

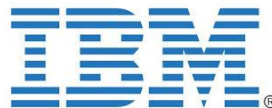
# *Internet of Everything – Powering the Smart Campus & the Smart City*

## *Geelong’s Transformation to a Smart City*

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*In partnership with:*



*The report draws heavily on the Smart Cities Round Table held at Deakin University in  
2015*

## Context

As industries are being disrupted by new technologies and business models, so too are regions and cities. Globalisation has caused a radical redistribution of wealth and redefined the workforce of the future. These shifts have been fuelled, in large part, by the Internet which has created opportunities for challengers to enter and disrupt new markets and supply chains.

The mass connectivity enabled by the Internet has helped reduce barriers to entry for firms and institutions to connect with 'buyers' or 'users' (i.e. citizens in the case of governments and students in the case of universities). The Internet's impact has been particularly acute as an engagement platform – i.e. its ability to connect people and businesses. And while the full benefits of the Internet are yet to be harnessed, it is clear that the notion of mass connectivity has already moved from 'human scale' to 'machine scale'. The next wave of innovation will be propelled by the ability of humans to connect to machines, or for machines to connect with other machines. The Internet of Things describes the mass connectivity of machines (or things), and this has been augmented by the notion of the Internet of Everything (where things, systems, processes and people combine to create value). While we have barely scratched the surface of what's possible with the IoE, what has become evident is that value will not be derived from the connection of the 'things' but from the data that is created as things and people connect. Cisco's estimate is that the economic value of the Internet of Everything in Australia is over \$65B in new jobs, productivity and value creation.

All phases of the Internet's growth, including the Internet of Everything, have been greeted by a mixture of some enthusiasm tempered by considerable skepticism, even hostility especially from incumbent businesses and institutions whose power and influence has been threatened. But each time, the predictions of disruption and transformation, mostly (but not always) for the good, have transpired. It has been a good example of Arthur Schopenhauer's famous dictum that "all truth passes through three stages. First, it is ridiculed. Second, it is violently opposed. Third, it is accepted as being self-evident."

The Smart Cities Round Table was convened to dissect the myriad possibilities posed by the Internet of Everything for regions and cities. Smart cities are critical to the digital economy and for the nation's capacity to compete globally. The relationship between smart cities and connected universities is increasingly important to drive growth, sustainability and inclusion for stronger and more resilient urban and regional economies. The round table combined perspectives of a range of major stakeholders in the development and transformation of cities and campuses, including:

- Planners and administrators (most notably local government);
- Universities (as the intellectual – and increasingly economic anchor of cities and with the campus as a hub);
- Industry as likely collaborators and sources of economic growth.

## What is a Smart City – and a Smart Campus?

On the surface a smart city can be described as one that 'knows, is instrumented and is connected'. However, the round table discussion concluded that a genuinely smart city needs to be much more than that. Instrumentation – or the capacity to connect 'things' – is merely a first step. A smart city is one that exploits hyper-connectivity to meet real challenges, including:

- Mitigating the effects of rapid urbanisation, including pressure on infrastructure and quality of life, environmental sustainability and economic challenges;
- Meeting the demands of citizens and other community members, including their desires for greater choice, increased safety and social and economic opportunity.

A Smart Campus is a community within a community and – increasingly – the hub of a Smart City. The interdisciplinary nature of the Smart City relies on technical and non-technical skills and universities are well positioned to develop a workforce in every capacity that underpins all of the disciplines required in this ecosystem. The broad range of services delivered at a city level is also delivered on a university campus. An instrumented Smart Campus uses the data and insight that becomes available through technology to improve the lives of its student body, community partners and workforce.

Smart Campus as well as being a hub, is also a powerful anchor. At the heart of cities – particularly regional ones such as Geelong – the Smart Campus is a powerful source of momentum and innovation. Geelong has great opportunities available through the Deakin University educational infrastructure to succeed in the knowledge economy. A Smart Campus can therefore be a catalyst for a smarter city, as well as a city in its own right.

## Considerations in planning and implementation of a Smart City

There is a range of actors in the Smart City and Smart Campus agenda. It is a mistake to think that any one (or even two) parties can realise a comprehensive Smart City vision. These actors – and their role –broadly include:

### ***City Planners and Administrators***

The City / Municipality represents the logical architect and force for renewal and change. City planners tend to be accountable – or at least partly accountable - for a range of services that have the potential to be 'smart': transport, utilities, sports and entertainment, retail, public space and commerce. The City of Greater Geelong and Adelaide City Council, who both presented at the round table, described the role they played in identifying the 'problems that need to be solved' as well as the process used in trying to mobilise different parties. There is no template for a Smart City, and any response needs to be context specific. The imperatives for Geelong, as an example, relate to revitalisation of the central business and shopping district and associated challenges around public safety. For Adelaide City Council the driver is an economic one, with a focus on using 'smarts' to increase opportunities for local traders and businesses. Municipalities wanting to become smart cities can access a range of tools:

- Predictive analytics to identify issues, problems and early response;

- Instrumentation of `dark assets` (objects that are not connected/networked) used in the delivery of essential services to citizens and businesses (e.g. waste collection, lighting, transport, energy and water management);
- Platforms for more sophisticated engagement with citizens and traders (e.g. real time feeds to connect buyers with sellers and activate parts of the city that are dormant);
- Monitoring and surveillance to provide a safe and secure city.

### **Universities**

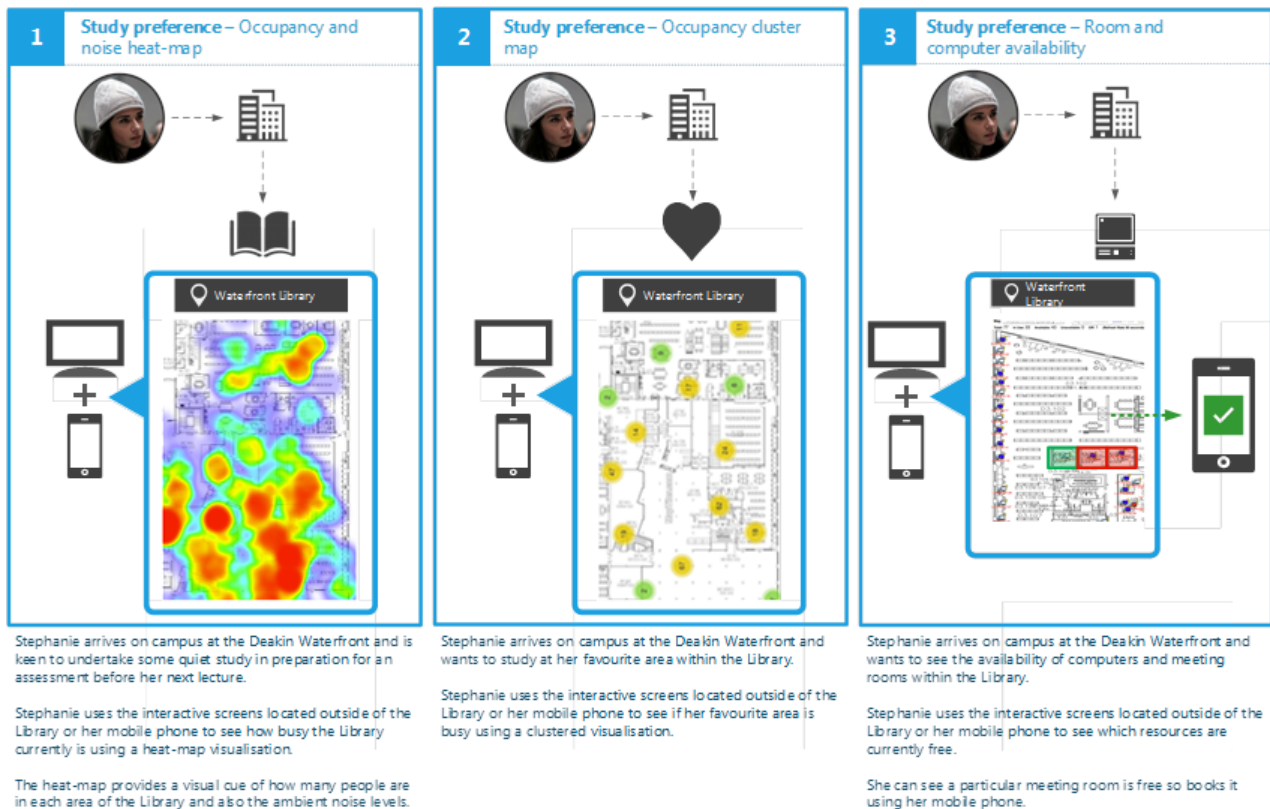
Deakin University is an example of a university that is committed to working at the digital frontier, applying new technology and wisdom to all aspects of its operations (teaching and learning, research and administration). Deakin's position as a regional university – and the need to service students that were geographically dispersed - created the initial impetus for its digital focus.

However, in 2015 it is clear that Deakin's digital agenda has a much bigger prize than the university's own success: Deakin has the potential to leverage its Smart Campus for the betterment of the broader community and city.

Deakin Vice-Chancellor, Professor Jane den Hollander, identifies Deakin's digital infrastructure and orientation as a significant competitive advantage. It is a major driver of engagement, attainment and achievement and crucial to the delivery of a contemporary and rich on campus experience. Deakin's Chief Digital Officer William Confalonieri described three broad motivations for Deakin's Smart Campus initiatives by applying the "three brains" framework:

1. Industrial Brain Dimension: the industrial brain was used to describe the broad set of imperatives around improving costs and productivity. The `low hanging fruit` for a university pursuing a Smart Campus approach is often the potential cost savings associated with deployment of smart lighting, smart waste management and smart systems and processes (e.g. scheduling) and building optimisation.
2. Customer-Centric Brain Dimension: The second broad set of a Smart Campus opportunities relate to technology's capacity to drive a better experience and outcome for students. The use of predictive analytics in learning, as an example, is creating opportunities to better understand how students learn and respond to different interventions. Many of the technologies deployed by Deakin in its Smart Library are driven by the Customer-Centric Brain orientation.

Figure 1: Heat Mapping Technology in the Deakin Smart Library: Depiction of Three Use Cases of Smart Campus Technology



3. Meta Brain Dimension: Confalonieri's thesis was that there is another set of potential Smart Campus benefits that are impossible to define, but potentially even more significant than the advantages arising from the first two categories. The notion that creating a Smart Campus or city will unlock a 'meta brain' – that is hyper-connectivity of 'things' and people will create possibilities that we cannot imagine. This creates an emerging capacity for people, knowledge and practice to be connected into new ways of knowing and acting at a global scale that draw on the kinds of shared insight and experience that can only be delivered by making it easier for people and organisations to share ideas, information and insights. In much the same way as we could never have imagined social media when the Internet was invented, there are 'killer applications' of IoE that are invisible today.

As noted, universities (particularly in regional centres) anchor a city. Deakin's Smart Campus therefore should not necessarily be seen as a microcosm of the city within which it is located, but an accelerant for the city's aspiration to be smart.

*"Behind every smart city is a smart university": – Dr Simon Eassom, IBM*

### **Community**

Citizen engagement and enablement is critical to achieving a Smart City mindset and vision. The Internet has already created engagement platforms that enable citizens to become more involved – and more influential – in decision-making and implementation decisions at a city level. So what does a Smart City look like from a citizen's perspective, and what is their role?

Adopting Confalonieri's Customer-Centric Brain approach, a Smart City (and Smart Campus) should be more attuned to the needs of citizens and more capable of meeting them. The use of sensors, big data and analytics is creating myriad possibilities to improve the design and delivery of services. A true Smart City does not simply push services to citizens. Rather, it catalyses the energy from the community to shape the vision and execution. This recognises that innovation is led by citizens, not institutions.

### **Industry**

The presence of a vibrant commercial sector is critical to the sustainability of regions. Industry plays a role as an economic driver and major employer, but also a source of energy and innovation. Industry partnerships – at many levels - are crucial to unlocking the potential of IoE and creating Smart Cities. Multinationals such as Cisco and IBM have a role to play in bringing global experience to bear in the 'architecting' and implementation of a Smart City vision. Despite this, no single vendor can expect to provide the capability and knowledge necessary to create a Smart City. A range of potential players – including industry beacons and financiers in the local economy – need to be mobilised to generate momentum. Another powerful industry force is start-ups and entrepreneurs. These institutions operate at the dynamic edge of local economies, creating new value, innovation and economic wealth and acting as a powerful force for renewal. A Smart City without a vibrant start-up ecosystem is not sustainable.

### **What it takes to implement and succeed**

Five success factors were identified for those wanting to pursue a Smart City agenda:

1. **Strong and sustained leadership:** Smart Cities are underpinned by a clear and compelling vision and a relentless commitment to achieving it.
2. **A robust architectural design and plan:** while there is merit in simply getting started and experimenting, there is no substitute for a vision and a plan. This is particularly important from a technology perspective where the high level architecture provides clarity around a raft of potential decisions. Without a robust architecture there is a risk that issues such as security and interoperability need to be addressed on a project-by-project basis, which is both inefficient and potentially risky.
3. **A collaborative approach:** Smart Cities are, by definition, cross functional. A Smart City or Smart Campus is invariably the product of multiple parties (planners, university, industry and the community) and multiple inputs (technology, human and systems). The role of universities as educators, researchers and community partners is also critical. Creating a Smart City is closely aligned to the Australian Government's nine science and research<sup>1</sup> and innovation agenda. Finding effective mechanisms to facilitate collaboration remains a challenge that must be overcome.
4. **Underpinning infrastructure:** Smart Cities are built on a robust infrastructure. At the core of this infrastructure is a robust, secure and scalable network capable of connecting sensors. Without high standards of connectivity, the vision for a Smart City or Smart Campus cannot be realised. Beyond network, a robust systems infrastructure is also critical to ensure that data can be transformed into insights, decisions and activity.

*"To adopt smart campus you need the network infrastructure first or you won't be able to go far"* – William Confalonieri

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<sup>1</sup> [http://www.science.gov.au/scienceGov/ScienceAndResearchPriorities/Documents/15-49912%20Fact%20sheet%20for%20with%20National%20Science%20and%20Research%20Priorities\\_4.pdf](http://www.science.gov.au/scienceGov/ScienceAndResearchPriorities/Documents/15-49912%20Fact%20sheet%20for%20with%20National%20Science%20and%20Research%20Priorities_4.pdf)

5. **A customer centric approach:** the challenge with Smart Cities and Smart Campuses is not identifying what's possible, but what's useful and relevant to the end user. People want to make their own decisions and any 'smart' solution needs to support citizens, students and other stakeholders to that end. Cases absolutely can be used to drive strategy and cases depicted as human 'stories' are particularly powerful. The City of Adelaide's Peter Auhl demonstrated the power of describing a Smart City from a citizen's perspective. Smart infrastructure became user-friendly tools in following a person walking out of a sports stadium after a game, or in relocating an expat to a new city to live and work.

## Conclusions

Like everything, our cities, large and small, are changing. That renewal is economic, social and physical. In building more resilient cities and regions it is critical to exploit the potential of technology, including the opportunities offered by 'machine scale' networking. In terms of exploitation of new technology along with all available resources (such as universities) to embrace renewal, - Australia is behind. Australia's relies too heavily on its natural assets rather than looking to its human capital to create new sources of wealth. The round table was distilled into a number of pertinent conclusions:

- The need to move from possibilities to practice. Getting started with projects is an excellent first step.
- The need to move from consideration of individual pieces (of a Smart Cities agenda) to contemplation of the design of the wider puzzle. Almost a counter to the first conclusion is the need to approach implementation strategically. Getting started is important, but getting started with a clear architecture and design is preferable.
- We have barely started to explore the transformation of institutions and businesses being driven by mass connectivity and the rising power of the Internet of Everything. While there are risks, there are opportunities too for new ways to tackle challenges around employment, skills, social development and sustainability. Human purpose and values need to be at the heart of the endeavor of economic and social change, much of which will play out, and will benefit, the growth of smart and connected cities and their universities.