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The praxis and politics of building urban dashboards

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ABSTRACT

This paper critically reflects on the building of the Dublin Dashboard – a website built by two of the authors that provides citizens, planners, policy makers and companies with an extensive set of data and interactive visualizations about Dublin City, including real-time information – from the perspective of critical data studies. The analysis draws upon participant observation, ethnography, and an archive of correspondence to unpack the building of the dashboard and the emergent politics of data and design. Our findings reveal four main observations. First, a dashboard is a complex socio-technical assemblage of actors and actants that work materially and discursively within a set of social and economic constraints, existing technologies and systems, and power geometries to assemble, produce and maintain the website. Second, the production and maintenance of a dashboard unfolds contextually, contingently and relationally through transduction. Third, the praxis and politics of creating a dashboard has wider recursive effects: just as building the dashboard was shaped by the wider institutional landscape, producing the system inflected that landscape. Fourth, the data, configuration, tools, and modes of presentation of a dashboard produce a particularised set of spatial knowledges about the city. We conclude that rather than frame dashboard development in purely technical terms, it is important to openly recognize their contested and negotiated politics and praxis.

1. Introduction

There is a long history of cities generating data about their form and activities and distilling such data into information and knowledge to manage and control urban operations and guide and evaluate public policy. Over the past fifty years, much of these data have been digital in nature and the increasing power of computation has been used to process, analyze and store them, for example, through information management systems, spreadsheets, stats packages, and geographic information systems. More recently, there has been a step change in the production of urban data through the embedding of computation into the fabric and infrastructure of cities – what Greenfield (2006) describes as the creation of 'everyware' – to produce a new form of data-rich and data-driven urbanism (Shepard, 2011; Kitchin and Dodge, 2011). Here, a variety of devices, cameras, transponders, actuators and sensors, each producing streams of big data that can be processed and responded to in real-time, are used to augment and mediate the operation and governance of urban systems (Kitchin, 2014a). These machine-readable and controllable environments form a critical part of the present drive to create a new form of urbanism, what is widely termed 'smart cities' (Townsend, 2013).

The introduction of 'smart cities' into the urban and popular lexicon is a relatively recent phenomenon, popularised through an aggressive IBM marketing campaign started in 2010, accompanied by the efforts of several other large multinationals looking to generate a new city market for their technologies and services, and the place marketing of a number of cities seeking to re-brand and re-position themselves in the global city hierarchy. It is, however, the latest stage in the evolution of networked urbanism that has been developing rapidly since the late 1980s (Graham and Marvin, 2001) that has variously been termed 'wired cities' (Dutton et al., 1987), 'cyber cities' (Graham and Marvin, 1999), 'digital cities' (Ishida and Isbister, 2000), 'intelligent cities' (Komninos, 2002), and 'sentient cities' (Shepard, 2011). Whilst the definition of smart cities is somewhat open and contested within the literature and among stakeholders, smart city advocates generally agree that a smart city is one that strategically uses information and communication technologies (ICT) and associated big data and data analytics to improve existing city services and create

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new services, engage citizens, foster sustainability and resilience, solve urban issues, and stimulate innovation and grow the local economy.

In such a vision, the generation and analysis of contextual and actionable data is a central pillar, with the city becoming increasingly knowable and controllable in new dynamic ways. As such, accompanying the rise of networked urbanism has been an increased emphasis on harvesting, collating, processing and analyzing urban data across all aspects of city life and urban systems. Correspondingly, since the early 1990s there has been the growth of two related phenomena. First, a proliferation of urban indicator and city benchmarking projects utilising administrative and official statistical data. These were given impetus by the sustainability agenda arising from the 1992 United Nations Conference on Environment and Development (UNCED) and the publication of Chapter 40 of *Agenda 21* which called for sustainable development indicators to be developed to provide an evidence base for decision-making, and by the rise of new managerialism and the desire to reform the public sector management of city services to make them more efficient, effective, transparent and value for money (Innes and Booher, 2000; Holden, 2006). The result has been the development of city indicator systems such as Citistat and accompanying forms of performance indicator-driven urban management (Behn, 2014; Kitchin et al., 2015), and the adoption of an ISO (International Organisation for Standardization) standard for city indicators (ISO 37120:2014). Second, the expansion of a diverse set of urban control rooms of varying kinds (e.g., security, transport, utilities) capable of handling so-called big data (generated in real time, exhaustive to a system, and large in volume). Such control rooms, utilising SCADA systems can be traced back to the mid-twentieth century, but have multiplied with the growth of networked urbanism (Luque-Ayala and Marvin, 2016).

Increasingly, urban administrative and operational data are being centralised into single city operating systems and facilities, collapsing the walls between data silos and enabling a more holistic and integrated view of city services and infrastructures that can guide daily operations and long term planning and policy formulation. The archetypal example of such a system is the Centro De Operacoes Prefeitura Do Rio in Rio de Janeiro, Brazil, a data-driven city operations centre that pulls together into a single location real-time data streams from thirty agencies, including traffic and public transport, municipal and utility services, emergency and security services, weather feeds, information generated by employees and the public via social media, as well as administrative and statistical data. These data are overseen and processed by a staff of 400 operatives working across three shifts to provide twenty-four hour analyses and services.

A key approach to making sense of such data has been a new suite of visual analytics that are dynamic, interactive, interlinked, and use traditional graphs, charts and maps, as well as more innovative visual presentations such as gauges, 3D models and augmented landscape images made possible by advanced computer graphics (Keim et al., 2010). Unsurprisingly then, a key feature of urban control rooms are banks of computer screens displaying visualised data. Such data are often presented and navigated through a dashboard interface. Dashboards provide a visual means to organize and interact with data, enabling users to drill down into data sets, filter out uninteresting data, select an item or group of data and retrieve details, view relationships among items, extract sub-collections, and to overlay and interconnect disparate data, enabling summary-to-detail exploration within a single visualisation system (Dubriwny and Rivards, 2004; Few, 2006). Dashboards act as cognitive tools that improve the user's 'span of control' over a large repository of voluminous, varied and quickly transitioning data (Brath and Peters, 2004) and enable a user to explore the characteristics and structure of datasets and interpret trends without the need for specialist analytics skills (the systems are point and click and require no knowledge of how to produce such graphics). They can also facilitate the exporting of visualizations for use in documents, or sharing via social media, or accessing the underlying data for importing into other analytical packages. With the recent drive towards producing open data, some of the data feeding urban control rooms and city dashboards, as well as wider administrative and statistical data, are becoming freely available for wider deployment. As such, other parties are able to use the data to conduct their own analyses, build city apps, and create their own urban dashboards. And in some cases, the city itself is publicly sharing data and visualizations via an open dashboard.

The power and utility of urban dashboards is their claim to show in detail and often in real-time the state of play of cities. As Kitchin et al. (2015: 12–13) put it, urban dashboards purport to "enable us to know the city *as it actually is* through objective, trustworthy, factual data that can be statistically analyzed and visualised to reveal patterns and trends and to assess how it is performing vis-a-vis other places. [They supply] a rational, neutral, comprehensive and commonsensical evidential basis for monitoring and evaluating the effectiveness of urban services and policy, to develop new interventions, and to learn and manage through measurement." In so doing, dashboards facilitate the illusion that it is possible to "picture the totality of the urban domain", to translate the messiness and complexities of cities into rational, detailed, systematic, ordered forms of knowledge (Mattern, 2014). In other words, they provide a powerful realist epistemology for monitoring and understanding cities, underpinned by an instrumental rationality in which 'hard facts' trump other kinds of knowledge and provide the basis for formulating solutions to urban issues (Kitchin et al., 2015; Mattern, 2014, 2015). As such, they seemingly provide a neutral and value-free medium through which to govern and plan a city. Indeed, dashboard initiatives have become central to the regimes of urban governance in many cities, either providing a means to assess, guide and resource daily operational practices across public services and/or provide wider contextual information that shapes policy formulation and planning (Edwards and Thomas, 2005; Gullino, 2009; Behn, 2014).

In contrast to such thinking and framing, the realist epistemology and instrumental rationality of urban dashboards has been critiqued from a number of perspectives. First, dashboards, it is contended, are not simply neutral, technical, commonsensical tools, but rather are framed socially, political, ethically, philosophically in terms of their form, selection of data, modes of display and analysis, and deployment (Kitchin et al., 2015). Urban dashboards are the product of the ideas, instruments, practices, contexts, knowledges and systems used to generate, process and analyze them. This is often keenly understood by the designers of such systems, who are aware of the technical limitations and design and policy implications of indicators (Sawicki and Flynn, 1996; Wong, 2006; Behn, 2014), though they seemingly practice a form of strategic essentialism in their promotion and deployment (Kitchin et al., 2015), but can be somewhat less appreciated by city administrators.

Second, dashboards act as translators and engines rather than mirrors, deploying a communicative protocol that frames how data are visualised and thus what the user can see and engage with, and what questions can be asked and how the answers are displayed (Franceschini et al., 2007; Galloway, 2012; Mattern, 2014, 2015). Dashboards do not simply represent urban phenomena, but generate new visions and understandings of the city; they actively produce meaning and do work in the world. Moreover, they deploy a global scopic system of generalized visual forms that occludes certain forms of knowledge and keep black-boxed the algorithms, databases, software and design decisions that shape the interface's