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Disciplines

Education | Social and Behavioral Sciences

Publication Details

Dowling, R., McGuirk, P. & Gillon, C. (2019). Strategic or Piecemeal? Smart City Initiatives in Sydney and Melbourne. *Urban Policy and Research*, 37 (4), 429-441.

Strategic or piecemeal? Smart City Initiatives in Sydney and Melbourne.

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This paper focuses on the smart urbanism that is being crafted by local authorities in metropolitan Sydney and Melbourne, Australia. Offering an extensive analysis of the Australian context, we chart firstly how engagement with smart is primarily focused on improving quotidian local government functions. Second, our analysis of the diverse mechanisms and policies through which cities are being made smart shows that piecemeal initiatives rather than smart city strategies predominate in the two cities. There is a variegated geography of smart urbanism in these two cities, we conclude, that is incrementally rather than radically transforming cities and their governance.

Keywords: local government; smart urbanism; urban technologies; smart city; Sydney; Melbourne.

1. Introduction

Smart cities are squarely on Australian urban policy agendas. Packaged within a broader *Smart Cities Plan*, the Federal Government has recently committed two tranches of funding—AU\$50m to 81 projects—to advance the deployment of smart technologies in Australian cities. The first annual Smart Cities Week in October 2018, run by the peak industry association Smart Cities Council, attracted 435 delegates and, at a conservative count, more than 20 consultancy and advocacy reports on smart cities were produced in 2018. This plethora of activity is increasingly being mirrored across Australia’s urban landscape. While just two years ago only a handful of local governments were engaging with smart technologies and policies (see Maalsen *et al.*, 2018), recent, more extensive surveys are showing that a broader uptake is now emerging across Australia (see Yigitcanlar *et al.*, 2018). In this context of proliferation, our purpose in this paper is twofold. The first is to document the extent to which smart city discourses and associated technologies are being implemented, taking stock of the ‘actually existing’ smart city (Shelton *et al.*, 2015). We do so through a focus on Australia’s two largest cities, Sydney and Melbourne, documenting how and for what purposes smart technologies are being implemented. Our second aim is to contribute to the burgeoning literature on the smart city. Smart city scholarship is broad, with critical concentrations including urban technologies’ recasting of citizenship (e.g Foth, 2018) and the smart city as a lever for neoliberal urbanism (Cardullo and Kitchin, 2019). Our focus in this paper is on understandings of the *processes* through which cities are being made smart. In this context, research articulates the relative significance of the government and private sectors in shaping smart cities, with early attention on corporate-led developments (e.g. McNeill, 2015) now being joined by explorations of government-led processes (e.g. Taylor Buck and While, 2017, Dowling *et al.*, 2019). More recently there has been an emerging debate on planning for smart cities and in particular the extent to which smart city processes

are piecemeal or strategic—‘accidental’ or ‘articulated’ (Coletta *et al.*, 2018). We engage with both these ideas in this paper, focusing on the types of smart initiatives implemented by the local state, and the means through which they are implemented.

The paper begins with a brief rehearsal of the relevant scholarly debates and an outline of the multiscalar and variegated governance of smart in Australia, with a focus on Sydney and Melbourne. The middle section of the paper considers the smart city *in situ*, using an extensive analysis of smart city strategies and initiatives undertaken across the greater metropolitan regions of Sydney and Melbourne, including their satellite cities of Newcastle, Lake Macquarie, Wollongong and Greater Geelong. We provide an empirical analysis of local authority-led initiatives, consider the levers and technologies involved in delivering these initiatives, and reflect on the relationship between the on-the-ground translation of smart and its strategic co-ordination. In the conclusion we summarise emerging trends from the audit, discuss these trends alongside ‘actually existing’ smart city dynamics, and propose future avenues for research inquiry.

2. Making Cities Smart in the Australian context

Smart urbanisation, broadly defined, refers to the mobilisation of digital technologies to enhance urban management and address the multifaceted challenges of urbanisation (Luque-Ayala *et al.*, 2016) and also the leveraging of technically-inspired innovation and entrepreneurship to underpin urban economic development and city competitiveness (Kitchin, 2015, Coletta *et al.*, 2018). Critical urban analyses initially focused on the dominance of corporate actors and agendas in driving smart cities trajectories (Söderström *et al.*, 2014, McNeill, 2015). However, as Karvonen *et al.* (2019, 4) point out, engaging with local contexts and conditions brings diverse smart city stakeholders to light—including ‘local

governments, utility providers, small and medium enterprises, and civil society organisations’—and does so in the real-world context of urban functioning and governance structures. Moreover, expanding the research lens beyond the corporatisation of smart has drawn increasing attention to the role of current political and administrative geographies in shaping the development of actually existing smart cities (Kitchin, 2015, Coletta *et al.*, 2018), and to the diversity of applications of ‘smart city’ technologies that are emerging in response to context-specific iterations of urban challenges.

In this paper we seek to contribute to two emerging focal points within accounts of ‘actually existing’ smart cities. First is an increasing awareness of the everyday, business-as-usual, unexceptional domains and mechanisms of smart urbanism. Luque-Ayala and Marvin (2015, 2111) identify a research need to look beyond smart urbanism as only exceptional interventions, towards ‘querying the intricate and minor ways in which such smart urbanism shapes everyday life and constitutes unexceptional and quotidian spaces in the city’. Thus rather than approaching smart interventions in urban spaces as invariably catalysing wholesale, revolutionary technological change (as evidenced most clearly in experimental greenfield smart cities like Masdar City; see Cugurullo 2018), it is also necessary to examine smart cities as prosaic, dealing for example with matters such as upgrading municipal services or improving operational efficiencies (Shelton *et al.*, 2015, Karvonen *et al.*, 2019). Indeed, in this paper, we align with Taylor Buck and While’s (2017) suggestion that understanding local scale, incremental initiatives by governments, firms and citizens may be more crucial for understanding smart city restructuring than the notion of wholesale transformation. Is it, for example, that the city is ‘restructured through apps rather than operating systems’ (Taylor Buck and While, 2017, 516) and it is less restructured than recalibrated? Shedding the notion of the smart city as something that is or can be implemented via a hegemonic top-down, corporate-led smart vision, productively shifts the

focus to smart initiatives implemented as ‘bundles of experimental local practices’ (Cowley and Caprotti, 2019), which emerge in context in response to local challenges and opportunities, and in the context of localised political dynamics.

Our second focus is the relative influence of the strategic articulation of smart (cf. Coletta *et al.*, 2018) compared to an incremental uptake of smart urbanism. A smart city strategy is not necessarily a planning document. Indeed, Cowley and Caprotti (2019) observe that while there is a broad uptake of ‘smart’ in planning agendas in the United Kingdom, the landscape is characterised by fluidity and variety at local level, where strategy is not a prerequisite for smart engagement. Rather, initiatives emerge in *ad hoc*, opportunistic ways through experimentation, extant from formalised local planning priorities. In the United Kingdom, for example, the *Future Cities Demonstrator Challenge* gave local governments an opportunity for local governments to propel the rollout of smart initiatives through a competitive submissions process (see Taylor Buck and While, 2017). The resultant experiments with smart urbanism were largely opportunistic and piecemeal rather than the outcome of a deliberate strategy, underlining the necessity of considering the different mechanisms through which cities are being made smart.

In this context, it remains imperative to consider the ways in which incremental and strategic means of creating smart cities coalesce. For example, strategies can be important for city positioning—insofar that they are outward expressions of being ‘smart’. Coletta *et al.* (2018, 2) observe the political exercise of translating piecemeal initiatives into an articulated strategic vision: ‘The “articulated smart city” existing initiatives are corralled into the semblance of an overarching, coordinated, strategic and branded narrative, into which future smart city initiatives are likewise folded’. Nascent smart city strategy releases in Australia have been viewed more as an exercise in city positioning and economic redevelopment

(Barns and Pollio, 2019, Dowling *et al.*, 2019). Yet we are interested too in the relationship between the proliferation of piecemeal initiatives enabled by local governments and their coordination into and through purposeful, local smart city strategies. Therefore we also trace, in broad strokes, what role the existence of strategic frameworks plays in orchestrating local government initiatives, the domains they operate in and the infrastructures/technologies they depend on.

Empirically, little attention has been paid to the Australian experience of smart city adoption. There has been analysis of the implementation and application of smart critical infrastructure (Alizadeh and Sipe, 2015, Yigitcanlar, 2015, Barns *et al.*, 2017, Pettit *et al.*, 2018) and some more detailed attention paid to ‘early adopter’ municipal government rollouts in urban Parramatta (Barns and Pollio, 2019), regional Newcastle (Maalsen *et al.*, 2018, Dowling *et al.*, 2019), and South-East Queensland (Yigitcanlar *et al.*, 2018). Our focus in this paper is deliberately not on the specifics and details of one case. Though such cases are frequently insightful, there is a need at this critical juncture for a more extensive, city-scale focus to chart the broader urban landscape shifts that are being advanced under the guise of the ‘smart city’. In this paper we provide an extensive overview of smart city roll out across Sydney and Melbourne via a focus on urban local government authorities or councils, the domains in which smart technology is being implemented, the mechanisms through which smart approaches are being applied to particular urban challenges, and the opportunity structure that has enabled the particular forms of roll out we identify. The focus on urban local government authorities is particularly apt in the Australian context, where the emplacement of smart city technological assemblages—apps, sensors, data for urban management, dashboards—falls primarily in their purview. This focus allows us to unpack, characterise and illustrate their foundational role in orchestrating, governing and indeed enacting the smart city in Australia.

3. The Context of Smart City Governance in Australia

The governance of Australian cities is both multiscalar and institutionally complex, stemming from the Federal system of governance and the overlapping of urban responsibilities across national, state and local domains. State governments have certainly been concerned with digital infrastructure, establishing open data portals, and piloting other forms of smart technology such as autonomous vehicles, but at the time of writing are yet to claim a strategic role under the rubric of smart cities. Conversely, the Federal government explicitly identified smart cities as part of the Federal development agenda in April 2016 with the release of the *Smart Cities Plan* aimed to advance national infrastructure investment and delivery, and a national innovation agenda prioritising high-tech industries and the growth of Australia's digital economy (Commonwealth of Australia, 2016). The principal delivery mechanism for the *Smart Cities Plan* thus far has been the *Smart Cities and Suburbs Program*. Akin to the UK's *Future Cities Demonstrator Program* (see Taylor Buck and While, 2017), the *Smart Cities and Suburbs Program* is a competitive \$AUD50 million Federal grant scheme designed to encourage and support local governments to lead a pilot project, co-funded by at least one partner, that utilises smart technologies to address liveability, productivity, and/or sustainability goals. The scheme's two funding rounds have funded 81 projects to date¹. The second delivery mechanism is *City Deals*: long-term city-region scale planning partnerships between Federal, State, and Local authorities with commitments organised around three 'pillars': smart investment, smart policy, and smart technology. These deals—nine of which

¹ For a list of projects funded by the Federal Government's *Smart Cities and Suburbs Program*, see <<https://www.infrastructure.gov.au/cities/smart-cities/>>

have now been signed, including one in Western Sydney—seek economic development with smart innovation at its core, with their implementation focused on the redevelopment of regional centres. Together, the *Smart Cities and Suburbs Program* and *City Deals* address the two characteristic dimensions that define ‘smart city’ projects worldwide.

Although nationally initiated, collaborations with local governments are central to both the above Federal government smart city schemes. These schemes do not, however, capture all the activities of local governments in making cities smart; local authorities undertake a wide range of initiatives beyond connections with State and Federal programs. To capture this, we conducted an audit over 8 months to January 2019. We took the 69 identified councils in the Greater Sydney (n=37) and Greater Melbourne (n=32) metropolitan regions and searched their websites and associated documents for evidence of smart city initiatives, using search parameters such as ‘smart’, ‘sensor’, ‘app’, and ‘data’. By starting our analysis at local councils, this audit captures what urban local authorities are enabling and enacting as ‘smart’, and its translation into on-the-ground outcomes. In Sydney and Melbourne the audit reveals that over two thirds (54 of the 69) of local authorities have explicitly engaged with one or more of smart city thinking, technologies or initiatives, beyond business-as-usual adjustments such as interactive planning maps. Across both cities we identified 234 smart city initiatives, ranging across the spectrum from small-scale installation of sensing technology, for example to provide parking information, to larger-scaled precinct transformation projects. One key difference, and the focus of the rest of this paper, was how these initiatives came about, as illustrated in Figure 1 (a and b). At January 2019, eleven local governments have formally adopted a strategic approach, explicitly articulated as smart city or digital city strategies. Of the seven Sydney local governments with such strategies all but three have been in operation for more than two years and some have attracted research attention as field leaders in Australia’s adoption of smart urbanism

(Barns and Pollio, 2019, Dowling *et al.*, 2019). Comparatively in Melbourne, to date only the City of Casey has an established smart city strategy (2017), yet three others—the City of Melbourne, Wyndham and Greater Geelong—have initiated a smart city portfolio in their council structure. Nine authorities—six in the greater Sydney metropolitan region and three in Melbourne—have smart city strategies in development, as signalled by the beginning of consultation processes or statements of intention in budgets or operational plans. Many of these councils are middle-ring suburbs currently undergoing dramatic urban transformation. This suggests that the smart/digital city rubric is being consolidated in Australian cities as a strategic pivot of urban governance, and being increasingly centralised as a concern of urban local governments. It is also worth noting the strategic posture of satellite centres in this landscape: Newcastle is identified as an early adopter and leading example of Australian engagement with smart cities (see Dowling *et al.*, 2019).

[Insert Figure 1 about here]

Much more common than the strategic approach, however, is an approach that could be termed piecemeal². Thus 25 local governments in Sydney and 18 in Melbourne have undertaken diverse smart initiatives in a seemingly piecemeal way, independent of a formally adopted smart city or digital city strategy. Relatedly, as Figures 1a and 1b illustrate, projects supported by Federal *Smart Cities and Suburbs* funding are more or less evenly distributed, irrespective of whether the lead local government authority have a formal strategy in place, in development, or whether their engagement is more piecemeal in nature. The character of these piecemeal and non-piecemeal initiatives thus deserves further investigation, as we offer in the next section.

² We use ‘piecemeal’ rather than ‘incremental’, because piecemeal initiatives are not necessarily the beginning of a broader strategy.

4. Domains and Technologies of Smart Urbanism in Sydney and Melbourne

In what follows we present a more fine-grained analysis of what is being made smart in Sydney and Melbourne. We focus first on the *domain* in which smart initiatives are envisaged, before turning to the technologies being used. Six domains are commonly identified locally and internationally and used to categorise smart urban interventions: environment, economy, people, living, mobility, and governance (e.g. Coletta *et al.*, 2018). Each category is briefly profiled below in order of magnitude, describing indicative initiatives that were captured, and the governance frameworks involved (see Table 1 and Figure 2). Our second interest is in the type of smart technology deployed, since there is great variety in the scale, operation and impact of the different forms of smart technology, and characterising the technologies deployed is one way to identify the nascent character of smart urbanisation in Sydney and Melbourne. Initiatives are classed into five modes of delivery: the installation of digital infrastructure, the deployment of sensors, the rollout of smartphone applications (henceforth ‘apps’), the development of websites, and the release of open data platforms. Across both domains and technologies we investigate whether and how governance frameworks differ.

4.1 Smart domains

Smart governance initiatives primarily involve the digital transformation of government services, introducing new modes of connecting and communicating with citizens, often with the aim of increasing participation in decision-making. Their on-the-ground mobilisation focuses on two objectives: making government smart through digital transformation, and digital citizen engagement. Smart governance initiatives are the most popular type of initiative captured across the audit (see Table 1, Figure 2). Of the 234 initiatives audited in Sydney and Melbourne, 70 (30 percent) are primarily classified as smart governance. Typical

initiatives identified across all councils regardless of mechanism include council smartphone apps, which provide information on local issues, upcoming events, and access to council services. Across the councils, 11 had council service apps. Equally as typical are apps that enable direct citizen reporting of incidents in public spaces (for instance, road maintenance, graffiti and vandalism reporting, and other civic ‘complaints’). ‘SnapSendSolve’, a mobile app that crowdsources incident reports with/out photographic evidence, originated in Melbourne and has grown ubiquitous as a reporting app for inner Melbourne councils, but is also promoted by 7 Sydney local councils. Other ubiquitous initiatives include live webcasting of Council meetings and e-government website functions: such as interactive planning mapping portals, where residents can stay up to date with live works, strategic planning objectives, and track Development Applications, and online community engagement platforms.

[Insert Table 1 about here]

[Insert Figure 2 about here]

Less ubiquitous and more complex smart governance initiatives include open data platforms, which are only run by councils with smart city/digital strategies in place: City of Sydney, Lake Macquarie, City of Melbourne, Wyndham, and Greater Geelong councils. In addition, 3D planning platforms are slowly being adopted; Wyndham Council was awarded 2017 *Smart Cities and Suburbs* funding to develop CityLens, a 3D urban planning platform with augmented reality capabilities. Relatively absent across the board were urban dashboards, for reasons that may include the primarily vendor agnostic approach taken in Australian cities (Dowling *et al.*, 2019) and a relative dearth of real time data.

There are three observations to be made about the distribution of smart governance initiatives. First, almost two-thirds of governance initiatives counted are deployed in councils

where there is no extant strategy, suggesting that a strategy is not necessary to becoming smart. Second, those councils with extant/emerging smart city strategies are more likely to have a suite of these governance initiatives: a combination of local services apps, online/app-based community engagement, and interactive planning maps. A third observation is that more complex technologies, such as open data platforms, are more likely to be operating in councils with smart city/digital strategies in place—suggesting the importance of a strategy in advancing beyond widespread, relatively mundane initiatives.

Approximately one quarter of all smart initiatives in metropolitan Sydney and Melbourne are primarily classified as *smart living* (58 of 234; 25 percent). Smart living initiatives deliver physical digital infrastructure in public space at a number of scales (local to city-wide) with the purpose of improving quality of life and increasing digital civic participation. The most common type of smart living infrastructure installed is free wi-fi access, which is available in public spaces at 17 of the councils audited. There is also a slow rollout of wirelessly-connected technologies in civic spaces: smart poles across local governments, such as in Blacktown, Newcastle, and Lake Macquarie, or the trial of smart benches. Smart living initiatives rolled out in the interest of public safety, such as CCTV cameras, are also common. Across the audit, almost half (47 percent) of smart living initiatives are deployed in the eleven councils with a strategic approach. Thus, given the infrastructural demands associated by definition with smart living initiatives, their likelihood increases where a strategy is in place: all Councils with strategies, for instance, offer free wi-fi access in public spaces. Likewise, Long Range Wireless Area Networks (LoRaWAN) that enable Internet of Things (IoT) connectivity are more common in places with strategies: installed in Lake Macquarie, Newcastle (metro Sydney), and Wyndham (metro Melbourne)³.

³ A LoRaWAN network is also installed in Wollongong, but this network was delivered by the University of Wollongong's SMART Infrastructure Facility, rather than by the Council.

Smart mobility initiatives target technology-enabled infrastructure to deliver, or support the delivery of, new public and private transport modes. Just over one-fifth of the initiatives captured by this audit are primarily classified as smart mobility (50 of 234; 21 percent), principally centred on augmenting parking monitoring and management. The installation of parking sensors in Council-owned parking areas is very common, deployed in 19 of the 54 councils. These are sometimes paired with mobile apps that help locate an available park or offer an in-app payment method. Other local government-led mobility initiatives encourage active, less fossil-fuel based mobility modes. One way is through apps that map local walks and cycleways: for example, in Melbourne Bayside local council has developed a ‘walks and trails’ app; other councils have provided data layers that can be added to apps (Melton, Moreland, and Whittlesea Councils use the *Avenza PDF Maps* app). The relatively mundane nature and low infrastructural demands of parking sensors translates into their widespread distribution, irrespective of the presence or otherwise of a formal strategy. As Table 1 indicates, two thirds of smart mobility initiatives (66 percent) are deployed in councils without a strategy, and also account for a quarter of all initiatives in councils without an articulated smart vision.

Smart environment initiatives apply technology to better use, manage, and regulate finite resources. Of the initiatives captured by this audit, 39 are primarily classified as ‘smart environment’ (17 percent). Common initiatives include waste management apps developed by individual councils with information about local council pickup dates, kerbside clean-up bookings, and recycling regimes; these were more prevalent in metropolitan Sydney. Sydney and Melbourne councils are both avidly deploying sensors to bins in public and private space: bin tagging to monitor waste for private properties, and ‘big belly’ smart bins in public spaces that have in-built sensors to enable more optimal waste collection. In terms of energy, the most common deployments related to sensors installed to monitor water and energy use in

public and private space. A number of councils (six) are also upgrading and/or retrofitting lights in public spaces to be LED and/or sensor activated. There is potential for further interoperability with light upgrades: City of Greater Geelong Council, for example, has installed integrated smart street lighting with wi-fi capability. As with smart mobility initiatives, ubiquitous environment initiatives—apps for waste management, smart bins, and sensor-activated lighting—are being rolled out across councils, regardless of having a strategy. A relatively even distribution of smart environment initiatives occurs across councils: 59 percent of environment initiatives occur in councils with incremental smart engagement.

Unlike the previous categories, which could be said to fit broadly under the urban management strand of smart urbanism, *smart economy* initiatives seek to implement technology to attract industry and investment, concurrently supporting technology-based economic entrepreneurship and innovation. Twelve smart initiatives captured by this audit are primarily classified as ‘smart economy’ (5 percent). The distribution of smart economy initiatives is overwhelmingly linked to the presence of a formal strategy; two-thirds of initiatives are located in councils with a smart city strategy. For example, packaged within the smart city strategies for Newcastle and Lake Macquarie City Councils are economic initiatives attached to the Hunter Innovation Project: the University of Newcastle Living Lab in Newcastle’s CBD, and the Charlestown Innovation Precinct (ChIP), and the Dantia Smart Hub (DaSH) in Lake Macquarie. Of note in metropolitan Melbourne is the City of Melbourne’s innovation district, designed with the intention to retain skilled people.

Lastly, *smart people* initiatives focus on new modes of engagement to support equitable digital inclusion in the city. This creates opportunities to use technology to facilitate welfare and social support systems. Excluding digital literacy programs, which were common initiatives run by municipal libraries across the audited councils, just five smart initiatives

captured by this audit in Sydney are primarily classified as ‘smart people’ (2 percent). They include an app of Inner West Council called ‘New Locals Inner West’ that provides support and assistance to people who have recently arrived in Australia and the Inner West, and Frankston Council’s ‘Choose Respect’ app that helps teenagers build healthy relationships. Initiatives targeting people are also captured in other domains, in particular smart living. Initiatives are delivered in a piecemeal fashion; while local councils partner with these apps in their delivery there is little overarching structure to their rollout.

Overall, the majority of initiatives audited (140 of 234 initiatives, 59 percent) are delivered in a piecemeal, *ad hoc* fashion, deployed in the 43 councils who have to date engaged with smart without a formalised strategy. The remaining 97 of 234 initiatives (41 percent) are delivered by the 11 councils that have engaged with smart via a formal governance strategy (Table 1). From this distribution we conclude that the making of smart cities by local governments in Sydney and Melbourne is occurring, but not predominantly through an organising logic or road map. Places that have formally adopted strategies, however, are likely to have multiple initiatives for each category, possessing a suite of technology-enabled solutions.

4.2 Smart Technologies

Smart technologies are diverse in orientation and urban impact, and in this section we consider what types of technologies are being deployed by local governments in Sydney and Melbourne under the rubric of smart. The most common technology (30 percent), as depicted in Table 2 and Figure 3 was the installation of *digital infrastructure*, which includes city-scale technologies such as public wi-fi, the installation of a sensor network, or the establishment of an innovation district; digital infrastructure is most likely implemented as

part of smart living (digital infrastructure accounts for 71 percent of total), or smart economy domains (93 percent).

[Insert Table 2 about here]

[Insert Figure 3 about here]

The deployment of *sensor technologies* accounts for just under one quarter of the initiatives (56 of 234, 24 percent). Sensors are used largely for smart environment (64 percent of environment initiatives) and smart mobility initiatives (56 percent); they are mobilised for regulating and monitoring waste and resource use, and for collecting data on traffic patterns/flows and available parking spaces respectively. Next is the rollout of *smartphone apps*, which accounts for 22 percent of initiatives (52 of 234). Smart initiatives delivered by apps tend to offer small-scale, smart governance functions, such as schedules for municipal waste and recycling (‘Blue Mountains Waste App’, Blue Mountains; ‘Waste Smart App’, Camden), direct-to-citizen local government information platforms (‘My Marrickville’, Inner West; ‘Our Bankstown’, Canterbury-Bankstown) and citizen monitoring and reporting of graffiti, road conditions and other civic nuisances (ie. SnapSendSolve). Mobile applications are also used for smart mobility initiatives—namely, parking allocation, and smart living initiatives—such as apps that keep citizens updated on local events, or that augment local experiences of place.

The development of *website-based initiatives* is the fourth most commonly deployed technology, consisting of over one fifth of the initiatives (42 of 234, 18 percent). Websites are the most likely delivery technology for smart governance initiatives (51 percent), and reflect a broader trend of core civic services transitioning to online platforms (e-government). Functions include citizen engagement, and increased probity surrounding local government operations (for instance interactive mapping platforms, and live streaming of council

meetings). Lastly, 6 percent of the initiatives are classified as *open data*. This category refers primarily to the delivery of council-led open data portals, and the release of datasets to State/Federal government platforms.

The question remains as to whether or not the presence or absence of a strategy was linked to the technologies used. Not surprisingly, local government smart initiatives are most likely delivered by commonplace and lower-cost modes of implementation: almost two-thirds of initiatives are deployed through apps, sensors and websites (150 of 234, 64 percent). Over 60 percent of app-based and website-based initiatives are delivered by councils without a strategy in place. We conclude that the ‘smart solutions’ being delivered by sensors, apps and websites—namely more efficient management of civic responsibilities (rubbish, rates, roads) and increased citizen engagement—are ubiquitous city improvement functions, irrespective of their allegiance to a smart agenda that has been formalised in an adopted smart city strategy.

Where there is a notable difference in deployment is in physical infrastructure and open data. The eleven councils which have a developed strategic approach in place account for half of the digital physical infrastructure deployed in Sydney and Melbourne (35 of 70 initiatives). Strategy is more common for the more complex and infrastructurally demanding suites of projects. The installation of digital infrastructure is intended to lead to economic development through enabling technology-led innovation and entrepreneurship. The aforementioned rollout of LoRaWAN tech in Lake Macquarie, Newcastle, and Wollongong in Sydney, and Wyndham in Melbourne, is intended to encourage entrepreneurs to use the network as a testbed for new IoT products and tech start-ups. This connectivity is coupled with the continued release of open datasets: almost two thirds of initiatives engaging with open data portals/platforms have been delivered in Councils with strategies in place, reflecting the level of organisational prioritisation and resourcing this involves: two councils

operate open data portals in Sydney (City of Sydney and Lake Macquarie) and two in Melbourne (City of Melbourne and Greater Geelong). Local governments with smart city strategies, it appears, are making more significant technological investments.

5. Discussion and Future Research Directions

Through an analysis of smart initiatives being rolled out by local governments in metropolitan Sydney and Melbourne this paper contributes to understanding the nascent smart landscape in Australia. Overall, the smart city rubric is emerging as both a strategic pivot and matter of implementation for these urban local governments. This is evidenced by the formal adoption of smart city strategies in 11 of the 69 councils in Sydney and Melbourne, and the piecemeal implementation of smart initiatives by 43 of 69. Most common are initiatives primarily addressing smart governance and smart living domains: things more likely to fall under the banner of optimisation and efficiency of local government services and functions (for instance, interactive mapping, and webcasting of council meetings) and entry-level digital citizenship (for instance, free wi-fi access in public spaces, and new app-based or website portals for citizen feedback). We conclude from this emergent character that to date, the majority of engagement with smart urbanism has been primarily quotidian.

In highlighting this landscape of unexceptional and quotidian smart initiatives, implemented by local governments, we add to accounts of how political and administrative geographies shape the development of actually existing smart cities (Coletta *et al.*, 2018). Local authorities are charged with furthering the smart agenda in Australia; it is not a coincidence then that the on-the-ground translation of smart primarily focuses on the improvement of delivering civic responsibilities—upgrading the management of ‘rubbish, rates and roads’ through technology. Smart urbanisation, always operating within ‘existing configurations of urban governance and the built environment’ (Shelton *et al.*, 2015, 15), is

limited by the existing scales and jurisdictions of local authorities in Sydney and Melbourne: primarily resourcing and council size. This explains why enabling technologies for the majority of initiatives are simplistic and cheap (apps, websites), and also why there is considerable reproducibility of the kinds of initiatives from council to council.

This paper has also addressed debates about the imprint of opportunism, strategy and incrementalism in the making of smart cities. ‘Opportunistic projects’ (Cowley and Caprotti, 2019) that are more experimental in nature are certainly in evidence, and in turn these are more likely to involve deploying technologies to meet city-scale solutions (i.e. sensor networks). Yet opportunism only characterises a small proportion of initiatives. Places with strategies are likely to have multiple initiatives for each category, possessing a suite of technology-enabled solutions, and also are more likely to be implementing more technologically demanding initiatives such as those geared towards economic development (for instance, the rollout of city-wide sensor networks, and city support of innovation districts). Strategies are important levers for political legitimacy, and in the cases of Newcastle and Parramatta have delivered economic benefits (Barns and Pollio, 2019, Dowling *et al.*, 2019). This draws parallels with what Coletta *et al.* (2018) term ‘accidental’ smart urbanism, where initiatives under a smart banner are wrapped up in other cognate agendas (for instance, improving citizen services). Yet cities with strategies remain in the minority with most initiatives untethered to a strategic articulation of smart.

These findings can be used to underpin some broad advice for local governments considering whether to approach smart cities in a piecemeal or strategic manner. Context is critical. Where resources (human, technological and financial) are constrained, then piecemeal approaches have proven effective. Government aspirations are also important. If the aspiration is for efficiency improvements, then a piecemeal approach may suffice, but if the aspiration is more transformative, then a strategy may be useful *politically*. Articulated

strategies may help develop buy-in across council portfolios, and can help leverage broader funding streams. Finally, the findings illustrate that local governments do have the capacity to animate and orchestrate smart urbanism. That capacity is enacted alone and in partnership with diverse stakeholders, including federal and state governments. Future research should investigate further these multi-sectoral and multi-scalar partnerships, and the political dynamics of smart urbanism that ensue.

Smart Initiative Categories	Extant/Emerging Smart City Strategy 11 Councils				Piecemeal Smart Initiatives 43 Councils				Initiative Category Count	%Initiative Category
	Syd	Melb	Total	% of strategy initiatives	Syd	Melb	Total	% of piecemeal initiatives		
Governance	13	13	26	27%	24	20	44	32%	70	30%
Living	17	10	27	28%	21	10	31	23%	58	25%
Mobility	10	7	17	18%	16	17	33	24%	50	21%
Environment	7	9	16	16%	19	4	23	17%	39	16%
Economy	5	3	8	8%	4	0	4	3%	12	6%
People	3	0	3	3%	1	1	2	1%	5	2%
Total Count	55	42	97	100%	88	52	137	100%	234	100%

Table 1. Smart initiatives by category, cross-tabulated by governance mechanism (strategic/piecemeal approach).

Mode of Tech Delivery	Extant/Emerging Smart City Strategy 11 Councils				Piecemeal Smart Initiatives 43 Councils				Tech Delivery Total Count	% Tech Delivery
	Syd	Melb	Total	% of strategy initiatives	Syd	Melb	Total	% of piecemeal initiatives		
Digital Infra	24	11	35	36%	24	11	35	26%	73	31%
Sensors	10	13	23	24%	21	12	33	24%	56	23%
App	11	6	17	18%	22	13	35	26%	52	22%
Website	8	5	13	13%	17	12	29	21%	42	18%
Open Data	2	7	9	9%	1	4	5	4%	14	6%
Total	55	42	97	100%	88	52	137	100%	234	100%

Table 2. Technologies through which smart initiatives delivered, cross-tabulated by governance mechanism (strategic/piecemeal approach).

a)

Figure 1. Smart engagement at local government scale, and funding success in the Federal *Smart Cities and Suburbs* program, in Sydney (a) and Melbourne (b). Map credit: AUTHOR.

Figure 2. Smart initiatives in Sydney and Melbourne (at January 2019), organised by mechanism as strategy (tan) or piecemeal (coral), and classified by smart domain.

Figure 3. Smart initiatives in Sydney and Melbourne (at January 2019), organised by mechanism as strategy (tan) or piecemeal (coral), and classified by the type of technology deployed.

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