

Data-driven Cities? Digital Urbanism and its Proxies: Introduction

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Abstract: If ‘big data’, ‘smart cities’ and ‘data-driven cities’ are merely useful buzzwords, they nevertheless evidence an expanding chatter of heterogeneous voices who are merging with and reshaping the urban environment. This introduction addresses the data-driven city by focusing on the concept of proxy to articulate its multiplicity. We then provide an overview of the contributions included in this special issue, highlighting how they account for the particular sites where relations are made between knowledge practices, infrastructural developments and administration and management. Rather than take a stance with respect to particular definitions of the data-driven city – or its more commercial inflections as ‘digital urbanism’ or the ‘smart city’ – in this special issue we suggest there is value for urban research to draw on STS approaches in attending to the sociotechnical fuzziness of data as it falls between epistemological problems, material infrastructures and organizational concerns. We conclude by suggesting possible directions for further research.

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I. Cities by Proxy

The ‘data-driven city’ is a multivalent concept. To some, the data-driven city draws attention to the recent expansion of urban disciplines and their public influence in the business of cities. To others, the data-driven city re-

fers to the proliferation of computing infrastructure in urban environments and the possibilities for novel forms of interaction between communities. Other versions of the data-driven city can be found in developments in city administration that build on longstanding data collection practices and problems of city management. Still more versions of the concept abound in the technology and energy industries. This special issue presents a collection of empirical papers, interdisciplinary dialogues and book reviews that grapple with particular conceptions of the data-driven city, as well as practical attempts to realise its value, govern its uncertainties and resist its excesses.

Rather than take a stance with respect to particular definitions of the data-driven city – or its more commercial inflections as ‘digital urbanism’ or the ‘smart city’ – in this special issue we suggest there is value for urban research in attending to the sociotechnical fuzziness of data as it falls between epistemological problems, material infrastructure and organizational concerns. Spotlighting ‘the data’ has widely (although not exclusively) been a strategy of urban research driven by instrumental aims in social policy, planning and economic development and rarely exhibiting much concern for the contingencies involved around data collection, processing and application. Indeed, the ease with which we can detect traces of positivism in the work of the very researchers heralding a paradigm shift to a new computational urban science (e.g. explicit in Pentland 2014) might help explain why some versions of the data-driven city feel distinctly familiar and at times surprisingly unsophisticated (see Farias and Widmer this issue). As contributors to this special issue widely highlight, the data of the data-driven city rarely appear “raw” (Gitelman 2013); and where they do, this is often a highly fabricated, materialized and contingent accomplishment (Denis and Goëta 2017; Courmont, Marquet and Reed this issue). In other words, (big) data need to be considered as part of an assemblage (Kitchin 2014).

The erasure of the artifices of the data-driven city may be a common characteristic of positivist urbanisms (new and old) but it has also long been a key tenet of commercial and political strategies that seek to promote and exploit cities as information economies (Castells 1996). One of the central arguments of this special issue is that attending to the social and technical contingencies of the data-driven city would be of little critical consequence if its artifices are simply bracketed as ‘local context’ (e.g. “let 100 data-driven cities bloom!”). Rather, we propose that examining the construction of the data-driven city (in all its variations) also requires accounting for the ways in which this concept has circulated across the globe, not only making relations between diverse governmental authorities but also between the practices of urban disciplines, the engineering of digital infrastructure, and city management and administration. We ask in what ways can mass-market measurement devices like air pollution in cities as diverse as New York, Rio de Janeiro and Dublin? Can data infrastructure, like sensor-networks, provide an apparatus for the circulation

and exchange of technical expertise? How do city managers address uncertainties introduced into urban environments by ‘off-the-shelf’ smart city technologies such as government data platforms and energy monitoring systems?

In this special issue, we propose the concept of ‘proxies’ as a tool for interrogating the data-driven city as it is assembled as a sociotechnical artefact. Search the web for the word ‘proxy’ and you will likely return a list of companies offering ways to either browse the internet anonymously or access blocked content using intermediary servers. Today, the proxy is a core concept in the technical design of computer networks and the transfer of data between distributed locales. However, like so many things digital, internet proxies are infrastructure technologies that often come with particular forms of sociality hardcoded. Conventionally, the concept of the proxy described a particular form of social relation: a delegation of agency from one party to another and an indirect, or mediated, exercise of power. Like many technical components of digital infrastructures, proxy servers are widely invested (more or less explicitly) with particular social and cultural ideas about networked order (Bowker and Star 2000; Kelty 2008; Turner 2010). Users of internet proxies, for example, are often encouraged to understand them not only as mere intermediaries that facilitate flows of information but also as points of “data friction” (Edwards 2010) where, for instance, entities like IP addresses can be manipulated (anonymised or distorted). In addition to reasons of personal privacy, users may seek to preserve their anonymity to disrupt surveillance regimes or route around legal regulations and state censorship (cf. Van de Velden 2016). Indeed, it is not surprising that surveillance should be one of the key themes emerging in this special issue (see Evangelista et al.).

Our proposition is that to begin to understand the political and commercial affordances of the smart city we need to examine the particular *sites* (see White this issue) where relations between knowledge practices, infrastructural developments and administration and management are made, entangled or disentangled and sometimes obfuscated. Proxies are points of connection that facilitate flows of data but, as many contributors to this special issue point out, they are just as often points of bifurcation between heterogeneous networks and boundary markers between collectives.

One of the gambles of this special issue is the proposition that knowledge practices, infrastructure and management programmes developed in the name of ‘digital urbanism’ or the ‘smart city’ are as riddled with glitches, distortions and data-loss as they are competing social and political conceptions what the data-driven city is for and who it serves. While collaborations between the technology industry and city administrations often promote data-driven solutions and the renewal of technocratic governance and political managerialism (Morozov 2013), contributors to this special issue highlight that deployments of data for addressing urban issues often draw attention to those settings, practices and technical arrangements through which governmental and managerial power is derived and their

messy contingencies negotiated. Whether investigating the heterogeneity of urban data infrastructures (Shapiro this issue), comparing “off-the-shelf” pollution sensors (Reed this issue), engaging with design to develop a methodology for high quality urban environments (Hick et al. this issue), or creating smartphone games for CCTV sousveillance (Evangelista et al. in this issue), contributors to this special issue highlight the diverse ways in which proxies of the data-driven city both mediate the construction of urban issues and delegate the ability to act on them.

The second proposition that we wish to make is that a focus on proxies allows us to enrich our understanding of the indeterminacy and precariousness of contemporary smart city endeavours and achievements. A plethora of digital data-driven or data-aided sociotechnical systems are now in place, and further systems are continually being tested and trialled at varying scales in real-life urban settings, informing decision-making and involved in the performance of the spatial, material, and temporal dimensions of the urban. We especially refer to the formation and proliferation of “code/spacetimes” (Kitchin this issue) where software is a constitutive component of urban life, highly visible in control rooms, city dashboards, mobile apps and sensing networks, which in turn enact new forms of citizenship and governmentality (Gabrys 2016). The interplay of big data infrastructures and organizational processes contributes to increase the heterogeneity of “urban assemblages” (Farias and Bender 2010). The uncertain and mutable existence of such assemblages makes urban spaces typically “experimental” (Evans et al. 2016): cities become expanded laboratories where different sustainable, prosperous and liveable urban futures can be tested in the real world. Singapore, Barcelona, Dublin, and San Francisco are but few examples of cities undertaking experimental modes of development.

In these cities, experimental urbanism is often developed through combinations of networked infrastructures with economic development strategies seeking to foster entrepreneurship, and in some cases national identity. This combination has led to the adoption of pre-commercial procurement, hackathons and testbedding to prototype the urban at different scales, from ‘smart districts’, living labs, open innovation initiatives, developed in and for global cities such as Dublin, Boston, New York, and Paris to nation states such as India or Singapore as a city-state. While such rhetoric of experimentation often make gestures towards the openness of smart city programmes to public participation, various contributors to this issue note that the experimental processes developed through these programmes are often driven by deeply instrumental aims that both circumscribe the ‘public interest’ and limit the articulation of public concerns. While procurement is increasingly said to be becoming problem-oriented, the definition of what counts as a valuable problem is often left to the market, blurring distinctions between public and private interests. It is therefore perhaps not surprising that various contributions could be read as indicating the emergence of new forms of ‘public agnosticism’ as a response to the atmos-

pheres of uncertainty and anomie promoted in smart city experiments. The appearance of the Public as a weak actor with scarce resources to critically test urban solutions coming from industry, research or ‘the market’ arguably echoes debates about the capacity of democratic societies to deal with technological change reaching back to the early 20th century (Lippmann 1927). It would of course be a mistake to imagine that urban experimentation somehow plays out as a zero-sum game between public and private interests. As many contributions to this issue highlight, commercial actors are far from being a homogeneous group. For instance, broad shifts in local government from service provision to procurement have widely contributed to redefining what counts as commercial activity, and corporate aims often come into conflict in experimental processes. The creation of intermediaries able to orient and prioritize urban innovation strategies; the contradictions of “transparency by datafication” with the reuse of open data by the private sector; and finally, the role played by STS in engaging with and articulating these contingencies, as discussed in the *Crossing Boundaries* section by Young, Hoyng, Blok and Minor, offer tools and materials for reflecting upon these issues.

Under the rubric of urban experimentation, hackathons and other ‘open innovation’ events also make promises to solve urban problems by adopting a citizen-centric and co-production approach that celebrates a new horizon of citizen engagement. In practice, however, municipality-led participation initiatives rarely aim at problematizing competing political understandings of citizenship, and are instead more economically focused on the exploitation of highly skilled labour. In such initiatives, as described by Farias and Widmer (this issue), citizens are often invited to propose technical prototypes and are valued principally as providers of data or ideas (Perng forthcoming). It is understandable why a certain cynicism about participation might result from initiatives where the engagement of citizens is driven by municipal aims to marketize city infrastructure. A vision of citizenship based on ‘productive’ forms of collaboration with central and local governments has provided an important focus of smart city developments. Such a vision (and the participation practices it initiates) requires critical attention. As several contributors to this issue argue, aims to make citizen participation productive in smart city programmes – whether citizen science, civic hacking or ‘making’ initiatives – may not always be compatible with other governance aims of extending transparency and enhancing the accountability of administration actions. The question of how urban issues are defined and who owns the tools to act on them is unlikely to be answered by participation programmes that simply attempt to convert private individuals into ‘active’ citizens.

Initiatives to improve the openness, transparency and effectiveness of urban knowledge, governance and service delivery have typically expanded the open data franchise, produced new tools and technologies, and availed of citizen sensing, hacking or crafting communities.

2. The Contributions in this Issue

The development of these sociotechnical proxies and practices therefore leads to many of the questions this special issue seeks to address. To what extent cities are understandable through data? How do software and space interact in everyday urban life and urban management? How do data and policies actually shape each other? With many rich contributions, the special issue seeks to shed light on the multiple enactments and proxies of such experimental urban and data assemblages which affect the way time, politics, economy, design, engagement, control and knowledge are performed in diverse empirical settings.

As we see in Rob Kitchin's opening lecture, smart city technologies produce new timescapes. Kitchin unfolds the notion of "real-time city" as a constructed temporal condition "transforming management and governance of city systems and the pace, tempo and scheduling of everyday life": acceleration, simultaneity, colonization of dead time and decoupling from clock time are typical of the condition enacted through ICT in cities. The cases of the traffic control room and intelligent transport systems are emblematic for understanding how the temporal pulses of the city are maintained and adapted, as well as for observing the multiple latencies that take place. Through generating, recording, measuring, and sharing real-time data from cameras and sensors to regulate traffic flows and minimize congestion, they produce an accumulation of microseconds that in turn creates asynchronous code/spacetimes that need to be continuously readjusted. In practice, they are never quite in real-time and these temporal missing masses compose varying forms of "realtime-ness", namely distinct "real-time cultures" within platforms and systems.

A second, though not secondary, aspect involves the kind of politics attached to and detached from smart city discourse, this being the focus of Ignacio Fariás and Sarah Widmer's lecture. They unfold the question mark of "*Data-driven cities?*" by a combination of decoupling smart and data-driven cities and moving beyond governmentality as a lens to observe contemporary urban development. Drawing on Latour's cosmopolitical framework, their proposal addresses the city as a "multiple object, where different forms of governing, knowing, valuing and practicing the city interact and enter in conflict with each other". Accordingly, big data initiatives, smart urbanism and the non-digital logic of many civic engagement processes are often disentangled in shaping the urban. Exploring the trajectories of two actually existing instances of smart urbanism – the first on Foursquare, and the second, on Smarter Together – they account for the unconventional character of "ordinary smart cities".

In the *Essays* section, the contributors continue to unpack the multiple and problematic unfolding of data-driven technologies. We have generally assembled papers with a theoretical and critical analysis of data-

driven cities yet also include more practice-based and playful pieces as a means of teasing out and emphasising how cities reconfigure these technologies and also become reconfigured in the process.

In the literature on smart cities it is not uncommon to find computational metaphors applied to urban processes (for instance, the idea that cities could have unified “operating systems” – Townsend 2013). Shapiro interrogates the extension of the computing term “stack” to analyse the structure of the data-driven city. Through the “urban stack” Shapiro aims to explore what is beneath and behind the interface so as to identify the “digital-material assemblages” that produce data-driven cities. Shapiro reconfigures the concept of the “stack” in a broader and more heterogeneous way to capture the different ways in which both digital and non-digital objects, practices, technologies, institutions and infrastructures are assembled to enable data flows. His proposition is empirically grounded in two case studies: LinkNYC, a Wi-Fi infrastructure in New York generating real-time locational data to be used for advertising purposes, and fleet management algorithms acting as invisible layers of control in the on-demand economy of taxi hailing. While distinctively different, the two case studies together provide a critical understanding of how the soft, distributed infrastructures, including consumers, workers, laws, regulations and public institutions are enrolled into and also exploited in the enacting of calculated, passively experienced, controlled, surveilled and instrumentally rationalized cities.

Sensor networks are often characterized as a distinctive infrastructure of the smart city, and have been foregrounded in attempts to link technological innovation with environmental sustainability. Reed’s contribution explores how environmental sensing infrastructure can ‘script’ the competences of its users. Taking a moment of infrastructural breakdown in the installation of an urban pollution sensor network, Reed describes how concerns about a lack of public data literacy led engineers to manipulate the patchy data produced to appear more complete than it was. Highlighting the multiple ways in which sensor-produced data are routinely manipulated, Reed proposes the promotion of data literacies that do not fetishize ‘raw’ data. Rather, Reed argues, data literacies should instead encourage sensitivities to the ways in which such data ‘glitches’ provide moments for creative interaction between technology, the built environment and urban publics.

The design-based piece from Adam Urban, David Hick, and Jörg Rainer Noennig is partly a counterpoint to the more critically focussed papers. Like Mueller von der Haegen and Peter Sloterdijk’s (2005) pneumatic parliament that could be deployed within 45 minutes to conflict zones, it technicises problems that are cultural and organisational as much as they are technical. Although a serious piece with intent of developing further, its utopian thinking brings up the challenges we see everywhere with smart technologies; the replacement of human mediators (in this case, planners) with digital platforms, data analytics, and claims to

equitable participation. Where Uber sidelines regulators and trade unions and empowers those outside, so might data-driven design reduce the planner to that of “data concierge”. Nevertheless, it addresses key concepts concerning the computational drive into architecture that recalls debate on computational design and algorithmic architecture, only in this instance applied at the neighbourhood scale. We trust that it will be read in a context of experimentalism, counterbalancing our smart city critiques with smart city creativity from professional architects.

The contribution by Evangelista, Soares, Costa Schmidt and Lavignatti continues the examination of data-driven cities by engaging with design practices. They combine game studies and surveillance studies to propose a smartphone app called DIO to enable ‘sousveillance’ practices and civic hacktivism. The game starts with a dystopian scenario where all the data converge in a system called Digital Information Operative (DIO) that integrates public surveillance devices around the planet. Clearly inspired by Edward Snowden’s revelations, DIO is also a reflexive tool for understanding locative media and privacy issues related to contemporary urban life. Reflexivity also engages with what it means for an academic community to engage with the design of Massively Multiplayer Online Games and location-based games as a sociological experiment to ‘game’ the surveillance culture.

The *Crossing Boundaries* section provides a space for exchanges between researchers studying public and open data platforms and the implications for urban governance. Contributors to this section offer a series of joint reflections on public and open data platforms across a variety of cases: from cycling, traffic and digital mapping to activism, environment and data brokering. Often linked to open government initiatives, data platforms are frequently proposed both as mechanisms for enhancing the accountability of administrations and as sites for bottom-up digital invention. However, such promises of smooth flows of information, enhancing transparency, collaboration and interactivity rarely materialise unproblematically. The development of data platforms is always situated in particular administrative cultures, access always involves processes of social negotiation, and interfaces (such as sensors) may become objects of contestation. In this section, contributors draw attention to some of the substantive issues driving the development of public and open data platforms and shaping their deployment, as well as highlighting the limitations of urban governance programmes.

The opening contribution from Anders Blok and Kelton Minor recognises the changing framework around big data, expanding from discourses of technological development and deployment to that of reconstituting social relations through technology. They discuss efforts by the city of Copenhagen to harness new data infrastructures to advance their already advanced modal shift to cycling in the interests of climate change mitigation and to secure their reputation of environmental leadership. Blok and Minor discuss how their previous work within a large project on

social networks, based on volunteered smart phone data, can feed into further projects and the ethical implications involved with data re-use. In particular, their piece draws attention to how these encounters of STS research with the urban lead to further reflexivities on the agency of STS in an age of data ubiquity and cross-disciplinary meetings.

The “awkwardly engaged encounters” and the socio-technical relations of big data described by Blok and Minor are observed by Antoine Courmont as modalities of circulation, production and re-use. Describing a case of traffic open data, Courmont explores the interplay of attachment and detachment that allows the actionability and accountability of data across different publics with different representations of urban space. This perspective offers an opportunity to rethink information liberalism, emphasizing the dependent, non-neutral and materially inscribed character of data.

Ideologies of information liberalism are also the object of critique in Rolien Hoyng’s contribution, which explores the links between open data and the politics of transparency. Hoyng highlights how smart city open data initiatives widely instrumentalize transparency discourses in ways that often empower further, rather than hold accountable, governing powers. Affirming the disruptive and “messy” qualities of digital urbanism, Hoyng advocates for data-activism premised on seizing and freeing data in ways that allow open data to perform as a site and medium for political contestation and struggle.

As the contributors to this section highlight in different ways, producing data requires work. The focus on “data labour” in Clément Marquet’s contribution makes this aspect explicit. Marquet examines the forms of labour that are invented in the collaboration between Transilien, a public transportation operator in France and OpenStreetMap France. In a trial and error process of data production, various forms of labour are created and enrolled – from informal ones such as leisure and volunteering activities to formalised contracts and the use of professionals with specialist expertise. As Marquet further demonstrates, these actors and their labour are also crucial in “an ecology of data maintenance”, trigger “tag wars” (who owns which tags on the map), and also demand the intermediaries of Transilien agents to maintain the correspondence between new data inputs and reality.

Like Hoyng and Marquet, Christian Nold’s contribution highlights the limitations of governance approaches to account for the multiple, and often conflicting, practices of deploying data platforms to address urban issues. Nold examines the proliferation of what he terms “neo-environmental” sensing in which cheap and often low quality sensors are used for public data gathering on environmental problems outside of government mandated monitoring programmes. In a case study on airport noise campaigners, Nold highlights that the power of these sensing devices lies not in so much in precise measurements of particular material pollutants but in their networking capacities and in the production of affective visualiza-

tions. Despite the limited value of such devices for governmental monitoring programmes, Nold proposes that neo-environmental devices nonetheless provide platforms through which the ‘sensation’ of airport noise can be publicly articulated and evidenced.

Continuing to observe the mutations of public-private relationship, Meg Young addresses the open data initiatives promoted by government agencies. While, as Young makes clear, it is undeniable that open data programmes widely promote economized understandings of the ‘public interest’ and privilege corporate actors as drivers of social change, the author’s empirical study of an open data network in Seattle also highlights that the commercial value of such platforms does derive solely or principally from data made accessible for public use. Rather, Young describes how private interests are mediated through attempts to set standards for local government data platforms, thereby producing a number of data-brokers that set standards and profit from the preparation and release of open datasets. While increasing usability and interoperability across agencies, such standards afford an exclusive set of corporate actors the power to both unlock the commercial value of municipal data and act in the public interest.

Standards are the theoretical concern of the *Scenarios* section, where we invite the reader to make a move from issues related to the urban to issues related to spatiality itself and its making. James Merricks White proposes a site-based methodology to study standards and standardization. He draws on Karen Barad’s agential realism, with standards considered here as a material-discursive apparatus of bodily production, involving both human and non-human bodies. Thus conceived, the approach looks at human and voluntary standards as a narrow subset of what a standard actually does and is, with network addressing standards such as IPv4 and ISO 9001 seen as entangled sites which come into existence through iterations. White’s contribution is especially relevant considering the entangled sites where multiple (organizational) bodies, (public and private) agencies and infrastructures collide and intra-act to set the standards for what an allegedly desirable, innovative and smart city should look like.

Finally, the Book Review section includes the contributions by Caspar Menkman on Jennifer Gabrys’ *Program Earth*, that of Claudia Mendes and Pim Peters on Evans and colleagues’ *The Experimental City*, and the combined review by Susann Wagenknecht on Krajewski and colleagues’ *Dienstbarkeitsarchitekturen. Zwischen Service-Korridor und Ambient Intelligence*, and Meier and Portman’s *Smart City. Strategie, Governance und Projekte*.

3. Conclusion

The present ubiquity of sensors and computing devices moves in tandem with an increasingly powerful and extended multiform network of organizations, technology creators, epistemic communities, advocacy coalitions and users (Kitchin et al. 2017). If ‘big data’ and ‘smart cities’ are merely useful buzzwords, they nevertheless evidence an expanding chatter of the multiple voices who are merging with and reshaping the urban environment. The contributions included in this special issue offer a grounded account of various partnerships between city administrations, technology companies, civic activists and academics, among others. They unpack the different proxies and practices of data-driven cities and demonstrate how data-driven systems and schemes are deeply contested and have never been neutral and apolitical: (big) data and the ahistorical, aspatial, homogenizing vision of cities are problematized for recognizing how they are situated in the multiplicity of actual digital urbanism.

The politics of data, data analytics and visualization performs within specific urban and code assemblages embodying specific versions of real-time and anticipatory governance. The proxies and practices that are in play and examined here range from the sophisticated multi-purpose digital monoliths featured in Shapiro’s contribution to the rudimentary noise sensors described in the paper by Nold. Where the former are becoming the first visible and interactive manifestations of a new urban technology wave led by natively digital corporations, the latter reflect the increasing means at the disposal of concerned citizens who wish to articulate new issue-publics (Marres 2012) and new ontologies. Echoing the concerns raised by these citizens and amplified by the contributions, we look forward beyond this special issue to new critical perspectives on a number of issues.

The first one involves the disparities of scale, such as that between large urban systems and piecemeal civic projects. Where the former may subtly manipulate millions of human bodies in the synchronised performance of urban life, the latter may be far less powerful one-off projects associated with civic hacktivists, political actors, and other concerned individuals or collectives. The disparity might also be between widespread (and often taken-for-granted), and alternative sociotechnical imaginaries, upheld across different public/private actors and organisations, have the potential to strengthen or potentially challenge existing proxies for the production and circulation of data. The quality of democracy enacted by the heterogeneous urban proxies is then a matter of redistributing and articulating the calculative as well as the political agency of data-driven initiatives.

The articulation and redistribution moves are connected with the management and governance of uncertainty in urban development and the delivery of services. What is uncertain and contested is not necessarily unmanageable, and the second issue considers the capacity to include dif-

ferent publics into a common space as well as other initiatives not included in smart city discourse but critically relevant to it. To date, we note the expansion of IoT networks, control rooms, hackathons, city dashboards, and the development of smart districts which herald future change, yet also a rather subdued critical response from wider civic society. The challenges and the testbedding initiatives undertaken by city administrations are somewhat localized and disconnected from planning policies, and ultimately not ambitious enough with respect to actual needs in terms of work, mobility, environmental quality, and housing.

The third issue addresses the neoliberal elephant in the room. The specific ways in which data-driven innovations have been, and can continue to be, leveraged to legitimize the ongoing neoliberalization of urban governance requires further empirical and theoretical examination without using neoliberalism as an analytical shortcut. Looking closely, it may turn out that neoliberalism is not so much an elephant as it is an issue with how the room is arranged, and one of the aims of this special issue is to detach the big neoliberal assemblage starting from its specific, multiple and mutable proxies. This means, while unpicking similar rhetoric on efficiency or cost-effectiveness, it is also important to pay attention to any emerging means by which new markets are being created, often in unpredictable places. Similar to the re-constitution of the public, government and social relations, markets and market practices can be re-constituted through data-driven technologies. The proxies and practices that are then invented to exploit new forms of measuring, valuing and performing labour require new analytical lens grounded in empirical investigation to tease out the inventiveness of neoliberal proxies and their extension of market logic to urban governance.

Fourth, it is also important to consider emergent sociotechnical practices within, around or peripheral to the large networks and platforms as proxies that might challenge our assumptions, imaginaries and discourses about what it means to be ethical. The focus on practices, however, does not imply a dissolution of responsibility. Rather, it suggests one of the possible means to help ensure that the design, engineering, planning, regulation, and governance of these networks, platforms and cities are informed and inspired by socially-driven values and principles.

Academic perspectives thus can look not only towards how and where neoliberal inventions are made and where contestations against them arise, but also towards the underlying ethical frameworks which underpin large technical systems such as social networks and open data platforms. In a new age where large-scale political manipulation and distortion can be conducted with relative ease through the exploitation of the creations of naive digital evangelists, it may be that the future urban systems becoming commonplace in our cities will not expose false hopes of ethical neutrality and instead be purposely driven by specific shared values and principles.

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