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Why Smart Cities are so 2017 (and what this means for urban transport innovation)

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Abstract

There has been significant policy interest in Smart Cities as a means of harnessing the power of new IT solutions, urban sensors and Big Data to provide services more efficiently. But Smart Cities are part of a broader set of initiatives with a long history in urban technology and planning to try and generate innovation. Whilst data-driven service delivery initiatives are succeeding on their own, so-called living laboratories, knowledge precincts and other techno-utopian dreams that try to create a holistic Smart City have usually fallen short of expectations. Today's most interesting experiment is Google's Sidewalk Labs Quayside development in Toronto, where the firm is trialing tech solutions to urban problems, including shared mobility. This paper explores what underpins the Toronto experiment, describes what is happening with other Smart City initiatives, and provides critiques of Smart City philosophy from key urban theorists. This is used to explore what it means for innovation in urban mobility, and to identify a set of issues that require resolution.

1.Introduction

Smart Cities is a planning movement that is something of a zeitgeist at this point in the late 2010s. Evolving from the Digital Cities movement of preceding eras, the Smart City movement is about the use of innovative information technology (IT), sensors and Big Data to help urban management across fields as diverse as waste management, water, sewerage, parks, recreation and transport. In the transport field stand-alone applications are diverse and across all modes of travel. They include: car parking apps such as *SF Park*, the demand responsive on-street parking management system in downtown San Francisco (Alemi 2015); the Bluetooth and facial recognition sensors used to track pedestrians and cyclists in cities such as Shanghai (Joh 2018; Larson 2018); and the suite of applications transport planners group under the umbrella of intelligent transport systems (ITS). However, cities are increasingly seeking to adopt more holistic Smart City strategies, where the once sidelined position of the Chief Digital Officer in a council is being raised to one of the most important within local authorities. Tools like the IBM *Smarter Cities*^{TM} platform (see Söderström, Paasche and Klauser 2014) are applied across much of a council's operations. The technologies do indeed have very great potentials to increase the efficiency of urban operations, and to increase citizen welfare. In the language of the movements key supporters, they may help make cities do awesome things.

But there are many urban theorists raising questions about the Smart Cities movement and whether cities should be rushing to adopt such strategies without first thinking through some of the possible implications. Whilst transport agencies are well-versed in key issues Smart

Cities raise, especially privacy concerns, there appears to be much less consideration of a wider set of no less troubling issues. The aims of this paper are to: i) help better define Smart Cities as a planning movement; ii) to explore what is happening at the forefront of the movement via a short investigation of the most significant Smart Cities planning intervention of our time; and, iii) to bring to a transport audience a key set of concerns being raised in the field of urban studies. The structure of the paper is a sequential response to each of these aims, beginning with the question of definitions.

2. What is the Smart City movement?

The term Smart Cities is the latest in a long line of planning terms that are the "deployment of techno-political narratives which strive to signify potentially better futures" (Gunder and Hillier 2009:1). Whilst many authors talk of planning philosophies, paradigms or approaches, Smart Cities may best be defined as a *planning movement*. Such movements are a specific set of philosophies and methods that are promoted and implemented in planning practice, often at a particular moment in time, with an attendant set of popularisers and signature early projects. These eventually go through codification and then either adoption or rejection by the mainstream. Examples include the Garden Cities movement of the early 1900s (Howard 1902) and the New Urbanism movement of the late 2000s (Katz 1994).

The technologists have caused nothing but confusion adopting the term Smart Cities as the brand for their movement as the term had previously been used by the Knowledge Cities movement. Knowledge Cities was/remains another potent planning movement that had its zenith in the early 2000s around the publication of Richard Florida's (2004) *Rise of the Creative Class*. The Knowledge Cities movement emphasised the need for cities to shift to the rise of an increasingly knowledge-based economy and to position themselves to develop and attract 'smart' labour and capital flows. The state of Queensland even adopted the official moniker 'The Smart State' after the election of the Beattie Labor Government, showing its commitment to this movement. But increasingly the term Smart Cities has been employed by firms like IBM and Cisco to solely describe the use of IT, sensors and data in urban management (Cisco 2018). It is this latter understanding of the term that has now become dominant, though there continues to be conflation of the two meanings amongst some professionals, especially in Australia.

There are no accepted definitions and much dispute as to what constitutes a Smart City under this latter IT-based understanding. Perhaps the best definition is provided by Ramaprasad et al. (2017) who describe it as a city capable of intelligent sense and response. This shifts the concept well beyond the old Digital Cities movement of the 1980s and 90s, where we first installed IT kit in cities and digitised much of our urban systems using technologies like geographic information systems (GIS). The definition takes us into the realm of data analytics and response. Smart Cities are about using IT to better know what is happening within the city and to allow for intelligent, and often real-time, response to manage urban systems.

The title of this paper is deliberate. Smart Cities, as a planning movement, may possibly just have reached its peak in 2017, as it is now being adopted into the mainstream as business-as-usual. By example, one can look at the Commonwealth Government's first ever round of *Smart Cities and Suburbs Program* grants to local authorities in 2017. This shows the types of initiatives that are framed under the Smart City banner. It includes, amongst others, sensors to automatically turn on lighting and heating in Canberra bus shelters, some smart phone detection of pedestrian and car movements in Western Sydney, a new parking app and

sensors in Gosford, and, outside the transport sector, some bio-acoustics technology to monitor frog populations in Queensland (Dept of Infrastructure, Regional Development and Cities 2018). But there are a broader set of practices that are part of the movement, especially in terms of open digital data sharing, the use of Big Data analytics, and both collaboration with big IT firms as well as encouragement of voluntary civic 'hacktivism' by e-citizens and other small-scale entrepreneurship to develop applications and tools that can assist with urban problems. The combination of these ideas is what underpins the largest Smart Cities play globally today, which, by now turning to look at in some detail, will help illuminate key aspects of the movement as a revolutionary force in planning.

3. Sidewalk Toronto

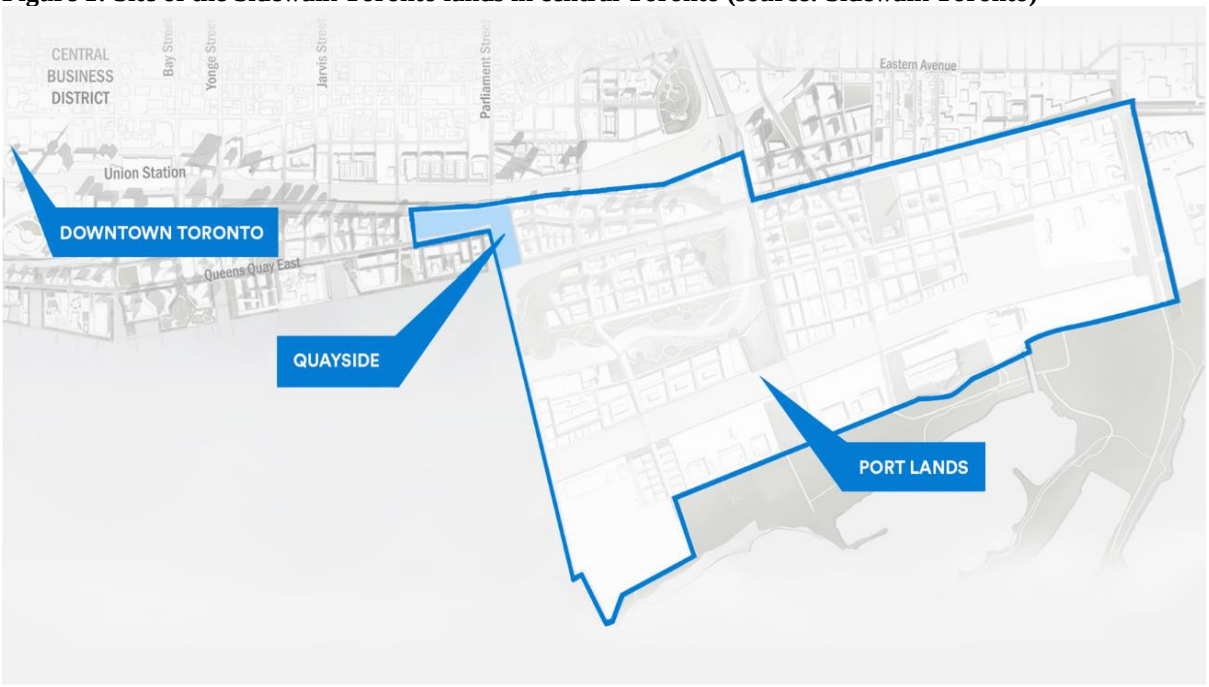
Though it hasn't turned a sod or sold an apartment yet, a great deal of media and academic interest is now being placed on a former docklands site in Toronto that is similar in size, scale and position to Barangaroo in Sydney. The City of Toronto and the Province of Ontario are engaged in one giant experiment, having formed a development corporation to partner with Sidewalk Labs (a division of the firm Alphabet, formerly known as Google) to develop 325ha of prime real estate – see Figure 1. They are presently developing a "Master Innovation and Development Plan" (and not just a development plan) for the site, which leverages off the relocation of Google's Canadian headquarters to create a new non-campus, urban lifestyle precinct (Sidewalk Toronto 2018). What we know thus far is that they are seeking to implement the following key elements as fundamental building blocks of the development: embedded sensors that will track and report key behaviours and conditions; stored datasets made accessible to the company or made open-source; and, a virtual model of the neighbourhood upon which various applications can be activated. Physically there will also be at-grade provision for walking, cycling, public transport and car/ride-sharing, but little private automobile use or storage, and an underground system for freight and waste delivery[1]. This will start in a small precinct called Quayside and then be rolled-out across the larger development.

Sidewalk Toronto have committed themselves to rolling out application programming interfaces (APIs – complex code that allows communication and integration of IT components) that will allow app builders to plug-in to their systems and eventually provide response. Though not being overly committal, within the transport field Sidewalk Toronto hopes to particularly resolve:

- Standardised curb-related data around loading and passenger pick-up zones, street-parking regimes, bus stops, etc.;
- Standardised tolling data; and,
- Standardised bike share data (see Coord 2018; Summers 2018).

[1] There is as yet no published masterplan for the development, with only mock-ups and illustrations provided by the consortium involved. For more on the development and to see its key features, the best place to look is their extensive website https://sidewalktoronto.ca as well as their *A. Project Vision* document (Sidewalk Labs 2017).

Figure 1: Site of the Sidewalk Toronto lands in central Toronto (source: Sidewalk Toronto)



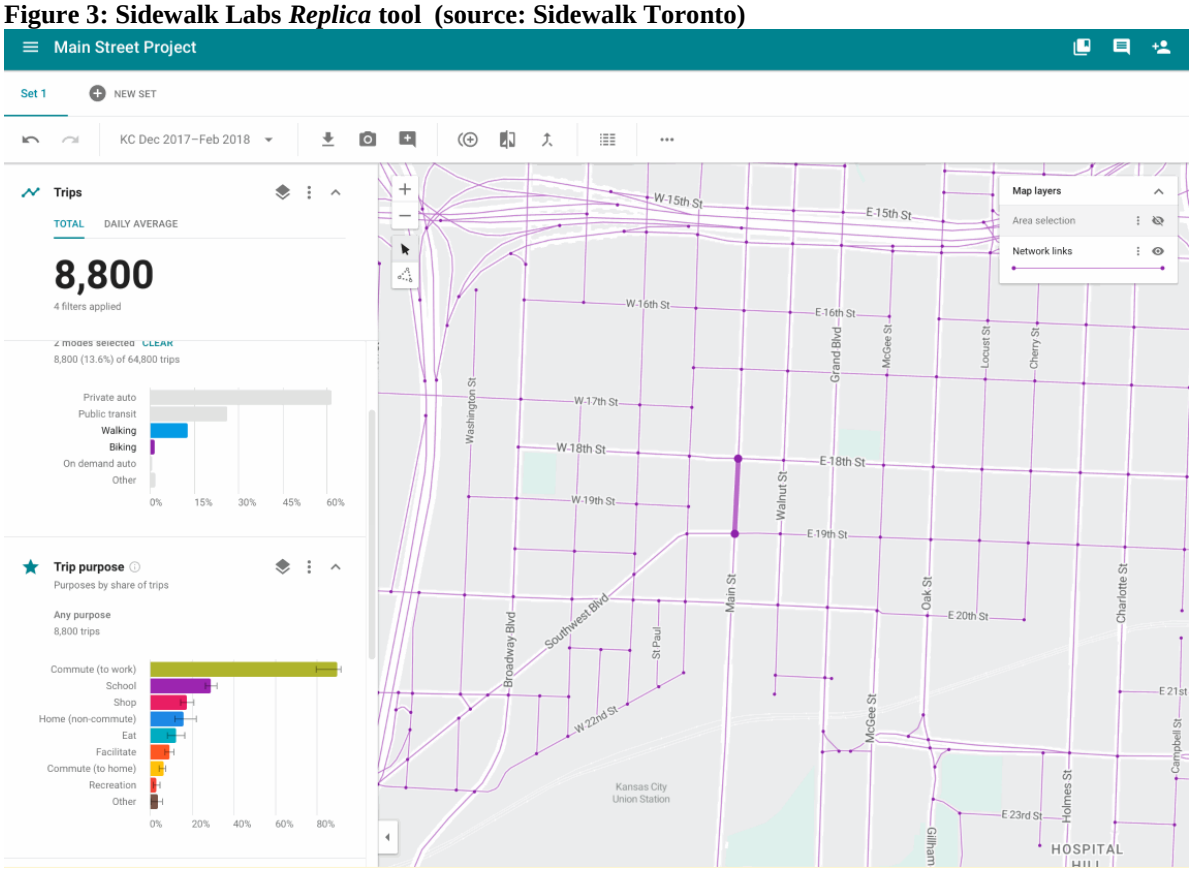
The development is also likely to be some form of test-bed for the roll-out of the Alphabet's fleet of autonomous vehicles and the trialing of other ITS solutions in local deliveries and in public transportation – see Figure 2. This all sounds great, and many of these APIs are already available from the Coord website run by Sidewalk Labs (Coord 2018).

Figure 2: Possible transport vision (source: Sidewalk Toronto)

The modelling tools are of particular interest. At first there is an overall digital model called *Replica*, the team involved are developing tools and models for understanding travel behavior. It essentially uses smart phone location data to reveal how and when (and infers why) people travel in the neighbourhood – see Figure 3. Of course, most of the IP underpinning these models has been built up over many decades by planners and modellers across a number of fields, including in the use of smart-phone location data for pedestrian,

bicycle and motorized travel modelling. But bringing them into one digital model, which could later be sold to other cities, is an ambitious task. Next, the Sidewalk Labs team have a simulation platform called *Model*. They are designing it at "metro area scale" to "cover the movement of every Quayside resident" (and presumably non-residents too) who pass its "virtual net" (Summers 2018). Sidewalk Labs wants to use these tools to test possible changes to roadway pricing, ride-sharing and its multiuse buildings and to create near-future simulations of the transport system (i.e. how will it look in 5 minutes, or 15 minutes?) (Summers 2018).

Figure 3: Sidewalk Labs *Replica* tool (source: Sidewalk Toronto)



In terms of mobility planning, these modelling tools may lead to some major breakthroughs in pedestrian modelling, in particular. This is to be commended as it is a sub-field with major limitations at present (Lindelöw 2016). Sidewalk Labs are also suggesting real-time monitoring transportation applications, such as in non-emergency medical transportation (knowing when a specific patient boards a particular vehicle and alerting a health provider of their arrival time) and in smart freight. And it could be in a precinct like this where early adopters try out a club-goods model of car-sharing that could be part of the future roll-out of the Waymo system once autonomous vehicles overcome their remaining issues for safe on-road operations in all conditions (Sidewalk Labs 2017).

Essentially the precinct should be a form of living laboratory in a major western city, involving a Goliath IT firm. This is what has outsiders so interested in the Quayside project as an example of urban development. But if we understand that to be the set of benefits, why are so many urban theorists so concerned?

4. Questions from urban theory

Previous planning movements have almost always produced unintended consequences. The Modernist systems planning (see McLoughlin 1969) which underpinned the freeway planning and urban reconstruction of the 1960s and 70s both facilitated sprawl and failed to overcome traffic congestion thanks in part to the phenomena of induced traffic. New Urbanism changed the layout of suburbia across North America and Australia for the better but also created gated enclaves like Disney's *Celebration.* Urban theorists are worried that the Smart Cities movement is already problematic. To group and theme these concerns a short review of papers critiquing the Smart Cities movement was undertaken using terms including "critique" and "Smart Cities" within the Google Scholar and Scopus databases and in key grey literature. Of 313 papers initially identified 51 were scrutinized in depth and only 27 were eventually used in the preparation of this paper, supplemented by five online sources from reputable publishers referred to within those papers. No systematic methodologies were employed beyond paper identification, instead preferring an interpretive approach.

Within this critical literature, there are numerous themes that appear: questions around privacy and surveillance (Greenfield 2013); questions around citizenship and democratic principles (Grossi and Pianezzi 2017; Luque-Ayala and Marvin 2015); questions around social equity and inclusion (Kummitha and Crutzen 2017); questions around corporatization (Krivý 2018); questions around the risks of investment in expensive and speculative IT systems (Kirkpatrick and Smith 2011); and, questions of being locked-in to proprietary technologies (Söderström et al. 2014).[2] This paper focuses on a few key issues that are less discussed in the transport field at present and that have implications for the sub-field of transport and land use planning.

4.1. The Deleuzian society of control

The best-known critique of Smart Cities in the transport field appears to be that relating to privacy, surveillance and control. The privacy issues involved are already being wrestled with in the field, given how vulnerable existing systems are to cyber-crime. Uber faced an enormous backlash for not revealing that 57 million of its users had been victims of a data breach (Wong 2017). But the surveillance and control aspects may be much more troublesome. Indeed, Smart Cities may be "the urban embodiment of the society of control" (Krivý 2018:8) as espoused by the philosopher Gilles Deleuze (1992). To live in Quayside one will almost certainly have to sign up to some form of "end-citizen" agreement that will grant one's approval for involvement in and subjugation to surveillance and use of their data. Whilst being constantly monitored may offer some advantages, those who are at first sensed are those that are most easily controlled. Will residents in Quayside be allowed to 'unplug'? Who will the data collected from residents and visitors be shared with? And, as Wylie (2017) and other activists are asking, "Who is the user that Sidewalks Labs is ultimately serving"?

It is also doubtful that ground-up citizen-led entrepreneurialism is going to counter-balance top-down control. Despite early rhetoric of how voluntary positive hacktivists would start to make use of open datasets en masse, there's been little enthusiasm by most folks to do an urban authority's work for them; indeed much digital hacktivism these days seems to be deliberate civil disobedience (Karagiannopoulos 2018). Most Smart Cities applications are instead led by major IT firms and are almost always top-down. These IT firms can be seen as

[2] Note that the best summary of these questions as they relate directly to the Sidewalk Toronto development is likely that on the Torontoist website Wylie, B. 2017. "Civic Tech: A list of questions we'd like Sidewalk Labs to answer." in *Torontoist*. Toronto, Canada: Ink Truck Media. Retrieved 2 June, 2018, from https://torontoist.com/2017/10/civic-tech-list-questions-wed-like-sidewalk-labs-answer/.

now being agents in what in many cities is an increasing surveillance society with considerable displinary options (Graham 2010). Urban planning, and innovations such as land use zoning, have long been used to manage and exclude deviance and 'the other' from urban spaces. There is also a long history of residents having their use rights or priveliges revoked when they have found themselves in dispute with developers or developer-controlled body coporates, with little agency to change the controls placed upon them once they have signed off on the mutual covenants that underpin these developments (Yiu et al. 2006). When IT firms are now becoming land developers and involved in planning decisions within city precincts, market impulses may encourage them to use similar tactics. As an example, is it possible that Alphabet could cut-off a Quayside resident from using its autonomous cars, or other mobility services, or limit their use in key ways, should that resident be in dispute with the developer? That is an overt example but there many more subtle and indirect forms of control that could be exerted.

4.2. Corporatisation

Smart Cities, like public-private partnerships and other recent innovations, are another way in which big corporations are monetising urban services. By locking-in local agencies into corporate IT ecosystems these firms can create path dependencies that will guarantee long-term revenues. When IT firms actually become the developer and a co-partner in the planning and approval agency, such as is happening at Quayside, then the city has by definition corporatised physical space. It seems doubtful that the streets built by Sidewalk Toronto will be public streets, as conventionally understood, instead being controlled by a less democratic development corporation. This privatisation of once-public streets has been increasingly common, not just in North America (see McKenzie 1994) but also in Australia, with examples such as the streets in parts of Barangaroo, Sydney, which are not local government roads. This leads to issues of rights to public space. Will homeless people be allowed to occupy what look like, but are not in a legal sense, public streets? Other essential infrastructures and many services will likely be controlled in similar ways. This could lead to outcomes that are counter-intuitive to the brave new world of choice in urban mobility that we are being promised. Will Alphabet let competing car-share or e-scooter companies service its estate? Or will its residents be locked-in to only its services? Beyond that, corporate interests can come to dictate development outcomes. The Toronto experiment has clear goals in its initial planning for inclusive housing and public space, which bodes well. But it will be interesting to see what gets left off the final plans first if the fancy IT tech and underground servicing systems prove too expensive to produce in a conventional project business case.

4.3. The unwelcome return of systems thinking in planning

The author has seen first-hand some less-than impressive actions from good planners – who have a heart and who should know better – when promoting Smart Cities across Australia in recent times. Workshops that encourage city managers to reduce the city to a small set of simple metrics. Promotion of very limited, simplistic and, at times, erroneous models of aspects of city life as exemplars of the kinds of models and simulations that should be replicated across all fields of urban management. Use of sentiment analysis from the narrow population bands using particular smartphone apps to define how happy a community is about some issue. Smart Cities as a planning movement lends itself to this techo-rational planning paradigm. It is a vision of cities "that frames all urban questions as essentially engineering problems to be analyzed and solved using empirical, preferably quantitative,

methods" and which gives "pre-eminence to urban phenomena that can be measured and are deemed important enough to measure" (Bell 2012: 73).

Transport planning was the most resistant of all the sub-fields of planning practice to giving up the techno-rational planning paradigm and Modernist systems planning (Mees 2000:55). This led to some poor outcomes. From the profligate freeway schemes of the 60s and 70s land use and transport studies at the metropolitan scale (i.e. Wilbur Smith and Associates 1965) to the limitations of 1970s approaches to planning footpath infrastructure at the micro-scale (Raad and Burke 2018) engineers of the time failed to take key social issues into account in their planning, and failed to meet the needs of many citizens. Thankfully most city authorities have now moved beyond the techno-rational. Recent transport strategies and plans, such as those of produced by local governments in Brisbane and the Gold Coast (i.e. see Gold Coast City Council 2013) were not developed solely by engineers in modelling labs, as in the 1960s, but were instead built up collaboratively with key communities of interest (or at least their representatives). Planners have often led such planning, and are increasingly involved in helping deliver transport projects, including IT-based solutions. Planners and some engineers increasingly recognise that there isn't one community, per se, but many different communities whose needs are important, and that there are key socio-spatial issues, including equity, across the city that need addressing. Though constrained by budgets and resources many agencies are trying to listen to and to work with businesses and affected communities to identify ways to improve on-the-ground outcomes, such as recent freight planning workshops on the Gold Coast that the author has been part of. Some Smart Cities applications may assist with these initiatives. But we can't allow Smart Cities to be a Trojan horse to bring systems thinking back at the higher levels of transport and land use planning.

At Quayside, there are city planners working across the same tables as the IT developers to help produce the precinct's innovation and development plan. That offers some hope for co-learning and for the retention of sound planning practice for that scheme as it develops. But that is not how some Smart Cities frameworks are being deployed elsewhere, where planners are occasionally being sidelined. Perhaps that is one reason Sidewalk Labs are themselves determining not to call Sidewalk Toronto a 'Smart City'; they seem to prefer the term "urban innovation" (Kobie 2018). 'Smart Cities' appears to be very 2017 for them too.

5. Ways forward

It seems clear from the existing momentum that the Smart Cities movement is becoming a mainstream part of business. Planners will likely soon move on to the next planning movement that floats from foreign shores into Australasia. Smart Cities, as a zeitgeist, will be dated to this point in time. But how should we move forward?

Perhaps the kind of urban experiment that Sidewalk Toronto represents – the purpose built IT utopia – is something to just be avoided. When one looks at the other purpose-built Smart City plays in urban development globally the outcomes aren't good. Songdo in Korea and Masdar in Abu Dhabi have attracted very little of the incoming investment by top IT firms and much less residential occupation than planned (Goldenberg 2016; White 2018). These two urban experiments were not in Western countries, did not have the power of a brand such as Google behind them, nor did they have the locational advantages of a downtown location. By having these advantages, maybe Sidewalk Toronto will prove the doubters wrong and show that an IT utopia can finally work in the 21st Century. That it can deliver on the greater benefits for urban management and systems that are envisioned. Time will tell.

We also need a fundamental rethink of how Smart Cities is going to be deployed, if not elsewhere, at least in Australasia. It needs to become a much more public-interest, emancipatory planning movement than it is right now. Most planning movements need their rough edges knocked off as they are adopted by the mainstream and Smart Cities will need to go through such a reshaping. Some key supporters of the movement are trying to push it in this direction, and these actors should be encouraged.

Transport managers in state and local authorities should continue to pick up and use the best that the IT industry creates as tools to help them deliver access to the goods and services that residents and firms need in daily life. But they should do so under collaborative planning frameworks (Healy 1997) and other planning paradigms that seek to mediate the interests of all stakeholders in the transport and land use system, including those who aren't necessarily in the developer's eye. We can't just prioritise digital natives and the IT firms that service them in our cities, just as we can't let developers solely build neighbourhoods just for the rich.

Similarly, we should not lock ourselves into determinist proprietary systems. Councils need to retain the value of data on their citizens. Signing up to the adoption of the worst of the Smart City frameworks across all of a city council's operations won't help. Nor will handing over all data-rights to the IT giants. We must also be careful with who we give priority access to developable land. Not resolving some of these greater concerns, will only lead us into trouble.

Finally, both Australia and New Zealand continue to have a digital divide. It may actually not be the best spend of scarce tax dollars to try to overcome that divide with IT spending. That should be judged amongst all competing claims. But broadband is far from ubiquitous; we are falling behind nations with 5G mobile networks up and running; and many Australians do not have smartphones. For Smart Cities to truly deliver the widest benefits, that divide will need to be diminished.

6. References

Alemi, F. 2015. *Evaluation of the demand-responsive parking pricing system: Case study of San Francisco*. Masters Thesis. MSc in Transportation Technology & Policy, University of California Davis. Available from ProQuest Dissertations & Theses Global. (1774978603).

Bell, S. 2012. "System City: Urban Amplificaiton and Inefficient Engineering". In: Gandy, M, (ed.) *Urban Constellations*. 71 - 74. Jovis; Berlin.

Cisco 2018. *Cities and Communities: Smart city solutions drive connectivity, productivity, and security for your communities.* https://www.cisco.com/c/en_au/solutions/industries/smart-connected-communities.html Accessed 7 September 2018.

Coord 2018. *Start Building*. [API webpage] https://coord.co/docs/ Accessed 7 September 2018.

Deleuze, G. 1992. "Postscript on the Societies of Control." *October* 59:3-7.

Department of Infrastructure, Regional Development and Cities 2018. *Smart Cities and Suburbs Program*. https://cities.infrastructure.gov.au/smart-cities-program Accessed 7 September 2018.

Florida, R.L. 2004. *The rise of the creative class : and how it's transforming work, leisure, community and everyday life*. New York, N.Y.: Basic Books.

Gold Coast City Council 2013. *Gold Coast City Transport Strategy 2031*. Gold Coast, Australia, GCCC.
Goldenberg, S. 2016. "Masdar's zero-carbon dream could become world's first green ghost town." *The Guardian* [online] 17 February 2016. https://www.theguardian.com/environment/2016/feb/16/masdars-zero-carbon-dream-could-become-worlds-first-green-ghost-town Accessed 7 September 2018.
Graham, S. 2010. *Cities Under Siege: the new military urbanism*. London: Verso.
Greenfield, A. 2013. *Against the Smart City*. London: Verso.
Grossi, G.and D. Pianezzi. 2017. "Smart cities: Utopia or neoliberal ideology?" *Cities* 69:79-85.
Gunder, M.and J. Hillier. 2009. *Planning in Ten Words or Less*. London: Routledge.
Healey, P. (1997). *Collaborative Planning: shaping places in fragmented societies*. Vancouver, UBC Press.
Howard, E. 1902. *Garden cities of tomorrow*. London: S. Sonnenschein & Co., Ltd.
Joh, E. E. 2018. "Policing the Smart City" *International Journal of Law in Context* (Forthcoming). Available at SSRN: https://ssrn.com/abstract=3189089
Karagiannopoulos V. 2018. *Living With Hacktivism: from conflict to symbiosis*. Palgrave Studies in Cybercrime and Cybersecurity. Palgrave Macmillan, London.
Katz, P. 1994. *The New Urbanism: toward an architecture of community*. New York: McGraw-Hill, Inc.
Kirkpatrick, L.O.and M.P. Smith. 2011. "The Infrastructural Limits to Growth: Rethinking the Urban Growth Machine in Times of Fiscal Crisis." *International Journal of Urban and Regional Research* 35(3):477-503.
Kobie, N. 2018. "Forget smart cities, this Toronto-based project is the future of urban innovation." *alphr.com* [online] 29 August 2018. http://www.alphr.com/the-future/1009826/the-future-of-urban-innovation Accessed 7 September 2018.
Krivý, M. 2018. "Towards a critique of cybernetic urbanism: The smart city and the society of control." *Planning Theory* 17(1):8-30.
Kummitha, R.K.R.and N. Crutzen. 2017. "How do we understand smart cities? An evolutionary perspective." *Cities* 67:43-52.
Larson, C. 2018. "China's AI imperative." *Science* 359(6376): 628-630.
Lindelöw, D., et al. (2016). "Pedestrian planning and the challenges of instrumental rationality in transport planning: emerging strategies in three Swedish municipalities." *Planning Theory & Practice* 17(3): 405-420.
Luque-Ayala, A.and S. Marvin. 2015. "Developing a critical understanding of smart urbanism?" *Urban Studies* 52(12):2105-2116.
McLoughlin, J.B. 1969. *Urban and Regional Planning: a systems approach*. London: Faber and Faber.
Mees, P. 2000. *A Very Public Solution: transport in the dispersed city*. Carlton South, Victoria, Melbourne University Press.
Raad, N. and Burke, M. 2018. "What Are the Most Important Factors for Pedestrian Level of Service Estimation? A Systematic Review of the Literature". Presented at the *Transportation Research Board 97th Annual Meeting*, Washington DC, United States, 7-11 January 2018.
Ramaprasad, A., et al. (2017). A Unified Definition of a Smart City. Proceedings of *EGOV 2017: International Conference on Electronic Government*, pp13-24. Springer International Publishing. https://link.springer.com/chapter/10.1007/978-3-319-64677-0_2
Sidewalk Labs 2017. *A. Project Vision*. [RFP Submission] 27 October 2017. https://sidewalktoronto.ca/wp-content/uploads/2018/05/Sidewalk-Labs-Vision-Sections-of-RFP-Submission.pdf Accessed 7 September 2018.

Sidewalk Toronto 2018. *hello! How to get involved and help us imagine Toronto's newest neighbourhood*. WATERFRONTToronto, Sidewalk Labs. Toronto. https://sidewalktoronto.ca/wp-content/uploads/2018/02/Sidewalk-Toronto-Public-Engagement-Plan.pdf Accessed 7 September 2018.
Söderström, O., T. Paasche, and F. Klauser. 2014. "Smart cities as corporate storytelling." *City* 18(3):307-320.
Summers, N. 2018. "Inside Google's plan to build a smart neighbourhood in Toronto: Sidewalk Labs has a grand vision for the Eastern Waterfront." *engadget.com.* Article published online 16 March 2018. https://www.engadget.com/2018/03/16/alphabet-google-sidewalk-labs-toronto-quayside/ Accessed 7 September 2018.
White, C. 2018. "South Korea's 'Smart City' Songdo: not quite smart enough". *South China Morning Post* [online]. 25 March 2018. https://www.scmp.com/week-asia/business/article/2137838/south-koreas-smart-city-songdo-not-quite-smart-enough Accessed 7 September 2018.
Wilbur Smith and Associates. 1965. *Brisbane Transportation Study: Summary Report*. Brisbane: Main Roads Department, Queensland Government.
Wong, J. C. 2017. "Uber concealed massive hack that exposed data of 57m users and drivers". *The Guardian* [online]. 22 November 2017. https://www.theguardian.com/technology/2017/nov/21/uber-data-hack-cyber-attack Accessed 7 September 2018.
Wylie, B. 2017. "Civic Tech: A list of questions we'd like Sidewalk Labs to answer." in *Torontoist*. Toronto, Canada: Ink Truck Media.
Yiu, C. Y., Wong, S.K. and Yau, Y. (2006). "Property management as property rights governance: Exclusion and internal conflict resolution." *Property Management* 24(2): 87-97.