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Creating smart cities

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Introduction

Many cities around the world are presently pursuing a smart cities agenda in which networked ICTs are positioned and utilized to try to solve urban issues, drive local and regional economies, and foster civic initiatives. Regardless of whether cities have formulated and are implementing smart city visions, missions and policies, all cities of scale utilise a number of smart city technologies (e.g., intelligent transport systems, urban control rooms, smart grids, sensor networks, building management systems, urban informatics) to manage city services and infrastructures and to govern urban life (see Table 1.1). In this sense, we are already living in the smart city age, with assemblages of networked technologies being used to mediate many aspects of everyday life (e.g., work, consumption, communication, travel, service provision, domestic living), with the trend moving towards evermore computation being embedded into the urban fabric, previously dumb objects and processes becoming 'smart' in some fashion, and services being shaped by or delivered in conjunction with digital platforms (Kitchin and Dodge 2011). Smart city agendas corral the development and use of these technologies into a rhetoric and agenda in which digital technologies are championed as commonsensical, pragmatic solutions to all the ills of city life.

Table 1.1: Smart city technologies

Domain	Example technologies
Government	E-government systems; online transactions; city operating systems; performance management systems; urban dashboards
Security and emergency services	Centralised control rooms; digital surveillance; predictive policing; coordinated emergency response
Transport	Intelligent transport systems; integrated ticketing; smart travel cards; bikeshare; real-time passenger information; smart parking; logistics management; transport apps; dynamic road signs
Energy	Smart grids; smart meters; energy usage apps; smart lighting
Waste	Compactor bins and dynamic routing/collection

Environment	IoT sensor networks (e.g., pollution, noise, weather; land movement; flood management); dynamically responsive interventions (e.g., automated flood defenses)
Buildings	Building management systems; sensor networks
Homes	Smart meters; app controlled smart appliances

Source: Kitchin (2016)

The smart city agenda builds upon and extends a longer history of computationally networked urbanism that has been in progress from the early 1970s and variously labelled 'wired cities' (Dutton et al. 1987), 'cyber cities' (Graham and Marvin 1999), 'digital cities' (Ishida and Isbister 2000), 'intelligent cities' (Komninos 2002), 'networked cities' (Hanley 2004), 'sentient cities' (Shepard 2011), among others (Kitchin 2014; Willis and Augiri 2018) and overlap with other popular, current city framings (e.g., resilient cities, sustainable cities, safe cities, eco-cities). In contrast to earlier formulations of networked urbanism, smart cities as a concept, aspiration, and an assemblage of products, rapidly gained traction in industry, government and academia from the late 2000s onwards to become a global urban agenda (see Willis and Augiri 2018). In large part, this is because it has been actively promoted by a well-organized epistemic community (a knowledge and policy community), advocacy coalition (a collective of vested interests), and a cohort of embedded technocrats in new governmental roles (chief information officers, chief technology officers, chief data officers, data scientists, smart city policy specialists, software engineers, and IT project managers) (Kitchin et al., 2017). Beyond city administrations, many consultancies are offering specialist smart city services, tech companies have created new smart city units/divisions, and universities have founded smart city research centres. In just a handful of years, a number of smart city consortia of aligned actors have been formed at different scales (global, supra-national, national and local), each claiming to provide authoritative, neutral, expert advice, resources, and partnerships that can cut through the complexities of managing cities by using digital technologies to solve difficult issues/problems (Kitchin et al., 2017).

Given this step change in activity and the embracing of smart city rhetoric and the formulation of associated policy and funding programmes by governmental bodies, the emerging market for smart city technologies, and the potential consequences with respect to urban living, management and governance, not unsurprisingly the concept of a smart city and the drive to create 'actually existing smart cities' (Shelton et al., 2015) has attracted much media, scholarly (including fundamental and applied research), policy and corporate

attention. However, the focus, intention, and ethos of smart city ideas, approaches and products remains quite fragmented and often quite polarised across and within these domains.

On the one side are those that seek to develop and implement smart city technologies and initiatives, often with little or no critical reflection on how they fit into and reproduce a particular form of political economy and their wider consequences beyond their desired effects (such as improving efficiency, productivity, competitiveness, sustainability, resilience, safety, security, etc). Typically, this grouping is composed of scientists, technologists, and technocrats working in universities (in disciplines such as Computer Science, Data Science, Civil Engineering), companies, and government. When challenged about some of the underlying assumptions used in developing their technologies, or the problematic ways in which their inventions are being used, they try to side-step the critique by claiming that: they employ a mechanical objectivity in their work, thus ensuring that it is neutral and non-ideological; they are developing what society, the market and city administrations want or need; and they are not responsible for how their products are used in practice. Their role is to create technologies that solve instrumental problems, such as how make a process more sustainable, efficient or cost-effective, not to evaluate whether it is the most appropriate solution or to address wider social, political and philosophical issues of fairness, equity, justice, citizenship, democracy, governance and political economy (though they may try to utilise these notions in promoting/marketing their solution); those are the remit of practitioners, policy-makers, politicians, and social movements.

On the other are those that critique such initiatives from political, ethical and ideological perspectives, focusing on issues of power, capital, equality, participation, citizenship, labour, surveillance, and alternative forms of urbanism, but provide little constructive and pragmatic (technical, practical, policy, legal) feedback that would address their concerns and provide an alternative vision of what a smart city might be. Much of this critique has emerged from the social sciences (especially Geography, Urban Studies, Science and Technology Studies, and Sociology) and civil organisations. They contend that smart city technologies are never neutral, objective, non-ideological in nature, both with respect to how they are conceived and developed, and how they are promoted. Smart city technologies they argue prioritise a technological solutionist approach to issues (Morozov 2013; Mattern 2013), rather than solutions that are more political, fiscal, policy, deliberative, and community development orientated, and they inherently have certain values embedded in them which produce particular kinds of solutions (Greenfield 2013). The smart city they contend facilitates and produces instrumental, functionalist, technocratic, top-down forms of

governance and government (Kitchin 2014; Vanolo 2014); are underpinned by an ethos of stewardship (for citizens) or civic paternalism (what is best for citizens) rather than involving active citizen participation in addressing local issues (Shelton and Lodato, this volume; Cardullo and Kitchin 2018); and often provide 'sticking plaster' or 'work around' solutions, rather than tackling the root and structural causes of issues. With respect to how they are promoted, smart city initiatives often leverage from neoliberal arguments concerning the limitations of public sector competencies, inefficiencies in service delivery, and the need for marketization of state services and infrastructures. Public authorities, it is argued, lack the core skills, knowledges and capacities to address pressing urban issues and maintain critical services and infrastructures. Instead, they need to draw on the competencies held within industry and academia that can help deliver better solutions through public-private partnerships, leasing, deregulation and market competition, or outright privatization (Kitchin et al., 2017). In turn, the logic of a reliable, low-cost, universal government provision in the public interest is supplemented or replaced by provision through the market, driven in-part or substantively by private interests (Graham and Marvin 2001; Collier et al., 2016). Luque-Ayala and Marvin (2015: 2105) thus argue there is "an urgent need to critically engage with why, how, for whom and with what consequences smart urbanism is emerging in different urban contexts."

Smart city protagonists then are largely divided into those that advocate for the promise or warn of the perils of smart cities (see Table 1.2). That said, we would acknowledge that this division is somewhat of an over-simplification. Over time, many of those promoting smart cities have come to recognize that they need to be more mindful of critiques, often trying to reframe smart city interventions in ways that are more citizen-centric and complementary to other approaches for tackling urban issues – though often it is the discursive framing that it is recast, rather than the fundamental principles and implementation of technologies/initiatives; Kitchin 2015a). Moreover, they have come to realise that implementing a smart city initiative/strategy consists of a complex set of tasks and politics that are difficult to resolve in practice and require multi-stakeholder negotiations, policy changes, and investments to address. For example, beyond the concerns that critics typically focus on (as set out in Table 1.3) the 42 interviewees – from local government, state agencies, business, universities, civic bodies active in smart city initiatives in Dublin – that were interviewed in a sub-project of The Programmable City project[1] discussed over 60 different issues that can be characterised as 'critique, challenges and risks' with regards to Dublin becoming a smart city, nearly all of which are practical, pragmatic, organisational, and

institutional in nature (concerning issues such as personnel capacity/competency, funding/procurement, processes and procedures, structures, coordination, priorities, strategy, leadership, policy/law, competing interests, etc.), rather than being political or ideological (see Figure 1). Similarly, many critics have recognized that smart city technologies do provide workable solutions for some urban issues, are often well-liked by citizens, and such technologies are not only here to stay but are going to become more entrenched in the future. Their focus of attention is thus on modifying the formulation and ethos of smart city initiatives and implementing them in ways that minimize perils, rather than seeking their abandonment.

Table 1.2: The promise and perils of smart cities

Promises[2]	**Perils**[3]
Will tackle urban problems in ways that maximize control, reduce costs, and improve services, and do so in commonsensical, pragmatic, neutral and apolitical ways through technical solutions.	Treats the city as a knowable, rational, steerable machine, rather than a complex system full of wicked problems and competing interests.
Will create a smart economy by fostering entrepreneurship, innovation, productivity, competiveness, and inward investment.	Promotes a strong emphasis on technical solutions and overly promotes top-down technocratic forms of governance, rather than political/social solutions and citizen-centred deliberative democracy.
Will enable smart government by enabling new forms of e-government, new modes of operational governance, improved models and simulations to guide future development, evidence-informed decision making, and better service delivery, and by making government more transparent, participatory and accountable.	Solutions treat cities as ahistorical and aspatial and as generic markets, promoting one-size fits all technical fixes rather than recognising local specificities.
Will produce smart mobility by creating intelligent transport systems and efficient, inter-operable multi-modal public transport, better and dynamic routing, and real-time information for passengers and drivers.	The technologies deployed are positioned as being objective, commonsensical, pragmatic and politically benign, rather than thoroughly political, reflecting the views and values of their developers and stakeholders.
Will make smart environments by promoting and creating sustainability and resilience and the development of green energy.	Promotes the corporatisation and privatisation of city services, with the developers of smart city technologies capturing city functions as market opportunities which are run for profit rather than the public good, and potentially create propriety technological lock-ins.
Will create smart living by improving quality of life, increasing choice, utility, safety and security, and reducing risk.	Prioritises the values and investments of vested interests, reinforces inequalities, and deepens levels of control and regulation, rather than creating a more socially just and equal society.
Will produce smart people by creating a more informed citizenry and fostering creativity, inclusivity, empowerment and participation.	The technologies deployed have profound social, political and ethical effects: introducing new forms of social regulation, control and governance;

	extending surveillance and eroding privacy; and enabling predictive profiling, social sorting and behavioural nudging.
	The technologies deployed potentially produce buggy, brittle and hackable urban systems which create systemic vulnerabilities across critical infrastructure and compromise data security, rather than producing stable, reliable, resilient, secure systems.

Source: Based on analysis in Kitchin (2015b), see endnotes 2 and 3 for specific sources of promises and perils.

Table 1.3: Critique, challenges and risks in seeking to become a smart city

Critique/challenges/risks	
• Antagonism/conflict/misunderstanding between stakeholders • Best practice • Business case issues • Capacity issues/staffing • City complex systems • City requires stability/risk adverse • Communication to public • Competing interests • Competitiveness • Creating impact • Cultural mindset • Data dumps/quality/governance • Data protection/privacy • Data security • Digital divide/inclusion • Drift in roles • Endless experimentation/pilots • Future proofing • How to prioritize/assess proposals • Ignores planning system/process • Internal politics/inertia • IP, NDAs and legal issues • Lack of clear route to engagement • Lack of economy of scale • Lack of inclusion of citizens • Lack of investment/finance • Lack of national level support • Lack of openness • Lack of opportunities • Lack of proper implementation • Lack of transparency • Lack of trust in government • Legacy infrastructure • Local authorities lack nimbleness	• Mismatch needs/solutions • Multinational/jobs focused • Need action not talk • Need alignment with wider planning • Need bespoke solutions • Need champions • Need CIO, CTO, CDO • Need for education/data literacy • Need for joined-up thinking/coordination • Need for strategy/sense of direction • Non-interoperability/lack of integration • Not using locally-sited industry • Path dependency • Political geography of city • Poor choice/implementation • Privatisation • Procurement issues • Proprietary systems/data • Resistance • Scepticism • Setbacks • Solutionism • Standardisation/standards • Surveillance • Sustainability • Too many barriers to implementation • Unanticipated consequences • Under-utilisation of installed tech • Unofficial state aid • Upgrade treadmill • Variances between local authorities • Vendor-led rather than city- or citizen-led • Wasting investment • Weak governance/leadership

Source: MAXQDA coding of Rob Kitchin's Dublin interviews (conducted 4th Feb to 7th May 2015)

The collection of essays in this book seek to bridge the gap between advocates and critics by critically examining the production of smart cities and suggesting new visions of smart urbanism that seek to gain some of the promises of networked ICT while addressing some of their more problematic aspects. Indeed, it is fair to say that none of the contributors are against the use of new innovative technologies *per se* to help mitigate urban issues, but they are all cautious and concerned about how smart city initiatives envisage and deploy technologies and re-imagine how cities should be governed and managed. Thus conceived, the book explores the various critiques of smart city rhetoric and deployments *and* to suggest social, political and practical interventions that would enable better designed and more equitable and just smart city initiatives. In particular, the essays explore the benefits of smart city initiatives while recasting the thinking and ethos underpinning them and addressing their deficiencies, limitations, and perils. The essays were initially drafted in advance of an invited workshop that took place in September 2016 as part of a European Research Council funded project, The Programmable City (ERC-2012-AdG-323636).

The political economy of smart cities

The first half of the book considers issues of political economy, including how smart cities are framed and promoted, how they are sustained by and reproduced particular formations of power and regulation, and how they shape patterns of economic development. The chapters highlight how smart cities need to be reimagined in new ways that enable technologies to be deployed to aid city management but which are less technocratic, more inclusive in orientation, and do not simply serve the interests of capital and elites.

In Chapter 2, Jathan Sadowski calls attention to the ways in which the smart city is not merely an assemblage of technologies, but rather a concerted attempt to enact a neoliberal transformation of urban governance. He divides his analysis into two parts. In the first, he contends that the push for smart cities has been driven by two sets of processes: austerity and accumulation. In a time where cities are starved of resources they are forced to seek to do more with less and compete in the global marketplace for investment. Technological solutions offer cities a pathway towards efficiency, entrepreneurialism, and economic development. At the same time, these technologies provide a means of generating and accumulating a massive amount of data about people, places and systems that underpin a new

data-driven economy, which is also reshaping the operation of urban governance. These twin drivers (re)produce technocratic, neoliberal urbanism. In the second part of the paper, he sets out an alternative view, contending that 'the smart city is a battle for our imagination' and it is necessary to offer other ways to re-imagine and reframe more progressive smart cities. The model he offers, the Digital Deal, is modelled on the New Deal policies that were implemented in the United States during the Great Depression. Whereas the New Deal was based on the three principles of relief, recovery, and reform, the Digital Deal he advocates for is based on participation (by citizens in visioning and programmes), protection (from the excesses of data accumulation), and progress (towards a more a just, equitable, prosperous city for all). Without new visions and politics of smartness, he argues that city leaders and decision makers are provided with limited and limiting urban imaginaries of the present and future city.

Over the past decade there has been a number of initiatives to create standards for smart cities and their associated technologies. James Merricks White explores two key questions with respect to such standardisation projects: what do smart city standards attempt to standardise? and, what do they hope to achieve by doing so? He argues that standards seek to map out and formalise the systems that compose smart city assemblages. This is important, as producing and adopting standards enables the mediation of the relationship between supply and demand in the market for city services and technologies by providing certainty in knowledge and systems, stability in consumer demand, and permits benchmarking and interoperability and the breakdown of system silos. He contends that the creation of standards is shaped by three orders of knowledge – systems theory, neoliberalism, and governance – each of which he details with respect to a different standard making initiative: City Protocol Anatomy, BSI PAS 181, and ISO 37120. He then describes points of contradictions and conflicts in what he calls the 'field of possibilities'. These show standardisation to be an intensely political and normative act that posits ideas about how the world is and ought to be. His chapter highlights one aspect of the political work undertaken to produce particular visions of smart cities, namely putting in place technical specifications for particular technologies and guidelines for how smart cities should be measured and governed. An alternative vision for smart cities needs to undermine or operate in this terrain if it is to provide a counter the present dominant vision, for example, setting out standards for the ethical use of smart city technologies and embedding privacy-by-design and security-by-design as core orientations.

Alan Wiig provides a detailed case study of the surveillance capitalism that lies at the heart of much smart city technology. His focus is the city of Camden in New Jersey, United States, a city that has been in decline for decades and is blighted by high rates of deprivation and crime, but whose waterfront is being regenerated through $800 million in public and private investment, with another $1.2 billion being invested elsewhere in the city. A key part of the strategy to encourage and protect such investment, and to re-imagine the city, has been the rollout of an automated, militarized surveillance and policing system. This has included the use an 'Eye in the Sky' camera network, an interactive community alert network (an anonymous, online neighborhood crime watch), automated license plate readers that can track vehicle movement, and a body-worn camera program for police officers, with the data flowing into an urban control room and into predictive policing software. Here, economic development and a militarized surveillance grid and policing practices are synergistically intertwined, with the city becoming a market for repurposed military technologies and expertise, and the securitised city protecting the interests of capital and enabling orderly and planned economic development. This is a city of cybernetic control that seeks to capture and contain undesirable behaviour. While Camden is a relatively exceptional case in terms of its scope and depth, the assemblage of technologies detailed are being deployed extensively across cities, particularly in North America, and provide a salutary example of how surveillance capitalism is being used to produce securitised smart cities. There is clearly much to be concerned about with respect to civil liberties and new forms of city governance in such an assemblage, but as yet there have been little sustained interventions to reverse such deployments where they have been rolled out.

Félix Talvard also considers the links between economic development and smart cities, but does so by focusing on the assembling of economic performance and social inclusiveness, rather than securitisation. His case example is Medellín in Columbia, a city once ranked as one of the most dangerous on the planet. However, whereas the Camden example ensnares the local population in a grid of control designed to shackle their actions, Medellín has sought to enrol public and private actors to build consensus on how the city should be organized politically and economically. Talvard focuses on one key initiative, *Medellinnovation*, a specially designated district that acts as a site of urban experimentations and seeks to attract transnational investment. Unlike other smart districts that seek to minimize or control who lives in them, *Medellinnovation* is located in an existing neighbourhood and engages with the local community, with a stated aim of serving them rather than producing gentrification that pushes existing residents away from the area. In this

sense, the community are invited into the practices of urban experimentation and learning taking place. However, while Medellín has sought to become what city administration terms an 'inclusive and competitive smart city', Talvard details it still delivers a 'rather paternalistic and market-oriented notion of smartness' and follows a linear path of development that favours the interests of commercial actors. He thus concludes that despite the emphasis on social inclusion, it appears that there has been a 'corporate capture of the public interest masquerading as local development'. However, he contends that the situation is more complex in practice, with the city authorities aware of such criticism and have sought to counter 'smart imperialism' by adapting rather than copying best practices from elsewhere. Despite the specific governance and funding circumstances of Medellín, it is clear that some of the normative ideas being developed and practised in the city are transferable elsewhere (indeed this is ambition of the city administration). It would, for example, be interesting to see how they would be grounded in a city like Camden.

Similarly, Liam Heaphy and Réka Pétercsák examine the creation of a smart district in area of brownfield sites and old working class residential neighbours in the Dublin docklands. Formally designated as a 'strategic development zone' (SDZ), the area is a site of urban regeneration in which a cluster of mostly foreign direct investment ICT and finance multinationals are mixed with high-end apartment complexes and heritage and leisure amenities. It has recently been designated the 'Smart Docklands', an innovation zone for trialling new urban technologies by university research centres and private enterprise. While local authorities are still regarded as the main providers of city services, the emerging platform of engagement in the area seeks to reshape how services are delivered through new forms of partnerships between city authorities, local start-ups and multinationals. The chapter highlights two important aspects that is often missing from smart city research to date. First, the need to place smart city developments into a longer historical context. Smart Docklands is the latest phase in a much longer trajectory of urban and economic development framed within an evolving political economy. Rather than start their discussion of the emerging smart district with its formal inception in 2016, they begin with the foundation of the state in 1922. Second, the need to understand the complex organisational and political work required to initiate, mobilize and sustain initiatives such as Smart Docklands that involve multiple stakeholders whom have different motivations and aims. They note that the initiative consists of an ecosystem of vested interests that must try to find common ground and work in concert to achieve its ends. These are tasks that require much liaison and coordination, and are prone to inertia and failure, especially when formal processes and legal and financial frameworks

are missing or partners do not understand or appreciate the roles and constraints each is operating under. They conclude that the challenge for smart cities initiatives is not only to develop and trial new urban technologies, but to determine the optimal operational practices and organisational frameworks to enable collaborative innovation. This includes local residents, not simply public and private stakeholders.

For Brice Laurent and David Pontille, the real-time policing in Camden, Medellinnovation in Medellín, and Smart Dockland in Dublin are forms of city experiments – a form of urban trialling and testbedding in which new forms of 'smart' governance and economic development are being deployed in real-world context. Here, the city becomes a living lab in which experimentation is practised as systems are developed and refined. In both cases, the technologies and organisational practices are still prototypes, being actively developed based on performance, feedback, analysis, and reflection. In their chapter they advocate that smart cities are considered as consisting of city experiments, as specific initiatives that can be made sense of through a Science and Technology Studies approach that focuses on understanding their constituent elements and processes – experimenters, experimental subjects and objects, laboratories, and audiences – as well their consequences. They illustrate their ideas with respect to two case studies: Virtual Singapore, a dynamic three-dimensional simulated city model and collaborative data platform produced through a public-private partnership; and MuniMobile, an app developed by the San Francisco Municipal Transportation Authority and a non-profit organisation that enables fare purchase and trip planning. By focusing on specific initiatives, their praxes, politics, and interlinkages to other experiments, rather than on the broad sweep of smart cities writ large, they argue it becomes possible to more clearly understand their nature and implications. In essence, they are advocating that a deeper understanding of how smart cities are created requires an epistemological shift in how we frame and unpack the projects and technologies at work.

Andrew Karvonen, Chris Martin and James Evans discuss one form and example of city experimentation in their chapter on the role of universities as sites and conductors of experimental smart urbanism. They note that universities are often ideal living labs for urban trials because they are large, single-owner sites that are managed in-house, thus avoiding the political and administrative issues of using public spaces managed by local authorities, they can leverage the research and teaching expertise of their staff and actively contribute to those endeavours, and they have well-established and trusted links to city administration, companies and civil society groups. In this sense, following Laurent and Pontille, university living labs have well defined and bounded experimenters, experimental subjects and objects,

laboratories, and audiences. They focus their analysis on the roles of the University of Manchester (UoM) and Manchester Metropolitan University (MMU) in the Triangulum project and the wider Corridor Manchester, a knowledge-intensive urban development zone extending south from the city centre. They conclude that while university campuses present many opportunities for developing and experimenting with smart urbanism, and create a number of beneficial effects such as building stronger linkages between stakeholders and shaping local urban development, their wider spillover effects with regards local residents and driving smart urbanism elsewhere in the city has so far been more limited. A key question thus remains as to how to translate testbed urbanism conducted in 'smart districts' into mainstreamed smart urbanism available to all. This is a key challenge for producing more inclusive smart cities.

Smart cities, citizenship and ethics

As Dan Hill (2013) and a number of others (Gabrys 2014; Datta 2015; Cardullo and Kitchin 2018) have argued, the vision and deployment of smart cities and the forms of citizenship they enact predominately produce technocratic forms of governance that only pay-service to meaningful citizen participation. In addition, as Kitchin (2016) details in-depth, there are a several ethical implications arising from the assemblage of smart city technologies, including forms of dataveillance, social sorting and redlining, predictive profiling and anticipatory governance, nudge and behavioural change, control creep, and system security. These issues of citizenship and ethics are a significant blind spot in much smart city rhetoric, and if addressed are usually only done so through lip service. As the chapters in this section highlight, creating inclusive and principled smart cities means a radical rethink in how smart cities are framed and implemented.

In the opening chapter, Christine Richter, Linnet Taylor, Shazade Jameson and Carmen Pérez del Pulgar note that while digital devices and infrastructures are becoming ever-more embedded into everyday life, and administrations rollout smart city initiatives, we still know relatively little about citizen's perceptions of such technologies. While there is some research concerning specific technologies and platforms, they contend that we know very little about people's everyday experiences, thoughts, concerns and emotions concerning the entire coded assemblage encountered daily. To address this lacuna, they conducted interviews with twenty expert stakeholders and conducted focus groups with different constituencies in Amsterdam, including non-natives, ethnic and religious minorities, people who try to minimize their digital footprint, regulated professions such as sex workers,

freelance technologists, and school children. Their participants produced a continual refrain of concern characterised by ambivalence and insecurity and expressed through four tensions: convenience of use and risk of being tracked; visible as citizens and the invisibility of watchers; individualized data sharing and structural forces of digitalization; and the community of digital citizenry and fragmentation and individualisation of human concerns. These concerns are only partially addressed by administrations and companies, who continually push the boundaries of datafication and data-driven governance and products. In turn, citizenship has become highly individualized, with collective community responses fractured and uncoordinated, so while citizens hold many concerns these rarely translate into political action. They contend that a truly smart city would enable public concerns to be articulated and the use of digital technologies would be rearticulated to take account of them. In other words, the smart city needs to find an effective means to shift citizens from users and consumers to active stakeholders in order to become more democratic in nature.

Ayona Datta in her examination of smart citizenship in the drive to create 100 smart cities in India notes a similarly benign, post-political conception of citizenship – though one rooted in India's postcolonialism and the nationalism of the present ruling party. She details how the consultation process used by cities in the process of producing their applications to the government's smart city challenge (that selected which cities would leverage funding and political support to become a smart city) not only set the parameters of how the cities would be developed, but set the ideals for the smart citizens that would develop, live and work in them. Through a series of online surveys, competitions and infographics, citizens are encouraged to perform in ways designed to reproduce the discursive rhetoric they are being asked to comment on. This produces what she terms 'hashtag citizenship' – a set of jingoistic memes that discursively frame the ideal qualities of a smart citizen (e.g., 'green, honest, polite, social, bright, healthy and virtuous', who seek to 'be the change, stay on course, feel the need, meet the world, yearn to learn, follow the sun, and pass it on'). This is a digital citizenship of passive contribution and consumption, rather than rights and entitlements. Moreover, given the use of online e-government platforms and social media to undertake the consultations, the audience was largely self-selected to be those who already possessed digital skills and were users and developers of ICTs. Such citizens – mainly young, male and middle-class – are more likely to be open to the idea that ICT can be used effectively in the management of cities, and at the same time excluded many along lines of class, caste, and gender. She concludes that the process of creating smart cities in India has become 'synonymous with the production of a postcolonial technocratic subjectivity', with

production of citizenship practices moving from civil and political society to digital space. This redrawing of the political limits of citizenship shifts the boundaries of urban participation and democracy, and who gets to embody and perform being a citizen in a smart city. Her analysis highlights the need for sustained critical reflection on who smart cities are being built for, not only in India but globally.

In their chapter, Taylor Shelton and Thomas Lodato draw on fieldwork conducted within Atlanta's task force for smart cities to examine what they term the 'actually existing smart citizen'. That is, how citizens are imagined and citizenship enacted in historically and geographically specific ways within Atlanta's smart city vision and programmes of the city. They detail that while the city administration and companies often talked of producing a citizen-focused smart city, in practice citizens were included as two empty signifiers (both of which were also evident in Datta's Indian cities). The first is what they term a 'general citizen', wherein the citizen is framed as a catch-all community of seemingly homogenous residents and visitors. Here, the city administration and companies envisaged the smart city from within the frame of stewardship (delivering on behalf of citizens) and civic paternalism (deciding what's best for citizens). Here, citizens are generic recipients or consumers of services, rather than being meaningfully involved in their design and deployment. The second is the 'absent citizen', referring both to all those diverse communities that hold differing identities, values, concerns, and experiences to the 'general citizen' (which is largely framed as white, male, heterosexual, able-bodied and middle class) and the absence of citizens from the processes of formulating and implementing smart city strategies and programmes. Indeed, there were no citizens beyond those employed as city administrators, stakeholders and vested companies at the events they attended in Atlanta, and nor were there elected officials that citizens have chosen to represent them. They conclude with two contentions. First, that a truly citizen-focused smart city would adopt strategies to include citizen participation in their visioning. Second, that the path to just, equitable and democratic cities may well require a radical rethink of the present market- and technology-centric formulation of smart cities than simply adding citizens and stirring can supply. The challenge then in creating smart cities is to re-imagine citizenship beyond its present formulations.

Sung-Yueh Perng documents the politics and praxes of urban and public experimentation that actively involves citizens collaborating with local government. It takes as its case study the work of Dublin City Council (DCC) Beta, an initiative in the local authority that seeks to develop and implement what Halpern et al (2014) terms 'test-bed urbanism'; that is, experimental interventions in the urban milieu designed to produce new

products and practices. In the case of DCC Beta it is interventions that will improve the lives of local residents, but also enhance the work of the local authority. In particular, Perng focuses attention on a 'collaborative infrastructuring' project in which the local residents, artists, hackers from Code for Ireland, and city staff worked together. The project involved painting what seem like mundane street infrastructure – traffic light control boxes. However, these boxes attract graffiti and stickers which, as well as being ugly, produce a cleaning cost. Enabling artists to paint the boxes, and producing an app that would allow people to find them, would provide a public exhibit for the artist, enhance the visual appearance of the area, strengthen place identity, and save the council money. As he details, undertaking collaboration and experimentation, and aligning diverse viewpoints and practices is not straightforward, but can be immensely productive in terms of enhancing a sense of participation, value and trust in urban management and development. He concludes that the process of collaborative infrastructuring, while not without its challenges, has the potential to create a more inclusive means of creating smart cities.

Similarly, Duncan McLaren and Julian Agyeman examine the constitution of more citizen-orientated smart cities through the lens of sharing. Noting the various criticisms of smart cities detailed in other chapters in the book, they examine the notion that smart cities should become sharing cities. They detail, however, that the ethos and practice of sharing comes in different guises, detailing four broad types: commercial, monetized platforms (e.g., Uber and Airbnb); non-for-profit, peer-to-peer and communal platforms (e.g., Streetbank and Freecycle); commercial, social-cultural (rather than exclusive platform mediated) exchanges (e.g. Enspiral and Bitcoin); and communal, social-cultural exchanges such as sharing within families and communities. They note that these forms of sharing produce different forms of smart sharing city models, with commercial platforms prevailing in Anglo-Saxon cultures, while in Latin cultures, especially in South America, urban commoning is facilitated. Elsewhere in Europe and Asia, a range of hybrid forms exist. In the final part of the chapter, they compare what they term 'smart sharing cities', ones that prioritise the values of smart cities, such as being efficient, functional, and well-controlled, designed to produce economic development and treating people as consumers; with 'social urbanism' that holds the values of being effective, diverse, and resilient, designed to produce social inclusion and treating people as citizens. They contend that rather than producing smart cities rooted in the values of the sharing economy and serving the interests of elites and corporations, smart cities should be fair, just, equitable, sustainable and democratic, grounded in the ideas of social urbanism.

In contrast to the focus on citizenship, Maria Helen Murphy considers the privacy implications of smart cities from the perspective of the law, and in particular the new EU General Data Protection Regulation. She notes that the smart city poses particular problems for data protection and privacy because the issues of notice and consent are difficult to deal with in practice as people move through environments saturated with networked sensors, actuators, and cameras that generate huge volumes of data about them. She maps out some of these challenges, existing approaches to dealing with them, and the approach advocated by the GDPR and its likely effects. In particular, she considers the introduction of a privacy-by-design mandate and the roll that pseudonymisation might play as a privacy enhancing technique. These two approaches to protecting privacy are framed as 'positive-sum', in that they are pro-privacy but also pro-progress and the use of smart city technologies. However, she notes that while their use will be beneficial, they are not a panacea for the data protection and ethical challenges of smart cities. Of course, GDPR also relates solely to the Member States of the EU and significant privacy infringing practices will continue within and across other countries.

Leighton Evans takes a different tack, considering privacy from a phenomenological, behavioural, epistemological, and practical aspect of daily life perspective. In other words, rather than focus on the law and how privacy can be regulated in an era of smart city technologies, he draws attention to how the nature of privacy is being transformed, with the nature of the public and private sphere altering. He contends that traditionally privacy has been spatially separated, with spaces such as the home being private spheres. In the era of pervasive and ubiquitous computation, wherein networked computation becomes embedded into all manner of previously analogue objects and systems, and computation is available anywhere and on the move, spaces that were previously private are now becoming subject to a surveillance gaze that operates on an almost continual basis. Privacy then is transformed from a property of spatial boundaries, to one of orientation towards technology. Smart city technologies then are transforming not only the limits of privacy, but the very notion of privacy itself. In creating smart cities, such considerations have to date been absent or been dealt with fairly lackadaisically, yet they raise fundamental ethical and moral concerns. Indeed, as Kitchin (2016) details, the ethical implications of smart cities are profound and require re-dress in ways that extent beyond legal remedies if the trust of citizens in such endeavours is to be maintained, especially in the wake of a series of data breaches and scandals such as Snowden revelations and Cambridge Analytica's misuse of personal information.

As well as creating privacy risks and harms, smart city technologies are also vulnerable to security risks. In Chapter 16, Martin Dodge and Rob Kitchin examine the paradox that creating smart cities is promoted as a means to effectively counter and manage risks to cities, yet the technologies used create new vulnerabilities and threats by making city infrastructure and services open to hacking and cyberattacks, malware and viruses, and software bugs and data errors. They identify five forms of vulnerabilities with respect to smart city technologies – weak software security and data encryption, the use of insecure legacy systems and poor ongoing maintenance, system interdependencies and large and complex attack surfaces, cascade effects, and human error and deliberate malfeasance of disgruntled (ex)employees – and detail illustrative examples of security breaches. In the latter half of the chapter they explore how these vulnerabilities are presently being tackled via a technically-mediated mitigation approach, how this might be extended to include a wider set of mitigation tactics, and how such tactics might be enacted and enforced through market- and government-led regulations. In addition, they make the case for a more radical preventative strategy to security. They conclude that unless sufficient attention is paid to improving the cybersecurity of smart cities we will create fragile urban systems that are vulnerable to severe disruption – which, ironically, is far from the anticipated disruptive innovation smart city technologies are meant to produce.

Conclusion

Whether the term ‘smart cities’ will have longevity or be replaced by another label, the use and promotion of networked ICTs in managing and governing cities, fostering economic development, and mediating everyday life is set to continue into the future. Indeed, urban systems and infrastructure, and many of the tasks undertaken daily, are already reliant on and overdetermined by digital technologies (Kitchin and Dodge 2011). How these technologies are conceived, developed, promoted and implemented matters to future urbanism – how cities will be planned, built, and run. It is important then that critical attention is paid not only to the technical and instrumental aspects of creating smart cities, but also their politics, ideology and ethics. As the essays in this collection highlight, there is a need to consider how smart cities can be reimagined, reframed and remade, both in general terms and with respect to specific issues and initiatives.

This is a task that Rob Kitchin tackles in the concluding chapter. He details six ways in which smart cities can be productively recast that seek to leverage the benefits of using urban technologies while reimaging and reframing how they are conceived and pursued and

remaking how they are deployed so they are underpinned by an alternative rationale and ethos that is more emancipatory, empowering and inclusive. Three of his suggestions concern normative and conceptual thinking with regards to goals, cities and epistemology; and three concern more practical and political thinking and praxes with regards to management/governance, ethics and security, and stakeholders and working relationships. His contribution does not seek to be prescriptive, but rather aims to provide conceptual and practical suggestions and stimulate debate about how to productively reimagine smart urbanism and the creation of smart cities.

The essays in this collection provide a springboard for the kind of debate we think is needed if we are going to produce smart cities that serve all of their citizens and tackle effectively urban issues. While some might bemoan that there is already too much dissent and critique of smart cities, we would disagree. Urban centres are the places where most people on the planet live and where most work and consumption happens. It is vital that we seek to create effective, attractive and inclusive smart cities, rather than ones that perpetuate or deepen inequalities by serving only some interests. That means identifying shortcomings in present approaches and proposing alternative visions and agendas (see also Townsend 2013; Kitchin 2015a; Luque-Ayala and Marvin 2015; Willis and Aurigi 2018). The chapters that follow seek to do both and we encourage readers to move outside their comfort zones, to engage with the ideas presented and to be reflexive, challenging their own thinking and praxis, in order to consider the ways in which they might productively reimagine, reframe and remake smart cities.

Notes

1. http://progcity.maynoothuniversity.ie/
2. Compiled from Giffinger *et al*. (2007); Hollands (2008); Cohen (2012); Townsend (2013)
3. Compiled from Cerrudo (2015); Datta (2015); Dodge and Kitchin (2005); Elwood and Leszczynski (2013); Graham (2005); Greenfield (2013); Hill (2013); Kitchin (2014); Kitchin and Dodge (2011); Kitchin *et al*. (2015); Mattern (2013); Morozov (2013); Shelton *et al*. (2015); Townsend (2013); Vanolo (2014).

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