Digital Transformations in Planning: An Australian Context

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Abstract

Australia is currently undergoing sweeping changes in transforming and digitizing its planning and development sectors. However, numerous challenges still exist in consolidating and making accessible essential data in the country to effect evidence-based development policy-making. This has been argued to have tangible consequences in formulating solutions to urban problems, such as housing delivery, and driving new urban innovations that are data-focused. In this chapter, we discuss a new urban data governance model in the context of the development of a novel single housing data and analytics platform, which has been formulated based on Australia's current issues on data disparity, ownership, and interoperability. This platform, the Australian Housing Data Analytics Platform, seeks provide researchers with an integrated data repository and transparent analytical capabilities that hopes to drive collaboration, public participation, and data democratization across the country. In line with PlanTech principles developed through the Australian Planning Institute, this chapter describes how data in Australia can be made as a public good and integral commodity for policy-makers for the better planning for our cities.

1 Introduction

Australian cities face numerous housing challenges — the most prominent of which is the housing shortage faced by the country over the past three decades (Yates & Wulff 2005). Indeed, up to 2009, it was estimated that approximately 180,000 dwellings were needed to meet housing demand (NHSC 2010). However, to date, this gap has since continued to widen (Phillips & Joseph 2017, Pawson et al. 2020). Today, the disparity between housing supply and demand has become a highly topical subject. It has been attributed as the root cause of housing stress¹ experienced by many Australians (Rahman & Harding 2014). Most recently, the Australian Institute of Health and Welfare (AIHW; 2021)

¹Housing stress is identified in households that spend over 30% of gross income on housing costs (ABS 2019)

34 estimated that, in 2018, approximately 17% of Australians spent over 30% of
 35 their gross annual incomes on housing costs, with a more concerning 5.5% of the
 36 population spending more than half of their incomes on housing. This figure
 37 had risen year-on-year since 1994 when 13.8% of Australians were considered to
 38 be under housing stress (ref. Figure 1; AIHW (2021)).

Figure 1: Housing Stress in Australia between 1994 and 2018. Figure adapted from ABS (2019).

39 It is an issue that has become particularly pressing when considered in terms
 40 of demographic characteristics and geography. Not surprisingly, it was noted
 41 that lower-income households disproportionately feel housing stress; in more urban
 42 regions, close to 48% of low-income households were considered to be under
 43 some financial stress concerning housing costs (ABS 2019, AIHW 2021). Poorly
 44 addressed, these issues have continued to also contribute to numerous urban
 45 challenges. In many Australian cities today, issues such as homelessness, hous-
 46 ing affordability, and increasingly disparate intergenerational home-ownership
 47 rates have become the most tangible symptoms of the housing crisis (Yates
 48 & Bradbury 2010, Parsell & Marston 2012, Wood et al. 2015, Wilkins & Lass
 49 2018). Moreover, coupled with its persistence over time, they have made achiev-
 50 ing urban equity amongst the country’s most vulnerable demographic groups
 51 all the more difficult.

52 However, despite these longstanding consequences, housing delivery in Aus-
 53 tralia remains hindered by a multiplicity of unresolved factors. These include
 54 land supply issues, zoning and development restrictions, lengthy planning pro-
 55 cesses, and a lack of coordination between development bodies overseeing infras-
 56 tructure and housing delivery (Gurran & Bramley 2017, Phillips & Joseph 2017,
 57 Murray 2020). Pawson et al. (2021) added that, whilst increasing capacity for
 58 home building is undoubtedly crucial, housing policies addressing it needs to be
 59 more carefully considered to ensure the consistency of housing delivery and its
 60 accessibility across all demographic groups both financially and geographically.
 61 If we consider these issues more tangentially, it can be argued that missing in the

62 facilitation of better housing delivery is foremost the critical exchange of data
63 and information surrounding the housing stock at present. Indeed, for housing
64 development processes in Australia to be more efficient and communicative, crit-
65 ical pathways to better data management, visualization, and analysis of housing
66 stock need to be considered (Pettit et al. 2017). This is a gap that has not been
67 fully addressed yet, which has contributed detrimentally to housing delivery in
68 the country. In fact, up to more recent years, aspects of data management
69 and analytical communication had been relatively overlooked. This has since
70 changed, with the increasing digitization of planning data and the proliferation
71 of analytical tools that seek to create more data-driven and responsive urban
72 services (Barns 2018).

73 These linkages between digitization and housing are explored more deeply
74 in this chapter. In particular, opportunities that accompany the current digital
75 transformation of planning systems are discussed, with a view of the potential
76 shift in planning practice through the introduction of a singular housing data
77 for Australia. In this context, we detail how citizen-centered approaches in this
78 ongoing transformation may bring more granular communication of the current
79 housing development conditions, greater community engagement and ownership,
80 the democratization of planning technology and data to enable greater commu-
81 nity participation; as well as how such a platform may facilitate the essential
82 exchange of knowledge that precedes development and delivery.

83 1.1 Background

84 In 2020, the Planning Institute of Australia released a manifest on the guiding
85 principles for the future of digital planning systems. It was noted in the report
86 that, whilst there had been a marked proliferation of tech- and data- driven
87 planning assistance tools, there were reformations of Australia’s underlying dig-
88 ital data infrastructure that also needed to be considered (PIA 2020). Indeed, it
89 has since become clear that with the increasing digitization across all domains
90 of planning and development, strategic decisions need to be made in both its
91 administration and operationalization. These are pressing requirements that
92 focuses light on the central role that national governments must play in this
93 ongoing transformation (Dunleavy & Margetts 2015); which, ultimately, will
94 shape the future models of Australia’s data governance. Considering this, Pet-
95 tit et al. (2017) posited that the approaches to development of data management
96 systems and downstream analytical tools need to be more collaborative. They
97 put forward the notion that government agencies (as data providers) and external
98 agents (as the developers of these necessary toolkits) both require mutual
99 support in identifying and addressing a city’s national development priorities.

100 This integral step was also noted by (Barns 2018, p.5), who furthered that
101 whilst a more cooperative dynamic was essential, national government also
102 needed more tactical direction in their “curation and management of data assets
103 to support strategic (planning) priorities”. In this vein, there is a growing call
104 for government to adopt a more enabling environment in the co-design and co-
105 development of digital platforms in Australia. As such, policies that underpin

106 this movement needs to be aligned across all sectors (Barns et al. 2017). In doing
107 so, there may be more opportunities for individuals, institutions, and commer-
108 cial entities to aid and co-create data-driven approaches and formulate solutions
109 that can meet the remit of future development planning goals. Goldsmith &
110 Crawford (2014), and Barns (2018) maintained that this will require current
111 data custodians to recognize the value of open public data, prioritize their ac-
112 cess and work towards their standardization; which, in turn, may dramatically
113 boost innovation in a way that has not yet been realized in Australia.

114 Globally, the digital transformation of planning and city data has in fact now
115 become almost commonplace. In cities around the world, access to key informa-
116 tion on the city has burgeoned in the form of city dashboards. For example, in
117 the United Kingdom’s London CityDashboard, climate sensors, real-time pub-
118 lic transport and traffic data are integrated into a single interface (De Lange
119 2018, Li et al. 2020, Young et al. 2021). Or, in San Diego, the PerformSD
120 dashboard summarizes key metrics of public service performance, crime, trans-
121 portation, and other key socioeconomic data obtained from numerous public
122 service departments in the context of progress and improvements to numerous
123 policy indicators (City of San Diego 2021). In Australia, similar work on city
124 dashboards has also been undertaken (e.g., the Sydney City Dashboard by the
125 University of New South Wales) to offer citizens a single point of access to
126 similar data (Pettit et al. 2017). These examples provide their citizens ready
127 visualisations of key city information; and, this provision allows informed de-
128 cisions to be made in the way they engage with their environment, which can
129 ultimately be quantified in their feedback (Reponen et al. 2017).

130 However, as pointed out by (Kitchin et al. 2015), caution should be observed
131 given the level of abstraction in the representation of the city given the choice
132 of what data is presented. Further, it was also raised by Mattern (2013) and
133 Barns (2018) that these provide citizens only superficial access to data. Rather,
134 separately, they suggested that more value could perhaps be gained should cit-
135 izens or other development agents be allowed access to government data, in
136 addition to the choice of its utilization (Kitchin & McArdle 2016). Platforms
137 that offer these services, colloquially named data stores, place less emphasis on
138 the moderation and selective communication of data; leaning towards open, or
139 paid, access to a larger gamut of data formats to all user types (Barns 2018).
140 These are aligned towards the “Government as a Platform” digital strategy,
141 where the delivery of data is done through shared registers and APIs – but,
142 their downstream use remains undetermined (ref. Figure 2; O’Reilly (2011); Al-
143 Ani (2017)). The objective here can be loosely articulated as making available
144 the widest diversity of data, at the largest volume, to the highest number of
145 people. This is reflected in their “one-to-many” structure”, in that numerous
146 distinct applications can be derived from the same datasets (Pope 2019).

147 Considering this, data stores need to be designed around the needs of the
148 user given the far-reaching impacts alterations or modifications can have on
149 services and analytical model that depend on it. However, there presently also
150 remains numerous challenges in making data stores operational both in Aus-
151 tralia and globally. As indicated by Lopez et al. (2012) in their development of

Figure 2: A possible schema of use for data stores in Australia.

QuerioCity – a integrated database of city data –, critical structural, functional, and semantic considerations must be made to make the integration of existing datasets possible. It was stressed that urban data is often highly disparate, and they exist in multiple formats and structures. Consequently, datasets ingested into data stores need to be restructured, linked, and made relational to meet the primary objective of creating a single comprehensive data ecosystem (Pan et al. 2016, Schieferdecker et al. 2016). This includes the devising a common semantic structure across dataset properties to allow rapid queries to made by users; instead of a manual “mapping” of attributes within these large datasets (Schieferdecker et al. 2016).

Critically, it remains a difficult task as it may be, at present, unrealistic for many data custodians to adopt a single schema. These challenges appear to be ubiquitous and are also applicable to Australia (O’Reilly 2011, Al-Ani 2017, Gil-Garcia et al. 2019). Here, key city data are also held by diverse set of custodians in an even more varied range of formats. For example, Geoscape Australia, the national provider of location data, offers numerous data products, which include key building attributes (e.g., building footprints, materials, height, area), land parcel data (e.g., land ownership, zoning codes, valuation information), and geocoded address files; however, these remain as separate datasets that need to be queried individually. The resulting datasets include numerous data forms (csv, geojson, json, ESRI shapefiles, etc.) that will need to be also made relational. Utilizing these datasets and ensuring their interoperability require significant time costs in their processing and restructuring.

Specific housing datasets in Australia are also highly disparate and disjointed. There is often little information on the housing stock available to the general public; and, where data is available, they are fragmented or available only at an aggregated scale. Furthermore, these datasets are only made fully available through a paid subscription, which appends an additional barrier to both the research and the development of downstream tools. And, should these datasets be utilized in tandem with other relevant datasets from other major providers such as the Australia Bureau of Statistics, or the Commonwealth Scientific and Industrial Research Group, subsequent analyses may become decrease in granularity given the varying levels of data aggregation. As a result, there are numerous bureaucratic and procedural barriers for researchers and policymakers alike to implement evidence-based planning and downstream analytical modelling in the country.

2 An Integrated Australian Housing Data Platform

The challenges mentioned above distil only a minute part of the multidimensional challenges researchers and policymakers face with respect to obtaining and operationalizing available housing data in Australia. These challenges often manifest themselves tangibly in the coordination between development and institutional agents, which invariably lead to disruption and delay in activities related to housing delivery. Further, with the current pace of growth and urbanization in the country, there is mounting pressure on resource allocation and planning capacities for the much-needed housing delivery. These are issues that the national government has recognized, and, with smart infrastructure and planning policies now introduced (e.g., NSW Smart Infrastructure Policy and Smart Places Strategy), active calls for technology-focused, citizen-centered approaches have been made (Brown 2012, Pettit et al. 2017). Moreover, since its introduction, it has stimulated many discussions on rethinking how the country’s planning and development systems and processes can be enhanced (Pettit et al. 2015, Yigitcanlar et al. 2020). Despite this, however, a more systematic and coordinated means to facilitate these vital exchanges have yet to be developed or adopted.

Nevertheless, opportunities to address these issues do exist with particular respect to the nation’s ongoing efforts in the digital transformation of its planning system. Here, there is potential not only to remedy Australia’s need for a coordinated system of data management and exchange, but there are also actionable avenues to create more efficient, transparent, and responsive systems to those that already exist today. In particular, it is believed that tangible change can be effected by the consolidation of the diverse range of existing housing datasets, the maintenance of their relevance and validity, and the prioritization of data accessibility to all stakeholders, including the general public. These activities are integral in promoting several required downstream activities concerning Australia’s housing data: firstly, it facilitates the standardization of common built-environment data, sources, and processes to allow data integration and interoperability between multiple platforms and applications; and, secondly, allows for more rapid large-scale data exchanges to be made from a single platform without the need for lengthy pre-processing steps. By reducing these initial impediments, the development of such a data governance system would inevitably be valuable in promoting and expediting innovation and development in terms of policymaking and other high-value technological advancements.

These are the opportunities and challenges recognized by the University of New South Wales City Futures Research Centre in their ongoing development of a novel Australian Housing Data Analytics Platform (AHDAP). AHDAP seeks to address Australia’s housing data disparity by creating a consolidated and harmonized housing data governance model. In its current development, AHDAP is a federated data platform capable of large-scale ingestion, standardization, and management of all digital data on housing and the built-environment in the

Figure 3: Conceptualization of the Australian Housing Data Analytics Platform, its functionality, users, and services.

country. This includes the integration of the many existing and varied datasets held by individual custodians in the country. For the first time in Australia, the platform connects numerous critical private and public institutions in academia, industry, and government, who also recognize the concerted effort required in delivering and implementing such a novel data governance model in the country.

AHDAP is able to overcome the current shortfalls of data management in Australia in several essential tracks. First, by harmonizing the large mass of housing data in accordance with global management standards, rapid, multi-scale, and multidimensional analysis and simulations can be implemented with previously disjointed datasets to evaluate and substantiate future development scenarios more holistically. This moreover addresses present redundancies for policymakers and researchers in commissioning surveys to repeatedly collect the same data used downstream. As a result, significant time and opportunities costs associated with such activities are effectively minimized with a single trusted repository. The breadth and ease to which data can be rapidly attained and analyzed with AHDAP are central to accelerating policy evaluation and development delivery; however, more importantly, they are tantamount to better understanding the linkages between housing, communities, and the underlying land-use dynamics. Indeed, for policy and research in Australia to be relevant, they must be supported by data to allow timely and dynamic interventions at the correct locations and spatial scales.

Secondly, with its planned suite of analytical and decision support toolkits, the development of AHDAP holds significant potential in better interrogate current and future housing development scenarios. In particular, the integration of the proven and validated RAISE and WhatIf? toolkits that preceded AHDAP

257 enable extensible means to hypothesize and simulate possible development fu-
 258 tures with regard to land and property value change, infrastructure allocation,
 259 and real-time development decision support (Pettit et al. 2015, 2020). These
 260 are critical insights that are often inadequately addressed in reviews of the com-
 261 plex land supply, demand, and allocation issues, which have contributed to the
 262 country’s current housing delivery. The advancement of these indispensable
 263 tools creates opportunities to develop and elevate current metrics to account for
 264 these issues, and to communicate and visualize better the impact of planning
 265 and development choices with respect to aspects such as mobility, accessibil-
 266 ity, well-being, and diversity, which are fundamental dimensions to the lived
 267 experience of Australians. These outputs are made accessible with AHDAP to
 268 essential development stakeholders and agents, as well as comprehensible to the
 269 general public to inform and empower citizens through the insights gained from
 270 such spatial intelligence.

Figure 4: The newly launched Colouring Sydney Platform, as part of the Colouring Cities Research Programme, as novel tool for collecting voluntary geographic information and increasing public participation.

271 Lastly, with the integration of Colouring Australia (ref. Figure 4 – a collab-
 272 oration with the Alan Turing Institute’s Colouring Cities Research Programme²
 273 – AHDAP can leverage new public engagement methodologies and data collec-
 274 tion. The tool was borne from the acknowledgement that obtaining accurate

²Current [2021] partners include The American University of Beirut (Lebanon), The University of Bahrain and Bahrain Authority for Culture and Antiquities (Bahrain), The University of New South Wales (Australia), University College London and the Alan Turing Institute (London), The National Technical University of Athens (Greece), and The Leibniz Institute for Ecological Urban and Regional Development (Germany).

275 and granular building-level attributes is not typically feasible given its onerous
276 exercise an onerous exercise. As such, Colouring Australia is positioned as a
277 novel citizen-science platform that is able collect and disseminate voluntary ge-
278 ographical information on Australia’s building stock in a rapid way. Indeed,
279 with the ongoing Covid19 pandemic, digital engagement has become further
280 legitimized, and its role in enabling better outreach to more traditionally ex-
281 cluded audiences have been proven. Diversity and inclusion are central themes
282 in its design and development; this is seen in its focus on the ‘local’, with data
283 collection and inputs open to almost all demographic groups. As such, it al-
284 lows local communities to both contribute voluntary geographical information
285 and validate data within their local environment in a way that does not require
286 extensive digital training (Hudson 2018, Hudson et al. 2019).

287 These benefits are manifold; mainly, in light of the aspirations for participa-
288 tory policy and solution formulation to local urban challenges, the empowerment
289 and ownership of data gained from this engagement are paramount to increasing
290 support and trust in Australia’s planning processes. In a similar vein, commu-
291 nity engagement and data collection through this citizen-science space offer a
292 more novel approach to enhancing data granularity and accuracy, which will
293 ultimately be used to improve the current data offering in AHDAP and elevate
294 the accuracy of its corresponding toolkits. Further, as part of the Colouring
295 Cities Research Programme, the platform is approached in highly collaborative
296 way with both global and local research institutions, which allows significant
297 knowledge exchange in policy and operationalization. This also includes peer-
298 reviewed work on data analytics and machine learning models to ensure the
299 development and deployment of rigorous toolkits for all cities. Taken together,
300 there is vast potential for a singular housing data platform such as AHDAP
301 to herald a new shift in the way communities, public stakeholders, and devel-
302 opment agents in Australia engage with technology and data throughout the
303 entire planning and development process.

304 3 Conclusions

305 In this chapter, we have discussed the changing landscape of planning and de-
306 velopment in Australia. First, we have indicated how critical data is as a com-
307 modity for policy-makers and other development agents in creating more value
308 and driving innovation in tech- and data- driven services and applications. In
309 this respect, we have highlighted how widening access to data to these key user
310 groups may aid in identifying key areas of improvements and development; par-
311 ticularly, in the realms of Australia’s housing delivery. Here, we have introduced
312 the Australian Housing Data Analytics Platform which is a digital platform in
313 its infancy. The platform is able to support urban researchers, policy-makers
314 and industry to have access to a comprehensive array of data and decision
315 support tools to assist in addressing the challenges facing the Australian hous-
316 ing market, including housing supply, affordability and stress. The platform
317 endeavors to follow the PlanTech principles developed through the Australian

318 Planning Institute, including the that digital planning infrastructure should be
 319 public infrastructure built with open technology. In this chapter, we have also
 320 outlined one of the key digital components comprising AHDAP, which is known
 321 as Colouring Australia. This open-source digital platform provides a means for
 322 democratizing the access and contribution to knowledge of the city through a
 323 crowdsourcing approach. This conceptualizes data as a public good, which en-
 324 ables citizens access to information and analytics in a way that is not currently
 325 possible in the country. The next steps of AHDAP are to make more accessible
 326 a wider range of digital housing assets across Australia which in themselves pro-
 327 vide public value in supporting evidenced based decision making and the better
 328 planning of our cities.

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