beyond applications in transportation and energy, ambitious smart city implementations are scarce in traditional cities. The complexities of public institutions, the messiness of infrastructure bound to historical legacies and contingencies, and the tight constraints of municipal budgets made smart city products eventually unattractive for many IT companies. After the partial retreat of private actors, the second wave of smart city projects is increasingly driven by cities. In public-private partnerships, municipalities act as landlords, offering companies market access and infrastructure as a conduit for data collection, for example in the form of public information kiosks or wireless Internet on public transportation.

Smart City infrastructure is designed to be invisible, seamlessly connecting a multitude of networks in the background. Instead of exposing technical complexities, the system is expected to sense and adapt to the needs of the residents, for example in the case of on-demand public transport.

**Critiques**

It is fair to say that the smart city has a reputation problem — its critiques outnumber its praises (Greenfield and Kim 2013). Many critics consider its data-driven models as inappropriate technocratic abstractions that ignore social and political realities, sometimes with catastrophic results (Flood 2010). The smart city is often characterized as a project of top-down control and surveillance (Greenfield 2017). The underlying goals of efficiency are questioned as a technocratic fetish (Gordon and Walter 2016) but also as a potential weakness that makes cities less resilient — highly optimized systems tend to be fragile. The instrumentation of critical infrastructure with potentially hackable technologies is another risk (Kitchin and Dodge 2017). The design paradigm of
seamlessness, the attempt to hide all technical complexities, can exacerbate these vulnerabilities, by making the system more rigid, opaque, and harder to repair.

**Responsive Transparency — E-government Systems and Civic Technologies**

While the hardware-centric smart city paradigm focuses on the technicalities of public management, the paradigm of responsive transparency deals with its procedural and political aspects. Nowadays, most cities in the US operate citizen feedback systems in the form of 311 hotlines and smartphone apps for submitting complaints or reporting infrastructure failures. Data collected by these systems is used to improve public services, shared on open data platforms, and repurposed for other civic applications. Based on freedom of information laws of the 1960s and 1970s, the open data movement goes beyond mere disclosure of public information and demands public data sets to be machine-readable and available in real-time, so they can be better analyzed and used by citizens. Recently, land titles and public expenditures are recorded and opened for scrutiny on public blockchains—distributed databases that are considered especially transparent and tamper-proof. The paradigm of responsive transparency, however, goes beyond functions of public accountability. Civic technologies facilitate a two-directional flow of information, allowing the city to be responsive to the needs of its constituents.

Citizen feedback systems, participatory budgeting projects, and social accountability campaigns represent a new model of public accountability that favors outcomes over process. According to supporters of responsive transparency, this allows cities to experiment with unconventional and innovative ideas (Goldsmith and Crawford 2014). In contrast to the paradigm of seamless efficiency, this paradigm favors incremental changes rather than systemic interventions. The ecosystem of open source development, with its fast and public cycles of prototyping, testing, and deployment serves as an important inspiration. In many cases, tools developed for open source development are repurposed for participatory urban planning and governance (figure 2). This includes the use of version control systems—digital repositories that allow developers to keep track of code changes and resolve conflicts—as tools for asynchronous and distributed decision-making, bug trackers for collecting and managing reports about infrastructure failures, or collaborative authoring tools for participatory planning and co-production projects.

[Figure 2]

**Implications for Urban Form**

A review of reports submitted to citizen feedback systems across many US cities shows that a significant portion of citizen reports are not complaints, but suggestions and ideas to improve urban space (Offenhuber 2014). A responsive planning paradigm encourages such citizen input and considers such proposals serious. Although the paradigm of responsive transparency focuses on process rather than questions of urban form, its policy of small steps leaves visible traces in the urban environment. The paradigm favors small interventions over large-scale, comprehensive projects; local solutions over system-wide changes.

But transparency is not merely a procedural principle, but can have concrete design implications. As an increasing number of invisible sensors and interfaces become part of the urban environment, the legibility of data collection infrastructures and their governance becomes an important issue. The concepts of ambient accountability and accountability-oriented design address the need for making governance in physical space legible (Zinnbauer 2012; Offenhuber 2017). This can include, for example, physical hints that alert to the presence of sensors and cameras, information about what kinds of data they collect, who has access, and how data are governed.

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4 in the US, such systems are often described as 311 systems based on the telephone shortcode for reporting non-emergency issues.
Critiques

Responsive transparency may seem like an unequivocally beneficial goal. However, the capacity to engage with the local government and participate in planning decisions is not equally distributed. Studies of citizen feedback systems have shown that rich neighborhoods with a high level of public services often submit the most complaints, while low-income areas with poor services complain less (Martínez, Pfeffer, and van Dijk 2009; Verplanke et al. 2010).

It is also easy to forget that transparency by itself does not actually solve anything, and relying too much on its positive effect can actually be detrimental since transparency requirements can be easily circumvented by tactics of obfuscation. More importantly, transparency tends to call more attention to failures than to successes and can be easily politically misused through gotcha tactics (Lessig 2009). It is also worth noting that Open Source projects are transparent, but not necessarily always democratic — the governance of software projects exhibits the full range from constitutional democracies to “benevolent” dictatorships. The premise of “outcomes over process” can be problematic since outcomes have to be measured, and measures such as Key Performance Indicators (KPI) introduce their own idiosyncratic processes that can be gamed and exploited. With regard to urban form, incrementalism can be a distraction from necessary systemic change. A constant stream of requests for minor fixes can tie up the resources of a municipal government, preventing more comprehensive measures to address underlying issues.

Empowering Devolution — Inverse Infrastructures and Platform Urbanism

United by their large-scale system-building ambitions, the paradigms of seamless efficiency and responsive transparency complement each other; the former focusing on logistic, the latter on civic infrastructures. The third paradigm of empowering devolution is in many ways opposed to such ambitions. Like responsive transparency, this paradigm is rooted in the ethos of open-source development, but rather than focusing on the function of the finished system, it focuses on social practices of making and infrastructuring. While responsive transparency appropriates tools as means to an end based on their usefulness for civic purposes, this paradigm views the acts of making and maintaining as civic values in themselves. Often, new ideas emerge as side-products of collaborative efforts. The “smart citizen” — a creative, techno-literate, and civicly minded amateur expert — is heralded as a counter-model to the smart city. Beyond the use of civic technologies, the collaborative production of such tools is considered at the core of democratic discourse. The paradigm questions the need for central planning and large-scale infrastructure interventions, since the democratization and proliferation of digital technologies make it possible for individuals to build and maintain self-organized infrastructures. Examples range from public Wi-Fi infrastructure and air-quality sensing networks to twitter-operated food trucks or self-organized waste management systems.

Under various labels such as pop-up urbanism and tactical urbanism, empowering devolution promotes bottom-up organization as an alternative to public services and centralized urban design. Standardization is of no immediate concern; it is seen as an evolutionary outcome rather than a prerequisite for planning. If the paradigm of seamless efficiency strives for consistency and simplicity, empowering devolution embraces bricolage and experimentation. In many ways, devolution is a form of privatization, and commercial platforms including ridesharing services such as Uber, or hospitality services such as AirBnB can be counted in this category. Having emerged from outside the urban planning field, they have sometimes significant impact on the shape and socio-economic structure of the city.

[Figure 3]
Implications for Urban Form

Tactical urbanism directly intervenes in urban form, sometimes with acts of anarchistic appropriation — painting bike-lanes to instigate policy changes, asking for forgiveness rather than permission. Civic technologies and viral media are instrumentalized as means for “talking back” to planning authorities (Sassen 2011). The paradigm draws inspiration from the organic structures of the informal city, informal transportation services and food distribution networks. Planning and doing often coincide, leading to systems of improvisational governance, in which multiple stakeholders negotiate policy through direct interventions in the urban environment (Offenhuber and Schechtner 2017). As a counter model to the traditional infrastructure paradigm of the large technological system (Hughes 1987), this paradigm embraces “inverse infrastructures,” driven, developed, and maintained by their users (Egyedi and Mehos 2012).

Critiques

Similar to transparency, participation and self-organization are widely regarded as unquestioned positive values. However, it is doubtful whether user-driven models can replace traditional planning approaches. Self-organized infrastructures that rely entirely on a dedicated community of volunteers are difficult to maintain and scale; the results tend to be short-lived. Furthermore, praises for participation and volunteerism are often merely rhetorical maneuvers used, for example, to justify public spending cuts and privatization. Policy expert Sherry Arnstein identifies malicious forms of pseudo-participation used to placate, distract, or manipulate constituents (Arnstein 1969). Informality and bricolage are often romanticized but frequently insufficient means to address urban problems. Contrary to popular assumption, decentralized systems tend to be inefficient, fragmented, fragile, and opaque. Systemic planning and implementation guided by concerns for efficiency often lead to better and more sustainable results.

Similar to participation, empowerment is a frequently-abused term, often condescendingly used by planners towards constituents. Especially in low-income areas, however, participation in public service provision is often more a burden rather than a form of empowerment, especially when this burden is unequally distributed and participants are expected to contribute significant resources and carry responsibilities without fully benefitting from them (Bovaird 2007).

Shared Stewardship — Digital Cooperatives and Blockchain Governance

The paradigm of shared stewardship is more difficult to situate than the others in traditional dichotomies such as city vs. citizen, user vs. provider, top-down vs. bottom up. Shared stewardship refers to technologically supported models for collaborative governance among diverse stakeholders, whose interests are not always aligned. Each stakeholder group has different roles and responsibilities in managing and governing a commons – a resource that is accessible to everyone, but at the same time limited and easily depleted. As a critique of the economic “tragedy of the commons” argument according to which common pool resources are doomed to fail (Hardin 1968), Elinor Ostrom famously showed how common pool resources such as user-managed water irrigation systems can be successfully managed by a collective that shares responsibility for governance (Ostrom 1990). While the paradigm of responsive transparency assumes a traditional public authority as the governing entity, and the paradigm of empowering devolution tends to avoid questions of governance altogether, shared stewardship focuses on questions of consensus, conflict resolution, and alignment of interests.

Examples of shared stewardship include waste- and recycling cooperatives in Latin America, Africa, and India, which use digital technology for planning their collection or interacting with customers, community members, and public authorities. They also include energy cooperatives such as the Brooklyn Microgrid initiative, which builds and maintains an infrastructure of photovoltaic panels mounted on the roofs in the neighborhood to provide local energy. The
individual energy consumption and production is recorded in a dedicated blockchain ledger. In models of participatory design and co-production, beneficiaries of public services are often involved in their development, maintenance, monitoring, and governance, ensuring that the services address their needs and maintain their quality. The digital systems are manifestations of the social contract underlying these initiatives. This social contract requires constant updates, renegotiations, and clarifications. The incentive structures for the participating actors require fine-tuning as the system evolves. In blockchain applications, where governance happens exclusively through algorithmic or highly formalized rules, seemingly miniscule technical details can shift the power relationships between the participating actors and become expressions of political interests within the system.

[Figure 4]

**Implications for Urban Design**

Cooperatives focusing on the collective use (sometimes temporary), design, and governance of residual spaces have blossomed in many cities. Especially the city of Berlin houses a particularly active community of temporary use of residual or empty urban spaces, co-working initiatives, builder collectives and co-housing initiatives (Ring 2013). Local administrations have experimented with models of co-production of housing projects and public services. They are often inspired by the practices of participatory design and co-design, which have originally emerged from Scandinavian labor unions during the first waves of digitization in the 1970s (Kensing and Blomberg 1998). The degree to which digital technologies shape models of shared stewardship ranges from simply facilitating coordination and communication to more central roles. Similar to empowering devolution, the paradigm of shared stewardship tends to emphasize the local context rather than the systemic scale, while also addressing overarching questions of governance.

**Critiques**

Traditionally, critiques of digital governance models have centered on questions of access, inclusion, and the digital divide. This concern no longer holds economically, as access to digital technology is cheaper than most other basic products. Age, language, cognitive abilities, and the digital divide still remain important issues.

Complex governance structures are difficult to represent in algorithmic approaches. Considering the wide range of shared governance projects, it is not always clear to what extent technology was critical for their success. Digital technologies thrive in situations requiring the execution of simple tasks at a massive scale. As issues of governance become more complex, the potential benefit of technology diminishes. In the best case, technology plays a facilitating role, in the worst case it becomes an obstacle. The inherently informal and improvisational nature of governance negotiations does not also mix well with the rigid hyper-formalization of smart contracts and blockchain technologies, which execute formalized contracts without any space for interpretation and negotiation (Lehdonvirta 2016).

**Conclusion**

The four value paradigms for urban technologies discussed in this chapter are grounded in a system of practices and beliefs concerning the nature of urban change, its underlying problems, and appropriate courses of action. Urban planners have to ask themselves not only which values they subscribe to, but also which values a particular technology is aligned with in respect to its histories and practices, as well as which issues it can and cannot address. Comprehensive approaches that focus on system-wide efficiencies can be desirable in certain contexts (i.e. when resource consumption and infrastructure management are central challenges, which they often

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6 See [https://lo3energy.com](https://lo3energy.com)
are) and inappropriate in others (e.g. when a concern for efficiency hinders civic discourse). Systemic interventions such as city-wide networks of digital interfaces such as kiosks, responsive lampposts, or dynamic signage systems are aligned with the modernist planning tradition and emphasize a seamless experience of urban space. Most would agree that a paradigm driven by the principles of responsiveness to the needs of citizens and transparent conduct of government is wholly desirable. With regards to urban planning, the paradigm of responsive transparency promotes an incrementalism that is directly opposed to the systemic scope of seamless efficiency. Driven by civic technology tools such as citizen feedback systems, the approach is sensitive to the local context and individual needs but can exhaust the capacity of government by focusing on short-term issues and distract from long-term systemic problems. In the paradigm of empowering devolution, communities co-produce public services and take over more responsibilities for shaping their environment. Decentralization and informalization as demonstrated by the open-source community, the maker movement, or pop-up urbanism can foster creativity and local solutions but require keeping an eye on larger questions of equity and public responsibility. Finally, paradigm of shared stewardship focuses on questions of community governance and the difficult process of reaching consensus about the use of scarce resources. Digital tools such as liquid democracy⁶ are meant to facilitate this process, but it is not always clear to what extent such technologies can address the ambiguities and informal negotiations of governance in small groups.

The paradigms described come with a number of caveats: The paradigms are not mutually exclusive; their real-world manifestations are mostly hybrid. Responding to criticisms of technocentrivity, current smart city proposals emphasize civic and participatory elements. Their boundaries between the paradigms of responsive transparency, empowering devolution and shared stewardship are fluid, with most projects combining elements from each paradigm in different proportions.

Furthermore, the list of four paradigms could be extended. Some might argue that the phenomenon of platform urbanism (the provision of urban services through match-making platforms and crowdsourced marketplaces) deserves its own paradigm due to the ubiquitous presence of platform companies as recently described by economists (Parker, Alstyne, and Choudary 2016, Evans and Schmalensee 2016). I have decided against this choice, because its scope would be narrower than the four others, and it could be seen as a special case of decentralization and devolution.

The four paradigms are grouped by normative ideas about how cities should be designed or societies should be governed. Real-world projects, however, are rarely ideologically pure and usually combine conflicting, even contradictory beliefs. Design intentions and goals may be explicitly articulated, but whether they match the actual outcomes are a different matter. Most urban design or infrastructure projects take shape in a complex network of many actors with different interests (Hughes 2000). As projects progress, goals and constituencies can morph and change shape.

Nevertheless, I believe it is important to shift the discourse around emerging urban technologies from a discourse of technical possibilities to a discourse of values and goals. Too often is a technology that has proven successful in a particular situation is generalized and promoted as a universal solution.

**An integrated approach to planning with technologies**

The numerous interconnections between the paradigms show that simple conceptual models are not sufficient to guide the practice of planning and design. Such reductive models include the technological determinism of tech companies, which identify technology as the agent of change and explains its impacts through its intrinsic qualities, as well as the social determinism of

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⁶ See for example [https://liqd.net](https://liqd.net)
traditional social science, which considers technology neutral, a mere representation of larger socio-economic forces that can be safely neglected from consideration.

Digital technologies require an integrated design approach, which can no longer be neatly constrained into isolated disciplines with distinct responsibilities and scales on which they operate. As crowd-sourced navigation apps can disrupt entire transportation networks, technological design decisions on the micro scale have a noticeable effect at the urban scale.

A first challenge is to make these multi-scalar interconnections legible. Civic technologies have implications for how citizens read the city and its governance. The same technologies structure how planners and administrators read the city, as they try to extract knowledge from a multiplicity of heterogeneous data sources.

Their reading, however, is increasingly determined by algorithms that curate and filter the digital representation of the environment (Graham 2005; Hamilton et al. 2014). As light poles and park benches become conduits for data collection, design has implications for the enactment of governance, accountability, and the rights to privacy and anonymity in public space. Instead of tokenistic concepts such as the smart city, planners should confront an assemblage of heterogeneous technologies, which are at the center of an equally diverse range of participatory cultures and practices.

References


Waal, Martijn de. 2014. The City as Interface: How New Media Are Changing the City. Rotterdam: nai010 publishers.

Figure 1: Axonometric drawings that illustrate points of intervention are the most popular visual representations to communicate the smart city systems to the public. This example using a generic cityscape demonstrates the products of the Internet of Things (IoT) company Libelium.

Figure 2: g0v.asia ("gov zero") is a Taiwanese community dedicated to values of transparency, openness and committed to building civic technologies. The group emerged from the 2014 protests of the Sunflower movement but has since entered a partnership with the Taiwanese government. Source: g0v.asia
Figure 3: Digua Shequ (Sweet potato community) is a self-organized residential community squatting in the unused underground bunkers throughout Beijing. The Digua team organizes community improvement projects and connects residents above and underground. Source: DiguaShequ
Figure 4: Brooklyn microgrid, a neighborhood-scale electric grid, where residents can coordinate investments in photovoltaic panels and sell excess energy to each other using a shared blockchain ledger. Source: [https://lo3energy.com](https://lo3energy.com)