Experiences and Perspectives of Urban Sensing in Melbourne

Background

This report was developed from research conducted by the Emerging Technologies Research Lab at Monash University, in collaboration with City of Melbourne's Technology and Digital Innovation team between June - September 2020. The Emerging Technologies Research Lab is an interdisciplinary and internationally embedded research lab which conducts research into the social, cultural and experiential dimensions of the design, use and futures of new and emerging technologies. The Lab is a cross-faculty initiative through the Faculties of Art, Design & Architecture and Information Technology at Monash University.

The City of Melbourne's involvement in this research is underpinned by a council commitment to trial emerging technologies. The establishment of the Emerging Technology testbed environment in the City of Melbourne enables the council to partner with the community and other organisations to explore ways that Melbourne can grow as a digital city, respond to city challenges and create new opportunities using emerging technology and data.

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Introduction

As emerging digital technologies and data become an increasingly valuable part of the urban landscape—through their presence in public spaces, their uses in city operations and business practices, and their outcomes for local communities—it’s increasingly important for government to develop methods for ensuring their design, testing and roll out are transparent, safe and effective for the people who live in and use cities.

Keeping this maxim in mind, and situating it within the broader context of the smart urbanism movement, this project aimed to provide new knowledge to inform how the City of Melbourne communicate with communities about the city’s urban sensing testbeds.

Initial discussions of how Visual Sensing Language had been developed elsewhere provided a starting point for the key questions this report addresses:

- How community members and City of Melbourne stakeholders experience the city.
- How they interact with urban technologies.
- What they want (and do not want) from a smarter Melbourne.
- Where a Visual Sensing Language would be appropriate and when other modes of engaging with the people of Melbourne would work better.

Our research was guided by what we call the APP framework for emerging technology:

- **Awareness**: what are stakeholders’ (including people who live in and use the city) actual understanding of how emerging tech works, beliefs about what it is meant to do, and experiences of its impacts?

- **Perception**: what are stakeholders’ values and goals, hopes and fears about how emerging tech should (and should not) be designed and deployed?

- **Partnership**: what ways can stakeholders be empowered as a partner in the project, rather than, at best, seen as simply a passive user or, at worst, excluded, ignored, and stereotyped based on assumptions of their behaviours and values?

Through this framework we undertook research designed to investigate the people of Melbourne’s own experiences and experiments with emerging digital technologies and situate it within a broader context. This report describes our analysis and provides recommendations based on our findings.
How to read this report

In the Methodology section we further explain the multiple methods implemented in this project.

In the Spotlights section we provide a comparative analysis of seven thematic case studies focused on how and why smart urbanism is being implemented in Australia, Europe, United States, and South Korea. At the end of each spotlight, we offer a series of critical questions for the City of Melbourne to consider in their strategies and projects.

In the Experiences section we analyse the key findings from the virtual ethnography and the workshop. The virtual ethnography took place with members of the communities who live, work, and travel through the City of Melbourne’s two testbed sites of Argyle Square and Flinders St. / Swanston St. Our analysis is organised based on four themed vignettes that represent different aspects of living in Melbourne and interacting with urban technology. At the end of each vignette, we offer a principle that translates these findings into actionable insights.

In the Issues section we analyse the key findings from our in-depth interviews and the workshop with internal stakeholders from various departments in the City of Melbourne who represent different viewpoints, positions, and functions in the city. The analysis is organised based on four major themes that arose across this research. Each theme focuses on an important issue that pertains to the governance and operations of smart urbanism in Melbourne. At the end of each theme, we offer a recommendation for how the city should address these concerns.
Key Findings and Principles

Experiences

Key Findings

● People enjoy wandering and exploring; they value the surprising elements of city life.
● People do not trust technology to function perfectly and fear it will lead to the loss of human sociality.
● People worry technology will lead to new inequities and exclusions.
● People wish to understand why data is collected and what it is used for.
● People are interested in interacting with data, in contributing to meaningful uses of data and value transparency.
● People did not wish to grant consent to a private company to collect data by entering a public place.

Principles

● Technology can enhance the experience of discovering the city and the curiosity with which people approach life in the city.
● People prize being able to experience the “human touch” and unique quirks in their city.
● The city can be usefully viewed as an integrated and delicately balanced social ecosystem.
● Ensure that people understand the purpose of data collection, how they can participate and where it adds meaning.
● Notification and signage would benefit from being participatory and playful, to encourage people’s engagement and curiosity and avoid fears of surveillance.
● People have different expectations regarding privacy and the collection of data in different spaces of the city, where they subsequently experience these issues differently.
● People valued transparency regarding how they are contributing through their data and embraced the collective value of data.

Issues

Key Findings

● There is a shared understanding in the City of Melbourne of data as an asset, but a need for ways to effectively govern and capitalise on data.
● There is a common worry that digital infrastructure will lead to cluttered poles and streets and desire for invisible design.
● The goal of a friction free city may come at the expense of public agency and transparency.
● City of Melbourne stakeholders tend to be focused on achieving operational excellence: imagining ways of doing what they are already doing, but doing it better, faster, optimised.
● Political and technological processes often function like a black box that obscures the inner workings of how, why, and for whom decisions are made.
● Rather than earn trust and establish transparency, black boxed interactions actively
impede the implementation of systems meant to serve the public.

Principles

- Build the organisation's capacity for managing and deploying data as a core form of capital.
- Emphasise creating ongoing dialogues between the designers, communities, and stakeholders in smart urban space.
- Create space to leverage domain experience spread across City of Melbourne and explore alternative visions.
- When focusing on optimisation don’t forsake transformation and experimentation.
- The public values relationships built on mutual trust and respect.
- Build trusting relationships and empower the agency of various communities, especially those who have been traditionally excluded and marginalized.
Methods

The Emerging Technologies Research Lab innovated a new interdisciplinary research approach tailored to the specific needs of this project, and its timeline during the COVID-19 pandemic.

Spotlights:
We used desk research, as well as drew from existing research by the team, to write seven spotlight case studies of how smart urbanism is being implemented in seven different cities or places. The desk research involved collecting and analysing a corpus of materials related to the strategy, implementation, and outcomes of each spotlight, including government websites and reports, corporate white papers and brochures, media/news articles, and academic research papers.

Ethnography:
Ethnography is an in-depth research method designed to get under the surface of what is visible through other methods such as surveys or consultations. It involves engaging with people in their everyday circumstances to seek to understand their feelings, experiences, hopes and concerns. In this project we developed online virtual ethnography methods by recreating elements of the everyday environments that we wished to understand people’s feelings about. This involved stimulating the essence of ‘being there’ through ethnographic probes, including: videos of two sites of interest: the IoT testbed in Argyle Square, and the corner of Flinders and Swanston St; and representations of future cities, through images, renderings and comic strips inspired and drawn from the spotlight cities, that enabled people to think more broadly and openly about the current role of technology in the city in both the present and in possible futures.

We met with 21 people ranging in age from 20 to 80, using the online teleconferencing platform Zoom. They represented professions including: university students, teachers, nurses, small business owners, designers, fire brigade, police, and retirees. All participants lived, worked, studied, or regularly travelled to the City of Melbourne. This sample was designed to investigate the depth and complexity of the experiences of each participant, to situate these within a context of social and cultural diversity, and to detect themes and patterns across their experiences.
Interviews:
We conducted 17 interviews with internal stakeholders from a wide range of departments in the City of Melbourne. These interviews were an hour long, took place over Zoom, and used a semi-structured format. The interviews focused, first, on learning about the different perspectives on the city, practices in each department, and problems that need to be solved. We then asked about any previous experiences or encounters with smart urbanism, such as through specific projects and technologies, or generally as a strategy for planning and running the city. We then explored how each stakeholder thought smart technologies could change their department, what kind of initiatives and technologies they wanted to see implemented, and if there were any potential risks or issues that could arise from the implementation of a smarter Melbourne in the near future. The interviews were then analysed to discover major themes that ran across them.

Workshop:
We designed an online workshop attended by internal stakeholders proposed by the City of Melbourne, including people who had been interviewed within our study. This workshop brought our research materials and insights directly to the stakeholders using digital platforms that supported video, audio and other visual media. The workshop focused on developing discussion of the materials and insights, towards generating new ideas about the future of the City of Melbourne, and ways in which to account for and design with the experiences and needs of people who live in and use the city.
Section 1: Smart City Spotlights

More succinct than a typical case study, these spotlights are meant to be easily and quickly consumed. While they each give a good sense of what’s going on in a particular place, their real value is as a collective showcase of various initiatives and projects, which then reveal overarching trends and outcomes for smart urbanism.

Australia

Parramatta – Future City Unit

Planning Smart Urbanism

While Australia as a whole was a late arrival to the smart city movement compared to the US or Europe, Parramatta was an early adopter, starting its smart city planning in 2009. Smart urbanism in Parramatta is motivated by capturing or contributing to broad goals such as economic redevelopment (e.g. $2.7 billion Parramatta Square project), city rebranding (e.g. “Making Australia’s Next Great City”), operational effectiveness (e.g. data-driven decision-making), and customer experience (e.g. smart parking app, city dashboard, virtual reality flood awareness). These motivations are not unique to Parramatta; they are shared by many other cities around the world, but how they are being realised reflects each city's own context.

Parramatta has already gone through three distinct phases in its smart city development: originating with the Information Technology Department, then shifting to the Marketing and City Identity Department, and now situated within the Strategic Development and Outcomes Department with the creation of the Future City Unit in 2016. Yet it has not garnered much attention because its initiatives and strategies have been largely kept in-house, rather than through attention grabbing partnerships with major corporations.

Each phase of smart urbanism was situated in a different department of the city government with, sometimes radically, different people, values, and goals directing how and why smartness in Parramatta took shape.

There are few people who have remained consistently involved across these phases. When combined with a constant rotation of new people and hard to find documentation (e.g. meeting minutes and reports), this has translated into a hazy institutional memory over the last decade of smart city experimentation. To be clear, this is not meant to be a slight against Parramatta. Rather it is indicative of organisational dynamics within local government, which should be accounted for.

The Future City Unit is a small team of strategic planners and project officers with a few mandates that guide its activities. This unit is overseen by a Smart City Advisory committee composed of city councillors, relevant stakeholders, and public representatives. The Future
City Unit provides support for a range of smart projects across the city government, some of which predate the unit’s creation, and pull them together into a coherent strategy. The unit initiates and leads projects that are meant to address specific problems or discover useful information, while also building capacity within the government for using data and digital technology for better decision-making. They also build connections with new vendors by trialling their technology or contracting their services.

Compared to many smart cities that have contracted with a single service provider (e.g. IBM, Cisco, Siemens), Parramatta and the Future City Unit have remained largely vendor agnostic and committed to developing a strategy that they control and initiatives that meet their needs. This is partly to maintain autonomy over governance and partly due to the city’s smaller size and budget.

Smart city planning happens in a messy way. Existing drivers influence ad hoc initiatives, which are plugged into overarching strategies. Many major examples of smart cities tried to circumvent this process by handing over the design and development of smart urbanism to an external provider—resulting in much fanfare but questionable outcomes.

Key Questions

- How do we juggle key values like vendor agnosticism, local autonomy, and public engagement, with the realities and uncertainties of city planning for the future?

Resources

- Future City Projects | Parramatta
- Smart City, Future City | Invest Parramatta
- Parramatta Smart City Masterplan
- Parramatta Future City, What We Do
Darwin – Switching on Darwin

Communicating Smart Urbanism

The Switching on Darwin project garnered unfavourable attention from the media, experts, and the general public, particularly related to issues of surveillance, privacy, and conflicts of interest. Perhaps this attention was unfair or misinformed. Yet, it is also important to consider how the public communication of the project may have contributed to this framing, or at least, did little to alleviate the fears and address the criticisms.

Centred around purchasing technology and establishing digital infrastructure in Darwin’s CBD, Switching on Darwin was touted as the “largest single smart city initiative in Australia.” The project received $5 million in grant funding from the Australian Federal Government and $2.5 million each from the City of Darwin and the Northern Territory Government. The project commenced in February 2018 and was completed in May 2019, by which time it has installed the following technologies in the CBD:

- 138 CCTV cameras
- Public Wi-Fi precincts
- Environmental sensors
- Microclimate monitoring
- Parking sensors / app
- Vehicle sensors
- 912 CBD streetlights upgraded to LED smart lighting
- City Intelligence Platform

The Switching on Darwin project page provides a Frequently Asked Question (FAQ) section that briefly answers a long list of questions (link below). The FAQ largely focuses on describing the operation of various digital systems installed as part of the project, as well as explaining some background information about the idea of a “smart city” and the funding scheme/process that supported Switching on Darwin. These answers, however, can be brusque, vague, and/or buzzwords. For instance, in response to the critically important question: “How will this data be used by Council?” They answer, “Council will use this accurate data to better plan for our city’s future. Accurate information on car parking, people and car movement can improve city planning.” Such an answer is unlikely to be satisfying or helpful to a concerned citizen. Or, consider another question in the section CCTV cameras: “Will Council have privacy protections in place?” They respond, “The installation of new CCTV cameras will be supported by appropriate policies and guidelines.” No further links are provided. There are many other similar examples from the FAQ.

Much of the public material about the project focuses overwhelmingly on the technologies—where they are installed, how they operate, why they are good, what they are meant to achieve—rather than other social, political, or cultural issues.

Communication tools like the FAQ and interactive map are, it appears, targeted at a technical audience who are more curious about the technological components of the smart city’s “integrated and interconnected strategies and systems.” We can see a similar style in the Switching on Darwin Privacy Framework, which was published in February 2020 after the project was completed in May 2019 and after public criticism. The policy opens by
stating, “To attain smart city goals, a city must find a balance between promoting information availability (on the one hand) and ensuring privacy of those in the community (on the other).” The framework then lists seven principles (e.g. Transparency, Agility, Safety First), assures that all activities will follow legal requirements, and defines key concepts like Privacy by Design and key criteria like Use Limitation. A series of actions for each criteria are laid out, but it is unclear what progress has been made on them. The City’s information page about the Switching on Darwin project provides a list of “benefits for the Darwin community” that have been (or will be) achieved by the project.

The NT Police are mentioned frequently as involved in, having access to, and/or benefiting from many of these technologies. Their input, priorities, and goals appear to be an influential component of the project. That said, Darwin City Council and NT Police have a Memorandum of Understanding meant to “affirm Council’s strict position that CCTV footage collected via Council Smart CCTV cameras will not be subjected to facial recognition analysis.” At the same time, however, the Council’s “Smart Darwin” website also touts CCTV as “a very useful tool especially given the advanced capabilities in video analytics, artificial intelligence and machine learning.”

Thus, there are conflicting, or at least confusing, messages being communicated about these technologies.

Journalists, experts, and community members all raised concerns about the project—often by drawing comparison to the characteristics and outcomes of other smart city initiatives. The scale and rapid rollout of the project, some argued, meant it would erode Darwinians’ privacy through intensified surveillance. This project—which includes many systems built for surveillance and policing—is happening in the context of a city that has a turgid history (and present) disproportionately targeting, criminalising, and incarcerating Aboriginal and Torres Strait Islander people. Moreover, it is occurring in the context of the federal government’s plan to develop northern Australia. This development agenda has been criticised for, among other things, not giving due attention to the participation and rights of Indigenous people who are the traditional owners of much of the land.

Overall, rather than inform or engage with citizens, such nondescript statements give the impression of dismissing questions, rather than answering them.

When combined with public statements from Darwin’s Lord Mayor calling people raising well-established critical concerns about smart cities “conspiracy theorists,” this approach to public communication understandably creates an air of suspicion and distrust.

Instead of assuming a one-size fits all approach or trying to take a generic solution from one place and apply it to another, projects must be aware of local contexts and local histories. Not only does a generic approach risk ignoring the unique needs of a city, it will likely result in systems that are inappropriate for, or in compatible with, the people who live there.
Key Questions

- How can emerging technologies take into account the local historical, social, and cultural contexts?
- How can smart city projects partner with communities, especially those who are historically and presently marginalised and excluded?

Resources

- Switching on Darwin | FAQ | City of Darwin
- Making Our City Smarter | City of Darwin
- Smart Darwin Map
- Darwin Digital Strategy
- Darwin's Lord Mayor dismisses privacy fears of 'smart city conspiracy theorists'
- Darwin council promises not to use facial recognition technology in new CCTV cameras
Europe

Barcelona – Two Phases of Technology

Democratising Smart Urbanism

As the host of two large annual events, Smart City Expo World Congress and IOT Solutions World Congress, Barcelona has long been seen as on the cutting-edge of smart urbanism. It has attracted major investments and experiments by companies, particularly Cisco Systems, looking for a place to trial new smart technologies.

*Barcelona is also unique in that it has undergone major changes in its approach to smart city planning, shifting from one phase centred on corporate partnerships to the current phase focused on democratic decision-making.*

Phase 1: Technology Forward

When the city council proclaimed that Barcelona was starting a smart city strategy, Mayor Trias referred to it as creating a new “Urban Habitat” rather than a technological addition to the city. As he stated at the 2013 Smart City Congress inaugural address, “[Barcelona will be] the platform for innovation in the century of cities, to become a smart city based on the principles of efficiency, quality of life and social equity.” The idea was to convert Barcelona into a living lab to test innovative smart technologies from local and global companies, initially in close collaboration with Cisco. As Mayor Trias explained at a 2012 Barcelona City Council address, “All the cities in the world want to be the protagonist of the smart transformation, and Barcelona, the city where [the pioneering urban planner] Cerdà invented and implemented modern urbanism, has the chance of converting this need for change into the economic engine for the creation of wealth and welfare for its citizens… the new smart cities across the world offer a unique opportunity to apply solutions in which Barcelona can be the laboratory and leader at the same time.”

At the beginning of Barcelona’s Smart City Strategy (2011-2012), it was managed by municipal entities and civil servants that were already enrolled in the local government. The city quickly moved towards a narrative of efficiency and opening new urban economic paradigms along with tech companies like Cisco, IBM and Phillips, among others. The Municipal Institute of Informatics (IMI) was put in charge of coordinating the implementation and deployment with big companies and start-ups by the end of the administration in 2015, the City Council counted 122 projects organized in 22 programs that covered a wide range of operational and strategic aspects of the city—all of them coordinated and implemented in a centralised, top-down manner.

*Up until this point, citizens did not enter much into the equation except as the last recipients of the improvements proposed for the city.*

Mayor Trias and his city administration did not see the problem with this technocratic approach. However, various grassroots movements for citizen empowerment and
“technological sovereignty” began to form. These groups started demanding a more inclusive smart city agenda, which supported local ventures over large corporations. They wanted the resources and support to develop alternative technologies as opposed to standard “smart solutions.”

The broader movement for democratising Barcelona, with the smart city agenda as a key area in need of reform, propelled a new Mayor into power with a radically different political platform.

Phase 2: Participatory Platforms

In 2015 Ada Colau became the Mayor of Barcelona. With a government committed to a participatory and collaborative way of governance. They openly abandoned the previous administration’s Smart City Strategy, dismantling the government structure devoted to implementing it and publicly criticising its conception and process—especially, regarding the top-down approach and lack of citizen participation.

They sought to establish a distinctly new phase of smart urbanism focused on the idea that smart citizens have to be at the core of a smart city. Digital innovation ought to be used to enhance citizen participation.

In a total shift from its first phase, compared to many of its global peers Barcelona is now considered a prime example of democratic, transparent, and inclusive smart city governance. The city administration has sought to achieve this political goal through the use of various digital platforms meant to empower citizens in different ways. That said, many of these projects are not yet fully operational and still rely on external support, this time through the European Union rather than multinational corporations.

One major system is Decidim, an open-source platform that allows citizens to participate in the decision-making process around the city collaboratively. They are able to put forward proposals and engage in discussion about how the city is run—topics range from waste management and street lightning to school opening hours. Another important project is SENTILO, an open-source software platform where all the data produced by the city’s sensors and actuators is gathered. This works along with the urban data analytics platform CityOS that allows the city to better manage public services. Last is DECODE, a roadmap for data governance conceived by Francesca Bria, Barcelona’s former Chief Digital Technology and Innovation Officer. Its main objective was to build a data-centric digital economy where data generated by citizens and gathered through urban sensing and IoT networks could be used by companies and social organisations to create new services for common use.

These participatory platforms are not without their problems. Their actual ability or efficacy to enhance public engagement has been criticised, as has their feasibility and sustainability since the infrastructure depends on funding and resources from the European Union.
To be sure, we should be careful not to over-promise on Barcelona’s success too early. It serves as an interesting, even inspiring, case for how a city can drastically change the politics of its smart city strategy away from a corporate technocratic agenda to a more progressive democratic approach. Barcelona’s process of democratisation raises many questions about how to balance the interests of multiple stakeholders, how best to engage citizens about/using digital innovations, and when to bring democratic inclusion into policy and design.

Key Questions

- What kind of citizen organisations in Melbourne are leading grassroot movements for inclusion and sovereignty in the (smart) city? How can their work, values, and goals influence the direction of future city strategy?
- Do digital platforms for participatory democracy like Decidim in Barcelona have a role in Melbourne?
- What would a bespoke version of a democratic platform look like for Melbourne—how could it operate, who would create it, what should its purpose be?

Resources:

- Decidim: Free Open-Source participatory democracy for cities and organizations
- MetaDecidim | Community Page
- What is DECODE? | DECODE
- Sentilo
- Barcelona Ciutat Digital
- Barcelona – Smart City 3.0
- How Barcelona’s smart city strategy is giving ‘power to the people’
- The Technologies That Turned Barcelona Into A Smart City
- Barcelona: the world's smartest city? | E&T Magazine
- How Smart City Barcelona Brought the Internet of Things to Life
Aarhus - Collaborative Organisation Model

Experimenting Smart Urbanism

The second-largest city in Denmark, Aarhus is known for its well-developed digital infrastructure, its initiatives on “transparent governance” and environmental sustainability, and its reputation as one of the best university cities for students in Europe.

Launching their smart city strategy in early 2012, Aarhus was a European pioneer in embracing the visions and concepts of smart urbanism. However, contrary to many other European cities, Aarhus did not start from technologically driven notions such as efficiency or system integration, but rather from ideas of “digital urban living” and “participatory city.”

**With a strong focus on digital culture, art, and well-being, Aarhus’s strategy emphasises innovation as a means for improving the quality of life for residents.**

The overarching initiative, Smart Aarhus, is noteworthy for its collaborative organisation model that is built on traditionally Scandinavian values of social/economic equity and environmental sustainability. This model integrates three different sectors of society—public, business, and research—as equal partners in deciding how Smart Aarhus develops.

Branded as *Made with Aarhus*, this close collaboration between sectors has included, for instance, the University of Aarhus working with the Alexandra Institute (a non-profit private institute for IT development) on data infrastructure development, which is a cornerstone for economic growth in Scandinavia. The creation of public and private think tanks specifically for developing sustainable smart city initiatives has been a central tool for the collaborative organisation model. This approach has been successfully exported to other neighbouring cities.

The Smart Aarhus initiative has established the city as an urban living lab. Aarhus has a significant broadband penetration and is one of the first cities to have a publicly owned city-wide communications network for IoT devices (based on the low power, long range, wide area networking protocol LoRaWAN). This network makes it possible to connect devices across long distances at low costs, which enables the city to experiment easily with new types of technologies for business and public projects. These range from heavy infrastructure projects such as a smart harbour to social projects such as makerspaces, biohacking labs, and smart laneways. Aarhus is also the host of Internet Week Denmark, an annual festival for exploring new technologies, sharing new ideas, and discussing the digital future—akin to Melbourne Design Week

*The experimental character of Aarhus means that new innovations, such as for transportation, mobility, and energy, are often first implemented and iterated there before being exported elsewhere. Supporting this collaborative and experimental approach is central to the Smart Aarhus initiative and has raised their profile as an innovative city, both technically and socially.*
A key issue for Aarhus is data management. The city council has built an Aarhus Open Data Repository, which makes the data produced by the city available for the public. The purpose of the repository is to support collaborations and find synergies between government, the public, and businesses. In the beginning, the open data was often used by companies and entrepreneurs for their own independent purposes or to improve products already on the market. In 2014, the government sought to incentive and boost different uses of the Open Data Repository, which would better align citizens and their problems with companies and other actors who had the skills required to use the data and create technological solutions. The result was a myriad of small experiments around the city based on citizen concerns regarding issues like green design for infrastructure and accessibility in public space.

Public data ownership is positive but it also requires citizens to have the tools and the knowledge to utilise it, or it can easily become a deferential gesture. It is important to take into account and tailor smart city projects to local values and consider the various actors who benefit from smart urbanism.

Key Questions

- Is it enough to maintain a ‘transparent’ process around data so that citizens accept that their data is used by companies to obtain profits?
- In the name of digital innovation, should companies experiment with the people and their everyday environment/basic infrastructures?
- In a collaborative model, who is accountable if experiments go wrong?

Resources

- Smart Aarhus
- Open Data Denmark
- Aarhus City Challenges | Organicity
- Smart Cities: Aarhus, Denmark | National Geographic
- Smart Aarhus - a Scandinavian third way
North America

Toronto – Sidewalk Toronto

Resisting Smart Urbanism

In May 2020, Sidewalk Labs announced it would be “no longer pursuing” its blockbuster project in Toronto. In a statement on the company’s Medium blog, the CEO cited “unprecedented economic uncertainty [that] has set in around the world and in the Toronto real estate market” as the reason why the company—backed by one of the wealthiest corporations in the world—is withdrawing its plans for a smart urban district. This was undoubtedly a major factor in the decision, but nowhere has Sidewalk acknowledged another factor that also surely played into this decision: democratic criticism and public opposition. Citizen groups, civic leaders, and public interest groups in Toronto (and elsewhere) have exerted pressure on Sidewalk’s plans from the moment the Toronto project was announced.

In October 2017, leaders of government (e.g. Canadian PM Justine Trudeau) and of Alphabet (e.g. executive chair Eric Schmidt) announced a partnership that would put Sidewalk Labs in charge of redeveloping a waterfront district called Quayside. (It eventually came to surface that Sidewalk has grander ambitions for the much larger Port Lands area, too.) According to their proposal, Sidewalk Labs plans to turn Quayside into “a neighbourhood built as an urban innovation platform,” which includes decking it out with self-driving shuttles, underground garbage robots, experimental modular buildings and, of course, complete coverage by sensors harvesting real-time data. Put differently, Sidewalk Labs aimed to reconceive and construct this precinct as a “programmable public realm,” which it would code and control.

*The project’s planning process had been marked by rushed decisions in closed meetings, a slow trickle of publicly available information, and deliberate obfuscation at nearly every step of the way.*

The project has also been the subject of vocal resistance from public groups, who broadly see it as an egregious imposition of private interests and intrusive technologies into the city, to a degree that was unexpected by the company—and even its critics. Not only was this one of the first cases of meaningful resistance to a proposed smart city project, the coverage of this project also raised critical consciousness of (corporate) smart urbanism in general. Much of the opposition, however, was not particularly militant or radical in its tactics. Rather, it largely amounted to taking Sidewalk’s plans seriously and engaging directly with the company, Waterfront Toronto, and the City of Toronto. This included requesting access to documents like plans and meeting minutes, participating in public events and activities, taking an interest in governance processes such as procurement, and other ways of obtaining (public) information, engaging with decision-makers, and making their voices heard. It was clear from the company’s reaction that Sidewalk Labs did not expect the
citizens of Toronto to take such an active and direct interest in its plans for the waterfront district.

From this we can highlight two key takeaways: First, active participation by a public who expects consultation can feel like militant resistance, particularly when critical feedback is not expected. Second, in addition to asking how a project should be implemented, we must also take seriously the question of if a project should go ahead at all.

Importantly, this pushback forced Sidewalk Labs to reconsider its original plans—or, at least, come up with a new strategy—proving that none of these specific projects or broader proposals related to smart urbanism are a fait accompli. The fact that this project was led by Sidewalk Labs—with its ties to Alphabet and data collection, with its CEO who was a private equity financier, with its American attitude barging into a Canadian city—certainly fuelled the public scepticism. However, that should not be interpreted as an issue only faced by a company with as much attention (and baggage) as Alphabet.

The larger point is about democracy, inclusion, and equity, and how those key features are (or are not) part of such projects from the beginning.

It’s true that many people may not care about, or may simply acquiesce to, the idea of creating an ‘urban testbed’ or ‘living laboratory’ for experimenting with new systems on real people in real places leading real lives. But there will always be a segment of the public who are concerned about such initiatives, especially if they feel excluded or targeted by them (see Darwin, for instance). And if the conditions are right, that segment who criticise and push back against what they perceive to be an undemocratic and intrusive project can grow to be quite large and powerful.

Toronto raises interesting questions about community engagement, particularly the ability for a project to be stopped if the public doesn’t want it. Community engagement must be more than informing the public or allowing small inputs into projects you are already committed to. Democratic and inclusive engagement must start from the beginning conceptualisation of a project.

Key Questions

- Does working with a corporation change how people feel about initiatives?
- Is Toronto a ‘failed’ project or a successful example of feedback in action?

Resources

- In Toronto, Google’s Attempt to Privatize Government Fails—For Now
- Urbanism Under Google: Lessons from Sidewalk Toronto
- City Planning Heaven Sent
Anywhere, USA – Big Data Surveillance

Policing Smart Urbanism

Given current events in the United States, and the way in which urban digital technologies have long been built or co-opted for the purpose of policing cities, it is worth considering how the smart city is largely developing in ways that tend to grant police more power to monitor people, manage places, and make predictions about the future. Rather than home in on a specific project in a single city like the other spotlights, this case is meant to emphasise a broader shift happening simultaneously across many places. Though we might hear about examples in major metropolises like New York or Los Angeles, this dimension of smart urbanism is not unique to policing one city. Nor is this a feature unique to the United States. That said, this trend has perhaps reached its zenith in those metropolitan areas.

*Smart policing has taken off around the world in recent years. It seems that every police department, small and large, wants to get its hands-on data-driven tools—even when their value is ambiguous or dubious.*

Ready to meet and create that demand, there is no shortage of companies popping up to sell their own proprietary tech as well as convince police that they either have to get smart or get left behind. We are witnessing a transition where police operate more like an intelligence agency that probes and analyses the urban space. The shift to smarter policing is not a sudden break from older models of policing, but rather a process of phasing in new technology and tactics. Together these major shifts in smart policing have set in motion radical changes in urban governance, thus amplifying established surveillance practices and transforming the operations of policing.

*The ubiquity of these systems has spurred a rapid decline in the thresholds for inclusion into databases, whether operated by or accessible to the police.*

Thanks to new capacities to analyse data and new imperatives to extract it, “the police increasingly utilize data on individuals who have not had any police contact at all,” writes sociologist Sarah Brayne (2017). “Quotidian activities are being codified by law enforcement organizations.” All the cars driving past an automatic license plate reader are stored in a police database. All the phones that connect to a StingRay device (mock cell tower) are logged by a police database. All the people, vehicles, addresses, and phone numbers that are somehow connected to a “person of interest” are on the police’s radar.

In terms of new software, applications powered by facial recognition and artificial intelligence have become widely available, allowing police to integrate them into already-existing CCTV cameras and officer body cameras. While the City of Melbourne has stated they are not interested in using facial recognition, we must also recognise that installing the hardware infrastructure is the hard part. Once the infrastructure is there, installing new software later, if desired or deemed necessary, is relatively simple. And there are dozens of vendors who would be ready and able to provide such services.
For example, there are reported cases of cities and police in Australia trialling such applications from companies like Clearview Ai and BriefCam. The former provides powerful facial recognition functions, whereas the latter purports to use artificial intelligence to enable users to search through video footage with keywords. Rather than manually skimming through countless hours of video to find, say, a man wearing a red shirt or driving a certain model of car, police can simply enter their query and find all the relevant clips.

Technologies can materialise the motivations of different actors into urban space. Therefore, close attention must be paid to who gets to decide how the city looks now and in the future.

*Policy advocates argue that governments and businesses should both adhere to the principle of data minimisation: only collecting, storing, and analysing the data needed for a specific purpose. But many of these systems are designed to do the exact opposite.*

Instead, these organizations are driven by a principle of *data maximisation*: recording and storing all data, from all sources, by any means possible, even if its use is not yet apparent.

**Key Questions**

- How do we account for the hierarchy of influence in urban governance, when there are multiple public entities with their own values, goals, and access to resources?
- Who is meant to be representing the public, governing the people, shaping the city?
- Whose strategies (should) decide how the city looks now and in the future?

**Resources**

- [Big Data Surveillance: The Case of Policing | Sarah Brayne (2017)](#)
- [The Captured City](#)
- [Artificial intelligence is going to supercharge surveillance](#)
- [Tech companies Cash in on the Facial Recognition Gold Rush](#)
- [Australian Federal Police officers trialled controversial facial recognition tool](#)
- [Clearview Ai](#)
- [Facial surveillance is slowly being trialled around the country | ABC News](#)
South Korea

Seoul – 5G Infrastructure

Networking Smart Urbanism

South Korea has long been at the global forefront of large-scale experiments, projects, and initiatives in smart urbanism. It is, for example, the site of one of the original greenfield, built-from-scratch smart cities, Songdo—which is now widely considered an expensive “ghost town.” They built the smart city, but the people did not come. Songdo can be read as a warning against overly ambitious projects, but this failure has not deterred South Korea from seeking to integrate smart systems into how major cities like Seoul manage the operation of core services such as mobility, waste, and public space.

Instead, the national response appears to have been a shift in focus toward developing telco networks, namely 5G. This is an infrastructural rather than solutions-based strategy for building smart cities.

According to a government report the strategy strives to make “Korea the ‘5G Testbed’ of the highest quality through early expansion of 5G networks, establishment of infrastructure for piloting and verifying 5G terminals and services, and etc.” In other words, their plan is to build the foundations for next generation “core services” and “core industries”—not just smart cities, but also automated factories, autonomous vehicles, intelligent CCTV, virtual reality, etc—so that platform is there to support various systems.

Arguably, a major reason why smart urbanism has had trouble materializing in a meaningful way—or, has stalled and failed—is that the data and connectivity capabilities needed weren’t in place yet. Put kindly, perhaps the smart city as an idea was ahead of its time. Or, put more bluntly, perhaps there was a disconnect in the distribution of resources and concentration of influence driving smart urbanism. Either way, for better or worse, the network approach in South Korea represents a different tactic for making smart cities than what we’ve typically seen elsewhere.

As of April 2019, with the launch of 5G service for smartphones, South Korea became the “first country in the world to commercialize 5G,” according to a report on 5G+ strategy from the Korean government. Or, put more bluntly, as a Samsung case study on commercial 5G boasts, “Korea, always on the cutting edge of telecom communication.” Embedded in these statements is a crucial point about how networked smarted urbanism is coming about via a coalition of three major telco providers: SKT, KT, and LG. This high market concentration, which is supported by major government contracts, auctions, and licensing, is in no way unique to South Korea. We can see a similar relationship emerging in Australia with Telstra, Optus, and Vodafone. Such a method of delivering infrastructure—especially when pertaining to a technology that is intended to be pervasive, ubiquitous, and critical—raises many important issues about the politics and impacts of the “5G-based smart city.”
Networking a smart city not only relies on a dense technical infrastructure, there are also deep political considerations involved in decisions about how, and by whom, 5G networks are built and maintained.

This is not only a question of geopolitical controversies around Huawei and the fears their infrastructure will allow the Chinese state to spy on communications, which is how this issue is often framed by politicians. Nor is it about the health-related conspiracies that motivate many anti-5G movements. Instead, it is simple political economy. If a private company or public entity—following its own interests and driven by its own imperatives—is in charge of building critical infrastructure (or, anything really), then we should expect that its values and motivations will be embedded in decisions about how that infrastructure is designed and constructed. This in itself is neither good nor bad; it’s a feature of human endeavours. By paying attention to the political economy of smart urbanism, we are better equipped to ask questions rather than assume answers.

Consider that there is a strong case that the real benefits to be realised by 5G will be industrial, not consumer.

The high adoption of 5G in a place like Seoul has largely been led by South Korean telcos “heavily subsidizing unlimited data plans and new devices while also providing gaming and other services for free,” points out an analysis of South Korea’s 5G ambitions (Gillispie 2020). While 5G users are burning through 2.5 times the amount of data, if the perks and subsidies were subtracted it is likely that usage would also drop off “unless a new “killer app” emerges, which presents a compelling reason to pay a premium for unlimited 5G plans. Most analysts seem to agree that so far, we have yet to see such an app” (Gillispie 2020). South Korea’s ambitious plan to be first to commercialization may have also meant that the infrastructure was not robust enough to support the public’s expectation.

If consumer growth is slow, then it is likely that industrial and financial sectors will dominate the market for 5G, thus configuring this critical infrastructure to fit their needs, while the consumer side is more of a trickle-down benefit.

Arguably, this is how the smart city has been developing for the last decade, but with the consulting and policing sector dominating the market. South Korea’s 5G+ strategy is already, in a sense, assuming this will be the case by focusing on industrial 5G. While this strategy might contribute to increasing economic growth and “securing market dominance”—as is the government’s explicit hope—such benefits are not guaranteed and, importantly, are sure to be unequally distributed.

Perhaps no other critical infrastructure is as consequential and controversial as 5G, yet almost all attention paid to 5G has been decidedly uncritical. Either its benefits are assumed and its detractors are dismissed, or its harms are assumed and its proponents are dismissed. That’s not to say the right answer lies in the middle, but rather that the correct analysis requires questioning whose interests 5G serves.
Key Questions

- What capabilities does 5G infrastructure enable?
- Whose interests are embedded and what imperatives are enacted by 5G?
- How is access and how are benefits distributed?
- For whom is the 5G smart city built?

Resources

- South Korean 5G+ Strategy
- South Korean Smart City Brochure
- Samsung 5G Case Study
- South Korea’s 5G Strategy
Section 2: Experiences

This section of the report presents the ethnographic findings. It is organised into 4 sections, each of which presents a key set of questions and concerns that came from research participants. We include quotes from the participants throughout that illustrate their thoughts, feelings, and experiences of the city and technology.

Enhance the Values and Meanings of Life in the City

Before considering the future and the role of technology, we highlight the importance of capturing what people already love and value about life in Melbourne. Integrating this approach into planning for the future, will help to ensure that technology enhances—rather than undermines—the character and experiences of the city that people already value.

Key Findings

People enjoy wandering around the city.

While a few research participants had specific and clearly defined moments they reflected upon as a particularly memorable experience, such as their wedding day or Grand Final win, many others told us that their memorable experience of the city was their regular activity of simply wandering through it. This sense of discovering the city by moving through it emerged as a strong pattern in their memorable experiences.

“I don’t have one [memorable experience]! Because it all blurs together pleasantly…I just enjoy architecture, the atmosphere…It’s just wonderful wandering around the city.”

“I had this one day when about fifteen of us went to the botanical gardens at midday…and then we went straight to bar hopping around Carlton and the CBD, and then just kept going on until midnight. Twelve hours of wandering all over the city and just hanging out with each other”.
The unexpected and the “hidden gems” make the city unique.

Critical to this sense of wandering around the city was that while these days became memorable, they were rarely planned to be such. The element of surprise and the unexpected are highly celebrated traits of the city. People approach the city with curiosity as they explore and discover.

“I think a lot of my memorable experiences have themes of like mystery and wonder, and the unknown as well. I enjoy the city in all hours of the day.”

"I just loved those cows that were painted by the school kids. You’re just walking down the streets and there’s this cow painted in purple or whatever. Those sorts of things, the things that surprise you! It's a surprise element."
The infrastructure of the city enables the unplanned experiences.

The ability to walk around the city and to hop on a free tram were considered central enabling factors to what made these memorable experiences possible. The layout of the city, including its laneways and walkability is crucial to the experience of surprise. This enabled participants to travel through the city without a clearly defined plan and stumble across “hidden gems,” like unique small businesses, which make the city appealing and accessible on a “human scale”.

“Everything is strategically placed: the bars, the cafes, the restaurants. So, you don’t have to take a car or take a train to a different place.”

"The fact that we still have alleyways, small lanes because it gives you little niches. ...It is those nooks and crannies. they bring it down to a human scale."
Melbourne is perfectly imperfect.

Rather than perceiving Melbourne as flawless, people celebrated the aspects of Melbourne that might initially be perceived negatively but are actually a fundamental part of its character. Rather than valuing Melbourne as a clean, seamless, efficient city, people value its quirkiness, excitement and liveliness.

“I’m a cyclist and I really like riding through the city of Melbourne. I think Melbourne Uni to Swanston Street is a really nice set of safe roads for cyclists...But I tend towards liking the more exciting tracks, like Sydney road where you’re at risk of dying, but it’s really interesting”

“I went to Japan ... not even two years ago. It was so clean and orderly ... and after getting back to the city it was so dirty and grotty and the windows weren’t clean. But I was meeting someone down at the gallery and so you know there was the lovely experience of walking back and the buskers. There was a sort of vibrancy that maybe is a bit special to Melbourne. So, while it might be grotty, there is a bit of a buzz and a spontaneity. I don’t know, that might be a little bit special”.
How can technology enhance what people already love about Melbourne?

Technology was not at the centre of how these participants discussed their experiences or envisioned future positive experiences of the city. While they used existing personal technologies such as smartphones, when asked, people rarely noticed existing smart city technologies, and had a difficult time imagining how technology could play a role in enhancing their memorable experiences.

A notable suggestion made by a young adult participant illustrated their enjoyment of exploring and celebrating the city’s quirky character as well as their desire to learn about the city through different forms of storytelling:

“Often when a council wants to tell the story about a particular site of significance, they put up a plaque or an information board. This is durable media, so it doesn’t change very easily, and it’s something that requires resources and authority to put in, so it’s often the kind of bland story that’s been agreed upon by the people in power, rather than the really interesting anecdotes and kind of politically charged stories that could be told about particular places. I think using technology can allow for participation in storytelling about place. It’s easy for people to submit ideas or stories and ... it becomes more multivocal rather than a single narrative. And so that could be done either through screens, like information screens, similar to an information board. But then, people might submit stories to be displayed there. Or it could be done kind of with a little bit more production behind it to have augmented reality so that you might see images overlaid onto the landscape of how a place has changed overtime.”

Key Principle

By putting what is important to people first, we can better understand what the real ‘problem’ to solve is and think about how technology can enhance the experience of life in the city. While smart technology can deliver greater efficiency, our work has shown that rational optimisation and efficiency are rarely what people remember or celebrate about city life. To ensure that people who live in and use the city are excited about technology means also enabling its playful capacities which connect to the unexpected and creative character of Melbourne that people love.
People’s Fears of Technology: Loss of the Social

The main concerns about technology existed on an interesting spectrum in which technological breakdown and technological perfection were both futures to be feared. These anxieties were driven by the idea that technology will remove social life in the future city, by replacing people, their labour, and their community. These anxieties were associated with concerns ranging from the idea that too much trust in technology without human monitoring and management would lead to breakdowns, to the concern that if technology functions perfectly it would lead to a dehumanisation of the city.

Key Findings

People do not trust technology to function perfectly.

While participants celebrated the potential role of technology, they worried about breakdowns and did not trust technology to always function as intended. They were particularly concerned that technology will be developed to replace the human role in managing public spaces and that there would be a loss of human intervention and supervision to ensure technology functions as intended.

“I would be surprised to see if the technology can be as sophisticated enough to actually deliver what they promise.”

“There are lots of things that are so clever that if they don't work, it's very hard to figure out what went wrong. There are lots of things that are ‘low-maintenance’ or ‘no maintenance’, and therefore get no maintenance and so they go wrong…A degree of built-in maintenance guarantees efficient longevity.”
People fear that the more we depend on technology, the more vulnerable we become.

In addition to worries about growing dependence on the role of technology in managing core functions of the city, participants also raised concerns about security risks like hacking becoming an increased threat to the city.

"This is why we are all so worried about cyber warfare and the stuff at the moment. We are all incredibly aware of how interconnected things are. Like the Y2K incident. What if something like this happens too?"

“What happens when all the electricity goes down and what happens then? What’s the back up?”
Technology is viewed as potentially creating new inequalities and exclusions.

Participants pointed to the possibility that new technologies could exacerbate social inequalities. This included the potential for technology, both unintentionally and intentionally, being used in ways that are discriminatory and could widen the ‘digital divide’ for those without the financial means or technological skills to access new services. A vision impaired participant shared particularly personal concerns about technologies that are designed without taking into account different accessibility requirements.

“It’s important to ensure that vulnerable people, and more deprived people have the same access as other, more well-off people. The equity of this technology is still important.”

“The fear I have is from accessibility. Often when technology is developed, people with a disability are disenfranchised. The developers don’t look at it from the perspective of a person with a disability how they access it. Like a touch screen, it’s difficult for me to use a touch screen.”
People worry that technology will lead to job losses and decreased social interaction.

Participants were concerned that greater technological efficiency might lead to job losses with consequences for those losing their jobs and for the or the social life of the city. City workers were appreciated not just for the specific job they performed but for their contribution to the social and communal life of the city.

"Maintenance jobs...I think it's good to have human beings doing those things because it gives people jobs, and also there's somebody in the area. If you were sitting on that park bench and there was someone else there, you wouldn't feel so alone...it's more human”

“You know you make a robot and that robot breaks down so throw that in the tip and make a new better robot. What about a human being? You don't want to dehumanize and eliminate potential interactions, make it more conducive to contact, human contact.”
Two ends of the technological spectrum
We illustrated the participants' concerns by creating two speculative comic strips, which reveal the polar tensions between technological breakdown and technological perfection: The Mismanaged City and The Too Perfect City. (See figure A and B)

Figure B: The Mismanaged City, comic strip made using storyboardthat.com
Figure C: The Too Perfect City, comic strip made using storyboardthat.com

**Principle**

People have a range of existing concerns and anxieties about the implications of new digital technologies and services for cities. They need to be reassured and feel confident that their city understands these concerns and is able to protect them from the range of interlocking challenges that they believe new technologies could present to the delicate social ecosystem of their cities and to their digital safety. People prize being able to experience the “human touch” and unique quirks in their city.
Communicating the why and how of data

Participants in the ethnographic study viewed a short video which highlighted the IoT technologies in the Argyle Square IoT testbed. We captured their initial reactions to these technologies before explaining their purposes.

We found that when participants could easily discern the purpose of the technology themselves, they were generally supportive of it.

When the purpose of a technology was unclear to participants, they approached it suspiciously.

These suspicions were not specifically related to the City of Melbourne environment, but rather draw on people’s broader understandings of the use and abuse of technology derived from a globalised media.

Clear and open communication of the purpose of new technologies and the data collected and used by them will help to generate trust, acceptance and interest in IoT technologies.

Key findings

When the purpose is clear, technology can become impressive.

For technologies that people understood the purpose of, such as the air quality and microclimate monitoring, there was not only less suspicion but also a sense of being impressed at the presence of the technology and the city’s progressive approach.

“I’ll list the reasons why I, as a citizen and a rate payer, I think yes [I want signs]. Number one, we want to be informed. Number two, so we can know why these things are being done and are grateful that our rates are going to something to improve the quality of our life”

“To be honest with you, I’m really impressed because I never knew they would have invested that kind of technology, weather sensors, air sensors, microclimate sensors in that area”

“The people need to know the city is doing something good! And that really makes you feel proud of the city as well”.
People are interested in interacting with data and value transparency.

We showed people the City of Melbourne’s Open Data platform. Everyone we interviewed was positive about the idea that the data was publicly available and could be used by anyone, especially researchers and entrepreneurs, and it was viewed as a move towards transparency. Even those sceptical of the IoT in Argyle Square were less concerned when shown the open data platform. While not everybody thought they would be able to use it themselves, they recognised its value for others and were curious about the technology and data.

“As long as there is transparency of how the data is being used, I am comfortable with that. But people need to have access to their data”.

"Open data is good data because it means it's transparent. And it can benefit everybody”.

“With the bin usage sensor, I would like to know more! Like this device is collecting information about the bin fill levels. If they can illustrate how they send the information, and then what do they do with it to make things more interesting. So, it’s easier to read and then you can tell the kids that ‘hey this is what the government is doing”.
People are more likely to accept the collection of data when they can easily understand how it will be used.

Surprisingly, the most innocuous piece of technology, the small bench sensor, was viewed with the most suspicion when participants did not understand how the data would be used or its value for improving the park. Instead they feared it could be used to discriminate against rough sleepers. In contrast, the rubbish bin sensors, which had an obvious purpose that people could discern on their own, were viewed positively.

“The rubbish bins make sense. You can see how full it’s getting…. You can empty the more frequently filled ones. That makes sense. Work smarter, not harder, right, but all the tracking?”

“I’m assuming the tech is being used to make sure that the amenities are kept in good conditions. I think some of them are doing that: the microclimate, the air quality and the rubbish sensors to stop them overflowing, but I’m a little bit more suspicious about the bench sensor. Like could it be used to maybe move on people who are sleeping rough.”
Participants would appreciate more details that enable them to understand and engage with the ways IoT and data benefit the city.

For instance, in response to the proposed signage: “We are committed to improving the way we run the city and real time information like this is crucial,” participants wondered how the particular data was improving the city.

“They should give more detail as to why exactly they need the number of pedestrians or the using of the bench, “to improve the city.” [The sign] it’s just there saying it is there, but why is it there?”

“It’s a little bit vague. It’s not saying why they’re collecting information, like the specific information, and how that is going to improve the way the city is run, like what about the city is going to improve by knowing that?”

The inspiration of data contribution
One participant described a bicycle shop on her ride to work which has a digital sign counting the number of riders that pass. She told us how she loved seeing herself counted in the tally. She felt that the data she was contributing could be used to evidence increased investment in biking infrastructure, which made her participation feel meaningful.

The IoT testbed in Argyle Square is well positioned to offer similar experiences that would enable people to experience and engage with data meaningfully and creatively, thus harnessing their curiosity and desire to engage with the city.

Principle
People appreciate the drawing of clear and transparent lines between how, when, and the purposes for which data will be used. When data does not have a clear, explicit purpose, people question whether it should be collected at all. Enabling people to feel they are contributing in ways that matter to them and that benefit the community can underpin their positive engagement with data and develop their trust in the purpose and management of its collection.
Signage, Notification, and Trust

We showed research participants a video of the corner of Flinders Street and Swanston Street, and highlighted the various CCTV cameras in the area as well as the signage alerting to the presence of these cameras. Participants were largely not surprised by the presence of such cameras, recognising that this particularly busy part of the city presented unique hazards that legitimised the need for video monitoring. However, their interpretations of the signage relating to the cameras were varied and raised some concerns.

Figure E: Technology at the corner of Flinders and Swanston Streets.
Image credit: Dr Kari Dahlgren Monash University, Emerging Technologies Research Lab

Key Findings

People expected CCTV cameras in busy areas of the city.

Participants expected the corner of Swanston and Flinders Streets to have monitoring technologies, including video monitoring, while they were surprised at the IoT technologies in Argyle Square (pg. 37). These existing expectations, which were related to assumptions about what was being monitored and the practical purposes for this, led participants to accept the presence of these technologies.
“I think because I take it for granted and it’s the norm. I mean even in other cities that I’ve lived in surveillance is something very normal. So now it doesn’t bother me as much but I have actually read those signs around Fed Square and Flinders St. station and even in the trams where they say the whole thing is monitored and sometimes, I did feel very watched. But I think it’s just it’s the norm now so everyone’s kind of taken it as it is.”

“There was one pole in Fed Square that looked to be bristling with devices that no doubt was measuring god knows what?! But these are high traffic areas that, you know, must be managed and need all sorts of things like this to help”
People were less concerned about the Safe City Cameras but disagreed on their signage.

Participants tended to accept that the City of Melbourne operates CCTV cameras, because they expected them to serve the public interest and public safety. However, they felt that the information provided by Safe City Camera signage plaques in the footpath could be elaborated. It was recognised that the design was intentionally fitting the character of the city so that it wouldn’t stand out. This was celebrated by some, but others felt that it decreased visibility.

"It looks nice, but if it is on the ground where people are just walking. It is necessary to alert people to the fact they are being monitored. It should be somewhere more prominent, like on eye-level."

“I think the safe city one, the same with the park ones [Argyle square signs] from before, it's not actually designed to be read. And it's not designed to give information. I think it's intrinsically manipulative.”

“It’s beautifully executed. Like all the things that Melbourne city council does under their industrial design wing, their execution becomes adornment and enrichments to the character of the city…. the attention that's been paid to doing it with finesse can be as reassuring and enriching even if you don't read what it says.”
People were not comfortable with granting consent to private sector data collection.

We showed participants the sign that is posted by Federation Square Pty Ltd, which reads “By visiting or accessing Federation Square, you consent to us collecting, using and disclosing your personal information in accordance with our Privacy Policy.” Participants were distinctly uncomfortable with the assumption that by entering a public space they were consenting to a private company monitoring their use of the space. They would be more comfortable with the City of Melbourne doing so.

“I think that sucks. I don’t like that at all. As much as I’m concerned, Fed Square is an open space, public space so it should be monitored by the city or police.”

“Can I swear in this interview? I don’t like that personally...I see that as a huge invasion of my privacy and my right as a citizen to walk around without being a walking breathing data machine for some corporate interest.”

Complexities of Trust

Trust is a concept that is used to refer to the extent to which people feel sufficient confidence in particular sets of circumstances to feel comfortable and familiar with them. This might include other people, organisations, technologies or services (or more often a combination of these things). As our research findings have shown, participants raised a
number of different issues related to trust: trust in the technology to work as intended (pg. 31); trust that technology does not have hidden biases or faults (pg. 40); trust that the data will not be misinterpreted (pg. 33); trust in the organisation that collects and has access to the data (pg. 46); and trust that the data is securely managed and protected (pg. 43).

During the ethnographic discussions, we showed participants an image we described as the Data City, which included the logos of various organisations, government bodies, and corporations that might have access to personal data. We then asked how they felt about each organisation possessing and using their data. The City of Melbourne was widely considered the most trustworthy. Participants felt like they had a local connection to the city government and that its interests were most closely aligned with their own. However, their distrust of other actors affected their perception of all data collection. Several participants mentioned that City of Melbourne’s positive intentions did not preclude other mal-intentioned actors from accessing the data and misusing it. Concerns included the Australian Federal Police, corporations, and foreign governments who may hack into data.

**Principle**

People found it difficult to equate signage and consent. Their ability to trust in data collection processes and technologies was based less on the content of signage than on their existing expectations and assumptions about how data would be used, their confidence in the organisation collecting the data (i.e. they trusted the City of Melbourne above the private sector), and their fears about cybersecurity. Techniques could be developed to deliver notification in varying degrees of interactive modes in relation to people’s expectations for different areas of the city. These might engage people’s curiosity and sense of participation in the City of Melbourne and counter their resentment of private sector involvement and fears about external cyber security threats.
Section 3: Issues

Theme 1: Data-as-an-Asset

Until recently, it was common for companies to simply delete data they had accumulated, or chose not to collect it in the first place, because paying for storage and maintenance did not seem like a good investment. Now, though, companies are clamouring to collect data—as much as they can, wherever they can. A report on “the rise of data capital” by Oracle (2016), one of the largest software companies in the world, explains that, “Data is in fact a new kind of capital on par with financial capital for creating new products and services.” Or, as we have stated in previous work on the political economy of data

“Just as we expect corporations to be profit-driven, we should now expect organisations to be data-driven; that is, the drive to accumulate data now propels new ways of doing business and governance” (Sadowski 2019).

This data imperative was a key motivation for the rise of smart urbanism, particularly when led by technology companies. Cities are rich sites for collecting data. Urban systems can be transformed and much power can be gained by applying data in the right ways. However, the insight that data is a form of capital, and the mindset that changes how organisations value and manage data, has only taken hold in the halls of city government very recently—if at all, in some places. More advanced governments are still in the process of figuring out which policies, structures, and approaches to data work best for their context and needs.

In the interviews conducted across different departments in the City of Melbourne, it became clear that there is a shared view among most directors that data is an asset.

Somewhat surprisingly, this perspective was almost always raised and discussed without any prompting from the research team. And not only in relation to existing initiatives like open data, but also in terms of how certain kinds of data and capabilities could contribute to the goals of certain departments. Or, how departments are negotiating vendor contracts to maintain access and control over data assets that belong to the City of Melbourne. This is a great cultural foundation to already have in place, which speaks well of City of Melbourne’s position towards digital technology.

While this first hurdle has been cleared, there is still much work to be done to provide centralised support and guidance so that departments are not left to figure out their own idiosyncratic approaches to the data assets, thus creating a patchwork of policies across the City of Melbourne. A key balance to strike is to provide coordinated support across the institution without flattening the different experiences, insights, and needs of departments.
Recommendation: Capitalise on Data

The next steps are for the City of Melbourne to take advantage of their established cultural foundation and devote the resources to building the organisation's capacity for collecting, sharing, managing, analysing, valuing, and deploying data as a core form of capital.

In practice, this may mean convening a working group with representation from across the City of Melbourne tasked with drafting a Data Ownership and Management Policy that provides clear guidance for topics such as who handles data collected by the City of Melbourne, how to share or access data across the organisation, and how to ensure data ownership is retained when working with vendors. It might also include changes in accounting practices so that data is recognised on balance sheets as a valuable asset. As well as investment in digital infrastructure required to securely store data and the expertise to maximise the value of this new public good for the city.
Theme 2: Infrastructural Clutter

In every interview with City of Melbourne stakeholders, we asked what they thought could go wrong and what we had to be on the lookout when implementing smart city initiatives. Everybody who had anything to do with urban infrastructure or design raised a red flag about clutter. There was a consistent worry that the streetscapes would be filled with technology: telco boxes, sensor arrays, CCTV cameras, and other infrastructure meant to make the city wired and intelligent. The light poles would be packed, the bins would be strapped, the sightlines would be obscured, and the city would feel crowded. Melbourne would turn into something more like a gritty city from the latest sci-fi film, rather than the aesthetic city it has built a reputation for being.

This is, of course, a legitimate concern considering the roll out of 5G requires an extremely high density of new cell relays and base stations. This infrastructure has to go somewhere. The main solution discussed in the interviews, and already in the works by the City of Melbourne, is a smart pole that could serve as a platform for these systems. Thus, giving different telcos, as well as the City of Melbourne, dedicated spaces to install infrastructure, while also giving the City of Melbourne control over the design and placement of the poles.

A core value expressed in the interviews was the desire for invisible digital infrastructure.

This means, in short, designing technology so that it blends into the background and integrates into the existing urban fabric such that people are even unaware of its presence or operation. Or, to put this in terms of a common user interface design goal, the smart city will be a frictionless environment: full of technologies interacting with people and each other, performing their functions, without residents ever having to think about, or even notice, them. In terms of effectively planning infrastructure and efficiently delivering services, this approach to the problem of clutter makes a lot of sense.

However, this solution and the goal of a friction free city is not as straightforward as it may sound.

In a research interview conducted with Bianca Wylie, an open government advocate who was a major civic leader during the Sidewalk Toronto project, and Shannon Mattern, a professor of design anthropology, one of the key points they emphasised was how approaches to urban technological design based on “clean” and futuristic aesthetics can create cold, detached relationships between citizens and cities. The message of these designs is that the future has already been foreclosed, decisions have already been made, technologies have already been installed. The clean lines and unibody construction of an iPhone, for instance, are designed to prevent people from cracking it open, seeing how it works, making any changes.
A frictionless interface is designed to keep the underlying operations hidden, to make interactions intuitive but also thoughtless. In our ethnographic research, Melburnians expressed a similar fear that this kind of too perfect city would be created.

That is, a city so well managed, automated, and frictionless that is devoid of the soul, character, and cracks that make Melbourne what it is.

A smart pole risks transposing those same kinds of relationships to technology—and the people making decisions about how, when, where, and why to implement technology—into public spaces. Wylie and Mattern pointed out, with regards to the very slick visual language for urban data that Sidewalk Labs created, the stated goal was transparency but the ultimate effect was to merely tell citizens what had already been decided and what was already being done in their city. In other words, it was public relations not public engagement. While it might be tempting to circumvent controversy, such as that arising from the roll out of 5G, by hiding the offending technology. This does not live up to essential values of democratic decisions and public accountability.

**Recommendation: Implement Iterative Design Processes**

Rather than an approach based on finding the solution to the problems of digital infrastructure, there should be an emphasis on creating an ongoing dialogue between the designers and planners (e.g. City of Melbourne), people who live in and use the city (e.g. local communities), and stakeholders (e.g. telcos) of a smart urban space.

Especially when the purpose is to test new technologies. This could be done through early design ethnographic engagements where frank conversations about values, goals, and expectations can be had. Then regular (but not burdensome) check-ins between these groups can be planned to see if people have changed their minds, if they desire something different, or if they are happy to proceed. An iterative process ensures regular opportunities for communities to exercise their agency, for research and evidence-based interpretations of the possibilities, and for the city to seek permission to try new things.
Theme 3: Operational Excellence

Just as we asked internal stakeholders what could go wrong, we also asked what they would like to see from a smart city. What kind of technologies or projects they desired, what kind of goals should motivate their implementation? Overwhelmingly, these answers focused on what one stakeholder termed “operational excellence.” This meant different things to different people in different departments. But, in principle, they all meant something very similar: Optimising the systems they oversaw—such as waste and recycling, parks and greening, roads and footpaths, pits and poles, inclusion and access—and improving the services they provide.

In practice, stakeholders discussed multiple approaches to urban sensing, data analysis, and networked control that they would like to see realised.

For instance, waste management envisioned a system of just-in-time behavioural modification where bins have sensors that can detect what people are putting in them and, in the case where people might be chucking rubbish into recycling or vice versa, the bin could redirect people to the right bin. This would maximise the effectiveness of the waste and recycling system, contributing to the creation of a highly efficient circular economy.

Others imagined a hyper-responsive city that reacted to its inhabitants, both humans and non-human, and supported all their needs. Like parks with lighting that tracked people taking a stroll at night, brightening their way without disturbing animals like bats that need darkness. Or, systems for real-time monitoring and automated scheduling of all the infrastructure works happening across the city, which would optimise time and resources. Even ranging up to discussions of a hyper-detailed and real-time “digital twin” for Melbourne—or, a simulation of the city powered by data collected from its various urban systems—which would allow designers and planners to improve efficiency and test experiments inside the digital twin, thus being able to observe the effects before implementing changes in reality.

The consistent focus on operational effectiveness or excellence is to be expected considering many departments are focused on keeping their part of the city running. Their perspective is grounded in the here and now, in the daily operations and near-term strategies of their particular system, service, infrastructure.

It’s revealing that, when asked to think in blue sky terms about what a Smart Melbourne should achieve, their answers focused on ways of doing what they are already doing, but doing it better, faster, optimised.

This is not because they were unable to think in broad, abstract, or strategic ways. To the contrary, the interviews very often included those types of discussions, as some of the examples above illustrate. Rather, as many stakeholders admitted in the interviews, they didn’t have time or space to have those kinds of discussions and think about these things in
such abstract ways. They were focused on the immediate tasks in front of them; they wanted solutions for pressing problems right now.

Visions of a Smart Melbourne that are constrained by practices already in place—doing what is already being done, but better, faster, optimised—can foreclose other alternative ways of envisioning and developing a future city. What new purposes could city departments and urban systems have? What new practices could they adopt?

**Recommendation: Create Space for Alternative Visions**

*When focusing on optimisation don’t forsake transformation and experimentation.*

The City of Melbourne should, of course, leverage technological innovation to strive for operational excellence in the city. But it must also take full advantage of the domain expertise spread across the city—not just to ensure daily operations run smoothly, but to inform long-term strategies and experimentation. It’s already apparent, based on the interviews, that the City of Melbourne possesses the creativity, knowledge, and skills to imagine new purposes for the city and design new practices for achieving those goals. Many stakeholders also remarked, in the interviews and the workshop, how enjoyable and interesting it was to even just spend an hour or a morning discussing these broader issues and thinking about future developments. More opportunities should be created where internal stakeholders have space to share their expertise, discuss their wants/needs for a future city, and contribute to pushing beyond the status quo.
Theme 4: Trust and Transparency

Based on recent empirical studies by political scientists, there is strong evidence that the general public often have little actual and/or perceived influence over which policies are put into law, while the preferences of corporations and wealthy people are almost always supported by policy. These studies have largely focused on the United States, but similar systems of inequality can be observed in the politics of many other countries, including Australia. What's more, the inequality in making policy mirrors the inequality in creating technology. For most people, policy and technology is something that happens to them—not with them or even for them. The decisions about design and implementation are made by a few, while everybody else feels they must live with those decisions.

Consider how the writer Meghan O’Gieblyn (2016) describes the technological process: “For most consumers—who learn about new technologies only when they brighten the windows of an Apple store or after they’ve already gone viral—it’s easy to imagine that technological progress is indeed dictated by a kind of divine logic; that machines are dropped into our lives on their own accord.” When considered in these terms, it’s apparent that the political and technical process is far from transparent.

Policy and technology often function like a black box that obscures the inner works and keeps people from understanding, let alone influencing or changing, how things are done, for what reasons, and in whose interests.

Different aspects of this theme arose throughout many interviews, particularly those dealing with access and inclusion in city services. This lack of trust and transparency is most apparent in groups that have long histories of being excluded and marginalized. Examples from the interviews include indigenous people whose traditions and knowledges are not represented in decision-making processes, or older populations who are isolated from and ignored by the rest of society.

We can also see versions of this same general distrust echoed in the broader community. Such as when participants in the ethnographic research expressed strong dissatisfaction at signage about surveillance and sensing, which assumed their consent without even accounting for everybody’s ability to notice or understand the signs. Or, similarly when participants worried about the park bench sensors: Why does the city want to know when I sit down? Is the data going to be used to harass and punish rough sleepers? Here participants were trying to voice concern for homeless people, another group discussed in the interviews, who rightfully have deep distrust toward authorities: Why do you want my name and information on a list? Will it just be used for social services, or will the police get their hands on it too?

At their core, even more fringe concerns around 5G and health, for example, boil down to a lack of trust and transparency toward the system—the government, the telcos, the illuminati. Again, whether actual or perceived, their relationship with those in power is dysfunctional, their agency in techno-political processes is non-existent.
Rather than earn trust and establish transparency, these types of interactions actively impede the implementation of systems that are meant to make the city smarter and, most importantly, are meant to serve the needs of Melburnians.

Recommendation: Earn Trust, Empower Communities

The public values relationships built on mutual trust and respect.

In an interview with a leading open technology advocate involved in the community side of the Sidewalk Labs project in Toronto, Bianca Wylie emphasised an important point that is often overlooked in smart city projects: People recognise when public engagement takes the form of public relations. The focus is put on selling solutions and visions, rather than building relationships and empowering the agency of local communities, especially those who have been traditionally excluded and marginalized. This means explaining not just what will happen, but how, why, and for/with whom. For instance, signs about urban sensing might take inspiration from the types of informative and interactive signs in museums or the botanical gardens, which are meant to engage, educate, and empower audiences.
Next Steps

The City of Melbourne will consider the recommendations made within this report. The findings thus far have informed activity for planned council-endorsed activity across the 2020-2021 financial year, with a renewed focus on increasing transparency, trust and centering citizen voices in planned testbed activity.

One example of this application is the Reimagining the City Challenge, held in March 2021 which invited eligible entrants to submit pitches on how they could use technology and data to reinvigorate the city with a focus on delivering tangible community benefit. Informed by participation in this research, City of Melbourne added two new judging criteria to the Expression of Interest process. These were:

- Trust and Transparency - this focussed on the technology and data as well as the end-to-end pilot process (including decision-making).
- Universal Access - this focussed on a demonstrated consideration of users’ ability, location, education, finances, languages spoken, gender, sexuality, religion and age.

The City of Melbourne is also developing a governance framework for digital urban infrastructure that will embed guidelines on transparency and accessibility as well as on public engagement, data privacy and security. This governance framework will reflect findings from this research.

Internally, the Emerging Technology testbed is intended to continue to operate in an agile way piloting with domain experts from problem statements through to operations. These pilots will not be "tech for tech’s sake" but rather targeted opportunities to ensure the City is moving forward on its smart urbanism ambitions whilst also delivering operational efficiency improvements and, in parallel lifting the digital maturity of the organisation.

Figure G: Image credit: City of Melbourne, Source: https://participate.melbourne.vic.gov.au/emerging-tech-testbed/pitch-event
Conclusion

Emerging technologies have the potential to enhance the future city for all stakeholders. Our research took the novel step of bringing together these stakeholder contexts by analysing existing applications of smart city technologies elsewhere, the views of stakeholders within the City of Melbourne and the experiences of people who live and work in the city.

Our findings highlighted the possibility of bringing together the need to ensure management and operational efficiencies with the desires of people who live and work in the city to engage with city data in the same ways they engage with the character of the city - that is, ways that are curious, meaningful and playful. The research also suggested that the City of Melbourne’s unique commitment to smart urbanism built on mutual trust and transparency between its diverse stakeholders might be nurtured by ensuring that people are reassured, informed and can participate in decisions regarding how, when and by whom their data will be used.

The City of Melbourne intends to take advice on the recommendations made in this report paying particular attention to transparency, trust-building and citizen participation in its future testbed activities. Monash University’s Emerging Technology Research Lab will continue to collaborate with the City of Melbourne and expand its expertise in the possible futures of technology enabled cities.