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Institute for a
Broadband-Enabled Society

Free Wi-Fi and Public Space

The state of Australian public initiatives



August 2013

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Acknowledgements

This research was carried out in the context of the Discovery Project 'Participatory Public Space: A Right to the Networked City' funded by the Australian Research Council (DP120102664 2012-2014). The Chief Investigators on the project are Associate Professor Scott McQuire and Professor Nikos Papastergiadis. The authors would like to acknowledge the support of the Institute for a Broadband-Enabled Society, and the input of Dr. Danny Butt to earlier drafts. The authors would also like to thank those who participated in this research, including City Council representatives, Industry experts, the Melbourne Wireless Community, and members of the public who agreed to be interviewed.

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ISBN 978 0 7340 4837 0

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Executive Summary

This white paper examines the transformation of public spaces through free Wi-Fi services offered by Australian cultural institutions and municipalities.

Australian public institutions have been slower to offer free Wi-Fi services compared to their counterparts in Europe and the United States. Nevertheless, public institutions are beginning to discover a variety of benefits in offering Wi-Fi. These include: enriching community life; enhancing public safety; providing marketing and communications portals; servicing city employees and sensors; and, most prominently, enhancing local economies by attracting more visitors.

This white paper finds that Wi-Fi services can enhance public spaces by adding to their vibrancy and atmosphere. Wi-Fi services also provide a valuable digital resource for different mobile users, including out-of-office workers and travellers. However, Wi-Fi services should not be launched indiscriminately. Poorly thought out services can also support uses that isolate groups of users and prevent cross-group mingling in public space.

Despite the potential benefits, many public institutions are deterred from offering attractive Wi-Fi services due to cost and a lack of 'digital culture' in local government. Institutions are also concerned that next generation mobile broadband services will make Wi-Fi hotspots redundant, a position this report argues against. As online access becomes increasingly integrated into social life, these stances will need to be reconsidered.

This white paper recommends that:

- The benefits of Wi-Fi in public space are better conveyed to public institutions through educational initiatives.
- Public institutions consider the different network and business models available to subsidise the cost of a service. In so doing, institutions should be aware of the positive and negative aspects of privatising public space and spectrum, especially when it comes to control over amenities which service the public good.
- Institutions can learn from successful service models that focus on 'user-centric' service and consider the different positive 'place-attributes' described in this research.
- Institutions explore positive models for providing or seeding services that enable cross-group social interactions.

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Institutions Chosen

Free Wi-Fi has been offered by state governments, such as Hobart's Waterfront Project, transport authorities, such as the City of Sydney's Ferry project, and enterprise hotspots, such as cafés, bars, bookstores, hostels, and airport lounges. This white paper focuses on cultural institutions and municipalities, with particular emphasis on the latter. Cultural institutions such as museums, galleries and State Libraries initially embraced Wi-Fi in order to provide further information about exhibitions, usually in the form of audio tours, and sometimes in the form of Wi-Fi enabled educational games (see the National Museum of Australia). As is explored in section 3, cultural institutions have also found providing excess Wi-Fi bandwidth for general Internet access to be a good way of attracting visitors. Conversely, Australian municipal Wi-Fi projects have been slow to materialise. Both forms of public institutions have a direct role in planning, providing and curating public space. Moreover, both remain under researched in terms of Wi-Fi and public space. For these reasons, municipalities and cultural institutions warrant particular attention as they begin to embrace wireless networks. The following table lists the institutions and spaces that were found to be either providing or planning to provide free Wi-Fi services at the end of 2012.

Institution	Spaces with Wi-Fi
Museums Victoria	Melbourne Museum and surrounding Carlton Gardens
	Science Works
	Immigration Museum
Federation Square	Federation Square
State Library of Victoria	State Library of Victoria

Table 1: Institutions with Wi-Fi

City	Spaces with Wi-Fi	Type of space
Melbourne	The Hub	Community Hub
	Boyd	Community Hub
Darebin	Edwards and Broadway streets	Commercial streets
Geelong	Johnstone Park	Park
	Mallop St. Bus Exchange	Commercial street
Moreland	Harmony Park	Park
Perth	Northbridge Piazza	Park
	Grand Lane	Commercial laneway
	Sterling Gardens	Park
	Forrest Place	Plaza, commercial precinct
	Murray Street Mall	Commercial street
Brisbane	22 Parks	Park
Waverly	Bondi Beach	Beach and Park
Wollongong	Crown Street	Commercial street
Parramatta	Parramatta River	Park

City	Spaces with Wi-Fi	Type of space
Leichhardt	Leichhardt town hall	public building
	Balmain town hall	public building
	Pioneers Memorial Park	Park
	Leichhardt Aquatic Centre	recreational centre
Adelaide	Citylan - multiple sites	business hotspots
Pittwater	Newport	commercial street
	Avalon	commercial street
	Mona vale	commercial street, library, Park

Table 2: Municipalities with Wi-Fi

City	Site where Wi-Fi to be installed	Type of Space
Perth	Expansion of current network	multiple sites planned
Randwick	The Spot	commercial precinct
	High Cross Park	Park
	Coogee or Cloverly Beach	Beach
Adelaide	Multiple site CBD network	multiple sites planned
Liverpool	Bigge Park	Park
Dandenong	Civic and community complex	plaza
	The Drum	theatre
	Dandenong Markets	market place
Darebin	High Street	commercial street
Cairns	Esplanade	commercial street

Table 3: Planned municipal instalation of public Wi-Fi

1 Public Space, Municipalities and Wi-Fi

1.1 Public space and media

Public spaces are integral to the functioning of modern societies. They are places for broad communities to interact, providing a sense of identity and belonging for regular inhabitants. Through forms of commerce, individual expression, social interactions, public art, street performances and local events, they are key sites for the production of culture (Carr, Francis, Rivlin, & Stone, 1992). In busy cities public spaces lubricate urban flows by providing shelter, relaxation and places to socialise (Whyte, 1980). Public spaces are crucial for democracy and social change, affording visible political expression through protest and activism (Mitchell, 2003, Low and Smith 2006). Often public spaces are also the product of inequitable power relations, which they serve to reproduce by enabling forms of social stratification (Tonkiss, 2005). Therefore, socially diverse and respectful public spaces are a virtuous goal (Low, Taplin, & Scheld, 2005).

Following Lefebvre (1991), recent scholarship has emphasised the active 'construction' of public space through social interactions. As people increasingly use ICT networks out of the home, digital media increasingly co-constitutes public spaces (McQuire 2008). People talk in public on mobile phones, send text messages, surf the internet on smart devices, connect on the move through social network services, and signal their public location using locative social applications. Media are also integrated into urban infrastructure through artworks, sensor networks, and surveillance mechanisms such as CCTV cameras. Wired broadband backhaul networks that exist through and around public spaces support much of this wireless communicative activity.

Over the next 10 years the Australian National Broadband Network will be rolled out providing a superfast Internet connection for 93% of the country. Simultaneously telecommunications companies are deploying superfast 4G mobile broadband networks. As these innovations emerge, expectations of fast connectivity will increase. Hence, it is important to look at how institutions which control public spaces are seeking to meet these expectations. This report considers the viability of free localised Wi-Fi as one possible option for enhancing public space in Australia's emerging broadband environment.

1.2 The growth of Wi-Fi

Wi-Fi refers to the family of 801.11 technological standards that allow devices to establish a wireless local area network transmitted via unlicensed 2.4 GHz spectrum. Wi-Fi came to prominence at the turn of the millennium when 801.11 standards were refined and personal computer manufacturers began to market Wi-Fi equipped computers. With the distribution of affordable wireless routers, Wi-Fi quickly became ubiquitous in private homes. Wi-Fi networks also took hold in offices and universities where local area Ethernet networks already existed, while some businesses such as cafés established Wi-Fi hotspots to attract more customers (Economist, 2004). Free Wi-Fi 'hotspots' can now be expected where there are 'intersecting flows' of commerce and people (Mackenzie, 2005).

1.3 Wi-Fi and Mobile Broadband

The development and diffusion of Wi-Fi networks has paralleled that of Mobile Broadband services. These are usually Internet subscriptions for mobile phones, enabled by the convergence 3G cellular networks and smart phone technology. Wi-Fi technologies afford high throughput and fast speeds in a localised area (usually a radius of 100 meters around a wireless access point), while 3G networks make use of cellular handoff technology to enable roaming Internet access at the expense of speed (Lehr & McKnight, 2003). In Australia, emerging 4G networks promise superfast speeds of up to 100 Mbit/s outpacing Wi-Fi hotspots (Luo, Davis & Grant, 2012). However, unlike Wi-Fi, 4G telecommunications providers operate in licensed spectra that carry large costs for providers and end users. This limits the affordable data capacity of 4G subscriptions. The significance of this for public institutions will be discussed in the following section.

1.4 Municipal Wi-Fi

Wi-Fi growth in Australia, especially municipal Wi-Fi, has been far slower than other parts of the world (Goggin, 2007). Municipal Wi-Fi has had notable success in Europe and the US. In Europe municipal services have been empowered by competition and low broadband rates. Conversely, in the US the monopoly power of incumbent telecommunications providers has led to high rates and slow services, causing municipalities to offer a public alternative (Crawford, 2013; Gibbons & Ruth, 2006).

Previous research has explored a variety of potential benefits that may stem from free municipal Wi-Fi. Cities can leverage publicly owned rights of way and assets such as lamp posts and CCTV points to install network infrastructure (see image 1 below), affording strong, localised, publicly controlled internet coverage (Park & Bar, 2005). Wi-Fi can also facilitate the delivery of municipal information and services to residents and visitors (Heer, et al., 2010). It can provide a private communications channel to connect city employees and sensors (Park & Bar, 2005). Importantly, it allows cities to close the digital divide for those outside commercial service zones (Shaffer, 2007; Farkas, Szabó & Horváth, 2009; Evenepoel, et al., 2012). Sections 2 and 3 below explore how these motivations influence public space, and whether this influence is positive.

Despite these benefits, municipal Wi-Fi projects have been perceived as a challenge by the private sector, which argues that cities possess discriminatory market power that will stifle competition (McClure, et al., 2005). These issues can be positioned within broader debates concerning the privatisation of public space. A key policy question is whether private parties can be provided with incentives to uphold the public interest if given ownership or control over public spaces (Loukaitou-Sideris, 1993). It is thus no coincidence that municipal Wi-Fi research has investigated the different private-public partnerships and the roles played by private stakeholders in operating and controlling a network (Farkas, Szabó & Horváth, 2009; Evenepoel, et al., 2012). It remains to be seen which business models and stakeholder partnerships will work best given the Australian telecommunications climate. This white paper maps some of the different choices made by Australian municipalities and suggests that planners be mindful of balancing factors such as cost, ownership and network control. It is also important to note that successful Wi-Fi business models in Australia largely depend on macro-level issues of regulation and competition, including the ongoing debates around the impact of the NBN on Internet costs.



Figure 1: Wi-Fi access point positioned on CCTV camera post in Geelong's Johnstone Park. The access point makes use of existing broadband fibre used for CCTV.

1.5 The influence of Wi-Fi on public space

It is widely recognised that 'good' public spaces should be diverse, vibrant and enable activities that develop rich local cultures (Whyte 1980). How does the integration of mobile media into public spaces influence this goal? Researchers have investigated how mobile phones influence the way people behave in public. Phones strengthen existing interpersonal ties by making them always available (Ling, 2008). However, this can be at the expense of serendipitous encounters with co-present others (Habuchi, 2005). The convergence of social media and smart phones may extend this phenomenon. For example, locative social media such as Facebook Places contextualise public spaces in terms of one's proximity to known others, and may encourage movement toward familiar people and places, limiting serendipitous encounters (Humphreys, 2007). Such encounters are associated with the positive functioning of a well integrated 'public realm' in which the broader community come together and negotiate difference, leading to greater social harmony (Hampton, Livio, & Goulet, 2010). The small amount of research on Wi-Fi and public space confirms some aspects of this concern, finding that Wi-Fi users come to spaces in small tight-knit groups and are less approachable than users of other media (Hampton, Livio, & Goulet, 2010). However, this research also finds that Wi-Fi attracts more people to public spaces, potentially making these places more vibrant (Hampton, Livio, & Goulet, 2010). These findings inform the third part of this paper, which describes an ethnography of various Wi-Fi equipped spaces in Victoria, and seeks to discover how people use Wi-Fi in public places, as well as how the properties of a particular place influence this behaviour.

2 Free public Wi-Fi: Drivers, Models and Attenuating Factors

This section explores how public institutions plan and implement Wi-Fi services. It aims to understand what factors contribute to a successful service that enhances public space. Salient factors include the drivers behind offering Wi-Fi, the network and business models chosen, and the attenuating factors that may undermine a service.

2.1 Drivers for implementing Wi-Fi

Australian public institutions have expressed a range of reasons for providing free Wi-Fi in public spaces. These goals will influence public spaces in different ways.

2.1.1 *Connecting communities*

Wi-Fi technologies are expected to help build and connect communities. This is evidenced by the presence of Wi-Fi in most municipal libraries, and in dedicated community buildings such as 'the Hub' in the Docklands and 'Boyd' in Southbank, both administered by the City of Melbourne. Moreland's Harmony Park project aims to use Wi-Fi along with other amenities to support the local youth community (Oxygen Project, 2010). Waverly Council expects its Wi-Fi service will create a 'sense of belonging' for the local community by acting as a portal for community-related information (Finance, Ethics and Strategic Planning Committee 2012).

As discussed in section 1, good public spaces are those where diverse communities are able to interact with one another. How Wi-Fi affects this dynamic is an open question. Most policy documents assume that communities will be fostered through co-present interactions in public places, places made more popular because they offer free Internet. Wollongong Council argues Wi-Fi has 'the potential to change the population attitude and perception as it creates a more social environment' (Wollongong Council Meeting notes, February 27, 2012: 10). Section 3 investigates if and how Wi-Fi users interact with each other in public spaces. This will suggest whether Wi-Fi is conducive to the kind of community building institutions hope for.

2.1.2 *Closing the digital divide*

Public space can help foster more inclusive communities. Providing public access to digital resources is one way of achieving this. However, with the exception of Darebin's Reservoir service, the digital divide is not a common reason for Australian public institutions to consider offering Wi-Fi, though it has been an implicit reason for municipal libraries to provide broadband access in general.

2.1.3 *Social sorting*

Municipal authorities also hope that Wi-Fi can help make public places safer. Wi-Fi is deployed to attract a certain kind of person and force 'undesirables' and anti-social people to move. A Randwick Council report writes: 'Targeting specific areas by providing free internet access where seating facilities exist enables people to comfortably use notebooks, netbooks, tablets, etc and attempts to avoid contributing towards anti-social behaviour by encouraging "mobs" to gather in open spaces' (Graham Curley,

Randwick Council Report, July 24, 2012: 402). Here, Wi-Fi is used to facilitate a form of 'social sorting'. It is essential that those who are attracted already possess the skills and devices to use the Internet in public space. This is a form of exclusion which is in principle counter to the ideals underpinning a digitally inclusive society. Care must be taken to ensure such uses do not conflict with the fundamental principal that public space is open to everyone. Further research opportunities exist to probe the degree Australian public institutions are using technological amenities in exclusionary or inclusionary ways.

2.1.4 *Enhancing the local economy*

Wi-Fi is expected to have economic benefits stemming from enhancing a city's reputation, investing in the local ICT industry, and promoting local businesses. Institutions acknowledge that Wi-Fi is a 'common and expected feature of modern international cities' (Barbera Abley, quoted in Greater Geelong Council Press Release, 19 March 2012). However, certain municipalities believe that Australian local governments need to be more proactive in this regard. To build their reputations and attract investment, councils are seeking to position themselves as 'smart cities'. This speaks to deeper economic changes in Australia, as broadband becomes increasingly important to the digital economy (Ruthven 2012). For example, in rolling out its Wi-Fi service, Wollongong seeks to discard its reputation as a 'manufacturing city' and become known as a 'digitally savvy city' (Wollongong Council Meeting notes, February 27 2012).

Wi-fi is also often associated with building new industries. Geelong's Wi-Fi service is a co-operation between numerous private, public and education sector stakeholders to help spur investment in the city's ICT industry. Likewise the City of Adelaide's proposed Wi-Fi network aims to generate new innovations in its ICT industry. Various municipalities associate Wi-Fi deployment with generating new 'creative industries'. Arguably, creative innovation depends on empowering creative end-users, and hence on high-quality, non-discriminatory access to online content and applications.

Various municipalities refer to Wi-Fi as a tool for 'activating' or 'revitalising' public space. The City of Adelaide's planned Wi-Fi service aims to 'further revitalise laneways and other public spaces including parklands and squares' (Mayor Stephen Yarwood, quoted in Adelaide Council Press Release, November 28 2011). The term 'vibrant' is often used to describe the desired kinds of spaces. The City of Perth seeks to 'promote greater vibrancy and liveability in the city' (Perth Council Wi-Fi Report, 2012: 4). When asked what constitutes revitalised, vibrant spaces, cities emphasised the need to attract and retain more visitors. 'Any increased volume of people in an area would directly benefit the local businesses by encouraging more customers to stay longer and increasing the vibrancy of the area as well' (Graham Curley, Randwick Council Report, 24 July 2012: 402). For public institutions, a revitalised space is a populated one, with flows of people increasing an area's appeal and reputation, feeding back into local economies. Thus, city councils often choose commercial streets and shopping precincts to implement free Wi-Fi services (see figure 1). Councils also propose using Wi-Fi to serve location-based advertisements to promote local businesses. These advertisements have the additional benefit of being able to partly remunerate the cost of a service.

2.1.5 Marketing and communication

In addition to free Internet access, councils provide marketing and communication portals to deliver municipal information and promote local events. For example, Waverley Council set up a service in Bondi Beach partly to provide safety messages about ocean rips, sharks, sunburn, and swimming after drinking alcohol. Adelaide's planned CBD service will afford 'easy access to up-to-date information during major events like Clipsal, the Fringe Festival and the Christmas Pageant' (Mayor Stephen Yarwood, quoted in Adelaide Council Press Release, November 28 2011). It is common for cities to offer unlimited access to city-related content while limiting broader Internet access. The State Government funded Wi-Fi service in Hobart's waterfront region is intended to 'showcase the waterfront area through a range of applications and content covering local events, services and cultural and tourism assets that visitors can access while in the precinct' (John McCann quoted in Brown, 2010). However, there has been public annoyance regarding the service's meagre 5 MB Internet limit for any non-council related traffic (Martin, 2010).

These kinds of policy decisions about access to content have important consequences for how Wi-Fi projects influence public spaces. It is therefore valuable to distinguish between institution-centric services and user-centric services. The former discriminate in favour of content chosen by a city or cultural institution. The latter allow a user to choose what content on the Internet to access.

All of the institutions reviewed in this white paper were found to limit Internet access in some way. All municipalities filter inappropriate content, including pornography, gambling and file sharing sites, both as a legal protection and to fulfil a moral duty to constituents. Internet access and download quotas in particular are limited, usually because of funding constraints. It is therefore common for municipalities to justify a purely-institution centric service because of the cost of a user-centric one.

2.1.6 Multi-channel services

Many Wi-Fi services have private channels used by employees, as well as public channels used by visitors. The City of Adelaide is currently considering ways in which its planned Wi-Fi network can be used for communication between safety and emergency service personnel, as well as Wireless CCTV and traffic sensor nodes. The Melbourne Arts Centre service, covering Hamer Hall and the Spiegel Tent area outside, was originally set up to service visiting performers and staff. It was made public to integrate a phone application to deliver information about art exhibitions within Hamer Hall. Multi-channel services are attractive to institutions as they potentially justify the cost of Wi-Fi by enhancing efficiency and productivity in other areas.

A common theme unites the above reasons for implementing Wi-Fi: providing a publically accessible information network will attract and retain visitors by adding the valuable resource of information access to a space. For institution-centric networks, this information will influence the curation of public spaces by making visitors aware of cultural events, and hence may enhance the local cultures that are fostered in public spaces. For user-centric services, this information could be used in a variety of ways, and this in itself will attract and retain visitors, adding to a place's economy and vibrancy.

2.2 Business models

Public institutions must decide how to fund a service that does not yield primary revenue from end-users. Different services vary in terms of the sites covered, the technology and infrastructure used, and the amount of traffic carried. Quality of services differs with some networks offering little and others offering security encryption and helpdesk support. Cost varies greatly depending on these factors, as does the role of different stakeholders. For example, Moreland's Harmony Park service has a capital and first year operating cost of six thousand dollars. Conversely, Brisbane's expansive, 22 Park Wi-Fi services has a capital and operating cost of two million dollars. The three common business models for Australian public institutions are discussed below.

2.2.1 *Complete public funding*

These projects are completely funded by municipal or state governments, and hence by the public. Cultural institutions such as the State Library of Victoria and Federation Square fit this model. Certain cities, such as Dandenong, Adelaide, and Wollongong, rely on state government partnerships or grants to establish Wi-Fi. When cities fail to win grants Wi-Fi projects can be stalled indefinitely.

2.2.2 *Public-private partnership*

Institutions can partner with network providers, ISPs and/or advertisers to help fund Wi-Fi. Services in Geelong and Hobart offer 'freemium' options allowing users to upgrade to a paid account and receive increased access. Here the ISP has an incentive to offer a certain amount of free access in exchange for new paying customers. Wollongong and Randwick City Councils are considering advertising subsidised Wi-Fi projects.

2.2.3 *Complete private funding*

In certain cases a city will act as an 'anchor tenant' (Park & Bar, 2005), giving a private network operator use of city-owned assets, spaces and rights of way to provide a for-profit service. For example, Universal Network Technologies owns and runs Waverley's Bondi Beach service, and funds it through advertisements. Vivid Wireless supplies free Wi-Fi to Perth's Northbridge piazza in exchange for being able to promote themselves on the site's large public screen. In these situations, because a public institution no longer owns the Wi-Fi network, it loses a certain amount of control over how that network will be managed.

2.3 Network models

Wi-Fi networks have different 'network roles' which can be played by both public and private actors. Network models – the different combinations of these roles – have a significant impact on cost and control, and hence on the kind of service which is eventually offered. There are three primary network roles:

- **Network owner:** owns the physical infrastructure supporting the service, including fibre links, access points, servers and transmitting equipment.
- **Network operator:** maintains the hardware and software systems required for functionality. This involves network diagnostics, and sometimes the management of routing, roaming, authentication and billing software.
- **Internet Service Provider (ISP):** provides Internet connectivity to the Wi-Fi network. Additionally, ISPs sometimes provide further services, such as security, tiered access, and help-desk support. In most cases this is a for-profit company that provides Internet connectivity to the public institution. There are certain exceptions to this. Darebin's Reservoir trial carries Internet traffic via InfoXchange, a non-profit community minded ISP. While Museums Victoria has Internet connectivity via AARNet, a non-profit network organisation supporting education and research institutes. Sometimes, due to cost or coverage variables, an institution will choose different ISPs for different locations in a multi-site service (this is the approach taken by Leichhardt City Council in New South Wales).

For the public institutions covered in this report, these three network roles were commonly arranged in three different network models:

- **The public institution owns and operates the network and a third party supplies Internet connectivity.** The institution's internal IT department fulfils network operator duties. If the service is large, with multiple access points, then this can require the addition of staff to manage the service.
- **The public institution owns the network and third parties operate it and supply Internet connectivity.** The institution still retains a large degree of control, but takes a less technical and more administrative role.
- **Third parties deliver all the primary network roles owning, operating and supplying Internet connectivity.** The institution retains a small amount of control in exchange for leasing rights of way and other assets. For example, cities can set filters on inappropriate content and provide information portals. This offers the least amount of control over the service, yet it is attractive to cities as there are no capital or operating costs.

The more roles an institution plays the more control it will have over its Wi-Fi network. However, costs rise if a city must employ new IT staff to manage the network and support quality of service requirements. Institutions may opt for giving increased control to third parties. However, this may mean that parties use the network in ways not amenable to the public good and to public space. A city may be unable, for instance, to alter or remobilise a network in new ways to respond to changing social needs.

2.4 Attenuating factors

Once a Wi-Fi service has been proposed, a variety of factors may delay, transform, or prevent implementation. Following consultation with municipalities across Australia, this white paper finds that councils will often be deterred by high costs, caused primarily by high fees for Internet connectivity. When public institutions commission an internal business case on Wi-Fi, cost is a key factor deterring executives or councillors. Administrators who believe in Wi-Fi often express frustration at the bureaucratic and political issues that stifle a project. Moreover, they report a general absence of 'digital culture' in local government. There is a definite opportunity to educate municipalities as to the benefits of expanding access to Wi-Fi networks as a means of enhancing public spaces. Moreover, there is a need to better understand the implications of the NBN on connectivity costs for municipalities seeking to provide long term Wi-Fi access.

Some municipal representatives were concerned that ubiquitous 3G services have made Wi-Fi superfluous. However, there are important differences between Wi-Fi and 3G. 3G mobile broadband is a cellular technology that sacrifices throughput capacity for roaming ability. Wi-Fi, on the other hand, sacrifices roaming for higher localised throughput. Although Wi-Fi networks can be meshed to cover large areas, and roaming systems do exist, in reality Wi-Fi remains a localised phenomenon giving it the ability to transform specific places. Unlike 3G services free Wi-Fi networks hold no financial cost for end-users. Hence, Wi-Fi remains a viable means of attracting people to specific places and enhancing the space.

The evolution of 4G services in Australia may be seen by some to assuage these points, as 4G will outpace Wi-Fi in download speed. The city of Houston has thus found it viable, along with a mix of other wireless solutions, to purchase 4G bandwidth from a commercial telecommunications provider to act as a municipal wireless service (Vox, 2011). However, Australian municipalities are wary of this model. Although there are low capital costs as municipalities will leverage existing cellular infrastructure, because 4G operates in expensive licensed spectrum the cost per gigabyte of download which is transferred to customers is high. This renders offering a 4G municipal wireless network expensive and unpractical.

3 Wi-Fi working in and with public spaces

In order to understand how people use free Wi-Fi in public spaces, as well as how Wi-Fi can enhance public space, the authors of this white paper conducted ethnographic research in three municipal Wi-Fi sites: Moreland's Harmony Park, Darebin's Edwards and Broadway Streets, and Greater Geelong's InfoNet project in Johnstone Park and the Mallop Street bus exchange. Three cultural institutions were also investigated, the Melbourne Museum, the State Library of Victoria, and Federation Square. The sites were visited at least twice, with the researcher 'hanging out' and exploring the area for a number of hours on each visit.

3.1 Description of spaces

Johnstone Park and the Mallop Street bus exchange are both in the centre of Geelong, near offices, transport, shops, restaurants/cafés and Deakin University. There is a municipal library adjacent to Johnstone Park. The park has various places to sit down and access the Wi-Fi, while the bus exchange only offers a couple of sheltered benches.

Harmony Park in Moreland is a large, open space with a small shaded picnic area, playground and a skate park. It borders onto a primary school, and is close to a small suburban main street. The park is surrounded by suburban houses, and is primarily populated by families and young children.

At the Darebin site a variety of shops and eateries extend down Broadway and Edwards streets, constituting the heart of Reservoir's shopping district. Importantly, although many people walk through these streets daily, there are few open, outside places to sit down, relax and socialise.

The Melbourne Museum exists in the Carlton Gardens, a five-minute walk from the centre of Melbourne. The Wi-Fi signal is strongest near the museum entrance, a large, exposed concrete area offering few areas to sit down and relax.

Both the State Library and Federation Square are located in the heart of Melbourne's Central Business District, opposite major train stations and surrounded by offices, shops, and dining venues. The State Library is next to RMIT University and across from the busy Melbourne Central shopping centre.

In front of the State Library are steps, a concrete platform, and various patches of grass and shade. It was always sunny when visited, with the good weather bringing large crowds of mostly young travellers and students. There were equal people alone and in groups, talking, sunbaking, hugging, reading, writing, and using mobile devices. Outside, Wi-Fi users crowded closer to the front wall of the library, sitting on the steps and benches where the signal was strongest. There was also a dependable crowd of at least a dozen Wi-Fi users in the Library's foyer, which, being cool and comfortable, provided respite from the February heat.



Figure 2: People on laptops, tablets and phones on the steps outside the State Library

Federation Square is opposite Flinders Street Train Station and near the National Gallery of Victoria, the Arts Centre and Southbank. Federation Square also contains an art gallery and a large public screen. Federation Square has a large, sloped open area built around the public screen. Visitors use their devices in various places around this area: on the large steps tiering down towards Swanson Street, under trees, on small patches of grass, and on moveable beach chairs. Most users crowd on the thin ledges at the back elbow of the square, where there is shade and the signal is strongest.



Figure 3: Back steps of Federation Square

3.2 Wi-Fi Users

No users were discovered in any of the municipal sites, corroborating obtainable usage data. Harmony Park has received an average of 20 users a month since the service was implemented, less than one user per day. Excluding participating businesses, the Darebin project logged 413 sessions over 10 months, just over 1 session a day. The City of Geelong did not wish to reveal usage data.

The Melbourne Museum and the surrounding Carlton Gardens area also failed to attract an observable user during the visits. In comparison, numerous users were observed at the State Library and Federation Square. Administrators from both sites estimate that each service garners more than a hundred users at peak times every day. Given this popularity, the focus became observing and interviewing people at these two sites. In comparing these negative and positive cases, various factors can be ascertained regarding what makes a 'successful' Wi-Fi service.

Thirty-four participants were interviewed at the State Library and Federation Square. Many participants were in groups of two or more and were using Wi-Fi. Twenty-one were travellers while 13 lived in Melbourne. Most appeared to be in their 20s or 30s. Of the participants 14 used laptops, 12 tablets, and 7 smart phones. The researcher also approached many people who were using smart phones, but who were not using the free Wi-Fi, and who were either texting or using a 3G service instead.

The participants were a combination of first time, irregular and regular users, with travellers fitting all three categories. Some had been staying in Melbourne for some time, and had come to depend on free public Wi-Fi. Others were only in town briefly, but had used the service multiple times in that period, while a few had just arrived in Melbourne and were using the service for the first time. Most residents were regular users. One person reported coming to Federation Square hundreds of times to use the Wi-Fi. Another came to the State Library every day to use the service there. These places are very good at attracting and retaining visitors.

Participants stopped to use the Wi-Fi after engaging in a variety of activities. Tourist-related activities were the most common, such as exploring the city. Informants often had, or were going to meet up with friends, usually to have lunch. Some also came to the city to shop. Some travellers would go directly from their accommodation to the State Library or Federation Square to use the Wi-Fi before returning to relax. Travellers who were not working or studying had a lot of time to relax and therefore felt less pressure to move out of the public space. Overall, most people were observed to use the Wi-Fi for extended periods, sometimes hours.

3.3 How people use Wi-Fi

Based on participant responses four primary forms of Wi-Fi use were identified: supportive, entertaining, productive, and social. The most popular applications used by participants were email and Facebook, while less popular, but still significant, were general Internet use, watching videos, and Skype.

3.3.1 Supportive use

Travellers staying in the city depend on a proximate, free Wi-Fi connection to book flights, rooms, apply for jobs, and find accommodation. This need is emphasised for young students, who cannot afford the cost of Wi-Fi at a hostel. Travellers also rely on Facebook to 'keep up' with their friends. Wi-Fi is an important mediator for sustaining intimacy at a distance, and can help to prevent a sense of disconnection or loneliness.

Wi-Fi acts as a 'support mechanism' for travellers, helping anchor them both materially and socially. Traditionally, public spaces are envisioned as supporting local populations in some way. Networked public spaces are apt for supporting mobile populations, as they enable access to information with important material and social consequences closing a particular kind of 'mobile digital divide'. By helping mobile city dwellers such as travellers to anchor themselves in a locality public Wi-Fi affords a form of social inclusion.

3.3.2 Entertaining use

Participants would often say they were 'passing' or 'killing time' as they engaged in the leisurely consumption of online information and entertainment. This included watching YouTube videos, sports and news. Occasionally couples were observed watching videos together on laptops or tablets at Federation Square, sharing earphones, laughing and pointing at the screen. There are various nuances to the way Wi-Fi enables forms of entertainment and sociality in public space. On one level, the combination of Wi-Fi and smart devices remediates books, magazines and other forms of entertainment that people consume in public. On another, watching videos 'socially' extends practices commonly found in the home. Wi-Fi affords the transition of private media consumption into public life changing the dynamic of media consumption and the social life of public space.

Additionally, entertainment online is increasingly becoming more complex and data hungry. Hence, while a place need only provide an attractive area to rest and read for those who enjoy books, in order to attract Wi-Fi users sites must provide a robust connection with relatively light access restrictions.

3.3.3 Productive uses

Participants engaged in what can be called 'productive' use, working and studying at both sites. This included using Wi-Fi to check work-related emails and conduct research. Some came to the State Library as a respite from the distractions of working at home, and because they enjoyed the atmosphere. Some travellers continued to work even while on holiday. For example, one traveller was updating the website of her Yoga business. Wi-Fi is a key means of support for those on the move.

The transformation of public space into productive space signals the breakdown of traditional barriers between work and leisure, the office and the plaza. Public spaces, especially those in city centres, must

now accommodate a more autonomous and mobile workforce. Some of the municipalities reviewed expressed the hope that municipal Wi-Fi will foster 'creative industries' (Stonnington City Council, 2012) and bolster the 'digital economy' (Brisbane City Council, 2012: 15). The existence of productive public spaces at Federation Square and the State Library suggests these are achievable goals. However, further research is required to investigate in detail the kind of work performed in public spaces, and how this feeds back into local economies.

3.3.4 *Social uses*

Three forms of sociality were found to converge around Wi-Fi use: socialising online, socialising with known, collocated others and serendipitous social interactions with strangers. Online and collocated sociality was common, while serendipitous sociality was rare, confirming findings in similar research (Hampton, Livio, & Goulet, 2010).

Online Sociality: participants used Facebook to engage in real time chat, as well as various forms of asynchronous sociality, such as sending personal messages and status updates. Participants also communicated via Skype, and posted on other social networks such as Twitter and Flickr.

Co-located Sociality: people both reported and were observed using Wi-Fi alone, in couples or in groups. For those with one other person they were either a friend or a partner. Some couples were observed in intimate states, lying on the grass close to each other or cuddling in front of a screen. Many who used the service in groups were travelling companions with a common need to access the Internet. People in groups were engaged in all the forms of use mentioned above. Overall there is no significant data to suggest that using Wi-Fi in these places is primarily an activity in which social interaction with co-present others is displaced in preference for a virtual space such as a social network site. The public realm is composed of smaller, quasi-private social groups. On a sunny day, for example, a park could be composed of groups of friends picnicking and playing sport. On one level going online with friends may be similar to these pursuits. On another the relationship between the group and the space will depend on the qualities of the medium in question and what these social groups are actually doing with Wi-Fi. Watching a video on a screen, for example, may make a group less approachable by others than if they were playing sport.

Serendipitous sociality: participants were asked if they had serendipitous encounters with strangers while using a Wi-Fi service. Most people did not socialise with strangers. Some suggested this was because using a device makes one less approachable. Nevertheless, a minority of participants expressed that they would welcome such encounters. A minority were also asked questions by others, such as a how to connect to the network, if they could take a picture, or if they could help seek out information online. Some participants described how a simple question could evolve into a more extensive interaction. Although these moments are rare and often ephemeral, they are significant. That people can be friendly and conversational in diverse spaces such as the State Library and Federation Square is an admirable social attribute, and undoubtedly lubricates the functioning of urban social life.

3.4 The importance of service and place

Informants were asked why they came to either Federation Square or the State Library. Many travellers came to use the Wi-Fi because it was free, and because both services were high in quality compared to other hotspots in the city. They came because their accommodation lacked Wi-Fi, or charged expensive rates. Although cafés and fast-food restaurants offer Wi-Fi, travellers felt obliged to continue to buy food if they wanted to use a service for a long time, making the public alternative preferable. The quality of service offered by the Library and Federation Square was also a big drawcard. The Library offers a 50MB download limit, while Federation Square does not cap downloads. Both services were described as 'fast', 'easy to use', 'decent', and having a 'good connection'. In contrast, the Darebin, Geelong and Moreland projects have all had quality of service issues, and offer limited Internet access.

Although for many people Wi-Fi was the primary reason for coming to Federation Square and the State Library, other aspects of a place were also highly significant. Proximity to one's home, place of education, or accommodation was important. A successful Wi-Fi project benefits from being placed amongst intersecting flows of people, commerce and culture. However, people still need to discover a Wi-Fi site. When asked how people knew a particular site provided Wi-Fi, participants from the State Library reported that they just expected a library to have Wi-Fi, while participants at Federation Square were informed by friends, billboards, street signs, tourist maps, brochures, and information kiosks. Even in the CBD the need to promote a Wi-Fi site is evident. Hence, for sites that lack busy flows of people, such as Harmony Park, the need to promote a service is especially acute.

As mentioned in the previous section, provision of free Wi-Fi is not sufficient on its own to attract users to a specific site. Free Wi-Fi can supplement other attractions. Successful institutions invest in a variety of use values. For example, the State Library provides specific resources for those who want to work and study. Federation Square provides galleries, museums, places to eat and a large public screen that often broadcasts popular events. On one occasion the American Superbowl was being displayed on the large public screen. Researchers observed approximately 100 people sitting under trees, on ledges and steps, and in moveable deck chairs watching the event. Most were using a mobile device of some kind. American expatriates and travellers were communicating in real time with friends and families also watching the game. This is an excellent example of how location, environment, cultural event and media infrastructure converge to enable a fantastic networked public space.

Other Wi-Fi sites visited lack these multiple, synergistic use-values. There are only a few places to eat in the Reservoir Wi-Fi zone, but these hardly extend onto the public street. A Wi-Fi project should be structured around an open public area where people can gather. Geelong's Johnstone Park certainly affords gatherings, but access and quality of service is low, and other complementary use values are lacking. While the Park contains the Geelong Library the two spaces do not flow into each other, and both use different Wi-Fi systems. To get a good connection a visitor must obtain a guest pass from a librarian and remain within the library. Harmony Park provides a playground, picnic area, and skate park. The park appeals to youths and families who come to eat, play and skate, rather than access the Internet. These uses and related demographics are not synergistic with Wi-Fi, while a lack of shade makes it hard to see a computer screen in the sun's glare.

Participants also emphasised the importance of a place's look and feel. The State Library and Federation Square were considered comfortable, and 'easy on the eye'. Some mentioned the layout of trees, grass, and architecture. But most of all, participants enjoyed the atmosphere generated by lots of people. Previous research has recognised the draw of open, populous spaces (Whyte 1980). People enjoy being amongst others, being able to watch them relax and socialise. A good space facilitates this desire for atmosphere, accumulating closely positioned convivial groups. While Johnstone Park is an attractive space, not many people were observed 'hanging out' in the park. Conversely, the Mallop Street Bus Exchange was full of people, but was neither comfortable nor attractive. The area around the Melbourne Museum possesses some striking architecture. However, directly in front of the Museum is a vast, exposed concrete platform lacking shade and places for people to sit. People tend to huddle near trees in the surrounding Carlton gardens where the Wi-Fi signal is much weaker. Overall, neither the museum nor the municipal sites had the look, feel or atmosphere to work well with a Wi-Fi service.

3.5 Discussion of ethnographic findings

These preliminary findings provide an insight into what makes a free Wi-Fi service work in public spaces. Like the configuration of the public space itself, the service needs to have some design flexibility, so that users are able to configure it to meet their own needs. Successful services are user-centric, with good service quality and light access restrictions enabling a variety of data hungry uses. They are located where proximate users have a demand for Wi-Fi and are in places with various use values that work in synergy with free Internet access. The places must provide attractive, comfortable areas for people to gather and be convivial. Public Wi-Fi can work to enhance a space by further populating it and generating atmosphere. Parks and squares are good for Wi-Fi, though streets with little public gathering space are less beneficial.

The various forms of use mentioned above alter the social dynamic of public spaces in significant ways. Each form of use combines different social contexts with relative public and private qualities. Supportive uses such as keeping up with family merge the intimacy of family life with the publicity of city life. Entertaining uses, such as watching YouTube videos, merge domestic, private consumption with public exhibition. Productive uses combine private work with public leisure. While social uses, such as communicating via Facebook, implode two different kinds of 'networked public' (boyd, 2011): the asynchronous, online public, composed of invisible, non-present others; and the synchronous, offline public composed of visible, co-present others. Additionally, each person or social group using Wi-Fi represents a quasi-private social context with differing degrees of privacy. For example, researchers found that romantic partners watching a video conveyed greater desire for privacy than a group of convivial travellers checking their emails. Overall, institutions that successfully deploy Wi-Fi influence the public space in two seemingly contradictory ways. They attract more visitors and hence add to a space's atmosphere. However, they can also increase the partitioning of public space into isolated private units. This may mean that public spaces retain their vibrancy at the expense of their integrated diversity. Institutions should be mindful of this when considering how Wi-Fi can enhance communities.

4 Discussion and recommendations

Australian public institutions, and municipalities in particular, are beginning to find benefits in deploying free Wi-Fi services including: enhancing communities, bolstering local economies, marketing and communications, and providing multi-channel services for city employees. Institution-centric services with marketing and communications portals can provide information about cultural events in public spaces, which can enrich the relationship between public space and local culture. These services are also attractive to public institutions as they provide various internal benefits for organising and networking staff and systems. As discussed in section 3, user-centric services can support a variety of activities in public spaces, leading to a cycle of increasing use, enhanced atmosphere and continuing visitor growth. The user-centric services found in Federation Square and the State Library also provide a much needed information resource for travellers, helping to close the 'mobile digital divide'. Finally, user-centric services appear to offer the greatest potential for facilitating user-created innovation and enhancing the civic qualities of public space.

However, Wi-Fi can also isolate groups of users and prevent serendipitous interactions and cross-group mingling. Given that good public spaces should be diverse and integrated, rather than stratified, such interactions are a virtuous goal.

The cost of providing a service, and a lack of digital culture in local government, prevent many municipalities from actualising the benefits discussed above. Researchers found that some councils were completely deterred by costs, while others could only justify providing purely institution-centric services. Given the above factors, this report makes the following recommendations:

- The benefits of Wi-Fi should be conveyed to public institutions through educational initiatives such as partnering with digital advocacy groups to educate councillors through organisations like the Australian Centre for Excellence in Local Government.
- Public institutions should consider the different network and business models available to subsidise the cost of a service. Various municipalities contacted during this study had not considered public-private partnerships as a way of subsidising a service and increasing its user-centric appeal. Where cost remains a key issue, institutions should consider alternative options to balance cost, ownership and control. Business models will be influenced by industry change; therefore institutions should be mindful of how the coming NBN will influence the cost of providing public Wi-Fi.
- Institutions need to consider existing models of successful services that emphasise user-centric qualities and positive place-attributes. Obviously not every place is suitable for a Wi-Fi service and a service should not be provided if the aim is to attract people to a poorly functioning space. Municipal Wi-Fi should be seen as a means of enhancing spaces that already attract the public.
- To facilitate the social dimension of public Wi-Fi, institutions should seek to develop services that foster serendipitous interactions, for instance by integrating Wi-Fi with cultural events which facilitate cross-group mingling such as media art exhibitions, performances and festivals. Public institutions should consider offering institution-centric services, with specialised applications and communications portals, as well as general user-centric services.

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