Urban Digital Infrastructure, Smart Cityism, and Communication: Research Challenges for Urban E-Planning

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ABSTRACT

This article takes stock of the smart city concept by locating it in relation to both a longer history of urban computing, as well as more recent projects exploring the vexed issues of participatory urbanism, data ethics and urban surveillance. The author argues for the need to decouple thinking regarding the potential of urban digital infrastructure from the narrow and often technocentric discourse of ‘smart cityism’. Such a decoupling will require continued experimentation with both practical models and conceptual frameworks, but will offer the best opportunity for the ongoing digitization of cities to deliver on claims of ‘empowering’ urban inhabitants.

KEYWORDS

Data Ethics, Participatory Urbanism, Smart City, Urban Communication, Urban Surveillance

1. INTRODUCTION

I’ve been involved with the International Journal of E-Planning Research (IJEPR) since its inception, a fact that immediately says something about the nature of the field this journal has sought to address. Institutionally, I’m not from urban planning, or a traditional urban discipline but a media and communications program. The fact that there is a significant overlap between my research—which has broadly concerned the problematic of ‘media and cities’—and the interests of the IJEPR is testament to the profound transformation that has swept across both fields in the last two decades. If the study of cities and of urban life has always been interdisciplinary to a greater or lesser extent, with disciplines such as architecture, planning and design counterpointed by those such as geography and urban sociology, the profound reconfiguration of cities set in train as networked digital technologies are deployed as pervasive urban infrastructure has brought new voices into the conversation. This includes researchers from previous outlier disciplines such as media and communication, as well as new sub-fields such as interaction design. From the other side of the picture, media and communications has evolved by closer contact with interdisciplinary fields such as technology studies, manifest in the emergence of new orientations including software studies, platform studies, media archaeology and critical data studies. At the same time, the mainstreaming of mobile media has driven more systematic connections to traditional spatial disciplines including geography and urban studies, as well as to the broader cluster of mobility studies.

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Cities have always been meeting places, and this is borne out today by the variety of disciplines jostling to be heard regarding urban pasts, presents and futures. I use the term ‘jostle’ deliberately: while there are many good examples of genuinely interdisciplinary approaches and projects, there is arguably less—and less productive—crossover than desirable. Concerns, insights and approaches that are normal and normalized in one setting remain ignored or under-utilized in others. There is still much to learn from setting aside the presumptions of centrality that most disciplines carry as an integral part of their armature. While this kind of decentring is never easy, the need seems particularly acute when key trajectories associated with urban digital infrastructure — notably the capacity to automate the collection, storage, retrieval and processing of unprecedented volumes of data — cut across so many fields, changing fundamental aspects of social existence in the process. To take one example, which is perhaps not simply one among many: communication studies, like many disciplines, used to be organized around conceptual frameworks that relied on broadly dividing the realm of ‘face to face’ interaction from various forms of ‘mediated’ experience. The former was lived, the latter represented. While this binary relation was never watertight, it proved stable enough to authorise a whole era of research that can be traced across very diverse approaches from Goffman’s studies on social interactions in public to Debord’s theoretical elaborations on spectacle. However, this long assumed separation between ‘immediacy’ and ‘mediated’ social life no longer offers the same traction on experience and knowing in the 21st century. This shift is particularly acute in relation to cities, which have been the primary testing ground for emergent socio-technical regimes in which embodied interactions are everywhere tightly interwoven with new forms of technical mediation, generating novel, hybrid spatial and social forms.

This is the uncertain ground on which urban e-planning takes place. The fact that there has been ongoing debate over the orientation and demarcation of the e-planning paradigm (Silva 2010) is not surprising given that its underlying concern is formulating a relation to technology. Is e-planning a set of (digital) tools, a new urban planning paradigm enabled by ICTs, or does it require a more general reconsideration of the broader settings of urban life in which planning is now conducted? Whether you adopt a minimalist or more expansive position, posing such questions underlines the extent to which e-planning is implicated in ongoing debates about how to better recognize the complex and contingent interplay of technology with human and other agencies.

In one of the formative essays in technology studies, Melvin Kranzberg (1986: 545) asserted his first ‘law’: ‘technology is neither good nor bad; nor is it neutral’. It is this *in-betweenness* that I want to emphasize in relation to the urbanization of digital media and the digitization of urban space over the course of this essay. In the process I want to make an argument for a continued interdisciplinarity in researching urban digital infrastructure, by pointing to two recurrent problematics that benefit from such an approach. The first concerns the debates over ‘participation’ that have regularly sought to connect planning to wider agendas of empowerment and ‘democratization’ in urban life. The second is the growing concern with the ethics and politics of data in the digitally instrumented city, as an older Orwellian horizon is displaced by a new operability of mass surveillance capable of aggregating myriad individualized data points into population scale data at unprecedented speed.¹

In what follows I’ll begin from the historical threshold in which computing entered urbanism towards the end of the 1960s, a collision that eventually underwrote the concept of the smart city in the early 2000s. I want to consider what has happened to this concept over the last decade, in which it has been subject to growing critique but also to a new range of practical interventions. Underpinning this examination is another question: how might we reformulate the smart city agenda for a future in which it can better live up to the expansive aspirations so often claimed under its name? How can we ensure that the digitally instrumented city doesn’t *foreclose* key elements of the social ambience and political action that have been crucial to the distinctive culture of modern cities?

2. CITIES AND THE DISCOURSE OF 'SMARTNESS'

As Lewis Mumford (1934, 1973) argued in his voluminous writings on both cities and technology, the history of cities is co-extensive with the history of technological innovation and there is co-evolutionary relation between technological and urban development. The concept of the smart city does not break with this paradigm so much as inflect it in particular ways. As Mondschein et al (2019) note, 'the emergence of the smart cities paradigm has amplified longstanding tensions between democracy and technocracy in planning'. The idea of the smart city is dependent on a certain maturation of computing and related technologies including sensors, network connectivity, software and actuators. But while it is often presented as a technical transformation of the city, the smart city is also dependent on a related transformation of understanding: of what we think a city is and how it should operate. This shift in the urban imaginary can itself be understood as partly the result of the profound reconfiguration of the urban 'knowledge infrastructure' driven by the expansion of computing and digital networks, manifest in wholesale changes to processes of collecting, distributing and interpreting data about urban life, but equally extending to a related adjustment as to who can be considered an urban 'expert'.²

City authorities, managers and urban planners have now been using computer modelling for more than half a century. Journalist Joe Flood proposes the relation established between the RAND corporation and the NYC Fire Department in 1968 as a key threshold in this trajectory. RAND had been using game theory and computer modelling in military simulations of nuclear war scenarios since the 1950s. Ghamari-Tabrizi's (2000) detailed account of this program draws out the extent to which it involved a profound shift in the legitimation of military knowledge, as the expertise of command experience was displaced by civilian knowledge gained through simulation. While the 1950s was a moment when the 'war gamers' were primarily 'human computers' drawing on a mix of cybernetics, economic game theory and cognitive psychology, electronic computers were also being introduced into the process to help run the simulations. Along with these new computers came concerns that the new speed, scale and level of automation would move decision-making into a new orbit beyond human understanding— anxieties that persist in the present and are easily recognizable in current debates about automated-decision making and 'AI'.

By the end of the 1960s, the city of New York was in growing financial straits, which would eventually find the city facing notional bankruptcy in 1975. It was in this context that it was attracted to experiment with new computational approaches to urban planning on the back of their broad promise to save money by enabling more efficient public services. Despite the catastrophic consequences of this initial program, Flood argues that it became a template for 'modernizing' city operations right across the United States.³ Subsequent developments, including the evolution of computer-assisted architectural software in the 1970s and growing use of GIS software in planning in the 1980s, confirmed this trajectory. By the 1990s, as Ash et al (2018: 30) note, "cities became increasingly computational with traditional infrastructures augmented with networked sensors, transponders, and actuators, enabling new forms of real-time operational governance." The 'smart city' label doesn't become prominent until well into the first decade of the new millennium, piggy-backing on related developments including the 'internet of things' discourse and the mix of smart growth/intelligent city projects that had emerged in the late 1990s (Söderström et al 2014; Rosati & Conti 2016). Both developments can be seen as outgrowths of the expansive logic articulated by Weiser's (1991) influential 'ubicom' paradigm.

The corporate origins of the smart city label are well-known, as is its subsequent propagation by a range of companies including IBM who went on to trade-mark 'smarter cities' in 2011 (Söderström et al 2014; Luque-Ayala and Marvin 2016). These origins explain—at least to a certain extent—many of the problems that were soon identified in relation to the smart city agenda. While Hollands (2008: 304) immediately and correctly pointed to a "definitional impreciseness, numerous unspoken assumptions and a rather self-congratulatory tendency", key aspects of the orientation were clear

enough from the outset. When Siemens proclaimed that the future city would include ‘countless autonomous, intelligently functioning IT systems that will have perfect knowledge of users’ habits’ (Wohllaib 2008: 68), they restated positivist assumptions about the capacity for a technical system to model heterogeneous relations and states without bias or distortion. When they added that ‘The goal of such a city is to optimally regulate and control resources by means of *autonomous* IT systems’ (Wohllaib 2008: 68, *italic added*) they gave voice to the kind of technocratic vision of urbanism that many had desired or feared since the 1960s. Of course, it’s unfair to single out either Nikola Wohllaib or Siemens in this way, since it is easy to find similar proclamations from other companies and sources. These rapidly coalesced into what I’ll call *smart cityism*, a discourse marked by highly deterministic faith that new technical capacity to gather, aggregate and process data would inevitably lead to ‘improved’ urban outcomes that could be expressed through over-arching terms such as ‘efficiency’ and ‘optimization’.

These settings have lead to sustained critique over the ensuing decade. One of the immediate clusters of concern was the potential for corporate capture of urban planning and city governance. Noting that ‘Technology push is still dominant in the actual research agenda’, Schaffers et al. (2011: 437) argued that ‘smart city solutions are currently more vendor push than city government pull based’. Anthony Townsend went further, comparing the selling of smart city solutions to the earlier promotion of automobility as an urban paradigm:

As essayist Walter Lippmann wrote of the 1939 World’s Fair, ‘General Motors has spent a small fortune to convince the American public that if it wishes to enjoy the full benefit of private enterprise in motor manufacturing, it will have to rebuild its cities and its highways by public enterprise.’ Today the computer guys are singing the same song. (2013: 18-19)

Adam Greenfield was similarly caustic, suggesting that corporate authoring had fatally tainted the whole enterprise: “It’s as if the foundational works of twentieth-century urbanist thought had been collectively authored by United States Steel, General Motors, the Otis Elevator Company and Bell Telephone rather than Le Corbusier or Jane Jacobs’ (2013: 13–14). However, he was also pragmatic enough to recognize that this situation was unlikely to dissuade overworked and risk-averse city managers, particularly as they often lacked the specialised expertise needed to critically evaluate the systems on offer.

A linked set of concerns stemmed from the proprietary nature of the systems that were being marketed. Dependence on proprietary datasets and specialized software compromises the ability of both researchers and citizens to access data and utilize it in meaningful ways (Thatcher 2014). While citizen participation and social well-being ostensibly formed an integral part of many smart city programs, the roles of inhabitants⁴ were often limited to that of consumers of smart services. This orientation flowed into broader concerns that smart cityism prioritized an *extractive* logic, in which data collected from individuals and communities drove a new level of technocratic governance characterized by managerial approaches to service delivery and asymmetrical access to data (Kitchen 2014). Following Hollands (2008), a number of writers made the connection between smart city programs and the evolving public-private partnerships that characterised infrastructure provision and service delivery in a neo-liberal setting. Mobile devices were recognized to play a pivotal role in the practical realization of this model, offering inhabitants access to (processed) information and services, while at the same time enabling the collection of the granular data on which the smart city vision depends. As Gabrys (2016: 187) notes: ‘Urban citizens become sensing nodes—or citizen sensors—within smart city proposals.’

There were also related concerns that the kind of heroic claims about achieving ‘perfect knowledge of users’ habits’ were not only philosophically dubious, but wholly impractical. As Greenfield (2013) noted, engineers and designers are all too familiar with the trade-offs over capacities and outcomes that the practical construction of any technical system involves. However, precious little of this

perspective made its way into public discussions of smart city initiatives, which were characterized by hyperbolic claims as to what ‘data’ is capable of doing (Mattern 2013). Of course, urbanism was not the only field in which such claims were made: the moment was also marked by Wired magazine editor Chris Anderson’s (2008) exorbitant claim that the looming era of ‘big data’ obviated any and all need for ‘theory’ relating to understanding human behaviour.

While the corporate origins and promotional formulations of smart cityism have had a significant and enduring effect, it is important not to let them completely dominate all consideration of the urban computation paradigm. But developing new orientations is difficult for a number of reasons. Researchers such as Batty et al (2012) have argued in favour of publically controlled systems of urban digital instrumentation used for the ‘public good’.⁵ However, articulating the nature of that ‘good’ remains fraught and difficult. Publics and politics are never unitary, and competing visions of the ‘good’ are central to all political contestation. This challenge is greatly exacerbated in the present when so many dimensions of social life — including formal politics, economic value generation and social relations to others both near and far — are being reworked by digitization and computerization. This doesn’t mean we should abandon all aspirations to achieve public good — far from it — but that we need to recognize the complexity of such appeals. This is accentuated when we appeal to ‘public systems’ and ‘public control’. How might the public ‘control’ urban data — its collection, its aggregation, its operational use — at an historical conjuncture in which profit-based digital platforms, such as search engines and mapping systems, are becoming ‘infrastructure’ — which is to say they are so widely used and so deeply embedded in social life that they are often perceived as public services? (Plantin 2016; McQuire 2019)

Networked digital technologies have rapidly become a dominant element of the contemporary capitalist conjuncture. As much as this can be understood in terms of digital technology emerging in a particular policy and regulatory climate — the serendipitous ‘moment’ of neo-liberal political settings which shaped both infrastructure privatization agendas and ‘light touch’ regulatory regimes — we need to recognize that digital platforms have also been an integral to forming and consolidating these new settings. It has long been clear that digital platforms cannot be easily developed or controlled by the kind of centralized institutions and governance that characterized the state’s relation to earlier communication technologies such as telephony and broadcasting.⁶ Recent arguments by those such as Srnicek (2017) and Zuboff (2019) that data extraction via digital platforms has mutated into a new form of capitalism underlines the challenge in arguing for ‘public control’ of urban digital infrastructure in the present.

A critical understanding of this historic shift in the nature and effect of urban infrastructure as it is digitalized needs to operate on at least two, related levels. First, it requires ongoing consideration of the relations of power that digitally instrumented cities enable, disrupt and consolidate. Who is included and who is excluded by the provision of networks and devices, or the design of system architectures and software programs? What models of power and citizenship are embedded in overarching terms such as ‘efficiency’ and ‘optimization’? As Latour (1988: 22) argued in his advocacy of a ‘politics’ of technology, “If science and techniques are politics pursued by other means, then the only way to pursue democracy is to get inside science and techniques, that is, to penetrate where society and science are simultaneously defined through the same stratagems.”

These questions of technical detail need to be complemented by recognition that urban computerization — of which smart cityism is only one part — has shifted the way cities are understood. As quantification, statistical analysis, data visualization and pattern recognition have assumed greater prominence, other understandings of the city — such as phenomenological and narrative-based understandings of place and urban life — have lost some of their purchase. How is knowledge generated and legitimated in the field of urban studies today? Who figures as ‘expert’ and what counts as knowledge for decision-makers? How do the emerging sociotechnical relations of the networked city contribute to shaping our spatial experience and understanding, informing our

sense of possibility and in this way recalibrating our ‘humanness’ — even as we try to humanize, or as Sassen (2011) puts it, ‘urbanize’ those very technologies.⁷

3. TAKING APART PARTICIPATION

One focus of critiques of smart cityism was the common perception that the agenda only paid lip service to participation by inhabitants. But this problem was hardly an invention of the smart city model. As Brownhill and Parker (2010: 275) note, there has been a long and varied history of attempts since the 1960s to include ‘the public’ in planning processes. They added: ‘Increasingly, reflections on participation are tempered by a recognition of the challenges that “meaningful” participation faces and the limitations of much past practice’. Acknowledgement of this challenge was embedded in Arnstein’s (1969) influential ‘ladder’ of participation, which stages a climb from ‘non-participation’ through ‘tokenism’ to the higher rungs of ‘citizen power’ variously manifested in what she called partnership, delegation and control. Arnstein was arguably more aware of the limits of her model, which is offered as a ‘provocation’, than many who subsequently adopted it, but its enduring influence is emblematic of the many and varied meanings that have sheltered under the umbrella of ‘participation’. This diversity is heightened if we shift our sights from participation in formal planning processes to other, less formal modes of participation, including the kinds of everyday action that Lefebvre famously glossed as exercising one’s ‘right to the city’.

The participatory agenda in urban planning was revitalized by the spread of networked digital technologies as the internet, world wide web and mobile devices enjoyed rapid, if uneven uptake from the mid-1990s. As I have argued elsewhere (McQuire 2016), participation became a *zeitgeist* value that, fanned by the explosive growth of social media platforms, spread into all kinds of domains. While participatory media made ‘you’ — the individual user — into *Time* magazine’s ‘Person of the Year’ in 2006, fields as diverse as medicine, art, science, and government all found a new enthusiasm for participation on the back of web 2.0 culture. While some of the limits to the idealism of this moment are now more apparent— notably its embedding of proprietary commercial platforms that were developing sophisticated forms of data capture as a core business model— much of the devil still remains in the detail. This underlines the continuing importance of situated analyses of ‘participation’— ones that don’t treat technology as a neutral tool but as shaping capacities to know and to act, while at the same time recognizing that ‘technology’ is never a fixed and stable entity but is always adopted and adapted in particular settings where outcomes are influenced by a mix of factors including cultural literacies, institutional arrangements, legal and regulatory settings, and so on.

Historically low transaction costs associated with digital communication meant that new circuits of public feedback could be established in a variety of urban situations, ranging from expanded modes of information provision (open government publishing) to wider use of diagnostic tools (online polls and surveys) to experimental exploration of collaborative knowledge generation. These developments moved Mondschein et al (2019: 1) to argue that, parallel to the smart city discourse— and sometimes inflecting it— was “an increased interest in engaged planning that empowers communities, valuing local input and control over urban investment and design”.

While it is always risky to generalize across diverse project and contexts, one key learning that has emerged from this body of work over the last decade is recognition of both the complexity and the contingent factors that characterize the process of enacting public participation in a digital milieu. Of course, this recognition remains partial and incomplete. For example, Gil et al (2019) apply Arnstein’s ladder to their formal analysis of thirteen designated ‘e-platforms’, but completely exclude the behaviour of the public (‘end-users’) from their analysis. A salutary comparison is Gabrys’ (2016: 231-234) analysis of FixMyStreet— one of the platforms Gil et al analyse—in which she not only describes a more nuanced range of user literacies and agency, but brings the structuring effects of app design including forms of passive data collection into the picture (see also Cardullo & Kitchin 2019).

Critiques by those such as Gabrys and Kitchin have helped to clear the space for planning research that explicitly adopts a sociotechnical framework, and is therefore better able to recognize the way that interplay between different domains of activity and situated knowledge infrastructures conditions the outcomes of participatory planning projects. For instance, as Mondschein et al (2019) note, the desire to engage inhabitants in the process of collecting data may in fact be in direct tension with the broader aim of ‘empowering’ them. Data collection tends to function best (that is, most efficiently and accurately) when the collection process is highly automated; for instance, when an app is able to run in the background on a mobile phone. While open source solutions might offer the greatest capacity for providing ‘transparency’ as to how data is collected and shaped by the software, they can also increase the technical burden on participants. Using off-the shelf proprietary devices and systems to collect data might reduce transparency but help to widen the range of community participants by lowering the level of technical knowledge required. In a recent project, Staffans et al (2020) begin from the desire to embrace different forms of knowledge in the planning process. They argue there is a lack of recognition of the different models and practices of communication that are needed to support public participation in planning, where modes of engagement might range from online consultation with broad and diverse publics to facilitating small, face to face collaborative meetings. Staffans et al argue that, while digital technology such as social media platforms has been widely used in order to broaden public inputs by gathering or distributing information, less attention has been paid to the different communication models and techniques needed to foster collaboration.

What I find noticeable in these and other recent projects is a welcome willingness to explore the striations of digital systems in their interplay with diverse domains including the material histories of urban sites, the varied agencies, cultures and interests of differentiated publics, and the organizational and political dynamics of municipal institutions. Recognizing that ‘communication’ is an important and oft-neglected element of such interplay is less about trying to advocate ‘my’ area than to acknowledge its distinct affordances, forged in a long history of attention to the enactment of power relations across ‘formal’ and ‘informal’ communicative situations. In fact, terms such as formal and informal are never absolute, especially in the digital milieu which, as Sassen (2006) notes is characterized by the ongoing *informalization* of previously formalised domains and activities on the one hand, and the ongoing *formalization* of once largely informal practices (such as data gathering by citizens and inhabitants) on the other.

What can help to take ‘participation’ beyond the restricted and instrumental relations, which Gabrys (2016: 233) summarizes as ‘a matter both of “instrumenting the citizen” and of breaking down urban problems into computable tasks’? One line is to continue to work to expand our understanding of ‘urban communication’ beyond a cybernetic, message and goal-oriented lineage to better recognize its constitutive role in social relations including public socialibility. Urban sociologist Richard Sennett (2012) has described how *public civility* is not simply a matter of ethical intent — of wanting to do the right thing — but a skill that is acquired and nurtured through the experience of interacting in public with others. Public civility not only underpins the sense of collective belonging and responsibility that motivates engagement in civic processes such as planning, but is fundamental to the relation regularly posited between participation and democracy. This is particularly the case for the urban democracy that Lefebvre (1996) argued was so vital to translating the formal democracy of elected parliaments and political representatives into a lived democratic experience.

How is public civility built? This has become a pressing issue for many cities and societies at a time when interaction between strangers in public is rendered fraught by the ambient fear connected to widespread urban securitization strategies on the one hand, and the equally widespread colonization of attention by personal mobile devices that all too commonly function as tele-cocoons on the other. Rather than looking for a big answer — a single solution that can ‘scale up’ across diverse situations, agents and sites — I would argue that we need to begin in many places, particularly (but not exclusively) building from the ground up. To give one of many possible examples, I recall presenting at a ‘Smart Lighting Symposium’ in Melbourne several years ago. After showing a number of interactive digital

light art projects, there was a discussion about how to encourage public participation in developing urban lighting schemas. One planner recounted the way that a small-scale light art project had stimulated public engagement in redesigning the lighting for the park in which it was situated. By fostering public discussion about lighting design and levels of illumination, a public art project helped to renegotiate the space between policy, design aesthetics and community—a space that is so often left blank, which is to say that it remains governed by default settings rather than recognition of differentiated public interests.

Examples like this are always at risk of being dismissed, not least because of their ‘smallness’. But the gap between master-planning, project design and construction is inevitably filled by decisions made at such scale, producing a cumulative effect that exceeds the sum of individual cases. The broader and more salient point is that by focusing on how such interventions can contribute to building public sociability we can start to re-evaluate the criteria as to what might constitute successful ‘participation’ in urban planning. A recent project by l’Her et al (2019) described the utilization of smart phones as data collection devices for a ‘citizen science’ project. The researchers argued the project could be considered a success not so much because of the data actually gathered but because, by initiating citizen mobilization, the project led to the formation of a new public arena. This recognition is a small but nonetheless significant shift away from the language of optimization and efficiency that has dominated ‘smart cityism’.

Respecting the situated, often ambiguous and sometimes conflicted nature of public ‘participation’ remains critical to establishing a different relation to the digital city. If, on the one hand, this helps to push back against the managerial and extractive approaches that I have dubbed smart cityism, it equally requires ongoing effort to acknowledge and respect other forms of urban knowledge, experience and practice. Focusing too heavily on participation through digital avenues risks entrenching the exclusion of the non-digital. As Gabrys (2016: 225) concludes in her study of citizen-sensing: ‘A world of ambient intelligence makes a human without sensing capabilities potentially idiotic’.

4. URBAN/DATA/ETHICS

Smart cityism emerged on the crest of the broader wave of ‘big data’ that rolled across the world in the early 2000s, accentuated as the rapid uptake of the Internet began to offer novel opportunities for cheap, large-scale data collection. However, recent years have seen growing concern about the ethics of data collection by online platforms, but also by other fields that took the Silicon Valley model as their mantra. The Facebook-Cambridge Analytica scandal and the operationalisation of the GDPR—both in 2018—signalled something of a tipping point in public and government attitudes towards the ‘tech’ sector, although this has scarcely been uniform across particular territories let alone across the globe. Nevertheless, the hands-off, *laissez-faire* attitude to data collection and use that marked the period from the mid-1990s seems unlikely to continue without challenge. How this plays out in different settings will have significant implications for digitally instrumented cities of the future, given that the effectiveness of ‘smart’ programs are dependent not only on some level of social license to operate, but often require active forms of end-user co-operation such as inhabitants volunteering to act as ‘citizen sensors’. In these circumstances, both the legitimacy and the efficacy of such programs are likely to be critically influenced by public perception concerning not only their compliance with the law but their adherence to ‘best practice’ models (Floridi 2018).

One of the widely recognized problems with any kind of data collection is ensuring its security and integrity relating to storage and use. A key issue in the Cambridge Analytica scandal was Facebook’s lax protection against third parties gaining access to the vast database of user data routinely gathered by the social media platform. The specific issue came to light when a firm called Global Science Research accessed a significant tranche of Facebook user data in 2014. GSR had employed 270,000 individual Facebook users (recruited through the MTurk platform) to complete a personality survey ‘This is Your Digital Life’ (TIYDL), paying each US\$1. In order to do the personality test each

participant was required to use their Facebook login credentials, which gave GSR access to their Facebook profile including data about pages they had 'liked'. The importance of 'like' data had been previously established by a group of Cambridge University researchers, who had used a personality survey (the 'myPersonality' app) to amass data on 4-6 million participants between 2007 and 2012. This research had demonstrated that data from Facebook Likes can be used to "accurately predict a range of highly sensitive personal attributes including: sexual orientation, ethnicity, religious and political views, personality traits, intelligence, happiness, use of addictive substances, parental separation, age, and gender" (Kosinski et al 2013). However, where the researchers using the myPersonality app sought consent from all users to access their Facebook data, GSR's TIYDL app harvested data not only from paid and consenting participants but from each participant's 'friends'. This was done without any attempt to gain the permission of the friend group, and meant that GSR was eventually able to access the data of up to 87 million Facebook users⁸. GSR then on-sold this data to political marketing firm Cambridge Analytica, who used it in political campaigns in the United States including the 2016 Trump election campaign.

There are a number of salient issues bound up in such an episode. At one level the case is a textbook example of data that was originally legally collected in one context being appropriated and re-purposed in another—a practice that is explicitly prohibited without consent in a number of data protection schemes, especially those associated with medical research. Putting aside the legality of GSR's behaviour, the issue highlighted significant deficiencies in Facebook's attitude and practices for protecting the data that it routinely collected.⁹ The gravity of the situation was compounded by the fact that, while Facebook had been collecting user data for years, what could be learnt from it had been changing as analytical techniques were expanded and refined. However, these changes were not widely understood. In fact, the initial articles published in 2013 by the Cambridge University researchers who used the myPersonality app had sought to draw public attention to this emerging 'function creep'.

What can be learnt from such an episode in relation to the digitization and instrumentation of contemporary cities? Data relevant to urban operations is now captured by a slew of different technologies operated and controlled by a wide mix of public and private actors. These include dedicated systems such as sensors to measure pollution or meter energy use, or smart transit systems such as tollways or ticketing systems that may be operated by public, quasi-public or private companies. It also includes infrastructure such as CCTV cameras which are likewise operated by a mix of public and private concerns, ranging from cameras for traffic operations to private systems covering small shops and large scale commercial malls to cameras related to policing directly focused on pedestrian activity in the street and other public spaces. Some of this data might be intended primarily for 'live' use and only stored temporarily, while other streams are intended primarily for deferred use—for example, the vast Google Street View database which is archived in perpetuity.

An increasingly important aspect of the present conjuncture is that significant streams of urban data can now also be captured by what might be termed non-traditional sources such as mobile phones and social media platforms. Mobile phones enable a range of (mostly private sector) operators including telcos and operating system manufacturers to collect detailed data about the location and movement of individual devices and users. Something of the scale and reach of this data was intimated with the release by two of the major players in this space, Apple and Google, of datasets relating to changing mobility patterns in different cities around the world as a result of COVID-19 lockdowns. I've argued elsewhere that this capacity to capture granular, population-scale data about individual location and movement is a significant historical shift (McQuire 2016). Part of understanding this shift from media to 'geomedia' is to recognize its somewhat unplanned nature. Mobile communication devices such as smart phones were never designed with the primary purpose of tracking users. Rather, these affordances have evolved over time in order to support the expansion of services and applications. This explains to some extent why both governments and users seem to have been slow to recognize, and ill-prepared to dispute, the intrusive data-gathering settings that characterize these platforms. It

also situates the magnitude and depth of the current challenge, as business models based on rampant data extraction are not only up and running, but generating massive profits for the powerful interests that control them.

As Adam Greenfield (2011) pointed out in his interrogation of the data collecting habits of ‘digital street furniture’, such installations may be more or less intrusive. This spectrum of intrusion can be plotted by asking questions about what sort of data is being collected, but also what happens to it. Is it for a local and temporary use? Or is the data stored and retained, and potentially aggregated with other datasets for further analysis? Aggregation is recognized as the key to opening up new learning opportunities, and is integral to the ‘big data’ paradigm (Kitchin 2014). It also raises more concerns about the potential for data collection to intrude on personal privacy. Greenfield also points to the need to consider the *purpose* of data collection, particularly whether or not it produces some kind of public benefit. One of his examples is a motion detector that provides a visual signal to drivers that pedestrians are approaching an upcoming crossing, alerting drivers to the need to slow down and potentially stop. In this application, captured data is used locally, is not retained and returns clear public benefit. Greenfield contrasts this with other applications such as interactive vending machines which photograph users in order to personalise their offerings: here data is routinely collected without consent, may be stored indefinitely, and is subject to aggregation and analysis by unspecified algorithmic operations, with the benefit being heavily skewed towards the commercial operator rather than those from whom data is taken.

Applying these kinds of basic questions to existing and emerging digital urban infrastructure is an important step in addressing the instrumented city, particularly as regulation in this space remains uneven and often lags in comparison to the rapid growth of capacities. However, the broader question for the future city is how the generalization of these and other data collection systems might transform both the ambiance and the politics of urban space. Location is one of the most common forms of personally identifiable information that users give up in urban contexts. Sometimes this is a matter of ignorance, but often it is a required trade-off for using a particular service. The ‘take-it-or-leave-it’ bluntness of consent mechanisms has been recognized as promoting a level of resignation and disengagement, where users routinely click on ‘agree’ without reading let alone understanding terms of service provisions. In one well-known experiment in 2014, customers in a London café were asked to hand-over their first-born children in return for access to ‘free’ wi-fi. Six people consented.

Public concern about the gathering of location data has led to some modifications from major commercial platforms. Notorious ‘stalker’ apps such as *Girls Around Me* produced by Moscow-based developer i-Free, which mashed together location data from check-in service Foursquare with Facebook profiles and then used Google Maps to display a map showing all the girls in a users’ vicinity, including their photographs and other personal data, found themselves banned following negative publicity. Despite the unsavoury nature of *Girls Around Me*, journalist John Brownlee, who brought the issue to public attention, didn’t believe the app was breaking the law as it existed in the US. Brownlee (2012) noted:

[A]ll that Girls Around Me is really doing is using public APIs from Google Maps, Facebook and Foursquare and mashing them all up together, so you could see who had checked-in at locations in your area, and learn more about them. Moreover, the girls (and men!) shown in Girls Around Me all had the power to opt out of this information being visible to strangers, but whether out of ignorance, apathy or laziness, they had all neglected to do so. This was all public information.

Changing technological capabilities mean these kinds of challenges will keep recurring. Over the last decade it became common in many cities to provide ‘free’ wi-fi services, using a mixture of public and private providers (Lambert et al 2018). Changes in wi-fi technology mean that such systems are now able to track the position and movement of individual devices. This means that wi-fi systems can now provide rich, granular information about people movement —location, numbers,

density, dwell-time and trajectories—which has led to an upsurge of private providers offering ‘free’ installation of these systems in public space. Once you have logged in the first time, many of these systems are capable of tracking individual devices multiple locations and subsequent occasions (Holger 2018). This problem is exacerbated by the fact that many mobile devices are configured to automatically connect to any available unsecured networks as a matter of ‘convenience’. In the past, a standard response to concerns about tracking and tracing individuals in public space was the broad promise that only de-identified, aggregate data would be stored. However, as a number of researchers (Edwards et al 2019; OAIC 2019) have pointed out, de-identification is always context dependent and reversal increasingly possible.

Recognizing these kinds of problems is not about arguing that collecting location and other data should be banned in all circumstances, but asking what might be done to establish a more balanced regime than exists in the present. What might ‘best practice’ approaches to wi-fi data collection look like? This question took on personal urgency when upgrades to the wi-fi system at the university where I work meant that, for the first time, the university had access to data showing how many people moved across campus on a daily basis. The data also showed where people went on campus, and could even be used to determine the occupancy of particular buildings. This kind of data can obviously be extremely useful in planning building use, but also for developing emergency response scenarios. However, because the capability was put to use without the university population being made fully aware of it, there was understandable shock and negative publicity (ABC 2016). Ensuing discussion about ‘best practice’ recognized that changes needed to go beyond traditional issues of obtaining consent to embrace a more holistic and transparent approach that included providing public information about the possible trade-offs and benefits to those impacted. However, it is clear many other wi-fi providers in Australia do not feel constrained to adopt the same approach, and this national variance is evident when considering other territories and jurisdictions.

Concerns about collection and use of potentially sensitive data such as location has been intensified by the recent rapid growth in use of automated and assisted decision-making systems often referred to as ‘artificial intelligence’. A significant body of recent research has shown that such systems have a history of flawed design and application, ranging from decisions about what is included in a particular database to the programming of the algorithms that operate on this dataset, including the training data that is used. Researchers have argued that ‘biases’ may reflect the input and presumptions of a limited set of algorithm creators, skewed training data, as well as the unintended outcomes produced by otherwise functional systems (Campolo et al 2017). The intensification of such concerns in the period since the Cambridge Analytica revelations is evidenced by the growing volume of reports and discussion papers generated by public and corporate bodies. In Australia, reports under the auspices of the Australian Council of Learned Academies (Walsh et al 2019), the Australian Human Rights Commission (AHRC 2019) and the data and digital arm of the national science agency CSIRO (Dawson et al 2019) all landed in 2019. Like similar reports emerging from Europe and North America, they converge in their calls for the adoption of principles related to transparency, explainability, fairness, accountability and contestability. However, they remain short on detail as to how such principles might be implemented at a practical level, particularly in the context of widespread use of proprietary private systems. Moreover, while some of problems are better known today than they were 10 years ago, this does not mean that they are resolved or, in fact, will ever be resolved in the sense that they can be finalised. Every AI system, despite its best (or worst) intentions, will create gaps, exploits and ‘outsiders’, underlining the need for continued and proactive scrutiny of both system design and outcomes.

Of particular relevance to cities is the growing tendency to link older surveillance technology such as video cameras with automated decision-making systems such as face recognition programs. Such programs have spread from various law enforcement and security operations (such as passport control) to become part of popular culture. Facebook began using face recognition to enable the automated tagging of ‘friends’ on photographs uploaded to its platform as early as 2011, while Apple

introduced its biometric Face ID system in 2017, replacing older security formats such as numeric codes and fingerprints (TouchID).

However, current developments promise to extend face recognition into a more general logic operative across urban space. This lends a new urgency to a number of issues. One is the problem of errors. Face recognition systems have well-known inaccuracies, with error rates historically much higher when dealing with non-white and non-male faces. But, even assuming these limitations can be ‘fixed’ by adjusting technical standards and training data, accuracy will scarcely resolve all the issues. Andrejevic and Volcic (2019) persuasively argue that coupling automated face recognition to urban video surveillance is one of the primary axes for extending ‘digital enclosure’ from a web-based logic to a more general ‘operational enclosure’ suffusing urban space. ‘By ‘digital enclosure’, Andrejevic (2007) referred to the harvesting of data from the web by proprietary platforms and services. In an urban context, Andrejevic and Volcic (2019) argue that the extension of digital enclosure is not simply about extending data collection —although this is one of its preconditions— but about enabling new forms of operational control. One of their examples is the reported use of an assemblage consisting of video surveillance, face recognition program and actuators that would potentially enable a convenience store in the US to “automatically lock its doors to prospective customers whose faces appear in a database of ‘known robbers and shoplifters’.” While Andrejevic and Volcic raise a number of issues about just how effective such a system might be in practice, the salient point is the way the system aims to circumvent the problem of theft. Rather than reporting retrospectively to the authorities, the whole orientation is prospective. It is designed to foreclose access before any offence can be committed.

Surveillance studies doyen David Lyon has long argued that a primary characteristic of surveillance in the digital milieu is its new temporality. As the speed for gathering, aggregating and analysing data has increased exponentially, the surveillance mission is no longer primarily retrospective but is increasingly intended to be predictive and interventionist. Gathering data is less about knowing what happened in the past than knowing what might happen in the future. Of course, this is precisely the shift on which the ‘real-time’ orientation of smart cityism was based. If such a temporal realignment has undoubtedly been somewhat uneven, if not mythical in practice, it doesn’t lessen concern that such a setting has the potential to create new forms of behavioural —and political—*foreclosure*. Andrejevic and Volcic make the point that the assemblage of video-face recognition-actuator described above represents a significant shift in the well-known model of ‘disciplinary power’ conceptualised by Foucault. Disciplinary power worked via the principle of asymmetrical surveillance (famously illustrated by Foucault’s borrowing of Bentham’s penitentiary panopticon), where the potential to be watched functioned to induce a subjective modification of behaviour. The internalization of behavioural norms constituted a vital aspect in the exercise of power, since it was impractical to actually watch each individual all the time, let alone to respond to them in ‘realtime’. In contrast, the foreclosure of automated networked control no longer has to be concerned with the subjectivity of those it seeks to control. Instead it directly modifies the environment in which people operate. Recent adoption of face recognition systems to replace older ticketing systems for passengers using high speed trains on certain routes in China is a possible harbinger of things to come, as face recognition could be adopted for all kinds of services and transactions including everyday purchases .

While history shows that the growth of face recognition has been promoted through a combination of appeals to convenience and need (especially for security), there are good reasons to remain wary of its generalization. The growing potential for political coercion in the digitally instrumented city was laid bare during the Hong Kong protests of 2019, as protestors not only sought to mask their faces but avoided using mobile devices, smart tickets and credit cards — all the everyday technologies that now create identifiable digital footprints. This response suggests the urgent need for deeper consideration of the politics and ethics of data collection and use, particularly on key aspects of ‘the right to the city’ such as the fundamental conditions of public assembly. While much can be learnt about ethical approaches to data from other domains (for example, medical research which has a long history of collecting and utilising personally sensitive information), there is clear need for more thinking that

is specifically related to urban issues. To place one marker of this need, the presumption of a level of personal anonymity which has underpinned the distinctive public culture of cities over the last century is now fast disappearing under weight of public and commercial surveillance systems. To allow this to happen without much greater public debate would be a failure that will be felt well beyond urban planning.

5. CONCLUSION: FROM NAMES TO NUMBERS

Early in the 20th century, sociologist Georg Simmel (1997: 149) noted how the transition from naming to numbering of houses had conferred new affordances:

The named house cannot be immediately located; its position cannot be construed objectively, as is the case with current geographical designation. For all their indifference and abstractness, numbers do after all represent as ordering numbers a definite place in space, which the proper name of the locality does not.

While numbering had stripped the house of its singular qualities, it enabled a new form of urban knowledge that in turn supported new forms of action, such as postal deliveries by agents who lacked any personal knowledge of a neighbourhood and its inhabitants. Being able to turn all kinds of phenomena, from physical entities to behavioural states, into numbers conferred a new type of power, inaugurating what Ian Hacking aptly referred to as ‘statistical society’. The computerization of urban planning that dates from the 1960s, and the digital instrumentation of cities that really took off in the 2000s, have both enabled massive extensions of such statistical power. They offer new potential to understand the city — its patterns, flows, intensities and concentrations, but also its absence and ruptures— at a moment when the scale of cities and the jagged mobility of their inhabitants threaten to stretch the bounds of urban life beyond recognition.

However, as I have argued, these new capacities raise political and ethical concerns that are by no means settled. Computerization and digital instrumentation of the city has created a new urban knowledge infrastructure. Power has shifted towards certain skills such as data analytics, data optimization and data visualization; professions that are currently dominated by experts who ‘apply’ technical skills to data generated in multiple situations from medical research to urban planning with little apparent need to understand the specificities of these domains. Power has also shifted away from traditional public actors such as governments towards a variety of profit-seeking companies who provide much of the ‘infrastructure’ for the digitally instrumented city. Like most paradigm shifts, this moment is characterized by incompleteness and excess.

The challenge for urban e-planning research in the next decade and beyond is to achieve a better balance between quantitative approaches using the unprecedented data enabled by digital instrumentation, and other ways of knowing and acting in the city. As I have argued above, this challenge needs to be pursued on a variety of levels. If one involves the politics and ethics of urban technical systems, recognizing the inevitable exclusions encoded in software and algorithms and the need for more ethical approaches to data capture and use, another is to insist on the legitimacy of other types of urban knowledge, especially that produced by citizens and inhabitants. Part of this insistence is to recognize the importance of learning from detailed explorations of ‘participation’ enacted in particular urban socio-technical situations. Another part is to remain aware of other possible uses for digital and computing technologies; ones that go beyond the collecting, distributing and analysis of ‘actionable’ data and instead experiment with new modes for sensing and experiencing urban space. In my own research, I have benefited from ongoing interdisciplinary collaborations with artists including filmmakers, media artists, choreographers and dancers, who all bring different histories, experiences and frames to understanding urban space.

At bottom, this challenge is about the need to set limits on the prevalence of *extractive* models for data collection and use. If these models currently dominate most commercial and much governmental thinking about the digitally instrumented city, they clearly extend beyond it. As Zuboff (2019) argues in her work on ‘surveillance capitalism’

Surveillance capitalism unilaterally claims human experience as free raw material for translation into behavioural data. Although some of these data are applied to service improvement, the rest are declared as a proprietary behavioural surplus, fed into advanced manufacturing processes known as ‘machine intelligence’, and fabricated into prediction products that anticipate what you will do now, soon, and later. Finally, these prediction products are traded in a new kind of marketplace that I call behavioural futures markets.

Despite a decade of critique, ‘smart cityism’ remains alive and well. This is not surprising since it has powerful proponents; its offer to solve complex problems meets a need, and for this reason appeals to various levels of government who need to be (seen to) doing something. And, of course, data-led approaches can be effective, up to a point. Beyond what I’ve called smart cityism, the computerization and digitization of urban space proceeds apace, within, alongside and even against formal smart city projects and programs. This historic shift in urban infrastructure cannot be assessed simply in terms of whether it is ‘good’ or ‘bad’. Nor should it be reduced to a matter of purely human will, as if individuals or even communities can somehow decide to use the new digital infrastructure only for ‘good’. While not all choices are equal, every choice will inevitably produce a range of effects, some of which are more immediate and intended, while others emerge more slowly and were perhaps unintended or unforeseen. Deploying digital technology as pervasive urban infrastructure is modifying ‘us’ in the process of its ongoing adoption and adaptation. It is incumbent on us to be as self-aware and self-reflexive about this process as we can.

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ENDNOTES

- ¹ Latour (2007) described this shift in terms of the erosion of the “ancient divide between the social on the one hand and the psychological on the other”.
- ² Edwards et al (2013: 5) define ‘knowledge infrastructures’ as “robust networks of people, artifacts, and institutions which generate, share, and maintain specific knowledge about the human and natural worlds”.
- ³ Flood’s book describes ‘the war years’ in which fires destroyed whole neighborhoods in New York resulting in the deaths of more than 2000 people. He argues this outcome was largely due to the withdrawal of fire services from the city’s poorest areas on the basis of RAND’s computer modelling.
- ⁴ While smart city discourse tends to use the term ‘citizen’, I use inhabitant to recognize that many urban dwellers do not, in fact, enjoy the formal rights and protections of citizenship, however unequally these may be exercised in practice.
- ⁵ ‘In our vision, participation and self-organisation are the cornerstones to building a global knowledge resource that, by design, will represent a public good, accessible to every citizen, institution or business. [...] Only a public system capable of delivering high-quality information within a trusted framework has the potential for raising a high degree of participation, and only large, democratic participation can ensure the creation of reliable, timely and trustworthy information about collective phenomena’. (Batty et al 2012: 492)
- ⁶ This is not to deny the important role of publicly funded research in the development of both computing and the internet. But it is instructive to draw a comparison with the previous era of communication technology. In most national territories (other than the United States), broadcasting and telecommunications were led or strongly shaped by government-funded or government-controlled institutions that provided both infrastructure, and programming. This has been far less the case in relation to the internet and digital networks since the mid-1990s.
- ⁷ This is the limit of analyses such as Holland’s (2008) well-known critique of the smart city, where he argues the problems can be overcome by focusing more on ‘people’. What goes missing is consideration of how ‘we’ — the people — are being changed by the digitally instrumented city.
- ⁸ 87 million is the number that Facebook eventually reported as potentially affected, although GSR disputed it.
- ⁹ Facebook was fined a record US\$5bn in 2019 by the US Federal Trade Commission for violating consumers’ privacy rights. Facebook, GSR and Cambridge Analytica all face ongoing legal proceedings in a number of jurisdictions, including the United States and the UK. The Office of the Australian Information Commissioner launched a new Federal Court action against Facebook in March 2020.

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