

## Regional Innovation and Public Wi-fi

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**Abstract:** The paper focuses on the link between regional development, social enterprise and digital infrastructure, through analysis of an initiative in Goulburn NSW, in which local entrepreneurs rigged up a wi-fi network, providing free internet access to the public in the city's main street.

Public wi-fi, like open source software, the DIY and hacker movement, can be understood as 'inverse infrastructure': an emergent challenge to the modernist conception of infrastructure as centrally-provided large-scale technical systems such as electricity and water utilities (Egyedi et al. 2012). Inverse infrastructures may be enterprise-level responses to state or market failure, such as municipal broadband, or less formal citizen-based activities, such as community wireless networks. Such community-level initiatives are not necessarily demonstration sites of civic affiliation or bespoke provision. They involve competing interests, wavering volunteer commitment to repair and maintenance and the myriad disruptions caused by physical environments and human actions.

Our research maps the links between the human, material and institutional actors that make up the Goulburn network: the physical site, equipment and design artefacts, and the civic, commercial and association transactions associated with the enterprise. We track how community and local commercial interests used the affordances of the market, working within existing market structures to create a commercial commonality in the public interest. As the vision of a national broadband network fades, impacting on the thin telecommunications markets of regional Australia, we may see increasing 'bottom-up broadband' activism. Stories such as this one may support a more pragmatic understanding of these emergent public-private initiatives.

### Introduction

In September 2013 the *Goulburn Post* reported that a new infrastructure development could see in the inland NSW city of 20,000 people become "a world leading city in Information Technology" (Sebo, 2013b). Readers may have been surprised that the *Post* was not referring to the federal government's national broadband network (NBN), a multi-billion dollar infrastructure project that, since its inception in 2008, has been attributed with powers to transform the communications landscape in regional and capital cities alike. Instead, the *Post* was describing the rollout of a free public wi-fi network in the city's central business district by "a progressive minded community group ... [with] financial support from both Council and the local business community". Although the global advantages that might accrue from the network were surely overstated by the local paper, the Goulburn public wi-fi network was clearly represented as an important local response to what is increasingly perceived as the failure of both state-led and market-led telecommunications provision in regional areas.

In this paper, we explore a development emerging in regional cities and towns in what we characterise as a post-NBN policy environment: local innovation in what has traditionally been characterised as telecommunication infrastructure but in the context of convergent media content delivery might equally be thought of as media infrastructure (Parks and Starosielski, 2015). We focus on the rollout of public wi-fi, although other examples of this trend include investment in fibre networks by municipalities outside the NBN footprint (Gregory, 2012), and the acquisition of a telecommunications carrier licence by the City of Gosford (Braue, 2014). These initiatives represent a third approach to telecommunications provision adopted by regional centres concerned that neither the liberalised telecommunications market, nor a return to centralised planning with NBN, have delivered in regional Australia (BTBA, 2015). This approach, particularly when it involves community activism, has been conceptualised as *inverse infrastructure*, or infrastructure which is typically 'bottom up', user-driven and self-organised (Egyedi et al., 2012). While we apply the inverse infrastructures conceptual framework to describe the largely informal citizen-led development of a community wireless network, we recognise that this framework may be extended to encompass enterprise-level responses to state or market failure, such as municipal broadband. As Egyedi et al. (2012) argue, technological and institutional developments are challenging the dominant paradigm of Hughesian large-scale technical systems in areas such as electricity, water and telecommunications. In our area of focus, open source software and cheaply deployed off-the-shelf network equipment, together with the liberal regulatory environment and standardised equipment characteristic of wi-fi, have certainly encouraged local innovation and experimentation in telecommunications across the globe.

Australia has seen comparatively little community wireless activism, but is currently experiencing a local public wi-fi boom. Goulburn's public wi-fi network warrants detailed analysis as a pioneering Australian project in a field with little Australian-focussed literature. In this paper, we examine the context of the project, its supporters and opponents, its technological and economic models, and the project's outcomes.

Community wireless projects are sometimes described with homely metaphors such as 'barnraising', connecting traditional community values and digital enterprise (for example, Godwin, 1998). However, this is also a field with competing political interests, wavering volunteer commitment to mundane activities such as repair and maintenance, and myriad disruptions caused by the behaviour of physical environments and other humans (Verhaegh and van Oost, 2012; Graham and Thrift, 2007; Jungnickel, 2013).

Drawing on an analysis of institutional documents and media reports, and fieldwork conducted in 2013 and 2014 that comprised interviews with the president and technical officer of the Goulburn public wi-fi network development organisation, representatives of the local council and chamber of commerce, informal discussions with local business owners and site observations, we describe a DIY telecommunications initiative that represents a new provisioning model in Australia, but calls up a familiar concern with the image and economic vitality of regional cities. In Goulburn, we argue, the intervention was not simply about enabling new forms of communication or commerce in the city, but in enacting an ethos of local innovation, collaboration and entrepreneurship, captured by the promotion of a 'progressive' Goulburn.

### **Goulburn: Shifting economic fortunes**

Located in New South Wales' southern tablelands, 195 kilometres south west of Sydney and 90 kilometres north east of Canberra, Goulburn has a rich history as Australia's first inland city, the fortunes of which rode on the sheep's back. Indeed, the contribution of the wool industry to the city is made abundantly clear to the visitor by Rambo, the city's one-hundred-tonne three story high sprayed concrete statue of a prize local Merino ram built in 1985.

Unfortunately, the city did not prosper long under Rambo's watch. In 1991 the Australian wool industry collapsed and in December 1992 the city was by-passed by a new section of the Hume Highway that connects Sydney to Canberra and Melbourne, diverting more than 20,000 vehicles per day from city centre retailers and service providers (Massy, 2011; Goulburn Post, 1992). The drought that ravaged much of Australia in the 1990s and again through the first half of the 2000s was felt severely in Goulburn. By 2005, household water consumption was limited, the city managers turned off fountains and closed the public swimming pool, and the elegant city sweltered (Marino, 2005). The local council looked to halt development in the city at this time and the council's economic development officer reveals that the international reputation "as the city that nearly ran out of water" has been difficult to shake and continues to impact on local investment (Rodden, 2013).

In 2007, Rambo was called upon to help reinvigorate the city's fortunes. The statue, which prior to the highway bypass had attracted up to 40 busloads of tourists to Goulburn each day, was moved to greener pastures – a prominent location at the highway's Southern exit ramp (Harte, 2007). Unfortunately, while the relocated Big Merino and the golden arches of its fast food neighbour have managed to draw a substantial number of travellers off the highway, most resume their journey after a quick break, slipping back onto the open road without making their way into Goulburn's city centre.

### **The Goulburn Group and Wireless Activism**

In 2007, concerned that Goulburn was "really not where it could be" and wasn't making "use of the potential they have", a number of local residents and business people formed The Goulburn Group (TGG), a "not for profit community think tank and action group" that sought to articulate an alternative future for the city (TGG, 2014; Walterlin, 2013). The group is "committed to sustainable economic, social and environmental development in the Goulburn Region", which it considers to be impeded as much by conservatism amongst local government, businesses and residents as by the available stock of resources and infrastructure (TGG, 2014). This formulation calls for sophisticated action, as the group of self-identified 'progressives' seek to influence local culture. Although the group has been active in local government reform, endorsing a political independent who served a term as the city's mayor in 2010-2012, it has largely focussed on rolling out a series of hands-on projects that demonstrate what it views as an alternate and more productive future for the city and region.

This modelling of social and economic behaviours has been interpreted in Bourdieuan terms by economic geographers with a particular interest in regional development as building symbolic capital to attract new residents and new economic activity (Spigel, 2013). While TGG's work has a strong environmental theme, with projects including the *Goulburn Connects* sustainability festival, *Goulburn Goes Solar* energy promotion and *Goulburn Wetlands* urban wasteland regeneration its approach is not simply grounded in environmental politics (TGG, 2014). Instead, TGG identifies environmental sustainability as a market opportunity and basis for "an enriched social and economic community" (TGG, 2014). The group would like to see Goulburn emerge as "a hub for sustainable industries", particularly energy efficient building products: "We would like to become a host town for these kind of industries ... not just production ... but development", explained the group's president, Urs (Walterlin, 2013).

TGG recognises the important role population change will make to realising their strategic vision for Goulburn. Treechangers, such as Urs (who relocated from Sydney in the mid-2000s), bring new ideas and more diversity to the city. While the group has an information and support program to encourage professionals and entrepreneurs to relocate to Goulburn (TGG, 2015), it is also acutely aware that local infrastructure deficiencies are a barrier to the city's revitalisation. As a foreign correspondent covering south-east Asian affairs for Swiss and German media, the poor state of telecommunications in Goulburn is particularly apparent to Urs. It is in this context that TGG's wi-fi project is situated.

Telecommunications is a politically sensitive issue in regional Australia. In the late twentieth century, Australian telecommunications were liberalised by part-privatising the legacy public monopoly Telecom and introducing market competition. Where Telecom's universal service obligations meant that the Australian population had broadly equitable access to basic telephony, market liberalisation encouraged the patchwork provision or "splintering" (Graham and Marvin, 2001) of market segments. Telecommunication services in Goulburn, like much of regional Australia, have failed to keep pace with the capital cities. The delayed and uncertain rollout of the NBN means this gap is unlikely to be closed soon.

TGG promoted a range of reasons for investing in public wi-fi, a common strategy adopted by civic and government public wi-fi developers seeking broad community support (McShane et al., 2014). In addition to direct use-benefits for the city's residents, TGG emphasised the economic spillovers of the network. Public wi-fi would "boost tourism and foot traffic in the CBD" and thereby "benefit local retailers and increase the likelihood of a stopover visit" (Sebo, 2013a; Sebo, 2013b). Free internet would encourage people to pull off the highway and come into town where they might "stop for coffee and cake perhaps, or lunch and other meals, and to purchase incidentals such as newspapers or stationary, or petrol" (Sebo, 2013b; Anson, 2008, p.9). Although these types of functional benefits have typically won political and community support for public wi-fi promoters, TGG had a more complex rationale for public wi-fi investment.

As with its environmental projects, TGG considered that developing public wi-fi as a community enterprise would model local innovative and entrepreneurial potential, inspiring such behaviour in a wider set of local residents and businesses. The network would "send a signal to the tourist industry and business generally that Goulburn is moving into the future" and encourage Goulburn businesses "to take advantage of online services and applications to change the way they conduct and manage their business, [extending]... their activities beyond Goulburn and the region" (Anson, 2008, p. 9). Moreover, TGG argued that wi-fi would promote Goulburn "as a place with its eyes on the future, able and ready to attract more people to the city" including "people looking for a 'tree change' in a city not languishing in its past, and new business investment from within and outside the region" (Anson, 2008, p.9). As Urs explained:

if we can have a wi-fi network, just along Goulburn Street here...and promote it on the Hume Highway and through the media...then that could help in bringing people into town who would otherwise just pass. They come in, they look at the town, they think, 'it's quite nice here, you know...these people are quite progressive' (Walterlin, 2013).

As it turned out, TGG had to work very hard to overcome the conservative tendencies of local government and business to build its symbol of progressiveness.

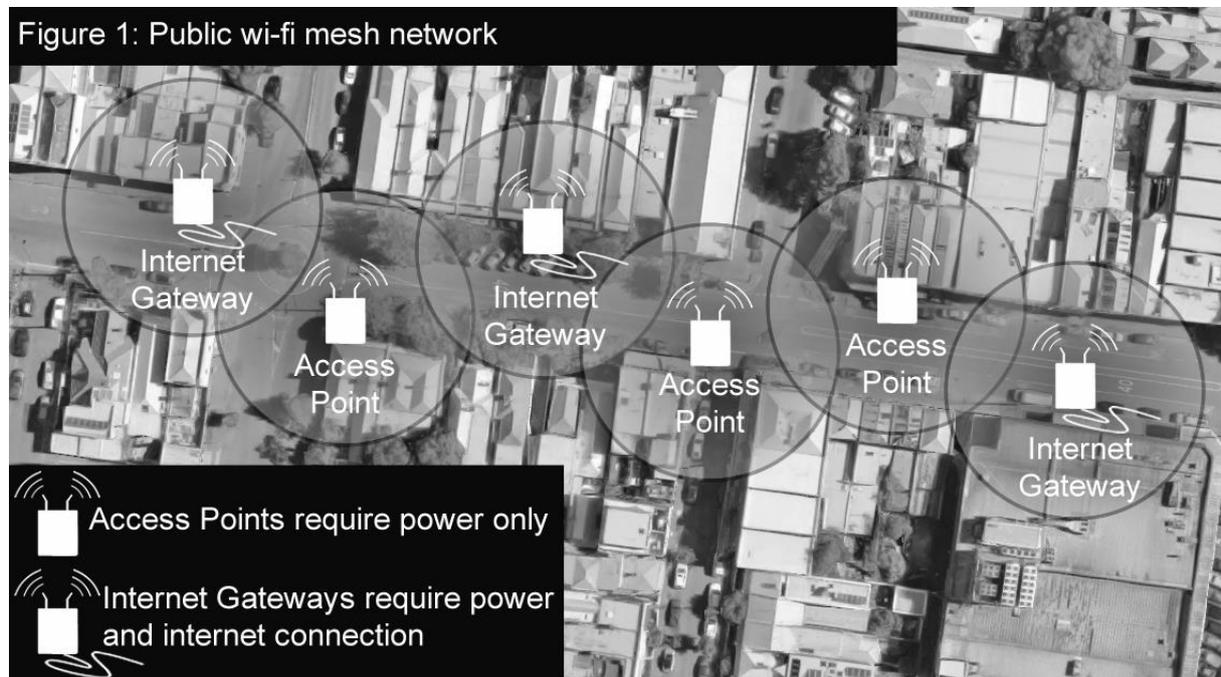
### **Building the Goulburn public wi-fi network**

The development of wi-fi technology has been well described elsewhere (Hills, 2011; Lemstra et al., 2011; Jungnickel and Bell, 2009; Gow and Smith, 2006). Relevant to our discussion are its operation in an unlicensed or 'open' band of radio spectrum, its low power range, and the incorporation of wi-fi chipsets in virtually all mobile communication devices. After revolutionising household computing, wi-fi

technology was adapted to facilitate portable computing in public spaces via hotspot access points (APs) that distribute signals over a short range (approx. 50 m). Subsequent improvements in the ability of wi-fi device connections to automatically transfer between geographically distributed APs with overlapping signal coverage has enabled the use of wi-fi for roaming/mobile communications. Demand for this type of access, previously the sole domain of cellular networks operating in the licenced spectrum bands (commonly signified as 3G/4G), has grown rapidly with the uptake of smartphone and tablet mobile devices.

The absence of regulatory constraints and spectrum access costs, together with low-cost off-the-shelf wi-fi networking systems, has created opportunities for a range of institutions (commercial, government and civic) to engage in wi-fi network provision. The relationship between institutional players in this space is dynamic and evolving. Initially, the provision of public wi-fi by civil society groups and municipal governments was closely scrutinised by higher governments and telcos seeking to protect commercial cellular mobile markets. However, continued growth in the number of mobile devices and the data demands of increasingly sophisticated applications has encouraged telcos to themselves explore wi-fi network investment options in a bid to improve service delivery by offloading data from their congested cellular networks, while also potentially increasing profitability. As the low-power limitations of wi-fi requires a substantial number of APs to create effective roaming/mobile wi-fi networks, telcos have increasingly sought to work with government authorities in public-private partnerships that make use of government's distributed physical infrastructure, such as light poles, to mount APs (McShane et al., 2014). It was with a similar proposition that TGG first approached Goulburn Mulwaree Council in 2008.

TGG engaged a consultant to draft a public wi-fi plan which, TGG argued, presented a unique opportunity for Goulburn "to become the first free wireless city in Australia" (Anson, 2008, p.3). Orb recommended the development of a wi-fi mesh network. This network architecture enables access to one or more Internet Service Provider connections (Internet Gateways) to be distributed across a geographic area through a series of AP signal repeaters (See Figure 1). Network coverage can be expanded quickly and easily by adding APs, while enhancing network capacity is made possible by adding additional Internet Gateways. By 2008, this flexible network architecture had become very popular, underpinned by the emergence of a number of companies providing easy to install and operate off-the-shelf wi-fi mesh AP hardware and software (Middleton and Potter, 2008).



The consultant proposed six outdoor APs, with three at council facilities serving as internet gateways, as well as an unspecified number of indoor units. Council was asked to fund procurement and installation of the infrastructure at a cost of \$10,000, and fund internet gateway access at an estimated annual cost of \$6,000. Consistent with TGG's entrepreneurial outlook, the proposal suggested that a commercial ISP might opt to provide free access in return for advertising and promotional opportunities. The plan suggested that the network be administered by council staff, a sensible proposition given that council was essentially providing all of the network resources and, like many Australian LGAs, had some

experience with public internet provision through the municipal library service (Anson, 2008, p.4; ALIA, 2013).

To TGG's disappointment, council rejected the wi-fi plan on the basis of "various concerns, including legal implications" (Goulburn Post, 2010). As a relatively small council, the proposed network carried relatively significant sunk costs and risk of unpredictable ongoing costs relating to network administration, maintenance and ISP fees. But it was security and legal fears that TGG felt had sunk the proposal. Urs attributed such fears to poor technical understanding among councillors at this time and to the risk-averse briefing provided to them by council staff (Walterlin, 2013). Debbie, the council's economic development officer suggests there was "some nervousness" about taking on the responsibilities of being an internet provider (Rodden, 2013).

For TGG, council's rejection of public wi-fi in 2008 was an encounter between old and new Goulburn. The Goulburn city council's conservative instinct had been strengthened by a recent merger with the surrounding rural Shire of Mulwaree. While Goulburn's elected councillors customarily describe themselves as independent or non-aligned, the region has traditionally elected conservatives to the state and national parliaments. In 2010, TGG submitted the plan, with costs revised upwards to \$20,000, to a new set of elected councillors, but were again disappointed (Goulburn Post, 2010).

TGG's wi-fi plan was revived again when Alex, the director of a Canberra IT company, joined the group in 2012. Alex had lived in Goulburn for ten years and his family operates a hairdressing salon on the main street. The combination of Alex's technical expertise and his connection to Goulburn's small business community proved vital to the successful establishment of the TGG public wi-fi network.

Alex retained the wi-fi mesh architecture but made adjustments that reduced the cost of network development, and removed the reliance on council for access to AP locations and Internet Gateways. Alex chose Openmesh hardware and software. The purchase and installation of Openmesh APs is AUD\$300, and their control through cloud-based software simplifies network setup and maintenance.

Alex solved the problem of securing AP locations and Internet Gateway access by enlisting the support of local businesses. Convincing business owners to host an AP was the least taxing part of the project. These small devices are easily mounted on the roof or awning of the business premises and do not require permission from local planners or the Australian Communications and Media Authority. In return for the site and power for the AP, which, as Alex explains to the businesses, is less in a year than "you would spend ...[on] having a light on for an hour", the business can display a *TGG Free Wireless* sticker at their premises, which for some retail and service businesses may yield increased patronage (Ferrara, 2013).

Alex recognised that convincing local businesses to provide Internet Gateway access would be more difficult. He developed an innovative solution. Aware that, like his family's hairdressing salon, local businesses tended to be signed up to retail broadband plans that provide data caps far in excess of needs, Alex speculated that these businesses might donate the unused portion of their monthly allocation without cost implications.

Goulburn's wi-fi network can be understood as an adaptive response to well-established telecommunication and broadband policy settings and concomitant business models. Australia is distinguished internationally by the aggressive use of data bit caps by broadband and mobile retailers. The typical configuration of retail broadband plans encourages over-purchasing by business customers, with the fear of cost and/or network speed penalties for exceeding data limits influencing their choice from a small range of broad and exponentially increasing data caps (typically stepped at 50GB, 250GB, 500GB) (Given, 2008; OECD, 2014; Telstra, 2014). In Goulburn's case, most of the participating businesses have purchased data caps well in excess of their needs, and donating the unused portion carries no avoidable cost—in fact the data use trend analysis conducted by TGG in the process of negotiating partnerships with new businesses could in some cases assist these businesses to select a lower cap and thereby reduce their broadband costs.

In addition to his own family business, which provided the first Internet Gateway for the network, Alex examined the billing trends of a number of local businesses to establish a conservative estimate of monthly excess data capacity; he convinced some of these businesses to provide the excess capacity to the network. He anticipated a range of risks that might dampen the enthusiasm of local businesses to participate in the network and used his IT expertise to address these. The biggest risk was financial, for if network use in a given month exceeded the data allocation of an Internet Gateway provider that

business would be liable for over-plan charges. To deal with this Alex developed a software program that constantly monitors use-data and warns of any possible overrun.

One concern that surprised TGG was the spectre of the cafe 'lingerer'. Confident that public wi-fi would enhance trade, one of the first businesses Alex approached was a café located on the perimeter of the main street city park that did not currently offer wi-fi to its customers. He told us:

...on the other side of the park there was quite a popular little café...and I thought, ...[public wi-fi has] got to be a no-brainer for them...After the initial meeting they came back and said 'no, we're not interested'...They were concerned about people just getting onto the free wi-fi and ordering one cup of coffee and staying at their shop all day and running their business from the shop (Ferrara, 2013).

While encouraging people to linger in Goulburn's CBD had been promoted by TGG as a benefit of network investment, Alex's experience highlighted the need to carefully consider the impact of the network (real or perceived) on stakeholders. The encounter, according to Alex, "got us thinking...about the use of the wi-fi and limiting time and limiting speed and all that kind of stuff" (Ferrara, 2013). This wasn't, then, simply a story about realising technical potential, of enhancing local communication capacity and speed. Instead, it was a combination of speeding up and slowing down. Negotiating the politics of speed and mobility – setting network speed and functionality, calculating the appropriate length of time that visitors should linger in local cafes, and how impressed they should be with network quality – was an exacting part of the enterprise. The network was severely throttled when it went live in March 2013 with the aim of enabling email, web page and social media access, but not download heavy services such as video streaming (Sebo, 2013b).

TGG's caution in relation to network speeds seemed to contrast with their approach to network security and risk. Following some research on how other public networks handled risk and liability issues, the group modelled terms and conditions on those used by Brisbane City Council, and distilled these as "...basically just a one page" (Ferrara, 2013). The community enterprise was not bound by risk or quality of service expectations and Urs suggested that if anyone misused it, the plan was simply to take it down (Walterlin, 2013).

Although an intriguing model of social enterprise and inverse infrastructure investment in service of regional development, the fragility of TGG's public wi-fi network was clear to us when we visited Goulburn in December 2013. Not only was the network capable of falling apart at any time through malicious action, regulatory/contractual legal challenge, or changes to retail broadband plans, but the speed of the network was frustratingly slow – a situation likely to severely restrict use and erode the value of the network as a symbol of Goulburn's progressiveness that formed a key rationale for TGG's investment. Given the difficulties of sustaining volunteer, community-based digital enterprises in the post-development phase of maintenance and repair have been well documented (Verhaegh and van Oost, 2012), we were not confident the network would last.

### **Goulburn public wi-fi: A model of sustainable inverse infrastructure**

In November 2014 we returned to Goulburn to find TGG's public wi-fi network not only surviving, but thriving. When it was launched in March 2013 Alex's main street business provided the only Internet Gateway and two other businesses provided APs only (Sebo, 2013b). By September there were five businesses providing a combination of APs and gateways ((Sebo, 2013a). After twelve months, network coverage had expanded along the main street, with twelve APs and gateways in operation and a number of new sites under negotiation (Dubber, 2014).

Along with network expansion, usage had also risen. On a public holiday in June 2014, Alex recorded 8,624 individual connections to the network (Dubber, 2014). On our first visit to Goulburn we were informed that the network's busiest day was 80 logins. TGG had markedly improved the quality of service by increasing the network speed (download speeds were now four times faster), and this is also likely to have affected on network use.

TGG had also developed new mechanisms to encourage business participation. Internet Gateway providers can now promote their business on a customised part of the network login page. They can also provide customers with vouchers giving them higher network access speed (Ferrara, 2014). TGG had also investigated monetizing the network's business model itself to generate a revenue stream for other TGG activities. However, the group concluded that such a route raised philosophical and practical difficulties. Alex told us:

Well yeah, I mean the thought had crossed our mind and we have received interest from other parties. We're...I suppose not really in a position. The Goulburn Group is a non-profit organisation, so we have to be a little bit careful about how we go down the path of commercialising; but I mean realistically, we do want to help other groups and we are currently in negotiation with a couple of other groups — to show them how we've done it and to possibly do it for them (Ferrara, 2013).

Perhaps the most important development since the network's launch has been the increasing involvement of council. The council agreed to contribute \$9,000 over three years for network maintenance and expansion and erected signs at the highway exits advertising the service in late 2014 (2GN, 2014). The change in council's attitude was chalked up as a significant achievement by TGG. As Alex said:

When we proposed the current implementation of the wi-fi project...[a] lot of the councillors...recognised that...public wi-fi is something that's very attractive to visitors and very attractive for people when they're looking for destination locations, it actually was something they saw as very much positive, whereas the first time that it went to council, it was quite the opposite, they just looked at the negative, you know, 'What could go wrong?' (Ferrara, 2013).

Urs put it this way:

...this whole thing really started to change. We did it, then we started very early to involve the mayor...who is - he says it himself - an arch-conservative...Every time he sees me he says, "You have done a good job, but it doesn't mean I'm now more left". He always assures me that he is not going bad, going to the left, because he approves of what we think...he has very strongly supported us because he could see we deliver, we don't just talk (Walterlin, 2013).

Some within council clearly acknowledged that TGG's action-oriented approach had worked. Economic development officer Debbie told us that although council does "want to be seen as being awake and in this century" and "should have been a little bit more innovative and gotten on board in the beginning", "sometimes the bravery that's required [is] a little slower in coming through" (Rodden, 2013). However, Debbie suggested there were pitfalls in expecting council support for civic initiatives, with residents sometimes assuming the council is "...a bottomless pit of money and people and energy and so forth and it just isn't...I mean the projects that have been the most successful are when people say stuff council we'll go and do it anyway"(Rodden, 2013). Referring to council's change of mind to support the public wi-fi initiative, Debbie suggested:

I think that they were pushed into a corner. And I mean that in the nicest way because you have to do that sometimes, but I think it's – I think we were almost shamed into it (Rodden, 2013).

Interestingly, the council seems to have also taken up TGG's 'progressive' moniker to promote the region. Discussing a recent regional marketing campaign, council's acting manager of strategic marketing, Jessica Price, told Melbourne's *The Age* newspaper:

The aim is to promote Goulburn as a destination to visit, live, work and invest in, and to change people's perceptions of the region. We are trying to position Goulburn Mulwaree as a progressive and innovative community that offers attractive lifestyle choices (Strachan, 2014).

## Conclusion

The story of Goulburn's public wi-fi network deviates from the standard human-technology story of heroic communities that build a network and are transformed by it. This is a more pragmatic story about a bottom-up project to build public wireless broadband infrastructure that has both functional and symbolic aspects.

The success of the venture can be attributed to some local contingencies. The "hybrid community" (Callon, 2004) that is TGG, comprising a range of political, communication and technical skills, was a prime factor in framing the project, garnering business support, and setting up the network. Urs' subjectivity as an outsider, not bound by Goulburn's social and political conventions, able to articulate and defend an alternative economic path for Goulburn, was a crucial input. Alex's technical skills and his donation of many billable hours to the social enterprise was also a key input.

A range of structural factors also contributed to the project. The calibration of commercial broadband plans that encourage businesses to sign up to data bit caps far in excess of usage ensured availability of unused capacity to support the project. The absence of constraints in regulatory and planning

regimes, and the declining cost and increasing ease of deployment of mesh wireless equipment were also important factors.

When we first encountered TGG's public wi-fi project we were disposed to think the network had a limited future, because of the group's description of the network as a marketing tool, its seeming disregard for network functionality, and the preparedness to 'take it down' in the event of misuse or legal threat. The jerry-rigged character of this civil society initiative contrasted with the emphasis on service standards and accountability that underpin regulated commercial telecommunications ventures. However, perhaps TGG's tactical use of wi-fi is not a weakness, but a strength: it may be the project's key innovation. This pragmatism speaks to an increasing familiarity with wi-fi, to its incorporation within a suite of tools available to civil society groups to promote alternative development paths for local communities. TGG may have embarked on the project as a political ginger group, but it succeeded in developing a new business model for Goulburn's economy. As the former Australian Labor government's vision of a national broadband network loses political commitment, significantly impacting on the thin telecommunications markets of regional Australia, it seems likely that we will see increasing 'bottom-up broadband' activism in coming years. Stories such as TGG's will be helpful in framing expectations of what can be done, and in prompting a more pragmatic understanding of these emergent initiatives.

## References

- 2GN (2014) *New Wi Fi sign erected* [Online], (Goulburn: Capital Radio Network), [Accessed 21 November].
- ALIA (2013) *ALIA internet access in public libraries survey* (Canberra: Australian Library and Information Association), April.
- Anson, G. (2008) *Project Proposal: Free Goulburn Wireless Internet Access* (Goulburn: Orb Consulting for The Goulburn Group), 10 July.
- Braue, D. (2014) Telco Licence Enabling Gosford City Council's Cloud Ambitions, *ZDNet* [Online], 4 February.
- BTBA (2015) *Communique: Broadband for the Bush Forum IV* (broadbandforthebush.com.au: Broadband for the Bush Alliance).
- Callon, M. (2004) The Role of Hybrid Communities and Socio-Technical Arrangements in the Participatory Design, *Journal of the Center for Information Studies*, 5, pp.3-10.
- Dubber, A. (2014) Goulburn free wi-fi proves popular, *Goulburn Post*, 13 June.
- Egyedi, T.M., Mehos, D.C. & Vree, W.G. (2012) Introducing inverse infrastructures, in: T. M. Egyedi & D. C. Mehos (Ed.) *Inverse infrastructures: Disrupting networks from below* (Cheltenham: Edward Elgar), pp.1-19.
- Ferrara, A. (2013) *Interview*, (The Goulburn Group), 6 December.
- Ferrara, A. (2014) *Interview*, (The Goulburn Group), 13 November.
- Given, J. (2008) Australia's broadband: How big is the problem?, *Media International Australia*, 127, pp.6-10.
- Godwin, M. (1998) *Cyber rights: Defending free speech in the digital age* (New York: Times Books).
- Goulburn Post (1992) \$84 million bypass set to bring significant benefits to Goulburn, *Goulburn Post*, Supplement to the Goulburn Post and Highlands Post, p.2.
- Goulburn Post (2010) Free WiFi set for CBD?, *Goulburn Post*, 7 June.
- Gow, G.A. & Smith, R. (2006) *Mobile and wireless communications: An introduction* (Maidenhead: Open University Press).
- Graham, S. & Marvin, S. (2001) *Splintering urbanism: Networked infrastructures, technological mobilities and the urban condition* (London: Routledge).
- Graham, S. & Thrift, N. (2007) Out of Order: Understanding Repair and Maintenance, *Theory, Culture and Society*, 25(3), pp.1-25.
- Gregory, M. (2012) Is Rural and Remote Australia Being Dudded by the NBN?, *The Conversation* [Online], 5 November.
- Harte, L. (2007) Australia's big icons on the move, *ABC Radio - PM*, 23 May.
- Hills, A. (2011) *Wi-Fi and the bad boys of radio: dawn of a wireless technology* (Indianapolis: Dog Ear Publishing).
- Jungnickel, K. (2013) *DIY WiFi: Re-imagining connectivity* (London: Palgrave Macmillan).
- Jungnickel, K. & Bell, G. (2009) Home is Where the Hub Is? Wireless Infrastructures and the Nature of Domestic Culture in Australia, in: M. Foth (Ed.) *Handbook of research on urban informatics: The practice and promise of the real-time city* (Hershey: IGI Global), pp.310-325.
- Lemstra, W., Hayes, V. & Groenewegen, J. (eds.) (2011) *The innovation journey of wi-fi: The road to global success* (Cambridge: Cambridge University Press).
- Marino, M. (2005) Goulburn could run dry in eight months, *The Age*, 20 May.

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- Massy, C. (2011) *Breaking the sheep's back: The shocking true story of the decline and fall of the Australian wool industry* (St Lucia: University of Queensland Press).
- McShane, I., Wilson, C.K. & Meredyth, D. (2014) Broadband as Civic Infrastructure - The Australian Case *Media International Australia*, 151, pp.127-136.
- Middleton, C. & Potter, A. (2008) Is it good to share? A case study of FON and Meraki approaches to broadband provision, *International Telecommunications Society 17th Biennial Conference*, Montreal, June.
- OECD (2014) *Broadband Portal* [Online], Available:  
<http://www.oecd.org/sti/broadband/ocedbroadbandportal.htm>
- Parks, L.D. & Starosielski, N. (2015) Introduction, in LD Parks & N Starosielski (eds) *Signal traffic: Critical studies of media infrastructures* (Urbana: University of Illinois Press), pp.1-27.
- Rodden, D. (2013) Interview, (Economic Development Projects Officer, Goulburn Mulwaree Council), 20 November.
- Sebo, T. (2013a) City's tech tourism, *Goulburn Post*, 3 September.
- Sebo, T. (2013b) A high-tech present, *Goulburn Post*, 5 March.
- Spigel, B. (2013) Bourdieuan approaches to the geography of entrepreneurial cultures, *Entrepreneurship & Regional Development*, 25(9-10), pp.804-818.
- Strachan, J. (2014) Goulburn dangles childcare carrot in advertising campaign to lure Canberrans to the municipality, *The Age*, p.online edition.
- Telstra (2014) *Telstra T-Bundle BizEssentials*® Available: <http://www.telstra.com.au/small-business/bundles/tbundle-bizessentials/index.htm> [Accessed 18/12/2014].
- TGG (2014), *About TGG: Who are we?* (Goulburn: The Goulburn Group (TGG)), Available: [http://www.goulburngroup.com.au/about\\_tgg.php](http://www.goulburngroup.com.au/about_tgg.php) [Accessed 18 July 2014].
- TGG (2015) *Treechangers* [Online], (Goulburn: The Goulburn Group (TGG)), Available: [http://www.goulburngroup.com.au/?page\\_id=34](http://www.goulburngroup.com.au/?page_id=34) [Accessed 19 August].
- Verhaegh, S. & van Oost, E. (2012) Who Cares? The Maintenance of a wi-fi Community Infrastructure, in: T. M. Egyedi & D. C. Mehos (Ed.) *Inverse infrastructures: Disrupting networks from below* (Cheltenham: Edward Elgar), pp.141-160.
- Walterlin, U. (2013) *Interview*, (Chairman, The Goulburn Group), 19 November.