Future Blue – Designing Smart Cities

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'What is the city but the people?'
WILLIAM SHAKESPEARE, *Coriolanus*
http://www.notable-quotes.com/s/shakespeare_william_quotes.html#BqbCMDj6sCPMg8Ht.99

Introduction

On the 29 April 2016 the 'Smart Cities Plan' was released by the Prime Minister, Hon Malcolm Turnbull MP, under the banner that: 'Smart Cities will grow the innovation economy'(Taylor, 2016). He pronounced that:

> 'The performance of our cities - metropolitan and regional - is crucial to this transition. Great cities attract, retain and develop increasingly mobile talent and organisations, encouraging them to innovate, create jobs and support growth' and…'to succeed in the 21st century economy, our cities…need to be productive and accessible, but they also need to be liveable, with a clear focus on serving their citizens.'(Taylor, 2016)

The Plan acknowledges that at the heart of cities are people and communities who are essential in driving these changes. Turnbull's plan identifies three pillars to drive the creation of these new 'smart cities': 'smart investment'; 'smart policy' and 'smart technology'(*Smart Cities Plan*, 2016). But, what does really this mean for engendering 'smart cities'? For instance, do 'smart cities' make adequate provision for aging populations and people with disability? and, how do they support people with chronic illnesses to access services or amenities that is different from your typical or 'unsmart' city?

This paper picks up on the Plan's last pillar of 'smart technology' to explore whether this will improve mobility for a diverse group of people who cannot access public transport. We will discuss a current project analysing not-for-profit transportation as a key service to keeping ageing and disabled people in their homes. The project is led by the CEO of Regional Development Australia (RDA) Logan and Redlands, Mariae Leckie; on asset sharing in the not-for-profit, on-demand, passenger transportation sector across Logan, Redlands, the Sunshine Coast and Townsville.

What is the challenge and who does it affect?

The challenge is that there many people living in cities, both metropolitan and regional, who cannot access public transportation easily. These are our most vulnerable and disadvantaged members of society – the elderly, disabled and people experiencing neurodiversity (Holt-Damant, Guaralda, Taylor Gomez, & Nicollet, 2013; Leckie, 2016). Many of these people also cannot access private cars or commercial services like taxis, Über and Shofer.

What options are available to them in the 'smart city'?

Logan case study – background facts
The City of Logan has a population of around 300,000 that is expanding each year. Located equidistant between Brisbane and the Gold Coast, Logan is well positioned to take advantage of employment opportunities in either centre; with the added affordability of living on the peri-urban fringe of two cities. It also has a rich cultural mix; boasting 215 ethnicities and at least 197 different languages.

Regrettably though, Logan is higher than the national average on the SEIFA index of disadvantage, scoring 979.4, and home to the two lowest deciles in Australia (ABS, 2012; Zappia & Cheshire, 2014). The Productivity Commission reported that Logan was identified as having deep and persistent disadvantage, that in some instances, spanned up to five generations; producing a 'wicked problem of unsustainable cost and complex need' (McLachlan, Gilfillan, & Gordon, 2013). The people most likely to experience disadvantage include: single and lone parents; single adults over 65 years; the elderly; indigenous Australians; migrants; the unemployed; people on benefits/income support; people with long term health problems or disability; public housing tenants, and people with low levels of education (McLachlan et al., 2013). When these factors are combined they have a long lasting and compounding effect – Logan is over represented in all of these categories.

More concerning though, are the statistics that show Logan leads the country with the highest levels of chronic disease: heart disease; cancer; asthma; obesity; and diabetes; (Atkins, Marson, & Brann, 2015; White, Clemens, & Harper, 2013). If we take just one of these diseases: Type 2 Diabetes, a recent study commissioned by the RDA revealed that on average a person in Logan will require up to 19 visits to medical practitioners before being admitted to a hospital for treatment (Alexander, 2015; Leckie, 2015). The cost of treatment over the life of a patient adds up to around $300,000 if diagnosed in their 40s. The startlingly large number of visits are due to: missed appointments; appointments that need to be rescheduled because the critical test results have not been received in time; lack of patient mobility or ill health. Predictably, Logan accounts for the most visits to a GP per person in Australia; but the least number of visits to specialists (Atkins et al., 2015; LCC, 2013).

Considering how many visits are required to gain treatment in Logan for just one disease – Type 2 Diabetes; one can then speculate that the demand for passenger trips per year would increase significantly with any compounded chronic health conditions, such as, diabetes combined with obesity, and further down the track, heart disease. Again, Logan is also over represented in such statistics. If any one of these people are unable to take public transport; don't have access to private transportation; or cannot take taxi services; they would go untreated with serious adverse effects later on in their lives. In the case of diabetes this usually translates to amputation of a limb.

How are we engaging with this challenge?
While we have identified that there is an urgent need for an optimized, on demand NFP passenger transportation in the Logan case – there is no clear methodology for implementing such a service in the current legislation.

Recently though, the Hon Queensland State Minister for Transport and the Commonwealth Games MP, Stirling Hinchliffe, confirmed that there is a gap in service, declaring that:

> Mass transit is not suitable at every location and we need to find ways to offer services that can be responsive to community need and grow or adapt with development or population growth. Demand Responsive Transport is the next evolution of the booked transport market and involves using trip booking technology, flexible routes and shared rides to meet customer needs.(Hinchliffe, 2016)

In assessing the contribution of the NFP sector to the community, the Productivity Commission found that sweeping changes and reform were needed to transform and grow the sector into a viable and economically robust service (Gordon & McGregor-Lowndes, 2010; Leckie, 2016). These changes need to be backed up by the legislation and regulation which currently favours public transport and the commercial sector (taxi's and Über) with bus lanes, to assist flow during rush-hour traffic congestion, and taxi drop-off zones in places of high demand. Lastly, the Commission identified that there was potential for greater social innovation.

Picking up the challenge around social innovation, the CEO of the RDA Logan and Redlands, has assembled a concerned group of stakeholders across the sector to investigate the supply and demand chain of four NFP passenger transport providers: Transit Care, Anglicare, YMCA Schools Breakfast Program, and Meals on Wheels.

These four providers cover a wide range of essential services that supply the community with on-demand access to meet their daily needs covering:
Non-urgent medical appointments; treatments; respite care; Meals-on-Wheels; counselling; home care assistance; YMCA schools breakfast program; blue nurses; work rehabilitation; education; blood donors; community and allied health.

Each of these providers receive block and grant funding from the Commonwealth Government to deliver subsidized services while owning and maintaining their own fleets of vehicles. Drivers are hired, as needed, for shifts and coordinated by each organisation. Since the trips are heavily subsidized by the Government there is little incentive to change the operations; and no mechanism within this current system to incentivize efficiency. The NFP 'dial-a-ride' services are designed to: 'minimize costs as opposed to maxismising profits'(Egan & Jakob, 2016).
We have anecdotal evidence that, despite the subsidies, some providers are struggling to cover their costs. For example, services that have to park their vehicles in secure paid parking lots during periods of downtime, on weekends or during school holidays when programs, like the YMCA breakfast program, are not operating. Additionally, there is a great deal of overlap across the transport providers – some servicing the same clients several times in a single week.

Our study will analyse the process of demand and delivery in these four companies – from the time the services are booked; through to the scheduling of the routes that are serviced; the time taken for each booking; and the cost to service these routes. The data sets will be collated and modelled for each provider; then compared and analysed. This data will engender a better understanding of where the overlaps and inefficiencies lie. The circumstantial evidence of duplication indicates that any lazy assets could be better utilised providing greater service and wider mobility to more people. Using global exemplars from next practice we will establish a framework for reviewing any implications for policy before formulating our recommendations to the RDA.

How does any of this translate to social innovation?
Drawing on the rapid uptake of the shared economy in the commercial sector using social media networks, like Über (taxi) or AirBnB (accommodation) suggests that powerful crowd-sourcing tools are available for unleashing democratic and social innovation in the NFP transport sector. International studies in this area show that there are already alternative models that utilize mobile apps and internet and online secure financial transactions to produce higher profits along with cheaper pricing for passengers. According to a McKinskey Global report: 'as technologies are commercialized and come into widespread use, competition tends to shift value to consumers' (Manyika et al., 2013).

A recent European study found that passengers rarely changed their transportation habits once established; but were motivated when prices were significantly lower than normal and met their expectations of delivery within a set time frame.
The study established that the two threads of transport services: 'NFP dial-a-ride' and 'taxi and private hire services' both used a fixed pricing system that failed to take into account passenger preferences and variables while decoupling the pricing from the routing and scheduling. The first group aimed at minimizing costs while the second, maximizing profits (Egan & Jakob, 2016).

Egan and Jakob's study investigated what would happen if a new thread of on-demand transport was offered that was coordinated and owned by the provider (like the NFP 'dial-a-ride services) but profit-motivated (like the taxi services). They designed a new disrupted passenger model and a market mechanism that targeted efficiency, profitability with options on passenger ride sharing and preferences (Egan & Jakob, 2016). Their approach used 'agent-based passenger modelling' to enable multiple variables to be included in passenger preferences. The algorithm took into account pickup and drop off time requests along with routes and pricing; allowing the passenger to accept or reject the offer based on the price and timeframe. Their simulation study showed how the model would work and under which conditions. Overall, the new disrupted model managed to optimize the operational running costs for the provider while delivering choice and competitive pricing back to the customer (Egan & Jakob, 2016).

How does this challenge affect the idea of 'smart cities'?
At a high level European Commission meeting on 'Smart Cities' in Brussels in September 2014, world renowned architect and urbanist, Rem Koolhaas questioned 'what really makes a city smart?' Published in an online series: 'Digital Minds for a New Europe' he voices concerns that the emphasis of the current 'smart city' global movement is towards the upwardly mobile and elite rather than the citizens or community ("Digital Minds for a New Europe," 2014).

Koolhaas noted disparagingly that:

> 'The smart city movement is a very crowded field, and therefore its protagonists are identifying a multiplicity of disasters which they can avert…Apocalyptic scenarios are managed and mitigated by sensor-based solutions. Everything saves millions, no matter how negligible the problem, simply because the scale of the system that will be monitored. The commercial motivation corrupts the very entity it is supposed to serve…'(Koolhaas, 2014)

While it might be a crowded field there are few persuasive exemplars to draw from. Reorienting our attention to the quality of our cities, Koolhaas recalls 'Silicon Valley' as a paradigm in the field of digital innovation and city building – He argues that is far from compelling and only highlights how lackluster a suburban environment could possibly be (Koolhaas, 2014). One might be tempted to rejoin with the case of Masdar, in Abu Dhabi, as a compelling display of high quality city building and design-led technological innovation. But sociologist and pioneer of the 'global city', Saskia Sassen, points out that Masdar is not likely to be built again soon, as the educational showcase cost between US$18 and 22 billion and houses only 40,000 people (Sassen, 2012).

Goan Architect and Urban designer, Vishvesh Kandolkar, adds to the concern by evoking the 'smart phone' analogy in the conception of the 'smart city', reasoning that we slip into envisioning the city as a 'commodity' that is both generational and temporal. While giving tangibility to the concept of the smart city, it creates problems for instilling democratic use across the city. Only those who can afford to access to high technology will enjoy its benefits (Kandolkar & Fernandes, 2015).
Koolhaas, and Kandolkar, both reinforce that cities are ultimately about people and the communities they serve. Regardless of how 'smart' the technology and innovation is, if people are not included in participating in the process of transformation they will become 'co-opted into a process… by a 'smart city movement that does not necessarily share their same values'(Kandolkar, 2015; Kandolkar & Fernandes, 2015).

Head of the LSE Cities Program, Ricky Burdett advocates that the shape of a city determines how smart it actually is rather than the amount of technology it wields (Burdett, 2013). Furthermore, he prescribes that the environmental and social issues relate to quality of life in cities:

> 'In some cases, making a city smart is not just about technology, it's about solving some of the more fundamental issues. And information technology can do that…what matters is investment in smart technologies to help improve things like transport or ways of monitoring people's health so as to improve the quality of life of existing populations and not just think about the future of cities.'(Burdett, 2013)

Sassen believes that the biggest challenge we face in developing 'smart cities is a conceptual one around designing systems that puts all technology truly at the service of the inhabitants, and not the other way around: the inhabitants as incidental users' (Sassen, 2012). Koolhaas's well-timed caution about embedding sensors into every aspect of our lives and cities underscores Sassen's alarm about the 'sensored' becomes the 'censored' (Sassen, 2012).

As early as 2011, Sassen examines the necessity to: 'urbanise the technologies deployed in the "smart cities" project'(Sassen, 2011b, 2012). By linking technology back to city making she advocates grounding the outcomes to give people priority. She refers to the idea that the 'social' and the 'subjective' are two non-technological variables that widely influence and infiltrate the ecologies of technology. For instance, neither the objectives nor the logistics of the user are measured, or collected by technology, but greatly determine how people will behave in cities. She goes on to caution that:

> 'If technology controls all outcomes in a routinized fashion (as if it were a data pipeline) there is a high risk it would become absolete, … or so routinized that it

> barely is interactive. More like buying a ticket from an automaton: yes you have choices, but you can hardly call this interactive.'(Sassen, 2011b)

Business models, like Über, have already disrupted the commercial transport industry to create new markets and an appetite for ride-sharing and cost savings services; providing a catalyst for the not-for-profit transport sector in the Logan study (Leckie, 2016). The RDA's objective for the study is to look for market mechanisms:

> 'to reduce overheads, increase patronage and utilize lazy assets through avenues such as data sharing and cooperation between providers, new technology platforms for bookings, and the development of new economies such as the leasing out of vehicles on weekends and after hours.' (Leckie, 2016)

Sassen emphasizes that the city is 'a strategic space for all kinds of applications'(Sassen, 2011a). Given the substantial numbers of NGO vehicles used by the NFP transport providers in Logan, suggests that by connecting users, needs and networks, with a range of providers and service opportunities we could unlock these lazy assets. For example, the Logan 'after hours Doctors' vehicles are underutilized during the day; while the NGO fleets are expensive to park securely at night; and the YMCA breakfast vehicles are idle for at least 12 weeks of the year (Leckie, 2016). By exploring new opportunities for business, potential revenue sources might emerge from such third sector disruption. One possibility lies with Canefields Clubhouse in the Logan-Beaudesert area which is an NGO providing social rehabilitation and enterprise for people experiencing mental illness. They operate a car detailing service at the clubhouse that could clean the NGO vehicles; while the many number of experienced, but unemployed or retired, drivers could pick up a few hours paid shift work. The additional hours of income would improve their quality of life; and at the same time enable the vehicles to operate afterhours for new businesses, offsetting costs and overheads, while servicing more of the community (Leckie, 2016).

If we were to follow Sassen's advice, the answer might be in keeping 'the technologies open, responsive to environmental signals and to users choices, including what may seem quirky from the perspective of the engineer.' She believes that 'the city is full of signals and quirky uses: (and) given a chance, it would urbanise a whole range of technologies.'(Sassen, 2011b)

Conclusions

We have established that there is a pressing demand for a coordinated and efficient NFP transport service in Logan. As demonstrated here, the levels of disadvantage and chronic disease escalate when circumstances, and diseases, are combined and compounded. Likewise, when disruptive technologies are merged their impacts are amplified (Manyika et al., 2013).

Egan's alternative model for on-demand 'dial-a-ride' services creates a mechanism for a more effective and sustainable community transportation, while giving back decision making power to the people. By disrupting the current operational system of the NFP 'dial-a-ride' services in Logan, the RDA invites social participation, choice and preference; bringing new opportunities for business and start-ups through 'smart technologies' and thereby beginning to address Logan's social disadvantage. (Koolhaas, 2014; Sassen, 2011a)

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Image caption The cities of the future will be informed by data as much as by design. Simulation software that can create accurate "digital twins" of entire cities is enabling planners, designers and engineers to improve their designs and measure the effect changes will have on the lives of citizens. Cities are hugely complex and dynamic creations.Â Architects, engineers, construction companies and city planners have long used computer-aided design and building information modelling software to help them create, plan and construct their projects. But with the addition of internet of things (IoT) sensors, big data and cloud computing, they can now create "digital twins" of entire cities and simulate how things will look and behave in a wide range of scenarios.