

Smart cities

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www.afr.com | Tuesday 26 May 2020

Planning must meet community need

Transformation strategy

Mark Eggleton

With the United Nations predicting nearly 70 per cent of the world's population to be living in cities by 2050, governments and urban planners face some monstrous challenges to create the smart, sustainable cities of the future.

Getting the smart city concept right is going to require a lot of forward thinking. We've been building smart cities that reflect their time for millennia whether it be ancient Rome with its aqueducts and road system to the smart planning of Walter Burley Griffin's Canberra design.

The goal is to create smart cities that are contextualised for their era and to do that we've always used the data and technology available to us at the time.

New South Wales Minister for Customer Service Victor Dominello says a smart city is where citizens can go about their "day-to-day business using data-driven solutions and technology to take time pain points away from their day".

"It's about getting from point A to point B with a minimal amount of fuss. Every time you use data to take a point of friction out, you're allocating more time for your brain to be more creative and to do more productive things you want to do," Dominello says.

Chief data scientist for NSW and industry professor at UTS Ian Opperman says the COVID-19 pandemic has given us an insight into what a smarter city might look like and it's not all about technology. The virus has changed our group behaviours.

"If smart cities are about being able to deliver services to people and optimise service delivery, some of our group behaviours are the real blockers of progress. It's really hard to have a smart city when you've got people behaving exactly the same way they've always behaved."

Opperman says by all going to work at the same time in a physical location, dropping the kids off at school at the same time and picking them up again we're preventing any big leaps being made in terms of smart cities.



Cities endowed with great natural beauty such as Sydney will become smarter when planning is matched by behavioural changes.

"What we've seen with COVID-19 is those group behaviours changing."

We've discovered many of us can turn up to work at exactly the same time every day and log on without having travelled great distances and spent resources doing so. Our digital infrastructure has basically held up, although it could be better, and according to Opperman, "we're not moving atoms, we're moving bits and that's an incredibly more efficient process".

And by taking away that need for a vast number of people to be physically somewhere, Opperman says we can concentrate on optimising the industries which need a physical presence such as construction, maintenance and other services.

According to Opperman, using data to create a digital twin (see separate

story in this section) that can be used for planning and every city operation allows us to predict and optimise everything.

"You can do scenario planning in a digital environment which hopefully can be adapted to the physical world depending on how adaptable the real-world infrastructure or service actually is."

For example, garbage collection is a service challenge for every city and if digital twinning allows for solid scenario planning, we can optimise how they operate. You could turn lanes on and off on a smart bridge and map those changes before applying them to the physical world.

By modelling efficient ways to operate all the services together you can "create a high maturity smart city",

Opperman says. The key is ensuring we have strong communications infrastructure. Unfortunately, the infrastructure we currently have is still not at the level that we might've hoped it would have been, although Opperman states 5G technology will make a big difference as it rolls out and more devices are connected.

Yet while data is touted as the energy that drives the smart city of the future, the chief executive officer and founder of Unleash Live, Hanno Blankenstein, warns we're in danger of collecting too much that is fairly useless.

"There are a lot of smart city consultants out there making plenty of money talking up data but are we seeing the positive impact?" Blankenstein asks.

He suggests governments have the capacity to be smarter by "breeding

confidence, happiness and trust but we've seen with Covid when something happens they resort to the old sledgehammer approach which is what happened at Sydney's Bondi Beach in March and April," he says.

Blankenstein's company collects and brings together data through connected devices to provide insights into what's happening on the ground in real time and they currently have contracts in a number of countries around the world including state governments in the United States and India.

He says there is a treasure trove of consultant data telling governments they have a problem but most of their data is historical, which isn't of great help as events happen live.

"We need to better collaborate on

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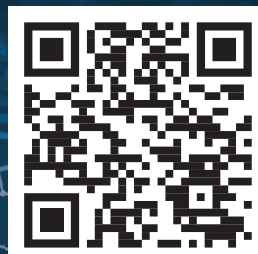


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Easier transport is within reach

Mobility

Ian Grayson

Of all the potential benefits offered by smart cities, one of the most enticing is greatly improved transportation networks.

According to research conducted by KPMG and social enterprise organisation Public Sector Network, smart mobility is one of the top priorities for centres undertaking smart city projects.

Of the cities surveyed, more than half (51 per cent) nominated mobility-as-a-service and congestion management as the key objectives for their programs.

Managing director of online automotive marketplace Carsales Australia, Ajay Bhatia, says workplace changes ushered in by the COVID-19 virus are further hastening the need for a smart-city approach to transportation.

Bhatia says research conducted by his firm has found people's preference for using their own car has increased in the past two months because of infection fears around using public transport. "Our research found that, of those people who don't own a car, more than half are now considering buying one," he says.

As more people return to their workplaces in coming weeks, a new fondness for cars could lead to an increase in traffic congestion and extended commute times.

This could occur despite previous campaigns mounted by authorities to encourage people to consider public transport alternatives.

"Now, more than ever, we need to manage traffic congestion and in a smart city you can do that," says Bhatia.

"We can use sensor networks and Internet of Things (IoT) devices to understand when and where peaks occur, where accidents occur, and where people tend to speed. When you understand these factors, you can manage traffic flows much better."

City of Melbourne chief digital officer, Michelle Fitzgerald, says creating an efficient transportation infrastructure within a smart city requires the connection of a range of elements from vehicles and traffic lights, to trams, buses, cyclists, and pedestrians. This, in turn, allows all road users to connect with each other, thereby making the overall system more efficient.

"The City of Melbourne's Transport Strategy 2030 commits to trial and support new technologies and service models to manage demand for road space to move more people in less space," she says.



Melbourne's strategy to becoming a smart city is similar to that of many global cities. PHOTO: AAP

Innovations within the strategy include smarter traffic signals, dynamic lighting solutions, and improved safety for pedestrians.

Fitzgerald says the city has already installed thousands of sensors in footpaths across the central business district.

This generates a data feed of pedestrian volumes that can be compared with similar time periods in previous weeks or months.

"We can see the impact of various factors such as major events or extreme weather conditions on pedestrian activity and compare the flow to short and long-term averages," she says.

Melbourne city has also deployed more than 4300 in-ground sensors under street-based car parking bays. These detect vehicle movements in and out of the bays and the length of time each is occupied.

Data is used by parking officers to ensure compliance with restrictions and is also made publicly available to promote creativity.

"There are now a range of free apps available which track Melbourne's on-street carparks, making it easier than ever to find a carpark," says Fitzgerald.

Melbourne's smart-city approach to transportation is similar to that being taken by other cities around the world.

Many are using data collected via

sensor networks to ensure different types of transportation run more efficiently by enabling tighter integration of services.

One example is the Finnish capital of Helsinki.

The city has invested heavily on building an integrated transportation network that has reduced traffic congestion and improved the quality of life for residents.

Helsinki-based transport planner Ian Sacs says creating multi-modal transportation infrastructures is an important step towards creating a truly smart city.

"A smart city is one that offers the community a menu of transportation choices," he says.

"The broader that menu, the more options people have. The more options they have, the more trips are distributed across different transportation types. It then ends up being a more robust and resilient city which adds up to being smart."

Sacs says Helsinki has succeeded in keeping walking and bicycling as a significant part of its transportation mix.

Sacs says he is encouraged by the rising number of smart city transportation projects being undertaken around the world.

"You've got to get the basics right first. If you design the basic infrastruc-

ture correctly, it should be easy for cities to accommodate new technologies as they come along in the future."

A big part of the transport story is ensuring we decarbonise our cities by decentralising energy storage.

According to AGL's general manager future business Ayala Domani, decentralisation involves home-owners, businesses or small communities operating electricity generation such as solar panels or storage assets like batteries for their own use.

"Essentially energy is generated where it is needed," Ayala says.

"These 'distributed assets' help increase the resilience of the grid, better manage supply and demand, and decarbonise the energy sector which includes transport.

"As we decarbonise AGL anticipates the uptake of electric vehicles will be much stronger than what we've seen with the uptake of home batteries. There will be a broader range of EV models, concerns over how far you can drive will be far less prevalent due to fast charging infrastructure, and prices will fall to the same as an internal combustion engine," Ayala says.

"In this scenario, by 2030 more than half of all new sales will be electric vehicles, which is 2.6 million vehicles and 15 per cent of the customer passenger fleet," she concludes.

From previous page Meet the needs of the community

data to maximise our potential. For example, does smart city data provide information as to whether it's safe to get on a bus? We need much more analysis and software to really understand the connections in a city so we can create smart solutions," Blankenstein says.

His caution around relying on data wholly for smart city solutions is reflected in Gartner statistics, which indicate 30 per cent of smart city projects will be discontinued by 2023.

There are three main reasons for this, including the fact that technology just isn't up to it, privacy issues and more pertinently, a lot of the projects just won't deliver great value. The challenge with many smart city solutions and why they are discontinued is they are hard to implement and scale up.

Opperman says people can come up with a proof of concept relatively inexpensively but when it comes to doing the mainstream work of embedding the technology into new systems and business practices – it's hard.

"With proof of concept, the least number of stakeholders with the smallest amount of effort and least number of dollars gets you something. Scaling that up means a lot more stakeholders to convince, and a lot more dollars to throw at it.

"It means a lot of people don't know where to start and it's why so many people who want to do something with smart cities end up with a smart light. It's achievable and often expensive but it means people can point to it and say, 'we've started'."

Opperman is working with Standards Australia, governments and industry to help people understand what it is to be smart.

"It's about assisting people understand how they think about a smart city and where they currently sit in terms of relative maturity. How their infrastructure is interconnected and what they need to consider and prioritise to become smarter."



Chief Data Scientist for NSW Ian Opperman says the pandemic has given us an insight into what a smarter city might look like.

Technology's main purpose is to improve liveability

Sustainability

Ian Grayson

While attention tends to focus on the hardware and software components that make a city smart, experts point out that the ultimate goal of projects should be improved liveability and sustainability standards for citizens.

City of Melbourne chief digital officer Michelle Fitzgerald says her city looks beyond the technologies being deployed and focuses on how they will benefit people.

"We're not in the business of rolling-out technology's latest 'bells and whistles' for the sake of it," she says.

"Instead, in Melbourne we're working with the community to design, develop and test the best ways for people to live, work and play. Our approach to new technologies is that it must demonstrably enhance the lived experience of our people."



City of Melbourne chief digital officer Michelle Fitzgerald says her city looks beyond the technologies.

She points to the city's open data platform that comprises more than 200 datasets. This information is shared with businesses and the broader community with the objective of it being used to create new innovations and adapt to changing conditions.

"The City of Melbourne is also proactively working with business and industry leaders across Australia to identify opportunities and challenges in harnessing the potential of new networking technologies including 5G and the Internet of Things," she says.

European-based transport planner and smart city expert Ian Sacs says having an open data approach is critical to ensuring smart cities can be sustainable and offer an improved quality of life.

"It's really important that data is open and multiple third parties can have access to it," he says.

"There is an open data platform in Finland, supported at both a national and city level, and there are many individual developers creating apps and services based on that data."

Sacs points to one project where the sharing of air quality data from monitors across Helsinki has led to useful services for residents.

Private-sector software developers

have created mobile phone apps that display the quality of air at a very local level in real time.

"The key is to focus on getting the best bang for buck when it comes to investing in smart city infrastructure," he says.

"It's a matter of the city (council) building the base infrastructure and then leaving the rest up to the private sector to make the most of it."

Fitzgerald says her council is aiming to use smart city tools and services to improve the liveability of the CBD and ensure the physical environment is as sustainable as possible.

"For instance, we use multiple sensors which have been deployed across the City of Melbourne's parks and waterways to measure a spectrum of environmental factors," she says.

"In most large parks in Melbourne, the soil moisture and water quality are measured and analysed to determine the watering required.

"This means we water only as needed and achieve a more sustainable outcome."

Fitzgerald says the council has taken further sustainability steps such as installing some 3700 solar LED light poles.

Each communicates via a smart meter network that monitors the performance of each light.

"Visitors can also observe our solar smart garbage bins, designed to hold and handle more trash and help improve our city-wide rubbish collection system.

"Smart bins can hold more waste by sensing when the bin is filling and using a gentle compaction system to store more waste.

"Each bin also contains a solar-powered sensor that alerts our contractors when it needs to be emptied. This means we have fewer waste trucks on our roads, cutting both carbon emissions and easing congestion."

Data-driven decisions enter the next stage

Science of modelling

Mark Eggleton

If nothing else, COVID-19 has given many Australians a preview of a future where we are driven by data-driven decision-making.

One of the first things everybody has come to understand about the pandemic is the idea of “the curve” and the need to flatten it.

It’s a global data interface and it has become ubiquitous for everyone around the world.

Governments are using a range of data to control and map the virus ranging from documenting where people have been to modelling disease scenarios to contact tracing by electronically retracing the steps of those who have been infected and who they’ve been in contact with.

The Economist magazine calls it the “coronopticon”, derived from English social philosopher Jeremy Bentham’s idea of a panopticon prison where the design supposedly allows for all prisoners to be seen by one “all-seeing guard”.

Interestingly, this increased use of data and surveillance is being accepted by the wider community at present because their willingness to do so is being tilted by the pandemic.

What this health crisis presents is an opportunity or an inflection point for

how governments use data and how we also create more connected and smarter cities.

NSW chief data scientist Ian Opperman says the community’s threshold for this enhanced use of data may change in the opposite direction once the worst is over so now is the time to get it right.

“We need to be saying that even in a crisis, even a pandemic, we will spend time building trust, ensuring privacy, being transparent, behaving ethically, and being demonstrable about it,” Opperman says.

New South Wales Minister for Customer Service Victor Dominello says “the best way to bring the public along is through results”.

“We realise now that we cannot solve complex problems such as a pandemic with voodoo. Data must be at the centre of decision-making.

“You can only beat it with science and leading countries around the world have used technology and data to wrestle the curve down,” Dominello says.

Dominello believes COVID-19 has seen us “cross the Rubicon” in terms of health and when it comes to technologies such as e-health and telehealth, we’ve been given a glimpse into the future earlier than expected.

GHD Digital’s leader of federal government, Yohan Ramasundara, says



GHD Digital’s leader of federal government, Yohan Ramasundara, says the pandemic has given us a glimpse of the future of health services.

the pandemic has inspired a lot of thinking on what health services will look like in smart cities of the future.

“It has really shaped our thinking in terms of streamlining health services. We’re getting a better understanding of telemedicine and making healthcare a

more seamless experience in a smarter city,” Ramasundara says.

“For example, can we use telemedicine to start off the healthcare process. People could just use their smartphone to reach out for an initial assessment and if there is greater data sharing. Peo-

ple wouldn’t have to give the same information up all the time.”

Beyond greater sharing of data between healthcare services, smarter cities can help with emergency response times as well.

When every second counts, ensuring first responders can get there quickly is of paramount importance.

Ramasundara says smart systems can optimise the route of the emergency vehicles and even clear the path along the way in terms of traffic signals and smart cameras working together to give emergency vehicles the right of way.

In the United States, some states are experimenting with the idea of proactive emergency responses rather than reactive responses where essential services examine data of potential accident hotspots for example and are better prepared for accidents.

In other parts of the world, researchers are looking at temperature variations in cities and how they can prioritise public health interventions especially in hotter areas.

These might include opening up more green space or better environmental monitoring around air quality, for example.

Dominello believes the first wave of change will mostly revolve around customer experience and more personalised health.

“We’re already seeing that through the uptake of wearable devices. Eventually we may see implantable devices if people want to go down that path and see it as the best way to optimise their health. Ultimately though, everything comes back to data. Like the human body, it comes back to DNA. Everything is a data piece in the 21st century.”

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'Big brother' concerns can be addressed

Managing risk

Ian Grayson

Large-scale networks of sensors and video cameras are important components of smart-city infrastructure, but the data they generate raises questions when it comes to the privacy of citizens.

Sensors can detect anything from air quality and temperatures to noise levels and traffic flow rates.

Cameras can monitor pedestrian and vehicle movements as well as identifying individuals through facial recognition software.

Data is collected through wired or wireless networks and sent to data centres for storage and analysis.

It can be used by authorities and other parties to adjust traffic signals to ease congestion, monitor crowds, and better schedule public transport links.

Collected data can also be made available to other parties who can add further value.

For example, a ride-share company could use the cameras to plot the most efficient route for cars as they traverse a city centre.

Town planners could use sensors in footpaths to monitor foot traffic levels and determine the most appropriate locations for new developments.

However, some people have raised concerns that such initiatives are detrimental to privacy.

They argue that "big brother" style monitoring networks strip away anonymity and are an attack on personal liberties.

Last year Australia's northernmost capital captured attention when the local council installed a network of video cameras and sensors throughout the central business district.

The sensors track traffic and pedestrian movements as well as measure air quality, temperature, and noise levels.

According to City of Darwin Council, the project represents the largest rollout of smart technologies anywhere in Australia.

Acknowledging that personal privacy is an issue within the community, City of Darwin chief executive Scott Waters says his organisation is establishing a framework to guide the man-



Darwin is establishing a framework of advanced systems to manage any concerns around data collection from the city's networks of sensors.

agement of data gathered by the new infrastructure.

"The privacy framework City of Darwin implements will not only comply with all applicable federal and territory laws, we also aim to achieve global best practice regarding privacy and the use of surveillance devices," he says.

Privacy within smart cities also becomes an issue when the collected data is shared with private-sector organisations.

Many are keen to build services on top of the data which can then be monetised.

Transportation planner and smart cities expert Ian Sacs says concerns about personal privacy are quite understandable, but it is important for authorities to adopt an "open data" policy to allow smart city initiatives to flourish.

Sacs points to the European Union's General Data Protection Regulation (GDPR) legislation that was implemented in 2018 as an example of regulations that can provide adequate protection for individuals.

He does acknowledge, however, that there are still issues to be overcome.

Sacs says a bigger challenge now is the desire of private-sector organisations to hold onto their data.

"There might be an e-scooter company or a ride hailing company that doesn't like to share their data with the public for commercial reasons.

"This is why (operating) licences and permits are important as they must include specifics about what data has to be shared publicly."

As smart city infrastructures are deployed in growing numbers of urban areas around the world, privacy will continue to be an issue that authorities

will be increasingly forced to address.

With the volumes of data being generated and analysed growing quickly, ensuring citizens maintain expected levels of privacy will be an ongoing challenge.

"It is still very early days when it comes to the issues around data sharing in a smart city," says Sacs. "GDPR has certainly taken a very progressive step forward and improved lots of things, but we all know that data still leaks and there are new aspects that haven't been anticipated. We still have a way to go."

NSW taking the lead in digital twinning

Simulation

Mark Eggleton

New South Wales is well-positioned to become a global leader in digital twin technology through the state government's Spatial Twin initiative based in Bathurst.

According to LendLease's chief product officer Daryl Patterson, Australia is leading the way in the development of digital twin technology.

He says LendLease works all around the world with a lot of sophisticated governments and "I have not seen any that are approaching what New South Wales is doing here".

"There's a great deal of talk (on digital twins) in the UK, and there's not this level of sophistication and the United States is kind of nowhere in this conversation," Patterson says.

As to what digital twinning involves, it basically revolves around creating hyper-realistic computer models of complex objects that are capable of simulating their real world function at such a high level of detail that it could function as a real-world scenario for

the purposes of planning and modelling. Put bluntly, it is about the technology of making a digital copy.

It's actually a pretty old concept with a number of industries such as the property sector, aviation and automotive sectors utilising the technology for decades but applying it to the urban environment is still relatively new.

For LendLease, which has been utilising the technology for some time, its implementation will decrease the cost of construction by up to 20 per cent relative to today's processes as well as increase speed to market by up to 100 times.

NSW Minister for Customer Service Victor Dominello says LendLease's numbers are an extraordinary game changer at a time when governments are trying hard to squeeze 3 to 4 per cent in efficiencies out of projects yet "by using a smart city digital twin you can get up to 20 per cent."

Patterson says the attractions of the technology are pretty obvious on one level in terms of simulating the physics and geometry of the built environment but the second part is important as it is about process.



NSW Minister for Customer Service Victor Dominello says the government has the foundations of modelling right. PHOTO: JEREMY PIPER

The ability to capture information around objects in a real-world environment and create a digital copy means you can see how things perform and simulate what happens when you change that environment.

"What the NSW Government is doing is not quite a full digital twin but it's the foundations for it.

"They've taken all of the data the state has relating to property and they started to bring it into one place.

"What we now have is a very accessible, truthful source of information that they've put a huge amount of effort into getting accurate," Patterson says.

With this huge amount of data, developers and urban planners can simulate the future impacts of development before the first shovel goes into the ground.

Things like traffic movement and how people interact with the built environment can be modelled intricately and digitally.

"What the state government has done is brought everything together and they've said, 'we'll keep putting stuff on top of it', so now you can see the buses moving in real time through it and they've got every tree actually modelled on it.

"It means we can make decisions with this really holistic data sitting there – it's pretty mind-blowing."

What makes it even more exciting for Patterson is digital twinning really offers the scope for more community involvement in how we create the smart cities of the future.

"People will be able to see not only the drawings but the whole concept," he says.

"The cause and effect consequences of all of the different decisions around placemaking could be better explained so all stakeholders can digest it."

The upshot is that we will all have the ability to make the smart cities of the future more human.