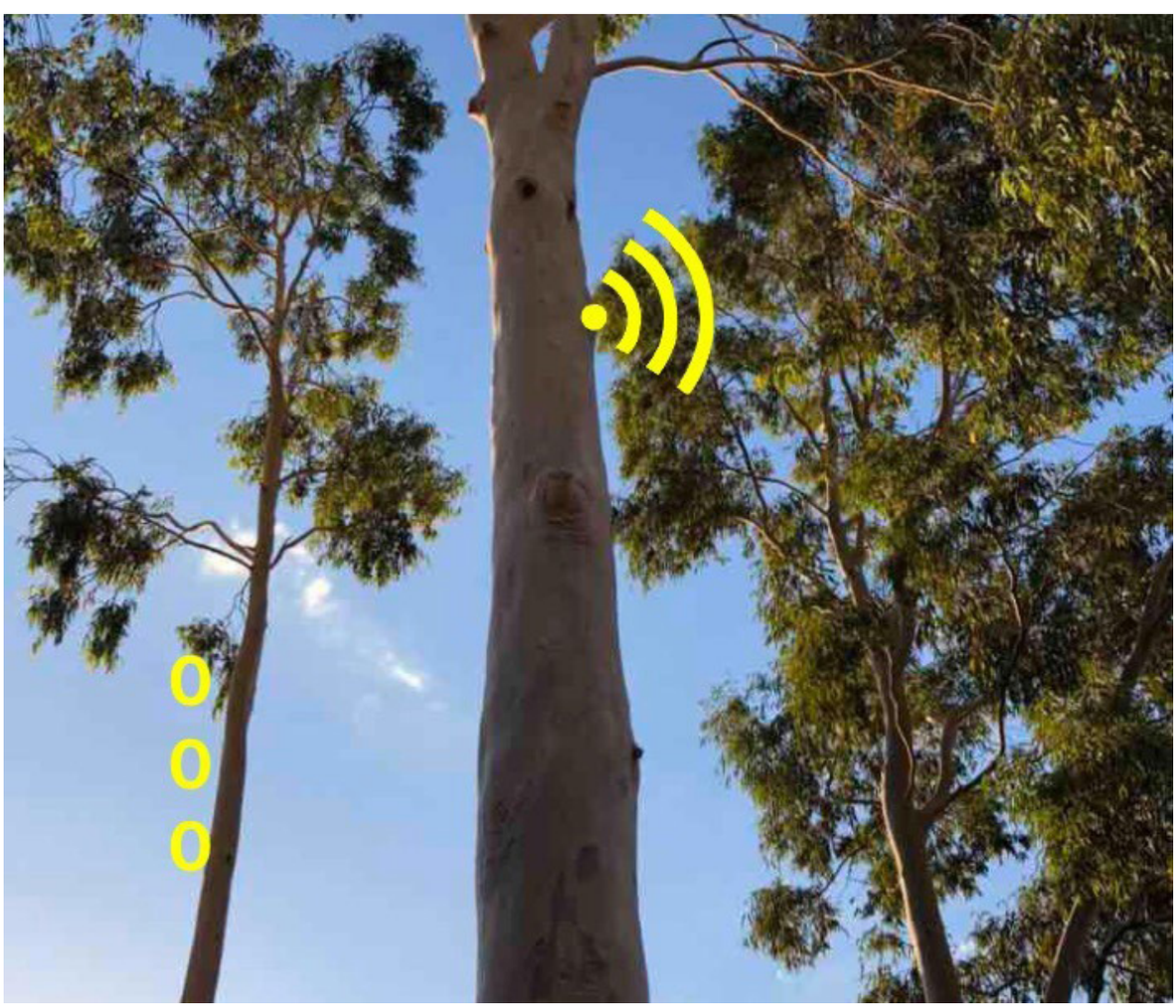
‘It just works!’

Regional and rural consumer understanding of smart technologies in North West New South Wales

Dr. Holly Randell-Moon and Danielle Hynes
November, 2021



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Acknowledgments

We acknowledge the sovereignty of the Wiradyuri, Wayilwan, and Gamilaraay Nations and language groups as well as the Gadigal peoples of the Eora Nation on whose lands this research was conducted. We pay respects to Elders past, present, always. We honour them for their custodianship of these lands which have enabled the maintenance of knowledge and information pathways across Country and into the future.

'It just works!': Regional and rural consumer understandings of smart technologies in North West New South Wales

Authored by **Dr. Holly Randell-Moon and Danielle Hynes**

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Executive Summary

Have you used a smart app like the COVIDSafe app or had a smart water meter installed on your property? Who owns your data? You? The government? The manufacturer of the app? This report provides information on consumer rights in relation to smart technologies in regional and rural North West New South Wales.

'It just works!': Regional and rural consumer understandings of smart technologies in North West New South Wales is one of the few studies to examine this consumer base. Research and policy tends to focus on smart technology in cities. This report puts the focus on smart tech in rural and regional areas.

This report draws on an evidence base from over 130 participants and 6 case studies including Dubbo, Wellington, Narromine, Peak Hill, Gilgandra, and Local Aboriginal Land Councils. The research was conducted by Dr. Holly Randell-Moon from the School of Indigenous Australian Studies at the Dubbo campus of Charles Sturt University, Australia. The project is funded by the Australian Communications Consumer Action Network (ACCAN).

Key Themes and Issues

The project identified the following key themes and issues regarding regional and rural consumer understandings and use of smart technologies:

- ***Polarisation*** in perceptions of telecommunications quality
  - Participants either assess quality as 'pretty good actually' or 'ordinary'
  - Quality telecommunications are essential for quality smart tech use
- ***High awareness*** of smart technologies and applications but ***relatively little use***
  - ***Demonstrated benefit*** is needed to aid take-up due to perceptions that the benefits of smart technologies and applications will become apparent when used
- Smart tech ***champions***
  - The use and development of technologies and applications for planning, business, and consumption should be championed by select individuals in the 5 areas
- ***Ewaste (electronic waste) considerations***
  - If regions are to become 'smart', how can shire councils develop plans to manage the increase in smart technologies and devices and consequently their waste?
- ***Inclusivity***: Local Aboriginal Land Councils are key stakeholders in planning and development in the region, including for smart regions and rural areas
  - This project included relatively few respondents with a migrant background, older peoples (70+ years old), and people living with a disability
  - These communities will grow in the years ahead in regional and rural areas and they are important stakeholders in smart cities and regional community planning
- ***Confusion regarding consumer rights*** in relation to smart technologies and applications
  - This was evident in the project data specifically in relation to data ownership, remote data monitoring, and who to go to for advice regarding smart tech

Recommendations include:

Further information should be provided to rural and regional communities promoting consumer rights regarding smart technologies and applications and clarifying councils' role in relation to these rights

Further opportunities should be found for all community stakeholders to trial the use of smart technologies and applications to increase familiarity and trust of the technology

Local councils should develop opportunities for identified smart technology champions to promote smart tech benefits among the community

Local councils and other stakeholders in smart development should identify the opportunities from engagement with Local Aboriginal Land Councils and First Nations in the development of smart regions

A key aim of the project was to develop a regional definition of smart technologies and applications. Based on the project data, this definition is ***practical confidence.*** Regional and rural consumers want technologies that 'just work' and 'do their job', with practical applications for regions and rural areas.

More information about the project and the results can be found here: https://smartregions.csu.domains/

Introduction - Understanding Smart Regions

Smart infrastructure is positioned as central to the liveability and viability of rural towns and regional cities. Regional and rural communities stand to benefit considerably from smart planning and services, provided telecommunications capacity and ability are aligned. Telecommunications capacity refers to the availability and operation of telecommunications, while telecommunications ability refers to the literacy and ability to use telecommunications.

One obstacle to assessing smart ability is that regional and rural communities are typically excluded from the evidence base for smart technologies and services. Focusing on regional and rural communities in the North West of New South Wales (NSW), this project provides data on the digital experiences and smart literacy of regional and rural telecommunications consumers to better understand how smart services can be applied. The sites for the project are Dubbo and the surrounding areas of Narromine, Gilgandra, Wellington, and Peak Hill.

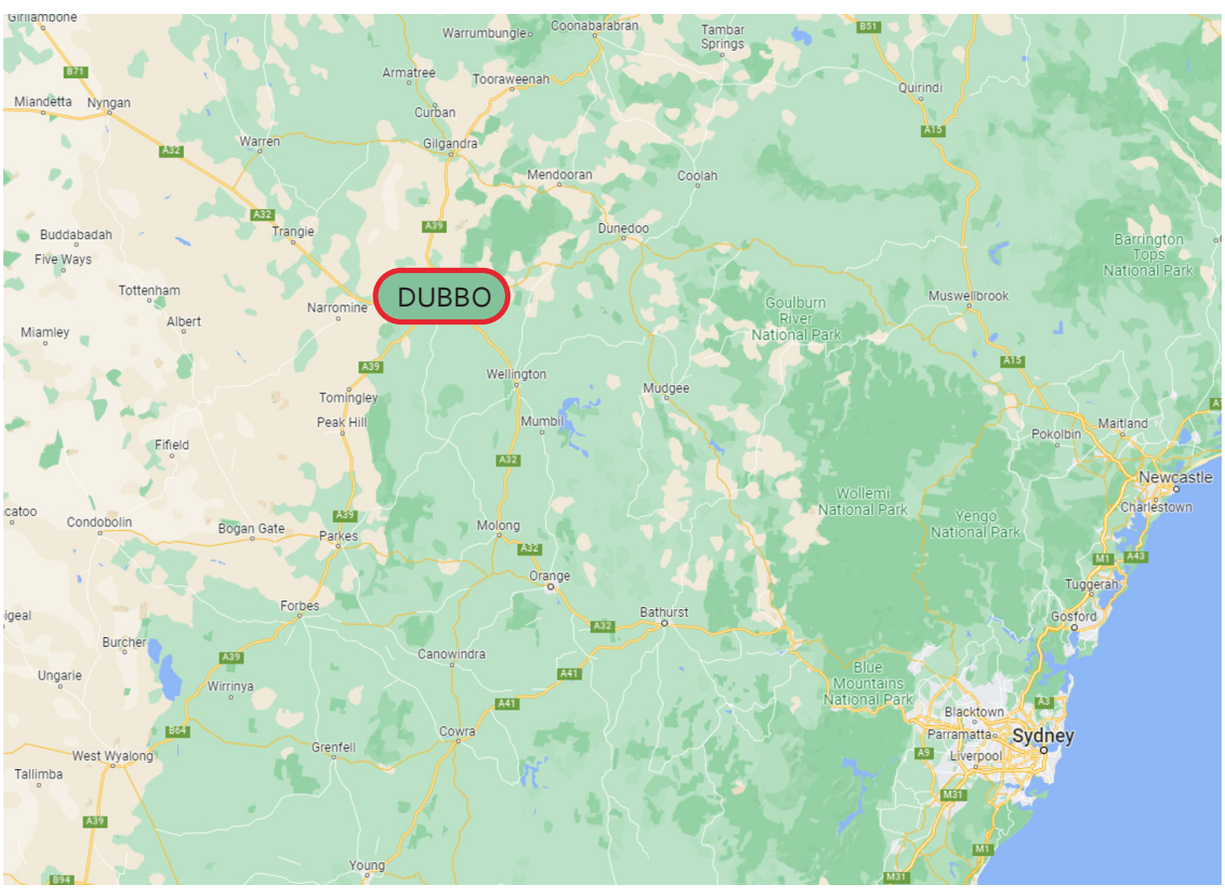

Image 1 Dubbo's location in New South Wales. Source: Google maps

Image 2 The 5 case site locations. Source: Google maps

This project provides a qualitative evidence base of over 130 North West NSW regional and rural consumers' awareness of smart technologies and applications. The project asked consumers and council stakeholders:

- How is 'smart' understood?
- What applications are consumers familiar with?
- Where can smart technologies be applied?
- What do smart technologies mean for regional and rural futures?

The findings provide an awareness measure benchmark of smart technologies and applications from regional and rural consumers. Six case studies of the participating towns and Local Aboriginal Land Councils are provided that detail telecommunications opportunities and challenges for smart policy alignment with consumer needs and expectations.

What does policy and research say about smart regions?

Regional areas have witnessed the gradual implementation of smart technologies ranging from smart water meters to Wi-Fi access points to sensors gathering road traffic data. According to the Dubbo Regional Council, an estimated 17,700 homes and 2,300 businesses will use smart water meters in Dubbo and smart health applications will expand with the healthcare sector expected to grow by 39% with the new Health, Education and Wellbeing Precinct (Bartley, 2019; Dubbo Regional Council, 2019a). However, regional and rural telecommunications consumers are one of the least understood market segments for smart services.

The 2020 *Smart Cities Down Under* report by the Queensland University of Technology confirmed that performance and infrastructural issues are obstacles for smart regional and rural development. Capability was just one facet of smart efficiency though as the latter requires 'a smart community that is knowledgeable' (Yigitcanlar et al., 2020, p. 42). Knowledgeability is hindered by confusion. The Australian Communications Consumer Action Network (ACCAN) project by Broadband for the Bush Alliance reported that while respondents had heard of telehealth, its applications were not well understood or utilised (n.d.).

In the Australian Digital Inclusion Index 2020, North West NSW is included as the largest geographical area in the state (Thomas et al., 2020, p. 26), without any local differentiation. The *Smart Cities Down Under* report focused on local government areas with a population of 50,000 or more (Yigitcanlar et al., 2020, p. 42). Residents of towns and cities in this area know internet speeds are different in Dubbo compared to Gilgandra (where the former has a population of approximately 38,000 [ABS, 2020c] and the latter, 3,000 [ABS, 2020g]). The Dubbo satellite area benefits from a case study approach that localises telecommunications issues in smaller regional and rural towns.

The 'city' paradigm for smart policy and planning dominates the literature (see Caragliu, Del Bo & Nijkamp, 2011; Campbell, 2012). Assumptions of smart applications for 'city' areas are evidenced in the Australian Government's Smart Cities and Suburbs Program (Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, n.d.[e]). Part of the metropolitan dominance is because internet access is assumed for smart capability (Yigitcanlar & Kamruzzaman, 2019; Haidar, Muttaqi & Sutanto, 2015). This research project centres regional and rural perspectives on smart ability and contributes these perspectives to policy and research frameworks.

Consumer rights for smart technologies and their applications is an emerging area. Consumer rights frameworks borrow, in part, from already existing consumer protection mechanisms related to data privacy and consumer rights. Smart technologies straddle data privacy, health, and consumer concerns. Data concerns relating to smart technology consumption are the responsibility of the NSW Information and Privacy Commissioner, the NSW Ombudsman or the Australian Competition and Consumer Commission. Smart tech and apps related to health are the purview of the National Health Practitioner Ombudsman and Privacy Commissioner or the Health Care Complaints Commission. Shire and Local Aboriginal Land Council data privacy legislation and governance frameworks are also relevant.

Policy support for smart regions and rural areas should consider the role of local government in mediating community use, particularly as smart technology increasingly becomes part of local government infrastructure and services. This will necessarily involve experimentation and innovation. As such, flexible consumer protection should align with the developing use of smart technology rather than technology determining the parameters for consumer use.

The role of First Nations in smart regional development

First Nations are important stakeholders in telecommunications and smart regional development. First Nations are adept at managing communication and the transmission of information across large distances and over thousands of years. Including Local Aboriginal Land Councils as stakeholders in these developments has implications for managing the digital processes associated with information and infrastructure moving across different Countries.

Working with First Nations communities on smart regional development provides opportunities in relation to the Indigenous business economy. A recent report indicated that this economy is worth $4.9 billion and is equivalent to Australia's beer industry! (Evans et al., 2021, p. 13). First Nations governance and cultural responsibilities with respect to data planning and sharing are also growing. Indigenous data sovereignty is a key concern of First Nations governance (see Kukutai & Taylor, 2016). Indigenous data sovereignty refers to self-determination in how data is collected and used by and for First Nations.

A great local app is the Wiradjuri Dictionary App[1] developed by Dr. Stan Grant and other Wiradyuri Elders. The app provides two-way Wiradyuri and English translation.

[1] https://www.wcclp.com.au/wiradjuri-dictionary/

Who should use the evidence from this report?

This project enabled the meaningful involvement of North West New South Wales regional and rural consumers in developing definitions of 'smart' as well as recommendations for smart technologies and their applications. The locally contextualised specific evidence base and research data provide increased knowledge of these communities' and consumers' perspectives for local shire and Local Aboriginal Land Councils, policymakers, and researchers. These findings will help regional and remote communities in North West New South Wales optimise the use of available smart technologies by:

Improving understanding of both smart technology infrastructure and consumer use and awareness of smart technology in North West New South Wales

Increasing understanding of remote data monitoring and the provision of policy frameworks

Developing insights and recommendations that help to improve alignment of smart technology infrastructure and community use

Working with First Nations to develop smart regions and grow the Indigenous business economy in North West New South Wales

Overall, the evidence base and research data provide knowledge for consumers, communities, and local shire and Local Aboriginal Land Councils on emerging trends associated with the normalisation of digital infrastructure. This includes information on how First Nations stakeholders are included in smart infrastructural planning. The findings can be used by stakeholders to manage expectations regarding community consultation in digital infrastructure planning and operation.

Project Summary

The study included a questionnaire, interviews with a range of stakeholders (shire councils, Local Aboriginal Land Councils, and consumers), and case studies of the 5 case sites plus 1 for Local Aboriginal Land Councils. The data was used to gauge broad understanding and perceptions of smart technology and its application to the region.

The sites for the project were Dubbo and the surrounding areas of Narromine, Gilgandra, Wellington, and Peak Hill.

The project comprised three components:

Percentages and numbers of respondents provided for this project's questionnaire equate to the number of responses for each question. Note that not all respondents answered each question. Interview participants who elected to be named in the project are identified. Participants from the questionnaire who were interviewed are identified by numerical code (Q1, Q2, etc.). When direct quotes from participants are used, the original spelling and grammar are kept intact to preserve the authenticity of the responses. Interviews were conducted by Dr. Holly Randell-Moon in-person or over the phone. The projected was approved by Charles Sturt University's Human Research Ethics Committee (H20316).

Research Team

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Project data

Questionnaire	119 respondents • 112 online respondents • 7 offline respondents	The questionnaire ran from April 21-July 19, 2021. The questionnaire was available online (https://smartregions.csu.domains/) and through hard copies distributed in the public libraries of each of the 5 towns.
Interviews	20 interviewees • 5 shire council members • 5 Local Aboriginal Land Councillors and members • 10 consumers	Interviews were conducted from March 8-July 30, 2021.
Case Studies	6 • Dubbo • Narromine • Gilgandra • Wellington • Peak Hill • Local Aboriginal Land Councils	The research for the case studies was conducted from November 2020-November 2021.

Local Aboriginal Land Councils

Local and state Aboriginal Land Councils play a significant role in governance and planning for regional and rural areas. In the case areas for this project, there are Local Aboriginal Land Councils in Dubbo, Wellington, Peak Hill, Gilgandra, and Narromine as well as the smaller surrounding towns. Interviews for this project included the Councillor for the Central Region[2], NSW Aboriginal Land Council, members of the Dubbo Local Aboriginal Land Council including an Elder, the CEO and Chairperson of Nyngan Local Aboriginal Land Council, and the CEO of Narromine Local Aboriginal Land Council.

Formal Local Aboriginal Land Council responsibilities include managing land acquisitions as well as engaging in commercial and community initiatives to sustain First Nations along with culture, identity, and heritage (NSW Aboriginal Land Council, 2021). The NSW Aboriginal Land Council 'oversees the network of 120 Local Aboriginal Land Councils (LALCs)' (NSW Government, n.d.[b]) and the state council represents nine regional areas.

According to the interviewees for this project, Land Councillors also facilitate access to digital and online technologies for First Nations residents.

> Having access to smart technology is a problem. We have a lotta community that don't have access, so doing things like assessment forms and things like that need to be done in person with people.
>
> Shelly Bayliss, CEO of Narromine Local Aboriginal Land Council

The quality of telecommunications is an issue for Land Councils' reporting and compliance requirements.

> All our business is done over the Internet now, most of it, so it has a big impact. If we can't get on properly, well, we can't hook in. We miss out on a lot of information and stuff.
>
> Lesly Ryan, Chairperson of Nyngan Local Aboriginal Land Council

According to the interviewees, coverage often drops out when performing land surveys so this information is compiled by hand and then digitised upon return to the office.

> You drop in and out. If we go out 50ks out the road, out towards Bourke, you've got nothing until you get to the next community. It depends on whereabouts you are, but if we were goin' out to do a site survey with our mapping, there's no chance. You can't even get on to find a site, to jump on, and find your location.
>
> Veneta Dutton, CEO of Nyngan Local Aboriginal Land Council

[2] The Central Region covers: Dubbo, Gilgandra, Mudgee, Narromine, Nyngan, Trangie, Warren, Weilwan, and Wellington: https://alc.org.au/land_council/

> Or do it all by hand. Instead of gettin' your GPS, your longitude and latitude and write it all in by hand, and when you get back, you can put it all into the computer.
>
> Lesly Ryan, Chairperson of Nyngan Local Aboriginal Land Council

Increasing digital infrastructure is often viewed as more efficient because face-to-face interactions with services can be reduced. The interviewees spoke about the importance of maintaining face-to-face relationships. In terms of reporting work though, there was support for digitisation while ensuring privacy and security of data is maintained.

> We're not doublin' handling, so it's straight up there, and it's easier.
>
> Efficiency.
>
> Holly Randell-Moon
>
> Efficiency. It'd be faster. It'd make our life easier.
>
> Lesly Ryan

> Oh, it'd be good to check on the sites and everything.
>
> Aunt Margaret Walker, Member for Dubbo Local Aboriginal Land Council

If given unlimited funding and training, the interviewees see scope for including drones for land surveys, increasing the efficiency of their work through more digitisation, and optimising smart technologies to support pop-up businesses. Shelly Bayliss said, 'Unlimited funds to technology would allow us to upgrade and use smart technology.'

A crucial requirement for Land Councils is access to data for planning and supporting their local First Nations residents. The project could find no publicly available policies relating to data sharing arrangements between Local Aboriginal Land Councils and local shire councils. This may be the result of legislative requirements. Interviewees stated their knowledge of council planning is derived from serving dual roles on both land and shire councils.

While it is increasingly common for shire councils to have Aboriginal Employment Strategies and Reconciliation Action Plans, there is further scope for specific responsibilities and opportunities for First Nations' engagement with planning. The project surveyed a range of smart and digital policy development in regional New South Wales and could not find publicly available evidence of First Nations being recognised as stakeholders in the community and economic benefits promoted by digital and smart technologies. The NSW Government's Electricity Infrastructure Roadmap, enabled by the recent *Electricity Infrastructure Investment Act 2020* (NSW), has a section specifically identifying the need for engagement and consultation with First Nations (NSW Energy, 2020). Local Aboriginal Land Councils have land assets that have the potential for use in energy sovereignty and the *Aboriginal Land Rights Act 1983* (NSW) enables Land Councils to make use of land assets for the economic benefit of their members. In order to benefit from these infrastructural investments, digital access to and management of data is crucial for development. The first two recommendations from OECD (Organisation for Economic Co-operation and Development) Rural Policy Reviews report, *Linking Indigenous Communities with Regional Development*, are:

1. Improving Indigenous statistics and data governance.

2. Creating an enabling environment for Indigenous entrepreneurship and small business development at the regional and local levels. (2019, p. 6)

Data and digital infrastructure are crucial for First Nations' regional and rural futures. Data from this project indicates a need for the development of data sharing plans and inclusion of the expertise, knowledge, and enthusiasm of First Nations for digital and smart regions and rural towns. Data planning aligns with the strategic goals of the NSW Aboriginal Land Council (NSW Aboriginal Land Council, n.d.).

As the editors of *Indigenous Data Sovereignty* note, First Nations require:

> the generation of demographic, wellbeing and community development information in ways that better respond to the self-determination aspirations of indigenous peoples. (Kukutai & Taylor, 2016, p. 2)

Indigenous data sovereignty

> considers the implications of UNDRIP [United Nations Declaration on the Rights of Indigenous Peoples] for the collection, ownership and application of statistics pertaining to indigenous peoples and what these might mean for indigenous peoples' sovereignty over data about them, their territories and ways of life. (Kukutai & Taylor, 2016, p. 2)

Questionnaire Results

The questionnaire comprised both closed and open-ended questions (see Appendix 1: Questionnaire for a copy).

Most respondents were from Dubbo (see Figure 1 and Table 1).

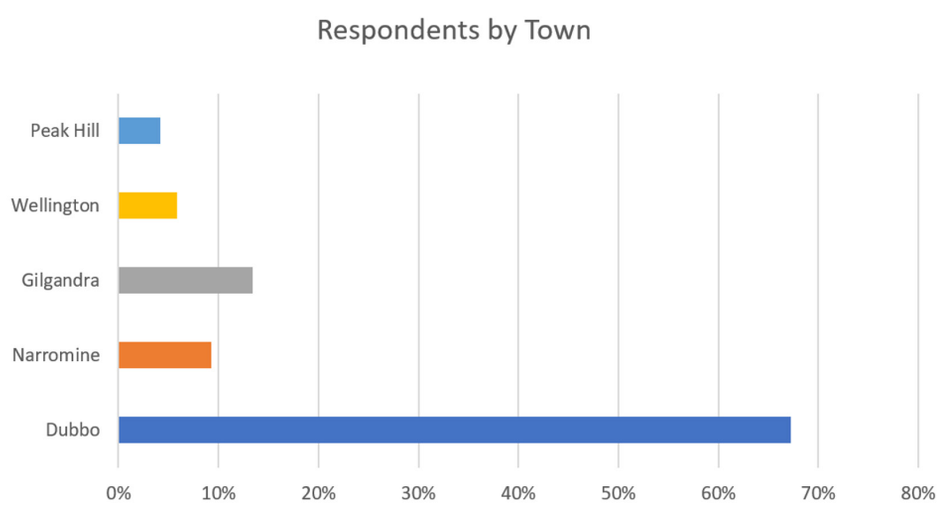


Figure 1 Percentage of respondents by town in questionnaire

Table 1 Number of respondents by town in questionnaire

Town	Respondents	Percentage
Peak Hill	5	4%
Wellington	7	6%
Gilgandra	16	13%
Narromine	11	9%
Dubbo	80	67%
Total	**119**	

Awareness of smart technologies and applications

While the majority of respondents had heard of smart technologies, around a quarter of respondents had not (see Figure 2 and Table 2).

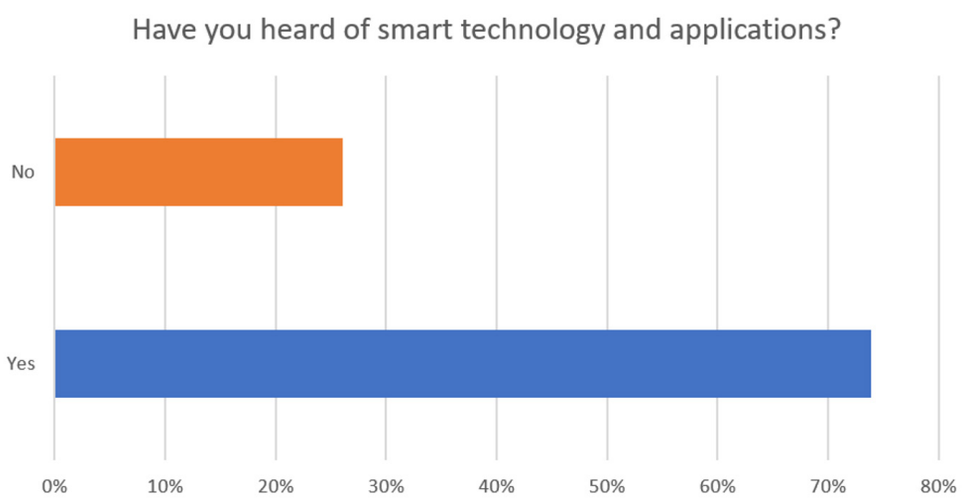


Figure 2 Percentage of respondents who have heard of smart technologies and applications in questionnaire

Table 2 Number of respondents who have heard of smart technologies and applications in questionnaire

Response	Numbers	Percentage
No	31	26%
Yes	88	74%
Total	**119**	

In the questionnaire, respondents were next presented with examples of smart technologies and applications. Figure 3 and Table 3 indicate which examples respondents were familiar with.

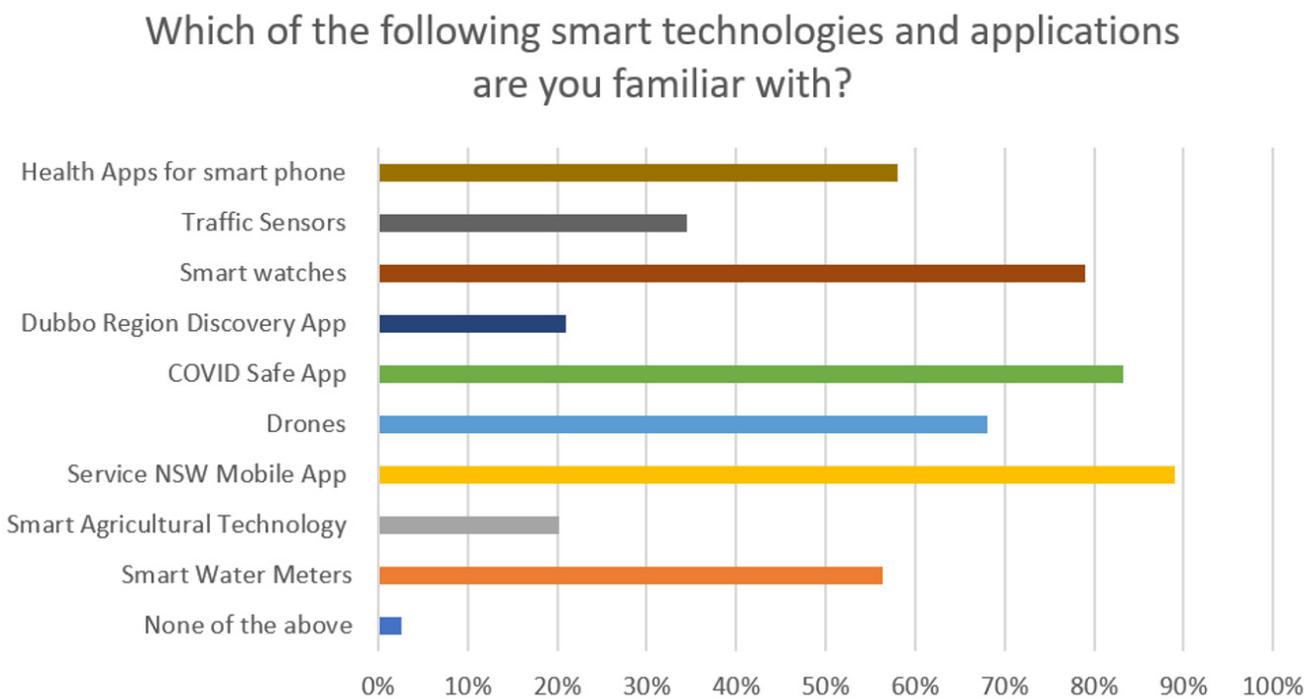


Figure 3 Percentage of smart technologies and applications in questionnaire that respondents were familiar with

A very small minority (3) were not familiar with any (see Table 3). Note that this response is lower than the response to the previous question. When presented with examples of smart technologies and applications, respondents' smart awareness increased.

Table 3 Number of smart technologies and applications in questionnaire that respondents were familiar with

Response	Numbers	Percentage
Health Apps for smart phone	69	58%
Traffic Sensors	41	34%
Smart Watches	94	79%
Dubbo Region Discovery App	25	21%
COVID Safe App	99	83%
Drones	81	68%
Service NSW Mobile App	106	89%
Smart Agricultural Technology	24	20%
Smart Water Meters	67	56%
None of the above	3	3%
Total respondents	**119**	

An open-ended question asked participants to list further smart technologies and applications they were aware of. There were 75 responses to this question and the responses demonstrate a high level of smart literacy due to the awareness of different kinds of smart technologies and applications. Some technologies and applications listed are not generally considered smart (for instance, social media, Facebook). The COVIDSafe app was mentioned several times (10). Smart phones had the most responses (30) in the open comments.

- IoT [internet of things], smart screens, smart bins, smart parking, traffic monitoring, environmental monitors, building sensors (light - monitors, energy monitoring), people counters
- Assistive technology for those who are disabled, apps, water meters, smart phones and watches
- Artificial intelligence, smart city, smart home , vmware, smart traffic management System
- Bank apps, news weather games info social media
- QR codes, Apps, Facial recognition, GPS tracking, smart meters
- Smart phones and smart water meters
- Smart water meter and QR code scanners
- Instagram FaceBook, Podcasts, Apps
- Covid Check in AGL smart energy app/metre Smart water meter
- Smart phones, televisions, computers, laptops, gaming consoles, applications on phones
- Smart phones, smart watches, apps that connect to location and provide personalised info based on use
- Soon I will use a smart card for taxi subsidy. Starts May

Some respondents listed platform applications used on a smart phone, for instance:

- UBER, MENULOG, EBAY

Smart water meters were very common responses to this open-ended question (22) along with smart household consumer items and appliances such as smart watches, televisions, refrigerators, and virtual artificial intelligence assistants (e.g., Alexa). The high awareness of smart water meters may have been influenced by the promotional blurb for the questionnaire, which mentioned smart water meters.

Some respondents listed smart brands rather than technologies and applications, for instance:

- Oculus Apple Samsung
- Google home Alexa

Other brands mentioned included Apple and a regional agtech (agricultural technology) company, GoannaAg. GoannaAg provide infield low bandwidth connectivity.

While there was a high awareness of smart technologies and applications, there was comparatively little usage (see Figure 4 and Table 4). Table 4 highlights percentages that indicate high or low levels of smart technology use. For instance, most respondents (approximately 73%) said they Never used smart water meters (compared to less than 10% who used them every day, every week, every month or a few times a year). The majority (approximately 84%) had Never used Smart agricultural technology, and the Dubbo Discovery Region App (approximately 78%). Thirty respondents had Never used any of the smart technologies and applications listed above.

The most commonly used technology were smart watches with approximately 40% of respondents using them at least once a day. A higher number of respondents (49%) reported Never using them though. Approximately 32% of respondents reported using the Service NSW mobile app at least once a day, 40% a few times a week, 13% a few times a month, and only 3% Never using it. Approximately 18% used the COVIDSafe app a few times a week. 24% of respondents said they had Never used it[3]. Drones represented the highest response for use a few times a year (19).

[3] During March–June 2021, Dubbo and the surrounding areas had very few COVID-19 cases and COVID-19 restrictions were generally more relaxed in the region but check-in to public places and businesses was still required. July 2021 saw more stringent COVID-19 protection measures due to the outbreak in greater Sydney.

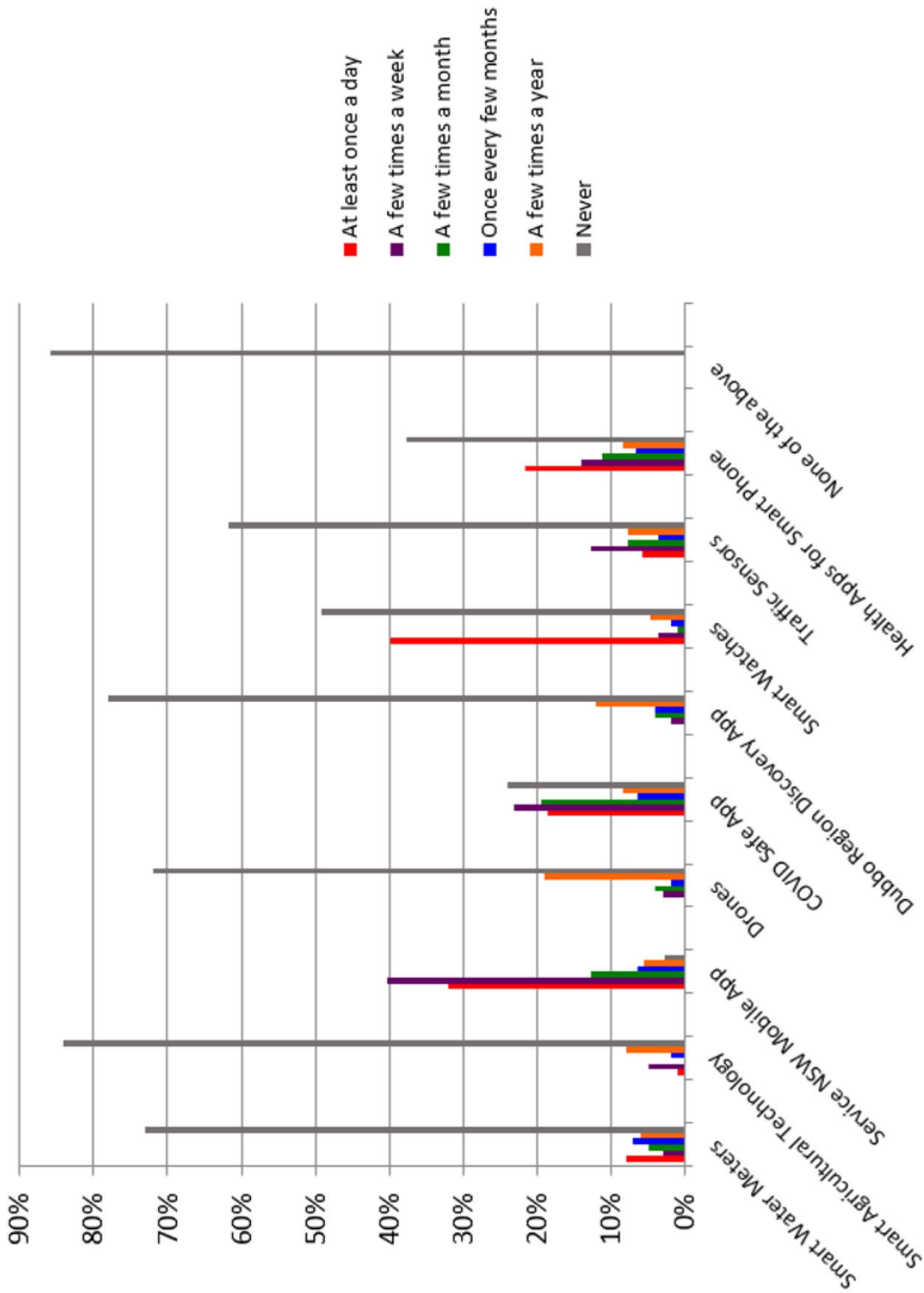


Figure 4 Percentage for How often do you use these technologies and applications?

Table 4 Questionnaire results (with highlights) for How often do you use these technologies and applications?

	At least once a day	A few times a week	A few times a month	Once every few months	A few times a year	Never	Total (respondents)
Smart Water Meters	7.55% 8	2.83% 3	4.72% 5	6.60% 7	5.66% 6	**72.64%** **77**	106
Smart Agricultural Technology	1.00% 1	5.00% 5	0.00% 0	2.00% 2	8.00% 8	**84.00%** **84**	100
Services NSW Mobile App	32.11% 35	**40.37%** **44**	12.48% 14	6.42% 7	5.50% 6	2.75% 3	109
Drones	0.00% 0	3.00% 3	4.00% 4	2.00% 2	**19.00%** **19**	**72.00%** **72**	100
COVID Safe App	**18.51%** **20**	**23.15%** **25**	**19.44%** **21**	6.48% 7	8.33% 9	**24.07%** **26**	108
Dubbo Region Discovery App	0.00% 0	2.00% 2	4.00% 4	4.00% 4	12.00% 12	**78.00%** **78**	100
Smart Watches	**39.81%** **43**	3.70% 4	0.93% 1	1.82% 2	4.63% 5	**49.07%** **53**	108
Traffic Sensors	5.88% 6	12.75% 13	7.84% 8	3.70% 4	7.84% 8	**61.76%** **63**	102
Health Apps for Smart Phone	**21.70%** **23**	14.15% 15	11.32% 12	6.60% 7	8.49% 9	**37.748%** **40**	106
None of the above	5.71% 2	0.00% 0	2.86% 1	2.86% 1	2.86% 1	**85.71%** **30**	35

Most participants agreed that smart technologies and applications could be applied to Health (approximately 92%), Government services (89%), Council services (87%), Education (85%), Tourism (85%), Community (84%), Agriculture (82%), Leisure (81%), and Planning and infrastructure (79%). As with the responses above regarding awareness of smart technologies and applications, respondents tended to tick most options when presented with them. The Dubbo Regional Council survey reported high results for the following smart applications: Environment, Energy, Assessment management, and Transport, Mobility.

Further open-ended responses for smart applications included:

- Everything
- Endless
- Literally anything!
- Because of the adaptability of the technologies these can be used in just about everything, especially via the catm1 and narrowband networks
- Virtual anything (e.g., virtual marathons could keep track and provide health data), charities/ activism
- Home environment control, electricity
- Waste Way Finding Safety Communication Transport
- Irrigation Scheduling
- Travel
- Youth Services
- Grocery Shopping
- Rodent eradication
- Aviation

Digital literacy and consumer rights

Most respondents assessed their digital literacy as Good (approximately 42%), Great (30%), Fair (24%), with only 4% (4 respondents) reporting Not Great, and 0 responses for Poor. A definition of digital literacy was not provided. Per the questionnaire provided in Appendix 1: Questionnaire, this question came after respondents indicated their awareness of smart technologies and applications, which may have influenced their assessment.

Most respondents (approximately 88%) reported that remote data monitoring was helpful with a small minority (4%) reporting unhelpful and 8% neutral. Remote monitoring means the ability to monitor in real-time (as it is taking place) water usage or traffic from a smart phone or computer rather than checking in-person. The majority reported that it was Pretty good but can be prone to errors like all technologies (approximately 85%) with a small proportion saying it is Flawless (4%). Ten per cent reported remote data monitoring was neither accurate nor inaccurate. This shows a practical awareness of some problems with smart technologies. The results are similar to those from the Dubbo Regional Council Smart Cities Strategy survey, where respondents reported Medium and High trust in digital technology. Trust could mean respondents have faith in the accuracy and efficiency of remote data monitoring.

There was a mixed response to the question regarding who owns the data created by smart technologies and applications. The majority responded the manufacturer (approximately 66%), the third party to whom the data has been sold (56%), then You (41%), with 39% for the Government and 33% for the local council. These findings are similar to those from the Dubbo Regional Council Smart Cities Strategy survey.

Respondents were equivocal in who they should contact regarding data/information produced by a council operated smart technology. The majority reported going to their local council (72%) and Go to the Information and Privacy Commissioner NSW (59%). The Australian Communications Consumer Action Network was reported at 50%, local Member for Parliament at 25%, and Local Aboriginal Land Council at 10%. Half the respondents who reported Local Aboriginal Land Council identified as First Nations. There was a 0% response for Other. The latter indicates participants could not think of appropriate complaints and consumer rights bodies beyond what was provided. **There is scope for government and business capacity building in partnership with local councils in relation to promoting consumer understandings of smart technology and digital infrastructure. These results also indicate the need for consumer-centric regulation in relation to emerging digital technologies such as smart devices and applications.**

According to information provided by ACCAN to the Project Lead, the Information and Privacy Commissioner NSW is the most appropriate body for complaints relating to smart technologies and applications along with the New South Wales Health Care Complaints Commission for health applications. It is expected that Local Aboriginal Land Councils will play an increasing role in mediating issues related to smart technologies and applications as they already undertake non-formal assistance with their constituents who require access to online and digital technologies (see Local Aboriginal Land Councils section above).

In response to whether Dubbo Local Council has a remote data monitoring policy, most respondents said they were Not Sure (approximately 89%) with 10% reporting Yes. One respondent answered correctly: No. These responses indicate the need for more awareness of consumer rights regarding data privacy and smart technologies and applications.

Smart technologies have the potential to replace face-to-face communication and relationship-building. This is a challenge for people who prefer face-to-face communication or are unable to use online technologies. Wiradyuri Elder Aunt Margaret Walker commented in her interview for the project that Welcome to Country and other cultural business is preferably done face-to-face.

In terms of engagement with local council meetings, the majority reported they did not attend meetings (approximately 72%) with 24% reporting they attended once or twice on issues of importance to them. Twenty-nine per cent reported they would engage more frequently with the local council through a smart application. These results are similar to those from the Dubbo Regional Council Smart Cities Strategy survey where a quarter of participants said they would like to be involved in smart policies via digital communication. In this project's questionnaire, 36% said about the same and 35% that it would make no difference to their engagement. **The 29% who said they would engage more with Council if given a digital opportunity to do so indicates there is potential to increase local council engagement through smart technologies.**

Two-thirds (66%) of respondents reported preferring in-person communication. This was generally regardless of age or location. This was summed up by a comment, 'in person of course'. Five respondents preferred telephone and 11 preferred online. Eight respondents were happy with either in-person, telephone, or online. As noted above, a third of respondents would engage with their local council more if provided a digital option. In other kinds of relationships, such as social or business, face-to-face communication is preferred.

Respondents assessed the quality and reliability of telecommunications infrastructure in the town/s they reside as Fair (41%) and Good (29%) with 16% reporting Not Great, 9% Great and 6% Poor. When sorted by town (see Figure 5), the results indicate that Dubbo was reported as Good in higher proportions than the other towns. Although the numbers of the other towns were small[4], only 1 respondent from the other towns (Narromine) reported telecommunications quality as Great and only Wellington and Gilgandra reported Good. Peak Hill generally reported the worst quality.

[4] Respondent numbers by town: Dubbo: 71; Gilgandra: 14; Narromine: 10; Peak Hill: 5; Wellington: 6.

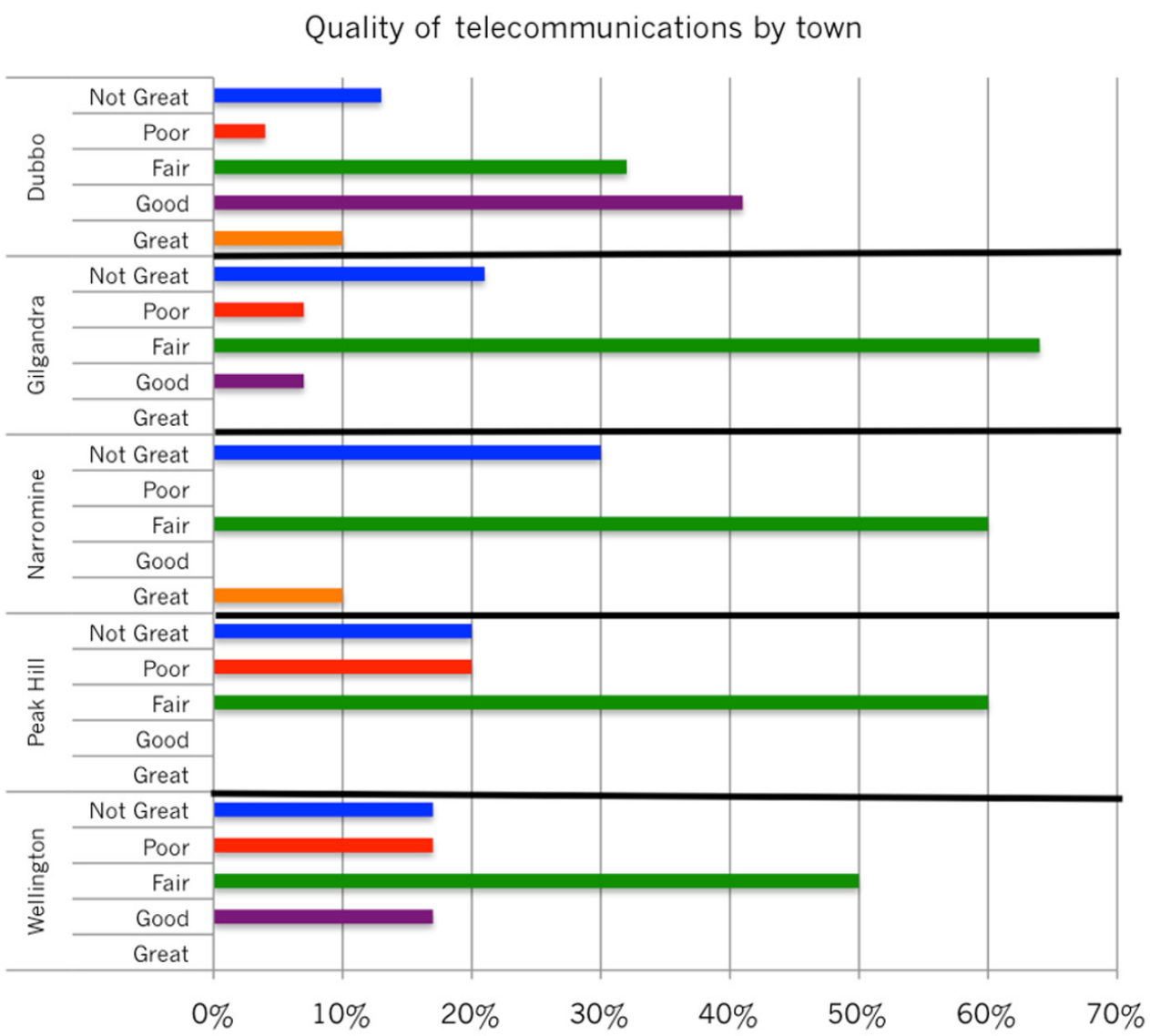


Figure 5 Quality of telecommunications by town

It should also be noted that per the results below, most respondents travelled less than an hour to work indicating a general centrality of residence in their town. Since centrality typically means the quality of telecommunications is improved, the results suggest some dissatisfaction with telecommunications quality (see also Key Themes: Consumer Understandings of Smart Tech and Implications for Smart Regional Development section). These findings are similar to the Dubbo Regional Council Smart Cities Strategy survey results, where most respondents reported mobile and internet quality as Fair.

Who participated in the questionnaire?

The average age of respondents was 44 with the youngest being 21 and the oldest 74. The average age of the respondents is older than the age profiles of Dubbo, Peak Hill, and Narromine. Questionnaire average age was even with Wellington and younger than Gilgandra (see Case Studies). The questionnaire participants therefore skewed slightly older than the general population.

The respondents are true locals. The average number of years for residing in the towns was 20 years with the minimum being 0 and the maximum being 70! Respondents who have lived in the towns less than 5 years generally came from Dubbo, with a small proportion from the other towns, indicating population growth in the former and marginal in the latter.

One interview participant from Narromine described how telecommunications could positively impact the choice of regional residence:

> something I have seen an emerging trend and that's accelerating is, not so much colleagues, my tech peers in these major cities, they're all leaving [laughter] literally from similar reasons. What I've just outlined is, we've left because it made no sense to be there anymore. This is a really good opportunity to start bringing that out. I've seen this talked about for 10 years. It is an exciting time for that to be highlighted, I think. (Q1)

Most respondents (approximately 96%) were not recent migrants to Australia (within the last 5 years). Dubbo does have a small but significant and growing migrant population (see Case Studies) and it appears they were not well represented in the study. Most respondents had children (71%).

Approximately 15% of respondents identified as Aboriginal and/or Torres Strait Islander. This is a significant community stakeholder in smart cities and regions. The Wiradyuri Nation is the largest First Nations Country in the Dubbo region. Most First Nations respondents identified as Wiradyuri as well as Weilwan (also spelled Wayilwan) and Gamilaraay. According to the Australian Bureau of Statistics, First Nations make up 6% of the population in the central west (ABS, 2020a).

Ten per cent of respondents identified as living with a disability. This is another important community to consider in relation to smart regions as they are likely to benefit from the remote services offered by digital technologies. Smart technologies can be accessed through the National Disability Insurance Scheme. Pete Horsely, founder of Remarkable, 'Australia's first disability-focused startup accelerator', has commented:

> With the rollout of the NDIS, there's a market forming where people have choice and control of the things they spend their money on. It used to be an under-resourced sector, and while there's still a lot of teething issues, we can see a strong market forming. (Powell, 2019)

In terms of gender, 64 respondents identified as female and 36 as male or 'bloke'.

The majority (89 respondents) travelled less than an hour to work.

Regional and rural consumer awareness and use of smart tech

Table 5 below combines the awareness and use data from Tables 3 and 4 with frequency mentions in the open comments of the questionnaire and interviews. It shows the awareness and use of smart technologies and applications. High correlates with high frequency percentages in the data from Tables 3 and 4 and the highest numbers of mentions in the open comments and interviews. High indicates most respondents were aware of and/or used these technologies and applications. Low indicates the lowest numbers or mentions. Medium indicates numbers that are in between the highest and lowest responses.

Table 5 Regional and rural consumer awareness and use of smart tech

Smart technologies and applications	Awareness	Use
Smart Water Meters	High	Low
Smart Agricultural Technology	Medium	Low
Service NSW Mobile App	High	High
Drones	High	Low
COVIDSafe App	High	High* Medium**
Dubbo Region Discovery App	Low	Medium**
Smart Watches	High	High
Traffic Sensors	High	Low
Health Apps for Smart Phone	High	Medium***
Smart phones****	High	
Smart energy appliances****	Medium	
Smart home appliances****	Medium	

*High use among 30s and 40s age group
**Medium use among 20s, 50s, 60s age groups
***Relatively high use for 30s age group
****Use of these technologies was not surveyed, respondents provided these examples in open questions

Key Themes: Consumer Understandings of Smart Tech and Implications for Smart Regional Development

The project takes a qualitative approach to regional and consumer understandings of smart technology and identified common themes in the questionnaire and interview data.

The following themes are drawn from the questionnaire, interviews, and case studies.

Polorisation in perceptions of telecommunications quality

Participants either assessed telecommunications quality as 'pretty good actually' or 'ordinary'. Quality telecommunications are required for quality smart tech use. As the above questionnaire results indicate, respondents were less likely to report telecommunications quality as Great and tended to report Good and Fair. Interviews provided more context to these results.

> From what I've seen so far, it's pretty good. (Q1)
>
> Yeah. It's not too bad … for the majority of people that live in town, it's pretty—it's good. (Q3)
>
> but I personally have felt that Dubbo's telecommunications is pretty good for a regional centre (Q7)
>
> It's better than what it was.
>
> Louise O'Leary, Parkes Shire Councillor

These comments illustrate how 'pretty good' qualifies the level of expectations surrounding telecommunications in regional and rural areas. That is, 'pretty good for a regional centre'. Conversely, interviewees were terse and blunt when they perceived telecommunications quality was poor:

> Can I say ordinary?
>
> Doug Batten, Mayor, Gilgandra Shire Council
>
> Poor. (Q5)

Others described telecommunications quality as 'terrible' (Q6) and that 'the NBN is a nightmare'.

Participants have a strong investment in telecommunications quality because it impacts ***liveability***.

> Well, there are a number of things that impact on, I believe, on the growth of the community. People are looking for good telecommunication access, they're looking for good health services, they're looking for good education facilities, and of course they're looking for their career path for the future.
>
> Annemarie Jones, Deputy Mayor Dubbo Regional Council

> Well, being connected, I suppose, and that's a bit of a pun, but being connected to the broader community. It means that you can be a small rural community, but still have access to up-to-date information … Because we have the technology now, you can be living in Peak Hill and still working … having that technology to be able to then work from home, which you could do in a very small community but still be connected to the likes of the world, I suppose.
>
> Louise O'Leary, Parkes Shire Councillor

As noted above, digital technology enables people to work from home and make international connections. Craig Davies, Mayor of Narromine Council, also discussed international business opportunities for Narromine (see Case Studies). Liveability is mentioned as a key factor in the Dubbo Regional Council's *Draft Smart Cities Strategy Background Paper* (Dubbo Regional Council, n.d.[b], pp. 5, 7). In a recent government survey of smart planning and policies, most respondents reported Liveability as a key reason for adopting these policies (Australian Government, n.d., p. 4). Notably this survey did not include Local Aboriginal Land Councils.

Others linked liveability to health and concerns regarding an ageing population, 'That's health-wise, quality living, everything else' (Doug Batten, Mayor, Gilgandra Shire Council). Health is also an important industry in regional cities and towns.

> Probably one of the big drivers is the hospital and health growth because that is one of the major employment generators in Dubbo. With that expanding, that's just gonna draw a lot of new specialists, new population and people using those facilities. That's probably … the biggest driver at the moment. Feeding from that, other businesses and commercial areas will just grow once all that new population comes in.
>
> Tim Howlett, Growth Planner, Dubbo Regional Council

Quality telecommunications is also crucial for business.

> The problem that we have is that without smart technology, we cannot attract industry here. Without smart technology, you can't attract young people here. Technology should be seen as electricity, water … They're the things that make people come to the—I'm not gonna call it the bush, rural New South Wales. Without them, you cannot get young people to come out here. No Internet? You're kiddin' me.
>
> Craig Davies, Mayor, Narromine Shire Council

Participants expressed concerns about losing jobs and a lack of industry and business attractiveness due to poor telecommunications infrastructure. 'There's obviously job opportunities are probably limited in what's there' (Louise O'Leary, Parkes Shire Councillor). Business efficiency was also an issue for Local Aboriginal Land Councils:

> All our business is done over the Internet now, most of it, so it has a big impact. If we can't get on properly, well, we can't hook in. We miss out on a lot of information and stuff.
>
> Lesly Ryan, Chairperson of Nyngan Local Aboriginal Land Council

Land Councillors acknowledged that funding was an issue for business efficiency, 'Unlimited funds to technology would allow us to upgrade and use smart technology' (Shelly Bayliss, CEO of Narromine Local Aboriginal Land Council). **These comments highlight the need for telecommunications to be officially classed as an essential service as outlined in the 2021 report from Infrastructure Australia.**

The Case Studies section of the report outlines some important business opportunities in the 5 towns including the state government Central-West Orana Renewable Energy Zone (NSW Energy, 2020) and the Special Activation Precinct (NSW Government, 2021b) that may provide opportunities for further digital infrastructure and smart businesses in the region. **Data from this project can potentially contribute to business needs by outlining consumer and community knowledge of smart technology and their expectations regarding digital infrastructure.**

High awareness of smart technologies and applications but relatively little use

Demonstrated benefit is needed to aid take-up

Interviewees suggested that the benefits of smart technologies and applications are understood when they are used:

> Once you see it used once and appreciate the benefits of it, you want it.
>
> Doug Batten, Mayor, Gilgandra Shire Council

> At the end of the day, they see something that they can use.
>
> Tim Howlett, Growth Planner, Dubbo Regional Council

> It's just all of a sudden you need it, and it's something, you may have looked past it several times, but not really realised or connected with it, but then all of a sudden there's a need that you need to connect with it.
>
> Louise O'Leary, Parkes Shire Councillor

There is scope for councils to provide opportunities for smart technology use and partner with business for open days to demonstrate smart technology benefits.

Smart tech champions

The use and development of smart technologies and applications for planning, business, and consumption championed by select individuals in the 5 areas

As reported in the questionnaire data, there was relatively high awareness of smart technologies and applications but relatively little use. Through conducting research for this project, the project lead came across a select set of individuals who were extremely enthusiastic about championing the benefits of smart technologies.

> We've got everything from drone technology to high-tech agricultural technology, neck collars, ear tags that are—will tell their—take their temperature, take their heartbeat and tell you how well they're feeling.
>
> *Craig Davies, Mayor, Narromine Shire Council*
>
> I think from a business point of view, there is a lot of opportunities there as well, all shapes and sizes. Right? From drones, right through to well, helping clean people's houses even, or mow lawns. I was looking at one of those robot lawnmower things. Yeah, the applications are pretty much endless. Something I've seen over the years is just IoT devices, or IoT boards being put in anything and everything, from kettles, to toasters. They're in toilets now. (Q1)
>
> For me, from a council point of view, I feel like they need to go all in in some regards, and they need to start thinking about stuff like traffic sensors and parking sensors, pedestrian density in parks or things like services, like the pool or that, so people can see—'Oh, hey. Listen. The pool is really busy at the moment,' because it's—it may not show specific numbers, but it might say there's a high demand of people going in and out of the pool. 'Maybe we should wait a little bit later,' stuff like that. I think that's—when I think about it, it's not really a little piecemeal approach. It's how do we buy into this, and how do we start to show some of this information as a holistic—across the LGA [local government area]? (Q3)
>
> Literally everyone, and I think, again, that this is probably Dubbo's biggest asset moving forward, is that on that industrial, agricultural side, there's gonna be that medtech [medical technology] and agritech application, and aviation, everything like that. Then, for people in the disability sector, there's obviously opportunities with autonomous vehicles for all the people to get them around town, for younger people and elderly people, anyone, visitors, wayfinding, digital apps, to go, 'Well, what's on around town?' (Q7)

Many of the questionnaire interviewees were also enthusiastic to share their personal and professional knowledge of smart technologies as well as suggestions for community applications and in particular working with Local Aboriginal Land Councils. Participants provided lots of ideas for the public use of smart technologies, such as planning for public spaces (Q1), smart lighting (Q7), smart watering of public parks, smart bus timetables, monitoring graffiti (Q2) and security (Q7), parking and traffic sensors (Q3, Q7) as well as pest control (Q9). People who reported high digital literacy in the interviews connected this to their professional role, i.e., they used smart devices and applications in their work which necessitated up-to-date training and knowledge in this area. This demonstrates how use is connected to seeing the benefits of smart technologies.

It is recommended that councils and business chambers sponsor interest groups and individuals with a passion for smart tech as 'smart champions' to promote their ideas and knowledge across the community. The Dubbo Regional Council's *Draft Smart Cities Strategy Background Paper* mentions holding open and free workshops to promote digital literacy (Dubbo Regional Council, n.d.[b], p. 8). These could be more targeted and impactful through using smart tech champions.

There was a strong perception among interviewees that age has a big impact on digital literacy and digital use

Due to a perception that older people did not use technology as much as young people, this was considered an obstacle for older people's digital literacy. There was an assumption that younger people can be smart tech champions and influence others in their smart tech use.

> For somebody my age, I think it's [digital literacy] quite high. Just in general, compared to everybody, like for a 30-year-old, it's probably mediocre, but for someone my age, it's quite good. (Q4)
>
> Holly Randell-Moon: Which segment of the community do you think has the most knowledge about smart technologies?
>
> Interviewee: The 20 to 30s. (Q6)
>
> The high school kids would use it but to a lesser extent. My kids, 38 and 40, are all over it. One of my daughter's kids is eight, six, and three. Well, they're all over it, which gets right up my nose: '… come and fix this telly, will you, mate?' He's three. (Craig Davies, Mayor, Narromine Shire Council)
>
> Aunt Margaret Walker (Member for Dubbo Local Aboriginal Land Council): Yeah, 'cause they grow up at home … on the phones and on the iPads. Yeah, they grow up at home … the phones and iPads and that. They should be learnin' technology right from the start at school.
>
> Grace Toomey (Council for the Central Region, NSW Aboriginal Land Council): Preschools.
>
> Aunt Margaret Walker: Yeah, and then, when they finish school, they're tech savvy, you know? They know all that.
>
> …
>
> Lesly Ryan (Chairperson of Nyngan Local Aboriginal Land Council): They're all smart with it.
>
> I mean, kids are right into technologies now … I think they just pick it up. They're just sponges. (Louise O'Leary, Parkes Shire Councillor)

The questionnaire responses provide a more complex account of digital literacy, smart tech use and age.

In the questionnaire, respondents in their 20s and 30s self-assessed their literacy as Great and Good in larger numbers than Fair or Not Great (see Figure 6 and Table 5). In the 20s age group, approximately 33% report Great and 50% Good. For the 30s group, 41% assessed their literacy as Great and 47% as Good. In the 40s age group, Fair was reported in larger numbers (27%) but so was Great (at 38% compared to 33% for people in their 20s). The percentage of respondents in their 50s reporting Great was 8% with Fair and Good at 42%. Great was similarly reported at 6% for people in their 60s with the largest percentage for Fair at 61%. Nevertheless, 28% assessed their digital literacy as Good. Respondents in their 50s and 60s reported Not Great at about the same rate as reporting Great. Interestingly, no age group reported Poor.

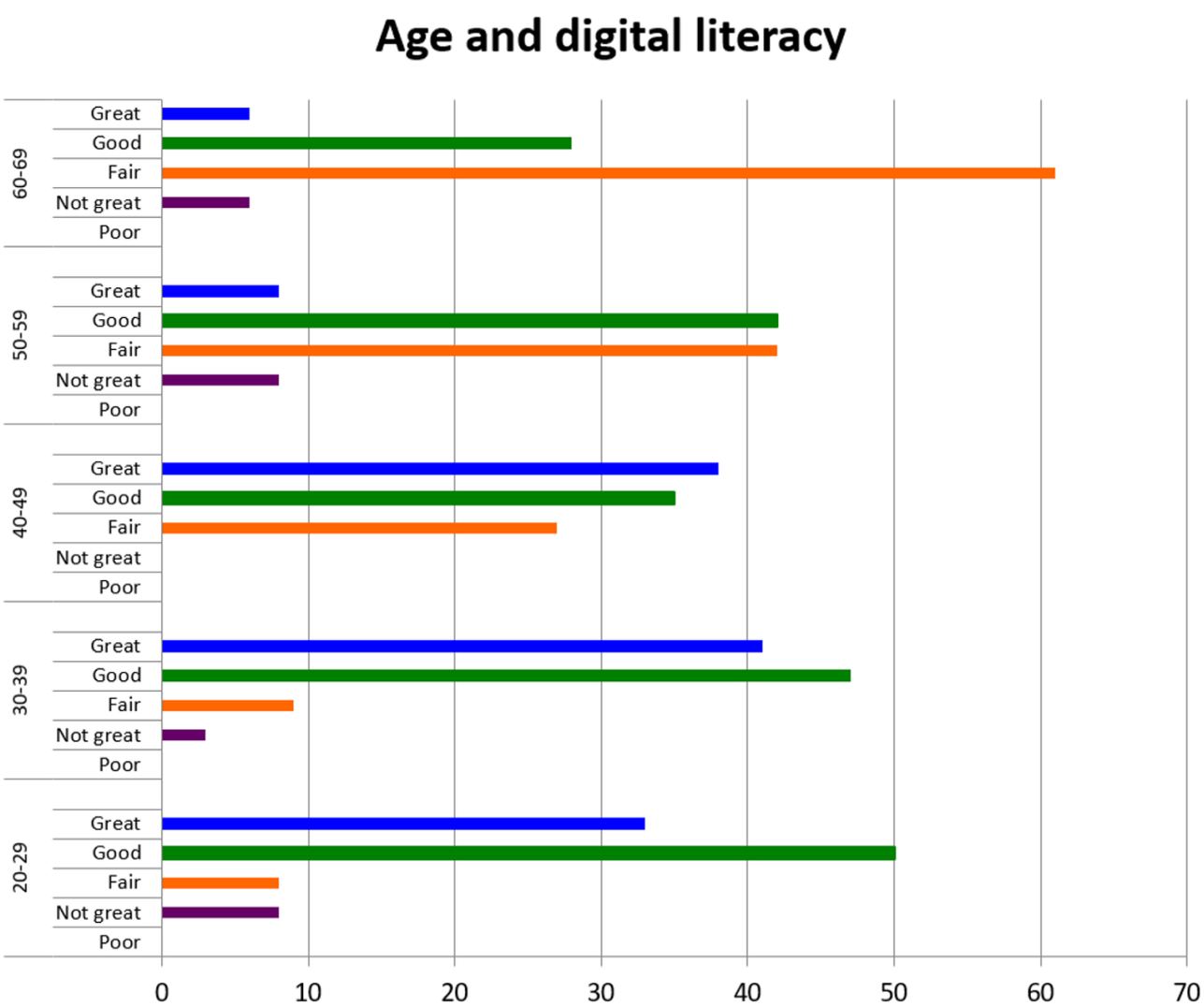


Figure 6 Self-assessments of digital literacy by age group

Table 6 Self-assessments of digital literacy by age group in numbers

Age	Digita l Literacy	Responses	Percentage
20-29	Poor	0	0%
	Not great	1	8.33%
	Fair	1	8.33%
	Good	6	50%
	Great	4	33.33%
Total		12	
30-39	Poor	0	3.12%
	Not great	1	9.37%
	Fair	3	9.37%
	Good	15	46.87%
	Great	13	40.62%
Total		32	
40-49	Poor	0	0%
	Not great	0	0%
	Fair	7	26.92%
	Good	9	34.61%
	Great	10	38.46%
Total		26	
50-59	Poor	0	0%
	Not great	1	8.33%
	Fair	5	41.67%
	Good	5	41.67%
	Great	1	8.33%
Total		12	
60-69	Poor	0	0%
	Not great	1	5.56%
	Fair	11	61.11%
	Good	5	27.78%
	Great	1	5.56%
Total		18	

Interviewees suggested that because younger people use technology more often, this increases their digital literacy. In the questionnaire, respondents' assessment of their digital literacy did not generally correlate with their use and awareness of smart technology. Respondents who reported their digital literacy as Fair, Good, or Great had similar levels of smart technology awareness and use. In terms of age groups, respondents in their 20s generally showed less use of smart technologies and applications than those in their 30s and 40s. The most common smart technology for the 20s age group was the Service NSW Mobile App and it was most commonly used a few times a week (7). Smart watches were the second most used technology (4, at least once a day and 3, a few times a year). Smart watches were the most commonly used tech for the 30s, with just under half (15) using them at least once a day. The COVIDSafe App was used consistently across the provided time periods, most commonly a few times a week (10). The Service NSW Mobile App was also consistently used, with 10 and 9 using it at least once a day and a few times a week, respectively.

The Service NSW Mobile App (10, at least once a day, 9 a few times a week), the COVIDSafe App (7, at least once a day), Smart watches (10, at least once a day), and Health Apps for smart phone (9, at least once a day) were used consistently by respondents in their 40s. The 50s age group reported consistent use of the Service NSW App and COVIDSafe App. There was less use of other smart tech and higher levels of Never reporting for this group. There was a comparatively higher use of the Dubbo Region Discovery App for this group, with 4 reporting they used it a few times a year.

These results were similar for the 60s group with the Service NSW App and COVIDSafe App being used the most with comparatively lesser use of the other technologies. There was a higher proportion of respondents reporting their digital literacy as Fair in this group and they tended to report Never using the smart technologies in higher numbers than those reporting Good and Great. This lack of use did not impact their awareness, as the Fair group reported similar levels of awareness to the Good and Great respondents.

More respondents in their 20s had not used the COVIDSafe App (6) compared to respondents in their 50s (2) and 60s (4). Seven respondents in their 30s and 40s had not used the COVIDSafe App. Only 1 respondent in their 30s reported Never using the Service NSW Mobile App, 2 respondents in their 60s reported Never using it, with 0 for the 40s and 50s age groups.

There was a consistent lack of use and awareness across age groups for those who assessed their digital literacy as Not Great. For instance, respondents in their 20s who reported Fair and Not Great had only heard of and used the Service NSW Mobile App. This was the same for respondents in their 30s reporting Not Great. Respondents in their 50s who assessed their digital literacy as Not Great had only used the Service NSW Mobile App but had heard of the other smart tech examples.

Interestingly, both respondents in their 70s assessed their digital literacy as Good and reported 0 Nevers in the use questions and had high awareness, ticking all but one of the categories.

These results indicate that self-assessments of digital literacy generally do not correlate with smart awareness or use except in cases where literacy was reported as Not Great. Respondents in their 30s and 40s generally reported more usage of smart technologies than the other age groups.

One interviewee commented that conversely, young people's assumed or existing digital literacy was a problem for employability given the patchy quality of telecommunications.

> Interviewee: One of the first questions I ask any person that I employ under the age of 30, I'll ask them 'What's 70+30+140, and then tell me what 10 percent of that is.' The answer's 21 but 90 per cent of people can't answer that question.
>
> Holly Randell-Moon: They use their calculators or their phones or something.
>
> Interviewee: ... They don't know how to do it on paper ... You gotta be able to answer their questions on the spot. You're gonna work with a farmer who half his time he's speak in imperial, and half the time he'll speak in metric ... You've gotta be able to know what five-eighths of an inch is. You've gotta be able to convert that to millimetres so you have to have a bit of an idea. The five-eighth of an inch is 16 millimetres, so you gotta understand these things. (Q9)

According to the results of this questionnaire, it is people in the 30s and 40s age group using smart technology more consistently and hence, are more likely suited to being smart tech champions. This demographic profile may also have implications for future smart planning and age groups most likely to benefit from and being literate about this planning.

[5] As millennials, the project report authors did indeed use their phone calculators to note here the correct answer is 24. The interviewee's point remains nevertheless relevant to a discussion of perceptions of digital literacy and how the latter intersects with age.

Ewaste considerations

If regions are to become 'smart', how can regional councils develop plans to manage the increase in smart technologies and devices and consequently their waste?

One interviewee pointed out the implications of smart policies in terms of the proliferation of smart devices and their supporting infrastructure in terms electronic waste (ewaste):

> Having that then, that ewaste, as to what then happens to that, and how does that generate, and does that then become another obstacle that we have to really look at technology wise … Now waste has become very much an expensive thing to manage. Councils have to be a bit smarter with how they go about that, and I think a lot of councils, and I know that ours are looking to have, like a bit of a recycle shop … Again, that then comes at a cost, but the bigger picture, in the city they have to be really quite smart about, 'cause they just don't have one, the land capacity. They need to be—people need to be smarter in what they do and how they recycle things or how they, how they ewaste their consumable items.
>
> Louise O'Leary, Parkes Shire Councillor

Ewaste is an important consideration for consumer rights regarding smart technologies and their incorporation into digital infrastructure.

Smart technologies are made with rare earth elements and other materials that are difficult (but not impossible) to recycle (Crawford, 2021). Much of the material used to manufacture smart devices such as smart phones is not biodegradable and can be hazardous when the devices are disassembled. This also holds for smart accessories as well as the cables, towers, and infrastructure used to make them work. Research has shown that:

> to manufacture a 129 gram smartphone such as Apple's iPhone 6 requires around 75 kg of raw materials … entailing that 99.9 percent of the volume of materials used are not seen in the final device. (Taffel, 2016, p. 128)

The ewaste from smart technology obsolescence is:

> the fastest growing global waste stream, whose volume was expected to exceed 50 million tonnes in 2015 … E-waste is classified as toxic waste, due to the presence of hazardous materials such as lead, polyvinyl chlorides, and antimony in microelectronics. (Taffel, 2016, p. 133)

Typically, the costs of ewaste are borne by consumers, though as Councillor O'Leary points out, the expectation for council services to increase their use of smart technologies will also require policy solutions. It is important to consider how consumer costs for ewaste may increase telecommunications debt for regional and rural consumers.

Dubbo and Narromine offer free ewaste and recycling services (Dubbo Regional Council, 2021e; Narromine Shire Council, 2021a). Chain businesses in Dubbo such as Officeworks (Officeworks Ltd., n.d.) and ALDI (ALDI, 2021) also provide free ewaste disposal for batteries and computers. Wellington residents can use the Wellington Waste Transfer Station for the free disposal of ewaste (Dubbo Regional Council, 2021d). Parkes Shire Council website requires residents to ring a number to determine where to dispose ewaste and encourages recycling and reuse (Parkes Shire Council, 2021c). It's not clear if the Peak Hill Waste & Recycling Transfer Station disposes of ewaste and if there are charges involved (Parkes Shire Council, 2021b). It is also unclear from the publicly available material on the Gilgandra Waste Facility site if free ewaste disposal is offered (Gilgandra Shire Council, 2021). Netwaste runs Community Recycling Centres for ewaste in Dubbo, Narromine, and Gilgandra and has a number of erecycling (electronic recycling) initiatives such as recycling mobile phones (Netwaste, n.d.).

In terms of policy planning for ewaste, the Dubbo Regional Council *Draft Smart Cities Strategy Background Paper* identifies environmental sustainability as a strategic goal for smart technology (n.d.[b], p. 8) but does not mention ewaste. In the *Local Strategic Planning Statement* (Dubbo Regional Council, 2020c), under sustainability, the following planning priority is mentioned, 'Create an energy, water and waste efficient city.' Ewaste is not specifically mentioned and the discussion of waste is not linked to digital planning and policies. Ewaste is not specifically mentioned in the *Delivery Program and Operational Plan 2018-2021* (Dubbo Regional Council, n.d.[a]).

The *Gilgandra Local Strategic Planning Statement* mentions the following as a strategic goal: 'Continue to invest in recycling operations in Gilgandra and investigate further opportunities to remove waste from landfill (organics options, education campaigns, e-waste, soft plastics, etc.)' (Gilgandra Shire Council, 2020, p. 32). Although this goal is not explicitly connected to its digital strategic goals, there is alignment between enabling further digital technology and accounting for its waste.

As mentioned in the Case Studies, Narromine and Peak Hill (as well as Parkes) do not appear to have publicly available digital policies or strategic planning in these areas.

With the development of the Renewable Energy Zone, there may be further scope for ewaste planning as well as the creation of businesses in the region to support this.

At a state level, both the *Smart Infrastructure Policy* (NSW Government, 2020) and *Smart Places Strategy* (NSW Government, n.d.[c]) mention the role of smart technology in improving waste infrastructures and efficiencies but do not explicitly connect the use of the former with the production of ewaste and the need to plan for managing this waste.

It would seem that smaller towns are less advantaged in terms of ewaste infrastructure and lack the presence of chain businesses in larger regional cities that also accommodate ewaste.

Inclusivity: Local Aboriginal Land Councils and other key stakeholders should be involved in the planning and development of smart cities and regions

Inclusivity is important for the planning and development of smart regions. This project included relatively few respondents with a migrant background, older peoples (70+ years old), or people living with a disability. These communities will grow in the years ahead in regional and rural communities and there is a need to include them as stakeholders in smart cities and regional community planning. As the interviewees in this project note, the quality of telecommunications and benefits of smart technologies are aligned to liveability and community needs.

The following list, summarised from Robert Shipley and Stephen Utz (2012), overviews several participatory methods that can be used for public consultation.

Public meetings

This format has been criticised for being ineffective and ritualistic, however, it can be 'a good way to convey information', 'set agendas' and 'give citizens a way of achieving their political objectives such as having their issues reported in the press' (p. 27).

Citizen juries

Based on the jury system in law, participants in this method are randomly selected from the community and decision-making power is placed in their hands. These representatives are paid to participate and there is emphasis placed on recruiting jurors, rather than selecting from volunteers, and ensuring a fair and transparent selection process, which aims to reduce the impact of lobbying on the development of policy and planning.

Focus groups

Designed to illuminate citizen perceptions that cannot be captured through other survey techniques. At their best they generate 'qualitative data that complements the current knowledge base on most subjects' (p. 27). This depends on the size of the focus group and the representativeness of participants.

Scenario workshops

These workshops involve meetings with a range of local actors aiming to develop 'visions and proposals for technological needs and possibilities in the future' (Street, as cited in Shipley & Utz, 2012, p. 28). This method is popular in Europe. A few groups of eight to ten stakeholders are selected and cross verified by 'appropriate government and non-government agencies' to deliberate on current conditions and potential solutions (p. 28).

Visioning

More specific to planning. This method is used to 'create collective plans and policies for the future of a particular geographic area' (p. 28).

Collaboration

'Collaboration is designed to resolve multi-party conflicts by transforming adversarial behaviour into a mutual search for information and solutions' (p. 24). Sharing information increases the motivation to participate and willingness to look for mutual benefits. There are drawbacks to collaboration, including that it is time consuming, it often does not work for large groups, and power inequalities can derail the process.

Consensus building

Individuals with differing stakes in a problem are chosen to participate. It is useful for complex situations as it can assist in understanding the cause of dissent, and theoretically enables an effective alternative to be reached.

Confusion regarding consumer rights in relation to smart technologies and applications

Many responded in the questionnaire that the Dubbo Regional Council already had policies relating to remote data monitoring when it does not (as of writing) and there was confusion over who owned data. Many also reported that their local council has a role in mediating concerns regarding data privacy and access. Here is how interviewees responded when asked if their local council had policies related to remote data monitoring:

> Oh, I'm sure they do. I'm sure they do. Everyone has. (Q5)
>
> If certainly a local council is using data and doesn't have policy on how they use people's data, and that should be something that happens. (Q8)

Perhaps anticipating consumer concerns regarding data-veillance (data surveillance), Dubbo Regional Council has a question and answer on their Smart Water Meters FAQs (frequently asked questions), titled 'Is this Big Brother?'.[6] Information on the site states: 'Smart meters are not intended to govern customer's water usage but give customers a tool to self-manage their own consumption to conserve water and save money. Owners can only view the water consumption on their own property via the online customer portal' (Dubbo Regional Council, 2021c). Without community informed smart policies and planning, the businesses that supply smart technologies and infrastructure may set the terms of community engagement. Interviewees commented on this:

> Well, I think coming from the tech point of view, usually it's the tech emerging and then the policies have to adapt because users are jumping on the bandwagon, or now, we've gotta do the deployment. (Q1)
>
> Holly Randell-Moon: Yeah. It sort of catches up to the technology comes first, and then the policy comes second.
>
> Interviewee: Yeah. Usually after some individual or individuals has suffered pretty badly. (Q5)

As discussed above in relation to the questionnaire results, **consumer rights regarding smart technologies and applications overlap in several different areas (health, information privacy, data collection). Part of the complexity here is not just the number of bodies involved (and therefore no single body accepting responsibility) but also the multiple levels of governments involved making coordination difficult. Essentially, the current framework for smart technologies and applications is not fit for purpose, with the responsibility falling to consumers to learn about, and enact, their rights (see also ACCAN, 2021).**

[9] This is in reference to the surveillance state and its leader 'Big Brother' in the fictional book, *Nineteen Eighty-Four* by George Orwell. This idea has also been popularised in the reality television series *Big Brother*.

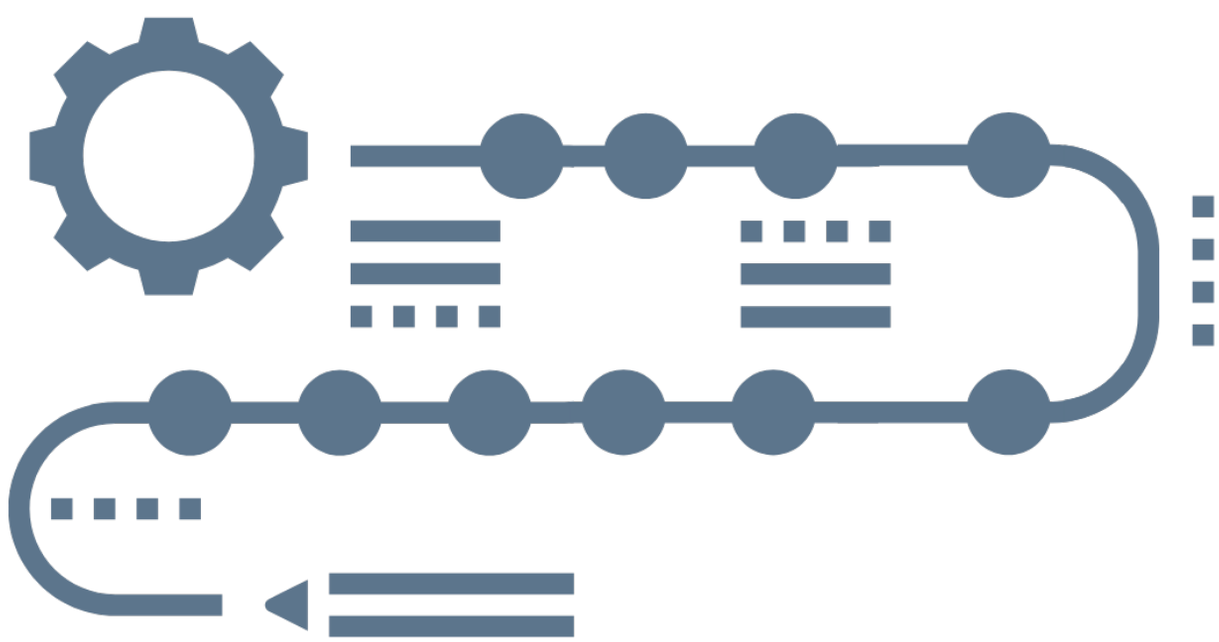
Changing role of council, smart technologies will change the ways council business is conducted and this will impact council workers and their engagement with community

Tim Howlett, Growth Planner, Dubbo Regional Council, discussed how smart technologies change the scale of planning:

> Probably the broader scale would help council from a land-use-planning perspective … We are looking at ways we can use technology to better interact with council, also potentially looking how technology can be put onto roads, pedestrian pathways, parking areas, and then data collected. We can then, I guess, as an example, analyse transport paths and find out which way and where people are going and then put infrastructure in that way. Or for parking meters, people can then use an app to see what car parks are available.

These comments also indicate a shifting role for council in predictive planning. Some of the interviewees also raised this as a possible application for smart technologies:

> Water is precious, and so use the information to try and change the narrative about droughts and things like that. Because if you think you're in a drought, then it's just—it's like a Band-Aid, but if you can use the information you get from all those meters then to make—to drive policy to, I don't know, make sure that people have a tank and make sure they don't water—you know what I mean? (Q4)



[7] https://www.snapsendsolve.com/

The use of smart technologies can address the scale of problems in different ways by transforming local resources and infrastructures into broader national priorities. Many interviewees mentioned the use of SnapSendSolve, a camera-based application that can be used to photograph infrastructure in need of repair, send the photo to the appropriate service, and address problems in real-time.[7] One interviewee from Gilgandra mentioned a similar application for weed management but the quality of telecommunications in the town made it difficult to work.

Telecommunications quality was a key obstacle for council performance with interviewees citing problems with even going paperless and needing to drive into town to download or have large paper files delivered.

Problems with existing policies and external support necessitate extrospective practices

Extrospective practices refer to councils looking beyond their local government area to external partners and solutions (see McGuirk, Dowling & Chatterjee, 2021). Many interviewees mentioned the Inland Rail (Inland Rail, 2021) and the importance of transport routes for facilitating internal growth (see Case Studies).

There was evident frustration with federal and even state programs intended to improve telecommunications infrastructure. The government broadband infrastructure, the NBN (National Broadband Network), was described as slow, not competitive in regional areas, not well aligned with community service obligations (see Gilgandra Case Study), and potentially exacerbating rather than addressing infrastructural inequality. It should be noted the NBN was established with a profit remit while being simultaneously required to provision internet access to regional and rural areas where there may not be a cost recovery or viable consumer base for a service provider. The federal government's Mobile Black Spot Program (Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, n.d.[b]), which can improve mobile coverage through tower and telecommunications infrastructure placement, was also considered slow and inefficient. This program may also be constrained through the difficulty of installing infrastructure in regional and rural topographies where signal transmission is uneven. Though the project lead asked about the federal government's Regional Connectivity Program (Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, n.d.[c]), it was not discussed as a key resource for resolving telecommunications issues. In the Dubbo Regional Council survey, red tape scored high among the barriers to Dubbo becoming a smart region.

There is currently a 2021 Regional Telecommunications Review[8] intended to assess whether the *Telecommunications (Consumer Protection and Service Standards) Act 1999* (Cth) appropriately serves regional, rural, and remote consumers. This may result in some changes to regional and rural telecommunication service provisions.

Given the federal and state push for smart policies and planning, the *Local Government Act 1993* (NSW) may need to be updated to account for digital infrastructure resourcing and planning.

[8] https://www.rtirc.gov.au/

Towards a definition of smart tech for, and by, regional and rural stakeholders

A key aim of the project is to develop a regional definition of smart technologies and applications. Based on the project data, this definition is ***practical confidence***. Regional and rural consumers want technologies that 'just work' and 'do their job', with practical applications for regions and rural areas.

Almost all questionnaire respondents (99) provided a smart definition (see Appendix 2: Definitions of 'smart' provided by respondents in questionnaire for full list). All interviewees were also asked to provide a definition of smart technology. Common words focused on what smart technologies are and included 'technology', 'data', 'use', 'information', and 'easier'. As with the latter word, less common words focused on what smart technologies do such as 'access', 'reporting', 'automation', 'make', 'monitoring', 'user', and 'analysis'. Definitions were unique with 75 or more featuring less than 3 common words (see Image 3 below).

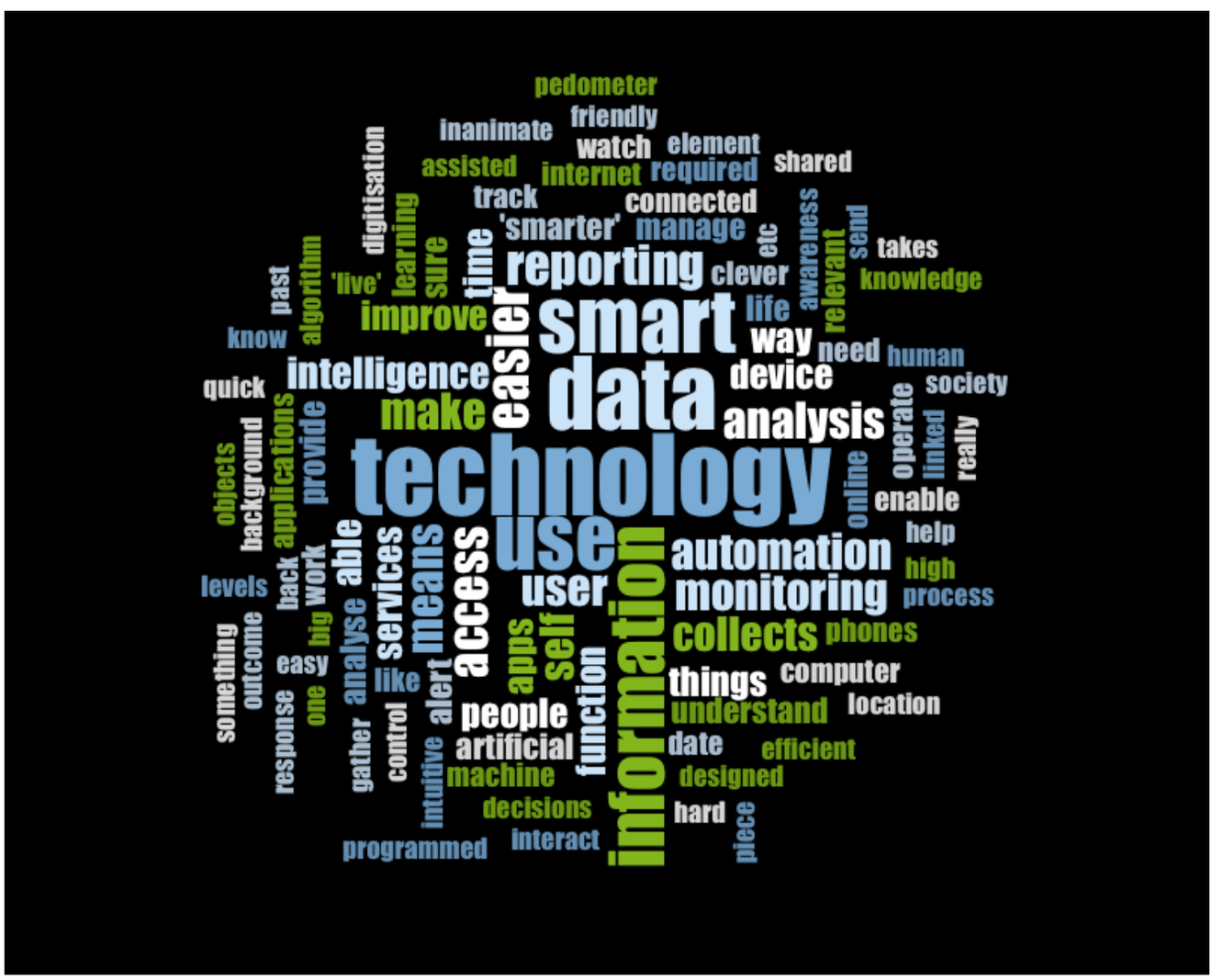


Image 3 Word frequency of smart definitions from questionnaire

The following is a selection of responses from the questionnaire:

- Able to cover a variety of elements that previously would require multiple pieces of equipment or more time. Eg. Smart watch able to read SpO_2 levels, HR, pedometer all in the one device rather than applying oximeter and attaching a pedometer. Plus being used as a watch at the same time
- adaptive control of a situation powered by software that analyses automated data collection from all relevent data inputs to arrive at the most efficient solution for a required outcome as conditions change
- As a developer these actually aren't smart devices, more connected that allow communication to servers which enable the smart element
- Automatic assessment and use of background data to send alerts or feedback to a user/consumer
- Clever
- Data collected and reported electronically to improve a service
- Data mining as well as using your information, location and behaviours to inform their data
- Device self manage
- Does the work for you
- easy to use,
- Have knowledge of things
- High functioning technology designed by smart people.
- improvement of technology and everyday life
- Intuitive
- Self-monitoring, analysis and reporting technology that uses artificial intelligence, and machine learning analysis to provide awareness to objects that in the past were inanimate.
- Smart means that it takes the hard work out of it for the end user
- time reduction
- User friendly
- Um, like….clever? The usual meaning of smart in the English language. It's probably short for something, but I don't know …

Where some respondents positioned smart to mean machine led, others situated humans as the smart actors: 'I understand the smart to mean that we're are using our own initiative to be kept up to date on current circumstances and data'.

Many provided machine or technology focused definitions. For instance, here the 'it' denotes an unspecified technology or technologies doing the work:

- It collects data and is programmed to analyse it and report back.
- It could detect the needs the owners want.
- It does all the thinking for you.
- It does more then 'regular' technology that we've come to expect
- It has an 'intelligence' built in through the technology to give information and outcomes
- It is self monitoring, as well as analysing and reporting on technology programs for hard drives.

Other definitions provided reiterated the technology focus:

- Does a lot behind the scenes… we don't do much… the tech does it
- Smarter than me (humans)
- For me, it does a lot of the thinking for you. (Q4)
- Something that collects data and then can be analysed to make something else easier. (Tim Howlett, Growth Planner, Dubbo Regional Council)

Some simply stated that smart means digital or the internet:

- Smart = moving to digital, whether that be online, to applications or technologically advancing a manual system
- Connected to internet, technology based
- To make things easier and become 'smarter' with it being online all in one place

Interviews provided more complicated definitions:

> Are these devices really smart? From a developer standpoint, they're actually not. The intelligence comes from what you do with it beyond the actual device … unless that AI [artificial intelligence] is doing something to someone that interacts with it, or something that interacts with it, yeah, I don't consider it smart. (Q1)

> I supposed, if I was to utilise the example of the watering of sporting fields, the smart part of it would be the decision-making capacity of that system to vary the watering times or schedules outside of a programmed norm. (Q2)

> Yeah, something I guess with the purposes of offloading some of the cognitive load on a person, so they can focus more on thinking about other things as opposed to remembering, 'Oh, I've got to pick up the dry cleaning,' or 'I've got to hang out the washing later this afternoon.' (Q8)

Some stated that smart means automated to the point the technology somehow works by itself without a power source:

> You can be anywhere. To me, smart technology means that you're accessible to pretty much everything as long as you've got some sort of service that you don't even have to be in a room hooked up to power anymore. (Q6)

These definitions put a lot of trust in the technology doing the data processing.

'Smart' has technologist origins in identifying systems' performance and failure. As referred to by one respondent above, it was originally developed as an acronym for Self-Monitoring, Analysis and Reporting Technology (S.M.A.R.T.) (Seagate Product Marketing, 1999). According to Xing Liu and Orlando Baiocchi, who compare smart definitions,

> The earliest smart object definition appears to be provided by [Bruce] Sterling[9] ... Smart objects defined by Sterling are space and time based, have unique identifications, are aware of their locations and environments, and can provide data about themselves and the environments they are in. (2016)

Recent research and policy argue for more qualitative and less technologist driven definitions. Andrea Caragliu, Chiara Del Bo and Peter Nijkamp in their 2011 journal article 'Smart cities in Europe' provide a definitive use of the term: 'The label "smart city" should ... point to clever solutions allowing modern cities to thrive, through quantitative and qualitative improvements in productivity' (p. 66). As one of the interviewees put it, 'It's not that smart if no one can use it' (Q3). Tan Yigitcanlar and Md. Kamruzzaman's recent study on smart commuting in Australia (2019) explains:

> Due to diverse disciplinary and sectoral perspectives, there is no common consensus on the definition of smart cities ... However, these cities are generally seen as localities that effectively utilize strategic planning approaches and innovative solutions to improve the quality of life of their communities, including ecological, cultural, political, institutional, social, and economic components ... Smart cities are also an umbrella concept that contain various sub-elements, ranging from smart economy to smart living, smart governance to smart people, and smart mobility to smart environment. (pp. 21-22)

As noted in the Introduction, due to physical infrastructure deficits, regional and rural communities stand to benefit considerably from smart planning and services, provided telecommunications capacity and ability are aligned. As such: 'Descriptions of smart cities are now including qualities of people and communities as well as ICTs' [information and communications technologies], it is therefore recommended that rather than defining a universal notion each definition should be tailored to the city (Albino, Berardi & Dangelico, 2015, p. 18). The authors of a journal article surveying smart definitions argue that: 'smart cities definition models should engage with the sustainability and community issues, beyond the use of digital technology' (Praharaj & Han, 2019).

This scholarly and policy work reiterates the importance of more inclusive and participatory consultation with residents in developing locally tailored smart definitions as well as policy. The following is an ideal approach to achieve this:

> We're finding out or trying to find out what the community wants, and then we can tailor our strategy that way.
>
> Tim Howlett, Growth Planner, Dubbo Regional Council

In the Dubbo Regional Council's public consultation for their *Draft Smart Cities Strategy*, residents scored 'Citizen-centric' as the top objective for Dubbo developing as a smart region.

[9] In his book, *Shaping Things* (2005), which defined the next wave of technology.

Case Studies: Dubbo

Dubbo is located in the Orana Region of New South Wales, roughly in the centre of the state and on Wiradyuri Country. With a growing population nearing 40,000 people, it is a central regional hub for business, tourism, health, and education in the area. Health, service, education, and primary industries make up the city's economies (Dubbo Regional Council, 2019a). The Dubbo Regional Council manages the Local Government Area, which includes Wellington and some smaller surrounding villages. First Nations make up nearly 15% of the population and, as indicated in the project questionnaire, include Wiradyuri, Gamilaraay, and Wayilwan or Weilwan. The median age of the Dubbo population is 36 years old, compared with 38 for the nation. Around 85% of Dubbo residents were born in Australia and 15% overseas, whereas at the national level, 30% of Australians are born overseas. In Dubbo, languages other than English likely to be spoken at home include Nepali, Mandarin, Malayalam, Tagalog, and Sinhalese (ABS, 2020c).

What are the telecommunications capacities of Dubbo?

Internet

Internet speed within Dubbo is variable. The NBN has been rolled out but access is not equal in all areas of Dubbo. Image 4 shows the status of the NBN roll-out but does not show which homes have access to Fibre to the Node (FTTN), and which have Fibre to the Premises (FTTP). FTTP offers faster internet speed, with download speeds of up to 100Mbps (megabits per second) and upload speeds of 40Mbps. The most recent *Measuring Broadband Australia* report, published in August 2021 by the Australian Competition and Consumer Commission (ACCC), found that FTTN connections performed lower than FTTP connections (2021). FTTN speeds have varying capabilities because FTTN speed is impacted by the length of the copper cable connecting the premises to the Node, and the condition of the copper cabling. Overall, this type of connection is slower than FTTP, and often inadequate for running a business (Ampalavanapillai Nirmalathas, 2021). The NBN is constrained by not being able to provide internet infrastructure through FTTP as originally planned (see Smith, 2020).

Important information: While most premises in the purple "Service available area" can connect to services over the **nbn**™ network, some premises may require additional work to be completed first. On rare occasions, some premises cannot be connected. Check your address above and contact a provider to find out if the **nbn**™ network is available at your home or business.

Map options

Rollout status — Service available area — Build commenced area — Other fibre provider area

Show service type — Fixed line — Fixed wireless — Satellite

Image 4 NBN roll-out map for Dubbo. Source: https://www.nbnco.com.au/learn/rollout-map

This variability in speeds is reflected in the questionnaire data where participants reported Good and Fair telecommunications quality (see Figure 5). Participant interviews also revealed the variability in internet speed and mobile coverage for residents of Dubbo:

> Yeah, I'm in town. I'm in town. I'm in East Dubbo. I'm in town. Internet is slow, NBN is slow. I mean it works. It's in that gray area where it sort of keeps working enough to get you by often times, particularly at odd times … It's just as slow as a wet week. It just will not load and it times out 'cause it's slow. NBN has been an epic failure. What should have been brilliant by a lot of government things, they just let us down. (Q5)

> That's a good question. I was living in town until earlier in the year. Had fibre to the premises. It was really good. I now live a bit out of town. I'm on fixed wireless, and it's pretty bad. From an NBN perspective, I guess it's really situation-dependent, your location, but I think, for the majority of people that live in town, it's pretty—it's good. It's better than when I was in Sydney. I have to put it that way. (Q3)

I think it's very reliable. I haven't got NBN. I just use my phone as a hotspot to my data, so yeah, I can't comment on—I do know that my daughter—she lives only 20ks out of Dubbo, and their internet is very unreliable. (Q4)

I only had fibre to the premises to the basement in the apartment, and it was all copper after that. A lot of other people I know, it's fibre to the curb or fibre to the node. I think it's one of the benefits of being in Dubbo. The connectivity is just fantastic. (Q3)

Well, it can vary across town from carrier to area, but I personally have felt that Dubbo's telecommunications is pretty good for a regional centre and probably one of its best strengths for moving into a smart ecosystem. (Q7)

Businesses may have different experiences from consumers as they are eligible for retailer packages and programs. A *Daily Liberal* article reported in 2020(b) that: 'Five hundred businesses can benefit from Dubbo being named a National Broadband Network (nbn) business fibre zone. Businesses are being offered NBN Co's premium business-grade fibre at the same wholesale price as in capital cities.'

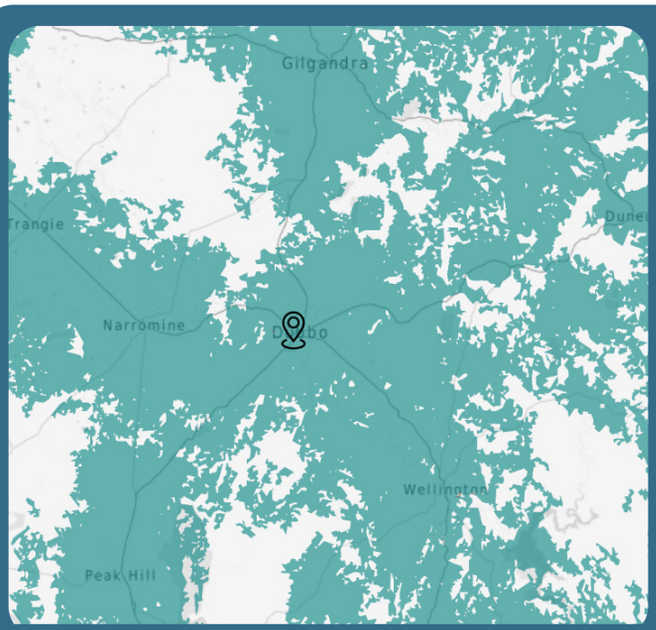
Dubbo has been dubbed in the media as a 'digitally divided city' due to the difference in speed offered by the different NBN connection types. Which homes receive fibre to the premises is based on a lottery system, resulting in some areas where one side of a street may have FTTP while the other has FTTN (Thompson, Carter & Richards, 2020). The ABS also reports that around 20% of Dubbo residents do not access the internet from their home dwelling, compared to around 14% at the national level (ABS, 2020c).

Mobile coverage

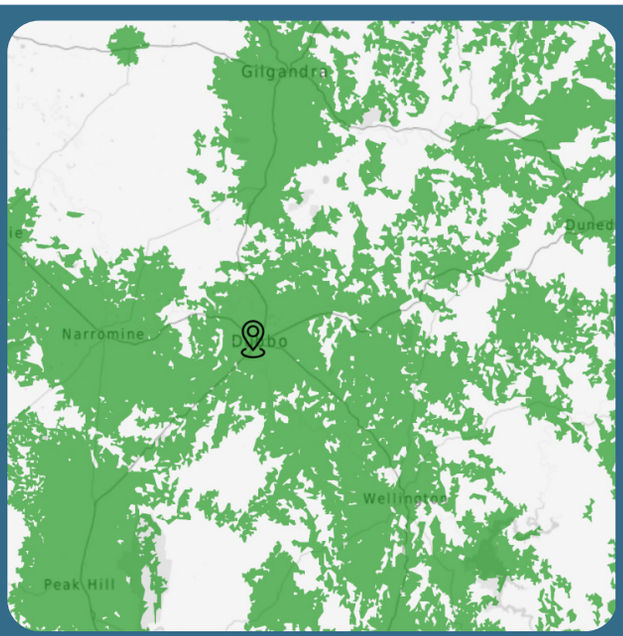
As the participant interviews pointed out, quality and access to telecommunications depend on service providers. Dubbo and the surrounding area have access to 3G, 4G, and 5G cellular networks or 'generations'.[10] Based on the speed of data transmissions, 3G would now be considered slow, 4G is standard to fast, and 5G is the fastest network available (Australian Communications and Media Authority, 2016). Vodafone, Optus and Telstra are the three mobile service providers in Dubbo. Telstra is the only provider that offers 5G coverage. Image 5 shows the coverage provided by Telstra across the generations.

[10] https://www.telstra.com.au/coverage-networks/our-coverage

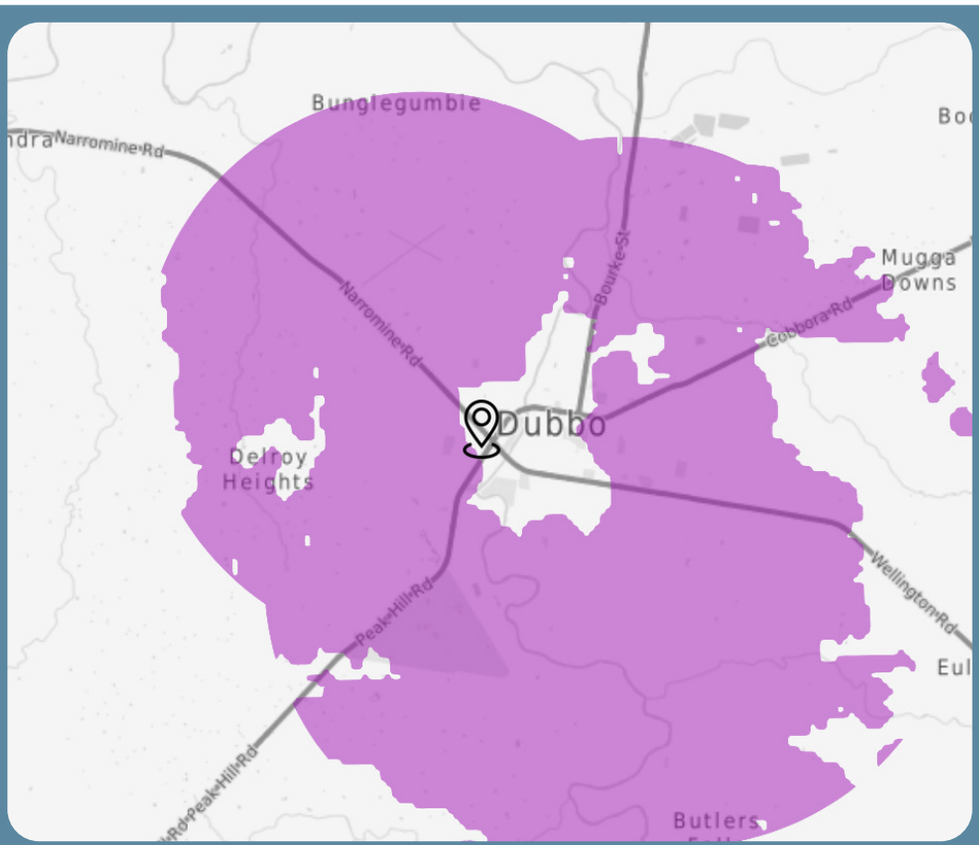
Image 5 Telstra coverage in Dubbo and surrounds. Source: https://www.telstra.com.au/coverage-networks/our-coverage



Telstra 3G coverage



Telstra 4G coverage



Telstra 5G coverage

Note, the map for 5G coverage is zoomed in closer to Dubbo as there is no 5G coverage in the surrounding areas. Overall, according to the coverage maps offered by mobile service providers, Dubbo appears to be well covered with 4G mobile networks from multiple providers, and 5G from Telstra. It is difficult to know whether these maps are reflective of on the ground experience of mobile coverage.

What digital policy and planning is taking place?

This report indicates high consumer awareness of smart technologies and applications but comparatively low usage and confusion over consumer rights.

Starting in April 2020, Dubbo was in the consultation phase of developing a Smart City Strategy. Dubbo Regional Council solicited feedback on its *Draft Smart Cities Strategy Background Paper* through conducting a survey (Dubbo Regional Council, n.d.[b]) and public meetings. The strategy is still in the development phase, with the background paper offering broad strategic goals and examples of the benefits that becoming a smart city and region may provide to residents of the local government area. Dubbo city comprises the city component of the policy, with the smart region component covering the broader local government area. The smart policy contains two prongs: one focusing on the community and one on the council to make its operations smarter. The Council recognises the importance of high quality and fast broadband internet. 'Council will investigate shortfalls and advocate to the Government to ensure reliable network availability is available throughout the entire LGA' (p. 5).

The Smart City Strategy aims to utilise technology to improve communication between the Council and community. The Dubbo Regional Council already provides public access to data through the Dubbo Region Data Centre for businesses (Dubbo Regional Council, 2021a) and the Council provides links to Remplan, a data specialist company that compiles data on the region.[11] The Council recognises the benefits of remote data monitoring, which 'allows Council to collect, aggregate and analyse data in more meaningful and beneficial ways to improve the lives of residents' (Dubbo Regional Council, n.d.[b], p. 6).

Given the questionnaire's findings that people have limited usage of smart tech and are confused about the council's role in relation to data monitoring, there is scope for further policy engagement with the community. The Council's *Privacy Management Plan* does not appear to mention how digital data specifically is to be stored or shared, though there are provisions for internet security relating to council practices (Dubbo Regional Council, 2020a).

Tim Howlett, Growth Planner, Dubbo Regional Council, said the *Government Information (Public Access) Act 2009* (NSW) and *Privacy and Personal Information Protection Act 1998* (NSW) would be relevant to smart planning and policy. The Dubbo Regional Council is also governed by Council Privacy Codes (Dubbo Regional Council, 2019b) and Codes of Conduct (Dubbo Regional Council, 2021f). There are also data collection provisions for the Dubbo Region Discovery App outlined online (Dubbo Regional Council, 2021b).

The *Draft Smart Cities Strategy Background Paper* states, 'The Strategy will be prepared with the help, assistance and feedback from all areas and members in our community' (Dubbo Regional Council, n.d.[b], p. 3). This could be strengthened with further consultation using a variety of methods and seeking diverse views by engaging with a wider range of residents. The consultation for the smart city strategy consists of an online survey and one in-person and one online consultation. This was performed by a consultancy group external to Dubbo. There are a number of participatory strategies that may assist public consultation (see the Key Themes: Consumer Understandings of Smart Tech and Implications for Smart Regional Development, Inclusivity section).

The *Mid North Coast NSW SMART Region Proposal* provides one example of implementing innovative participatory consultative methods in designing a smart proposal. One Councillor involved named this 'Creative Placemaking' (Regional Development Australia, 2018, p. 11). The region encompasses Bellingen Shire Council, Nambucca Shire Council, Coffs Harbour City Council, and Kempsey Shire Council. The Bellingen Shire Council ran a consultation process called 'Yarning about Urunga'. The name was a play on words as participants used

[11] https://app.remplan.com.au/dubboregionalcouncil/community/summary?state=Z4QnTq1yxuwzQ52Sr1DroJsWFaFaJZ

threads of yarn to weave between ideas they preferred in a physical space. The consultation process also involved a drop-in session at an Art Space, where people were invited to write their ideas on butchers' paper and complete a postcard survey of various ideas with space for comments (p. 11). Utilising creative consultation methods such as these can engage a broader range of participants than more traditional methods.

This project's data is a good starting point for using community participatory definitions and planning for smart technologies. This is needed if the council intends for the policy to deliver a tailored and actionable smart strategy. There appears to be no recognition of First Nations and Local Aboriginal Land Councils as stakeholders to Smart Policy development.

Dubbo Regional Council is already engaging with smart policy and practice using smart water meters (see below). During the consultation for the Smart Policy, it was mentioned that smart-enabled LED [light-emitting diode] lighting is an example of smart planning (Dubbo Regional Council, n.d.[b], p. 4; see also n.d.[c]). This was not well known among the participants[12] and the council does not manage the lighting, although it did facilitate the change to LED. The Council also has an online portal, DRC&ME (Dubbo Regional Council, 2020b), which while not smart, does embed digital technologies and processes into council services.

In an interview for this project, Tim Howlett spoke about the need to situate businesses next to transport corridors and how smart technologies and applications have benefits in relation to land use and maximising land planning. Dubbo is currently experiencing a housing shortage due to population growth, with associated issues in zoning and development (Ruming, 2021b).

Dubbo is also part of the Cities Power Partnership program aimed at renewable and green energy planning.

How are telecommunications performance issues addressed?

There are several federal and state programs that are relevant to Dubbo's telecommunications capacity. These include:

Regional Digital Connectivity program (NSW Government, 2021c)

The Regional Digital Connectivity program is an initiative of the NSW Government led by the newly formed Department of Regional NSW. Three sub-projects of this initiative are Gig State, the Mobile Coverage Project, and Farms of the Future. Dubbo is one of three target areas for the Gig State project, along with Wagga Wagga and Parkes. The Regional Digital Connectivity Program will spend $400 million to deliver new network infrastructure and boost fibre capacity for regional communities and businesses, $100 million of this is committed to the Gig State project. The tender round for Gig State closed in March 2021 (Talevski, 2021). One of the three farms in the Farms of the Future pilot was located in Narromine (the other two locations were Blayney and Coonamble). After these successful pilot programs, the NSW Government has committed a further $48 million to the project. The second stage of the project will involve constructing and operating a Long-Range Wide Area Network (LoRaWAN) in five unnamed regions. This type of network connectivity 'enables communication across wide geographical areas' (NSW Government, 2021a).

[12] Dubbo Regional Council Smart City Strategy Community, June 9, 2021, and Dubbo Regional Council Smart Strategy Online Session, June 10, 2021.

Regional Connectivity Program

The Regional Connectivity Program is an Australian federal government initiative led by the Department of Infrastructure, Transport, Regional Development and Communications. This program is currently funding 132 telecommunications infrastructure projects across regional, rural, and remote Australia, including $1.6m towards the Regional Australia Network in Warren. This will 'deploy a fixed wireless broadband network in the Narromine-Warren region. The network will extend high-speed broadband connectivity into areas with limited existing coverage, enabling the uptake of new agricultural and business technologies in a significant cotton, grain and livestock region with development opportunities in tourism and manufacturing, and improving access to telehealth and education services' (Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, 2021, p. 4).

The Regional Tech Hub

This is a federal government initiative, developed and operated by the National Farmers' Federation in collaboration with ACCAN and Better Internet for Rural, Regional and Remote Australia (BIRRR). The initiative was launched in December 2020 and aims to 'assist people who live and work in regional, rural and remote parts of Australia to realise the benefits of being digitally connected' (Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, n.d.[d]).

NSW Smart Places Acceleration Program and Federal Government Smart Cities Plan

Funding amounting to $45 million is available from the NSW Government to partner with 'councils and place-owners, such as government agencies, owners, councils or regional organisations, to accelerate the adoption of smart technologies and capabilities in their areas' (NSW Government, Planning, Industry & Environment, 2020). The federal government has also promoted smart regional development through its *Smart Cities Plan* (Commonwealth of Australia, 2016). A recent survey of this plan found that local councils who successfully received funding under the plan were able to resource and develop smart strategies and were on track to deliver them within the proposed timeframes (Australian Government, n.d., p. 4). As noted above, this survey did not appear to include Local Aboriginal Land Councils. The *Draft Smart Cities Strategy Background Paper* mentions leveraging the federal government's Smart Cities Plan and the NSW Government's Smart Places Strategy (Dubbo Regional Council, n.d.[b], p. 5).

[13] https://nationalmap.gov.au/#share=s-qmYEiDx3gp6CmV9gfGZRxw4aqmV

The Mobile Black Spot Program (MBSP)

The mobile black spot database is a database where community members can report mobile black spots.[13] Below is a screenshot of Dubbo (Image 6). Each blue dot represents a community reported black spot. The database was created in 2015 and updated in 2018. It appears most of the reports for Dubbo were entered in 2016. This nationwide database was used to choose locations for the federal government's Mobile Black Spot Program (MBSP) (NSW Government, n.d.[a]). This is an ongoing program 'to deliver better mobile coverage to regional and remote Australia' (*Daily Liberal*, 2020c). Towers and other telecommunications infrastructure can be set up in places where no business incentive for mobile coverage exists. The program partners with Optus, Telstra, TPG Telecom, and Field Solutions Group to deliver base stations for better coverage (Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, n.d.[b]).

A base station was funded at Oakdene, south of Dubbo, in Round One of the program. In Round Two Macrocell Base Stations were funded at Westella and Ballimore, to the east of Dubbo (NSW Government, n.d.[a]). Round Five is now underway, and 'will deliver 182 new mobile base stations (two from Field Solutions Group, 83 from Optus and 97 from Telstra) to continue to address coverage issues in regional and remote Australia' (Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, n.d.[b]).

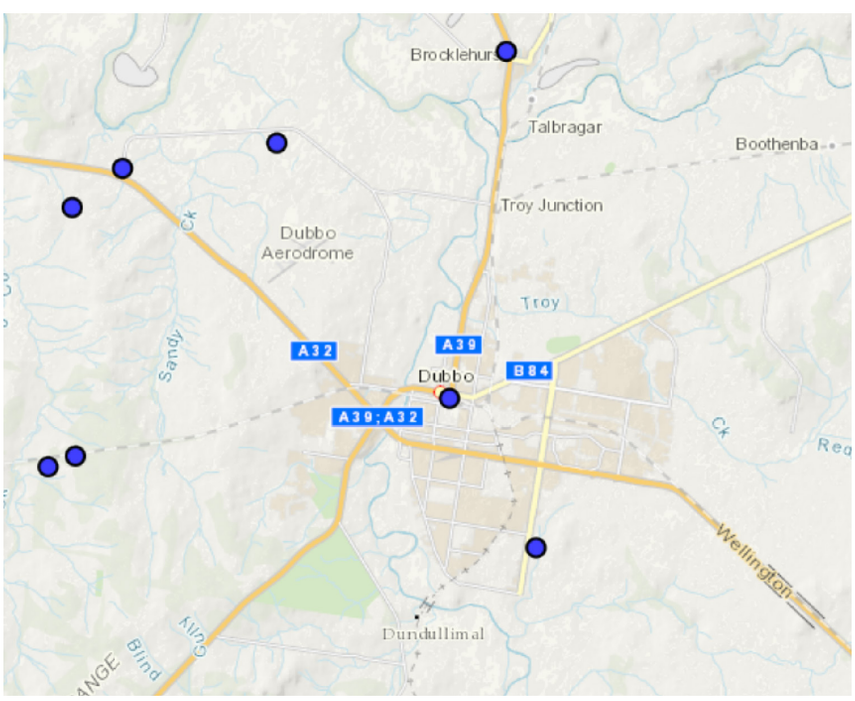


Image 6 Mobile Black Spot Database, showing community reported black spots.
Source: https://nationalmap.gov.au/#share=s-qmYEiDx3gp6CmV9gfGZRxw4aqmV

Smart Applications in Dubbo

Smart Water Meters

Smart water metres are used to provide 'high resolution and frequent water consumption data' (Randall & Koech, 2019) to consumers, assisting with water conservation and management. Traditional water metering required a time consuming and labour-intensive process of manual reading of water meters, generally undertaken quarterly. The frequent readings enabled by smart water metering technology allows for swift detection of leakages, improved demand and consumption management, and facilitates water conservation (Randall & Koech, 2019).

Dubbo Regional Council began a roll-out of smart water devices on 1 June 2020. This roll-out, anticipated to conclude in 2022, includes 17,700 residential water metres and 2,300 non-residential water meters (Dubbo Regional Council, 2021c). Taggle Systems was contracted by Council to deliver the devices (Taggle, 2020). Smart water meters in Dubbo were met with some controversy. There is some evidence of this in the comments section beneath the January 24, 2020 Facebook post by Dubbo Regional Council announcing the awarding of the tender for the smart water meters.[14] Of 72 comments visible on 8 September 2021, 14 were explicitly against the roll-out:

The cost will be in the millions, just to save a meter readers wages. The maintenance costs associated with these will huge compared to the current meters. Don't think much though has gone into this!!

I don't think people full understand that this Council has far too much authority over ratepayers. I don't want Smart meters. No one asked any ratepayers if they wanted it. Not democratic

Not so Smart. Shouldn't we be spending $$$ on resourcing water so we have something for the Smart meters to be SMART about. No a very SMART idea Dubbo Council

Eight comments were explicitly positive

Transparency is so important for a precious resource

Smart meters save the local community money. They help identify undetected leaks in businesses and homes

Great news. Hold those ones wasking [sic] water accountable. That's what people are worried about, they can't cheat any more![15]

The remaining 50 comments were not clearly for or against the roll-out. Council Director of Infrastructure, Julian Geddes, was quoted in a July 2020 newspaper article as saying 'the general feedback though has been positive, with the majority of residents and business owners enthusiastic about monitoring their water usage' (*Daily Liberal*, 2020a).

Telehealth

Telehealth often requires video calls. A high-quality video call requires a 'sufficient, sustained and available bandwidth of at least 350Kbps' (kilobits per second) (HealthDirect, n.d.). One megabit is equal to 1,000 kilobits, so 1 Mbps is 1000 times faster than 1 Kbps. As mentioned above, homes on a FTTN connection located a considerable distance away from the node have the slowest internet connections in Dubbo. These homes

[14] https://m.facebook.com/DubboRegionalCouncil/posts/tender-awarded-for-smart-water-meter-roll-outthe-planned-delivery-of-smart-water/2756970117702350/

[15] Ibid.

have download speeds of 25Mbps–30Mbps and so the internet should be more than fast enough to run video calls as long as the bandwidth is not being used for uploads or downloads of other data. Mobile coverage using 4G should also be fast enough to hold a telehealth appointment. Mobile coverage comes with several limitations – coverage can be weaker indoors than outdoors, and conducting a health appointment outdoors may come with some privacy concerns, and the cost of mobile data may be prohibitive.

Smart Agtech

Agtech has been utilised in the region for some time and is a booming business, though there exists some consumer confusion regarding these technologies and what they do (AgriFutures Australia, 2018). Charles Sturt University runs an AgriTech Incubator Hub in Wagga Wagga to support startups and SMEs (small and medium-sized enterprises).[16] This hub is part of the AgriPark (Agrisciences Research and Business Park)[17] located at the Wagga Wagga campus which supports smart agtech development and was recently awarded funding to host a Drought Resilience Adoption and Innovation Hub (CSU News, 2021).

One farm adopting smart agtech solutions in the area is Binginbar Farms, 'a 3,850ha family owned and operated farm nestled at Gollan, between Wellington, Dubbo and Dunedoo in central NSW. Since 2016, Binginbar Farms has been ramping up with a spectacular digital transformation' (Binginbar Farms, n.d.[a]). A December 2020 article explains that Hitachi Australia assisted Binginbar farms to consolidate their technologies into a 'single command centre' (MTAiQ, 2020).

On the Binginbar Farms, farm manager Nathan Simpson says: 'We can tell how much water the lambs are drinking and if that is less than expected, then we can check for blockages. These include water, weather and soil measurements together with data collected on every single lamb introduced to the property … The results are pretty clear. We have a solution that consolidates data sources into a single command center, which helps to speed up decision making in the farm' (Binginbar Farms, n.d.[a]).

Some of the technologies used on the farm include GPS (global positioning system) technologies with swap control to minimise overlap when planting crops, applying fertiliser with maps made with E38 surveys (digital survey and construction tools) and RFID (radio-frequency identification, which uses electromagnetic fields) tags to identify underperforming stock (Lentez.com.au, 2016). The Binginbar Farms website lists other technologies they use, including water tank and trough sensors, soil, weather, and camera sensors, and EiD (electronic identification) tags and readers (Binginbar Farms, n.d.[b]).

It was not clear from these sources how the farm has the telecommunications infrastructure required to support these technologies. It's possible that satellite and wireless were used for precision GPS and other IOT (internet of things) devices. These kinds of connections and devices can be set up to process low packets of data with relatively low bandwidth requirements. This data would then feed into a command centre at the homestead or manager station – the latter would require larger bandwidth and processing power. Fibre or copper broadband with gigabit connectivity would be the ideal infrastructure to support these technologies though this would be cost prohibitive on a large area such as a farm.

[16] https://research.csu.edu.au/engage-with-us/incubators/agritech-incubator

[17] https://agripark.csu.edu.au/

Pest control

Smart technologies have been used for pest control, another use and application of agtech. In the spring of 2020, a mouse and rat plague spread across the rural grain belt in New South Wales, Australia, and lasted for almost 10 months. In response to the 'biblical plague', a regional business, Flick Pest Control applied SMART boxes in the region. These are a form of 'SMART Digital Pest Control … an intelligent system which uses data and non-toxic methods to trap rodents. Monitoring the premises 24/7, it's catching mice in huge numbers' (Flick Pest Control, 2021).

Table 7 Opportunities and challenges for smart technologies in Dubbo

Opportunities	Challenges
• Generally good quality telecommunications and infrastructure as well as wide coverage in the centre of town • Dubbo Regional Council developing a Smart City, Smart Regions, and Smart Council policy • Regional investment and development as a result of the Renewable Economic Zone[18] and rare earth element (components of smart devices) mining[19] • Already existing ewaste facilities • Growing town and expanding industries in areas aligned with smart technologies • High consumer awareness of smart technologies and support for smart application and implementation • Variety of smart businesses, smart applications, and council smart planning already implemented	• High consumer awareness of smart technologies but relative lack of use • A clearer ewaste policy tied to the planned expansion and use of smart technologies and devices is needed • Confusion regarding smart consumer rights • Local Aboriginal Land Councils not integrated into smart policy planning and data sharing arrangements • Ensuring diverse communities are represented in smart policy consultation and development • Ensuring growth and investment opportunities do not result in private smart technology companies setting the terms of community engagement[20]

[18] This is mentioned in the *Draft Smart Cities Strategy Background Paper* (Dubbo Regional Council, n.d.[b], p. 5).
[19] See Australian Strategic Materials (2021).
[20] The *Dubbo Smart Cities Strategy Background Paper* states: 'Investments that enable partnerships between governments and the private sector will deliver better infrastructure sooner and within budget constraints' (Dubbo Regional Council, n.d.[b], p. 4).

Case Studies: Narromine

Narromine Shire Council is on the Mitchell Highway and has a population of approximately 6,500 people. Narromine has an aging population, with the median age increasing from 38 in 2006 to 42 in 2016 (see Table 6). It is one of the world's best gliding locations (Destination NSW, 2021b). Narromine has a strong aviation history, and the Aviation Museum is one of the town's attractions (Narromine Aviation Museum, 2017). Central features of the local economy include agriculture, particularly sheep, cattle, wool, cotton and cereal production, and commercial nurseries and research facilities supporting the forestry and vegetable industries in Australia (Narromine Shire Council, 2021b). The shire includes three towns: Narromine (population 3,528), Trangie (1,188), and Tomingley (330). Around 20% of the population are First Nations (ABS, 2020l) and the town is located on Wangaibon Country, from the Ngiyampaa Nation. Narromine reportedly comes from the Wiradyuri word 'ngarrumayiny', meaning 'honey people'.

Table 8 Demographic statistics for Narromine. Sourced from ABS QuickStats[21]

Year	Population	% change from previous census year	Median age Narromine	Median age Australia
2001	6,611		NA	NA
2006	6,508	-1.56%	38	37
2011	6,585	+1.18%	39	37
2016	6,444	-2.14%	42	38

[21] Statistics compiled from the QuickStats pages for 2001 (ABS, 2020i), 2006 (ABS, 2020j), 2011 (ABS, 2020k), and 2016 (ABS, 2020l).

What are the telecommunications capacities of Narromine?

NBN maps confirm that the town centre of Narromine has fibre to the node. Mayor Craig Davies mentioned that telecommunications quality in the centre of town is reasonably good. He lives outside of town and relies on satellite. This was confirmed on the NBN map. According to him, the quality of telecommunications outside of the centre of town is poor:

> So, at home, the speeds are woeful, you know, you go home, you turn your computer on and then you go make a cup of tea, you cook dinner and do the washing and hang it out, and you come back in and it's nearly there. It's just terrible. (Craig Davies, Mayor, Narromine Shire Council)

Several interviews mentioned that the service provider maps do not always match the experience of telecommunications quality on the ground.

Internet speeds in Trangie

According the NBN map, central Trangie is supposed to have the capability for fibre to the node but may require additional work to facilitate this. The public school, Central Trangie School, has fibre to the node, according to the NBN map.

What digital policy and planning is taking place?

As noted in the Key Themes: Consumer Understandings of Smart Tech and Implications for Smart Regional Development section, quality internet and telecommunications are crucial for attracting business. There is a risk that without enhanced quality in telecommunications, infrastructural inequalities in rural towns will become further entrenched.

> It's like giving up water. You've got to have it. In denying these rural, and I'm only saying rural, I'm not saying remote, but we are rural and we're almost regional in that we're only a hop, skip and a jump to Dubbo, but in denying us that level of technology, they are making life very difficult for us out here. They are holding back land values out here, they are devaluing our real estate area out here. (Craig Davies, Mayor, Narromine Shire Council)

There are significant development and workforce gains that can be achieved through quality telecommunications in Narromine: 'We've got a total workforce in the shire of 2,300. We can almost double it. That's just stuff that we've thought up here, but we need smart technology. It needs to happen quickly. We've got companies now that want to come to our shire.' Population decline and drift to regional centres is a major issue for rural towns and securing quality telecommunications infrastructure is viewed as a key strategy to address this issue. It should also be noted that population drift is largely non-Indigenous with First Nations populations remaining stable in the smaller towns, making these communities key stakeholders to growth-driven policy in the region. Councillor Davies sees a positive future for Narromine though and points to the increased development undertaken by the council in recent years:

> In the next three or four years, we will triple what we're doing now. Or we might improve it by a factor of 20, the way we're going because the level of investment that's coming into the shire, with the initiatives that we're aware of, is just mind-boggling.

Mayor Craig Davies said that while the town is a part of the Regional Digital Connectivity Program, progress has been slow. Fields Solution Group, a telecommunications service provider based near Sydney, has recently been awarded funding under the Regional Connectivity Program to implement fixed internet wireless services and towers near Narromine to increase coverage (Daily Liberal, 2021). At the moment, the Council does not have a formal smart or digital policy, it is being developed through relationships with business and other government stakeholders. The Council takes an extrospective approach to policy development and actively engages with the tech industry at local, state, national, and international levels.

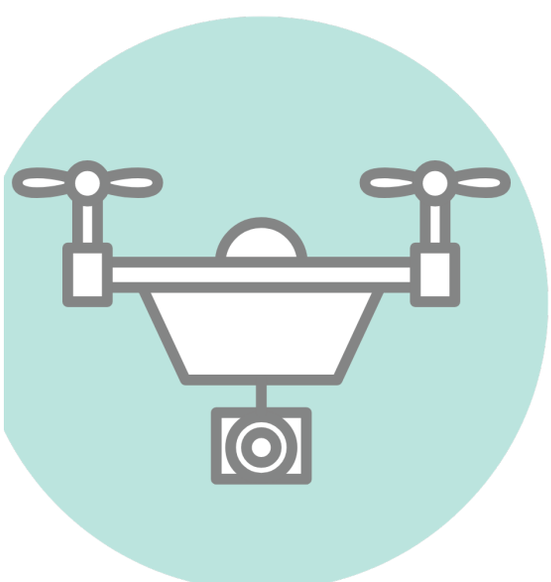
Lack of quality telecommunications impacts large-scale business investment in relation to manufacturing companies and other industries in the region. In addition to the lack of quality telecommunications outside the direct centre of town, where larger companies would need to build their warehouses, potential companies would also be required to invest in on-site infrastructure largely already accommodated in the metropolitan areas of New South Wales. As of November 2021, the NSW Government's Regional Job Creation Fund will enable the establishment of an advanced manufacturing precinct in Narromine. This will make it feasible for companies such Simmons Global to relocate to regional areas (The Premier, Deputy Premier, 2021).

Smart Applications in Narromine

Agtech

Narromine is part of Farms of the Future, a subset of the Regional Digital Connectivity Program. As discussed previously, the Regional Digital Connectivity program also includes Mobile Coverage and the Gig State project. The Farms of the Future project will 'deliver on-farm connectivity and encourage farmers to adopt ag tech to boost productivity and improve resource management, including water efficiency and drought preparedness' (NSW Government, 2021a).

One of the pilot farms, located in Narromine, relies on tech including GPS for tram tracking (the tracks used for spraying or extracting produce), yield mapping, and many sensors to monitor various aspects of the farm. Rob Tuck, the owner of Tuck Ag, discusses the Farms of the Future project in a video produced by the NSW Department of Primary Industries and Agriculture. Tuck says 'we love using technology and it's really made our enterprise boom' (NSW DPI Agriculture, 2020).[22] Mobile connectivity on the farm is not reliable, so the increased Wi-Fi connectivity the program bought was very helpful for checking sensors that monitor a variety of things (tank levels, weather stations, rain gauges) across the 40 km farm. This has greatly reduced the time spent travelling across the farm. Now that Tuck Ag has Wi-Fi connectivity on most of its farms, the number of cameras across the farm has been increased. The farm also uses water pump monitors that connect to a mobile phone.



[22] At 02:08-02:15.

Flying Cars

As a result of a $950,000 support grant from the NSW Government's Regional Investment Attraction Fund, sustainable aerospace company AMSL Aero will test electric Vertical Take-Off and Landing (eVTOL) vehicles at the Narromine Aerodrome Industrial Park. The Narromine Aerodrome precinct was funded by a $750,000 NSW Government Growing Local Economies grant in 2020 (Department of Regional NSW, 2020). AMSL Aero has 12 employees listed on LinkedIn, based in Sydney or Melbourne, according to their LinkedIn profiles.

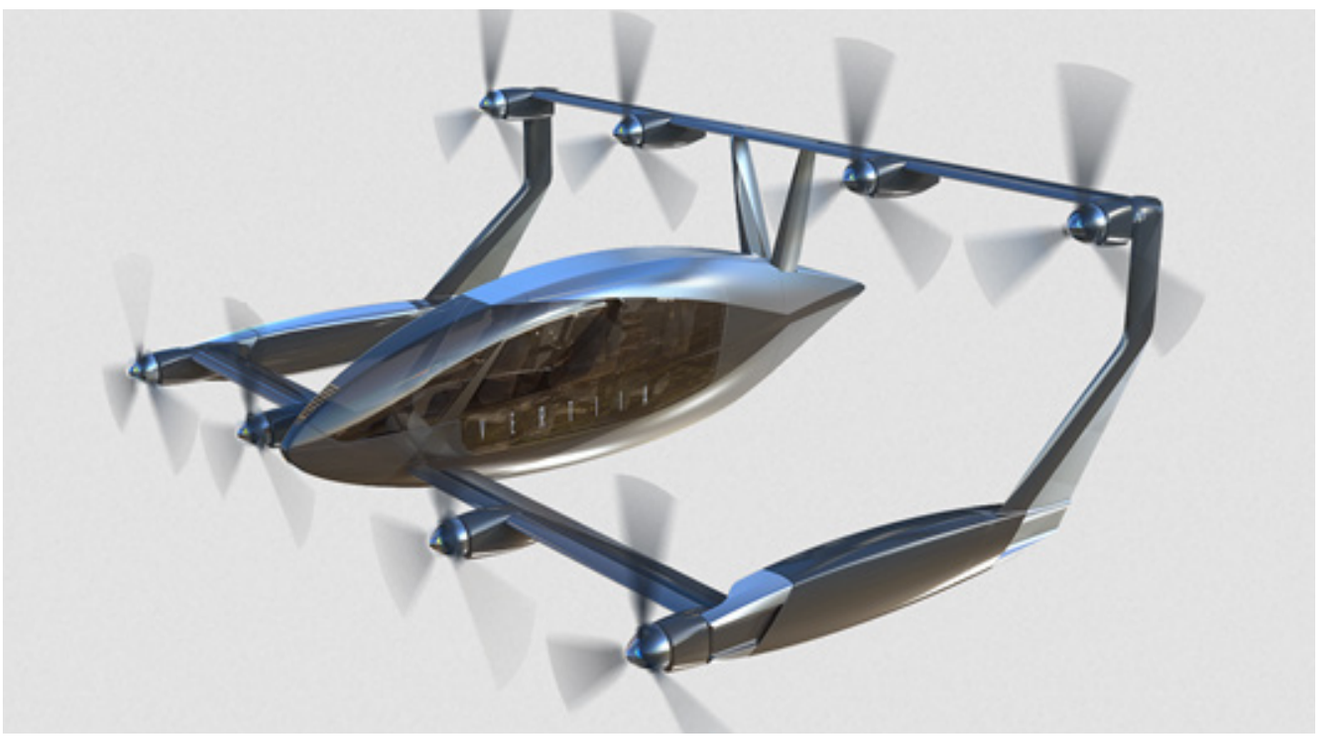


Image 7 An image of a flying car, the product name is Vertiia. Source: https://www.vertiia.com/

Table 9 Opportunities and challenges for smart technologies in Narromine

Opportunities	Challenges
• Generally good quality telecommunications and infrastructure in the centre of town • No official digital or smart policy but Mayor is highly extrospective and has built relationships with state, national, and international investors • Growing development and business interest in the area • Less urbanisation making the town suitable for large-scale smart applications such as smart farms and flying cars • Already existing ewaste facilities	• Problems with coverage and limited FTTN outside the direct centre of town • Need for smart and digital policies to include community driven needs and balance extrospection with introspection • A clearer ewaste policy tied to smart planning is needed • Local Aboriginal Land Council not integrated into smart policy planning and data sharing arrangements

Case Studies: Wellington

Wellington is located in the local government area of Dubbo Regional Council (since the 2016 amalgamation). The town has a population of 4,519 as of the 2016 census. The Wellington Caves are a significant site of megafauna fossils and tours of the caves are a key tourist attraction for the town (Destination NSW, 2021c). Another attraction is Lake Burrendong, where visitors and residents can kayak, canoe, and fish. Wellington, like Narromine, has a strong agricultural economy, with alfalfa, vegetables, wheat, wool, and lamb grown in the area. Other key focuses for economic and employment growth are tourism through the Wellington Caves, and the new Wellington Correctional Centre (Dubbo Regional Council, 2020e). Wellington sits on Wiradyuri Country and approximately 28% of the population is First Nations (ABS, 2020w). There are 39 cities named Wellington in the world, 20 of these are in the United States. As with Narromine, Wellington is facing an ageing and declining population (see Table 10).

There is some community concern regarding the amalgamation of the Wellington and Dubbo Councils (Ruming, 2021a). Due to rates alignment (to incorporate Wellington lands into the rateable area of Dubbo), rates in Dubbo were increased based on the land value of the Dubbo region being rated higher than in Wellington (Dubbo Regional Council, 2020d). For Wellington residents, their rates go to the Dubbo City Council. Some residents perceive decisions are made in Dubbo and then implemented in Wellington. As noted in one of the interviews, what is designed for a city like Dubbo may not necessarily work for a rural town.

Table 10 Demographic statistics for Wellington. Sourced from ABS QuickStats[23]

Year	Population	% change from previous census year	Median age Narromine	Median age Australia
2001	4,672		NA	NA
2006	4,660	-0.257%	41	37
2011	4,540	-2.575%	42	37
2016	4,518	-0.463%	44	38

[23] Statistics compiled from the QuickStats pages for 2001 (ABS, 2020t), 2006 (ABS, 2020u), 2011 (ABS, 2020v), and 2016 (ABS, 2020w).

What are the telecommunications capacities of Wellington?

According to NBN maps, Wellington has fibre to the node. As with Narromine, coverage decreases the further away one is from the centre of town. In an interview, Annemarie Jones, Deputy Mayor Dubbo Regional Council, said that she drives into Wellington to download large files because the satellite internet at her home is too slow to manage them. There is no mobile service where Councillor Jones lives, 47 km from Wellington. According to Councillor Jones, a tower was put in at Comobella but it does not reach her home at Gollan. This indicates how regional topography impacts telecommunications transmission. NBN offers Sky Muster satellite internet service where there is limited business incentive for the other kinds of internet access in regional and rural areas (see Joint Standing Committee on the National Broadband Network, 2017, chap. 4). Peak download and upload speeds for the Sky Muster plus plan are 512 kbps and 256 kbps, with off-peak times running faster.[24] If data allowance is exceeded during these times, caps are placed on speeds. As noted above, a high-quality video call requires a 'sufficient, sustained and available bandwidth of at least 350Kbps' (kilobits per second) (HealthDirect, n.d.). For a single user, these speeds can be sufficient but for multiple users and video calls, there may be limitations. Consumer satellite access is not generally designed to handle large amounts of data in real time.

Annemarie Jones believes good telecommunications access and services will lead to the growth of the town and have flow-on effects for good health services and education facilities as well as career paths for locals and workforce retention for professionals who migrate to the town such as health workers and doctors.

An aging population could be an obstacle to smart planning and policy as well as the community's knowledge of digital technology and digital literacy. According to Annemarie Jones, the local public library and TAFE (Technical and Further Education) run digital literacy courses but there is limited public transport infrastructure in Wellington. If people are not within walking distance of these facilities, it can be difficult for them to attend. There may also be financial barriers to undertaking training.

What digital policy and planning is taking place?

Wellington is part of the Dubbo local government area and so is included in the smart regions component of Dubbo Regional Council's Smart Cities policy. The Dubbo Regional Council *Draft Smart Cities Background Paper* outlines the following goal:

> *Dubbo and Wellington are 'smart cities' that capitalise on future technological advances in the way we travel, communicate, work, live and respond to change.* (n.d.[b], p. 4; emphasis in original)

A $540m solar farm was approved for construction in Wellington in May 2021 (NSW Government, Planning, Industry & Environment, 2021). Uungula Wind Farm is also due for construction this year and is situated within the Renewable Energy Zone in the Central West and Orana Region (CWP Renewables, 2021). Although specialist parts for the farm are likely to be delivered by companies external to the region, CWP Renewables, the company managing the construction of the farm, has made a commitment to local businesses in some of the tendering processes.[25] In addition to attracting investment in the region, it may potentially influence the local development of other renewable business portfolios, including smart technologies and applications.

[24] https://www.nbnco.com.au/learn/network-technology/sky-muster-explained/sky-muster-plus-explained
[25] O2N Industry Connection – CWP Renewables and Uungula Wind Farm Webinar, August 19, 2021.

Mobile coverage

Former Dubbo Regional Council Mayor, Ben Shields, wrote an opinion piece in 2019 touting the benefits of the new towers to be built as part of the Mobile Black Spot Program. 'In our modern world, digital communication is essential and it is virtually impossible to operate without good access to mobile phone reception and data. Unfortunately, we know too well that both of these have been lacking in some parts of our region' (Shields, 2019).

Round Five of the program is now underway and 'will deliver 182 new mobile base stations (two from Field Solutions Group, 83 from Optus and 97 from Telstra) to continue to address coverage issues in regional and remote Australia' (Department of Infrastructure, Transport, Regional Development and Communications, n.d.[b]).

Smart Water Meters

As in Dubbo, Wellington has seen the introduction of smart water meters. The *Wellington Times* published an article in May 2020 titled 'Knock knock: We're going to install your smart water meter now' (Bartley, 2020). The body of the article has straightforward factual information, but the title appears to position the technology as invasive, as though residents have little choice over the implementation of smart infrastructure in their homes. These ideas are illustrated in the following questionnaire response: 'Internet everything is connected big brother is watching'. These sentiments illustrate the need for community understanding of smart planning and infrastructure as a *participatory* rather than enforced approach. Smart infrastructure will continue to be implemented in the region. Further education and promotion of consumer rights regarding smart technologies and applications may help residents feel empowered as they navigate changing council priorities and roles in relation to digital infrastructure.

Table 11 Opportunities and challenges for smart technologies in Wellington

Opportunities	Challenges
• Generally good quality telecommunications and infrastructure in the centre of town • Part of the Dubbo Regional Council's Smart City policy • Construction of solar and wind farms align with smart energy infrastructure and have the potential to stimulate related smart business portfolios • Less urbanisation making the town suitable for large-scale smart applications such as the smart farms and flying cars examples from Dubbo and Narromine • Already existing ewaste facilities as part of the Dubbo local government area	• Problems with coverage and limited FTTN outside the direct centre of town • Scope for more inclusive rural definitions of smart in smart policy planning, what works for a regional city may not work for a rural town • Ewaste facilities are available through transfer stations to Dubbo but this may be distance prohibitive for consumers • Local Aboriginal Land Council not integrated into smart policy planning and data sharing arrangements

Case Studies: Gilgandra

The Gilgandra Local Government Area has a population of 4,236 (as of the 2016 census [ABS, 2020h]). The council area includes four towns, Gilgandra (population of 3,126) (ABS, 2020g), Tooraweenah (population 232) (ABS, 2020s), Ballandoran, and Curban (population 131) (ABS, 2020b). Gilgandra's attractions include the Emu Logic emu farm, Gilgandra Rural Museum, and the Windmill Walk, a stroll between trees and windmills on the banks of the Castlereagh River (Destination NSW, 2021a). Core industries include agriculture, forestry and fishing, accounting for 37.25% of the region's economic output.[26] Gilgandra has a declining and aging population (see Table 12). The shire is located along the Castlereagh River and at the foothills of the Warrumbungles and is part of the largest state seat in NSW, Barwon. The First Nations population is approximately 14% (ABS, 2020h). The Gilgandra region is home to the Gamilaraay, Wiradyuri, and Wayilwan peoples. According to the Warrumbungle National Park Guidebook, archaeological evidence indicates Aboriginal peoples have lived in the area for around 25,000 years and in the Warrumbungle Ranges for around 17,000 years (Fox, 1996).

What are the telecommunications capacities of Gilgandra?

Gilgandra faces several barriers to the introduction of smart technology in the town. The area has a rapidly aging population, which may be a barrier to digital literacy. According to Doug Batten, Mayor of Gilgandra Shire Council, the area received the 'poor end of the deal' in the NBN roll-out and much of the town has fixed wireless capability. According to NBN maps, central Gilgandra has fibre to the node. Program funding for telecommunications infrastructure and coverage is patchy with 'federal government funding piecemeal'. Some areas on the ground have difficulty connecting with the NBN, either due to a lack of service providers or poor coverage. According to NBN maps, Tooraweenah village and school have satellite capacity for NBN. Telecommunications quality is impacting liveability in the town. Doug Batten points out that there are health implications from living so far away from services. He believes that the growing population in Dubbo is drawing people away from Gilgandra. Narromine has managed to draw on the available funding and business benefits of smart technology, such as government grants and attracting industry and the use of an extrospective council approach.

Table 12 Demographic statistics for Gilgandra. Sourced from ABS QuickStats[27]

Year	Population	% change from previous census year	Median age Narromine	Median age Australia
2001	4,712		NA	NA
2006	4,522	-4.03%	41	37
2011	4,368	-3.41%	44	37
2016	4,236	-3.02%	45	38

[26] https://app.remplan.com.au/gilgandra/economy/summary?state=koGRHb30mForkXLTk9DB6JcoIzIzQ5

[27] Statistics compiled from the QuickStats pages for 2001 (ABS, 2020d), 2006 (ABS, 2020e), 2011 (ABS, 2020f), and 2016 (ABS, 2020h).

What digital policy and planning is taking place?

According to Doug Batten, Gilgandra has degrading infrastructure that would benefit from being digitally upgraded. The *Gilgandra Local Strategic Planning Statement 2020* identifies the need for quality telecommunications infrastructure:

> While the NBN has made it to Gilgandra, our rural and village residents still receive substandard mobile phone coverage. This is a significant barrier to growth in technological business in these areas. Through the recent Gilgandra Activation Blueprint (2019) our community has identified a need for greater community and business access to 'hotspot' technology in our CBD [Central Business District]. (Gilgandra Shire Council, 2020, p. 16)

The statement also identifies the need for a Smart Regional Policy and better 'infrastructure to support reliable mobile connectivity across our entire Shire (particularly in Tooraweenah and Armatree)' (p. 16).

Gilgandra's location next to major road transport routes makes it an ideal road stop for many. Mobile coverage is important to encourage drivers to stop in Gilgandra. Without reliable 4G cellular coverage in the area, drivers will likely proceed to the next town. As the Planning Statement notes:

> Gilgandra is ideally placed at the centre of NSW half-way between Brisbane and Melbourne on the junction of the Newell, Oxley and Castlereagh highways. Gilgandra is connected through the state road and rail network, within a 45-minute drive to the major centre of Dubbo, and also has direct access through the port of Newcastle.
>
> Utilising the highways which intersect the town, Gilgandra is a major transport hub, supporting traffic from the freight industry as well as tourism and the travelling public. (p. 5)

According to Doug Batten, smart council operations currently include vehicle tracking to meet occupational health and safety requirements.

Community Service Obligations

In an interview, Doug Batten discussed some potential problems and gaps with current community service obligations in telecommunications. In particular, Councillor Batten suggested the community service obligations of Telecom, the former national telecommunications service provider, were not replaced when the company was privatised as Telstra in the late 1990s. Community service obligations are the 'non-commercial requirements of government business enterprises' (Commonwealth of Australia, 1997, p. 1). Under Telstra these requirements are the Universal Service Obligations and relate to everyone having a fixed telephone line or access to a public payphone, which generally provided equity (Commonwealth of Australia, 1997).[28]

New telecommunications provisions enable access to the internet regardless of infrastructure and update universal service obligations with universal service guarantees. However, since access could mean through fibre, fixed wireless, or satellite (Australian Government, Department of Infrastructure, Transport, Regional Development and Communications, n.d.[f]), there are

[28] For the updated service obligations of Telstra, see: https://www.telstra.com.au/consumer-advice/customer-service/universal-service-obligation

significant differences in quality and speed, making the provision of access to the internet potentially less equitable. Doug Batten suggested there is a difference in service provision when the organisation is understood as a business rather than a public utility when Telecom operated through the former Postmaster-General's Department. As a public utility, telecommunications originated with the latter department alongside Australia Post (Telstra, n.d.), the government business enterprise that provides postal services.

According to recent policy requirements, the NBN is meant to deliver universal service. The use of existing copper wires and fixed wireless will result in different speeds. Information published by the government in early 2000 acknowledged that digital universal service obligations would be cost prohibitive (Jackson, 2000). Recently the commitment to deliver 100 megabits per second (MBps) for fixed wireless was dropped (Conifer, 2018). The NBN is also constrained, as noted above, by profit requirements which means that when services such as satellite are offered, costs are offset by other internet operations (such as FTTN or FTTP) that attract service providers and recoverable consumer bases.

The Mobile Black Spot Program can provide telecommunications infrastructure in places where there is unlikely to be cost recovery or business incentive for internet and mobile service. Regional and rural topography can hinder telecommunications signals as indicated in the Wellington case study. Considered from a First Nations perspective, this illustrates how Country has agency in influencing connectivity.

While governments at all levels are promoting regional connectivity and smart policy planning, and some local councils are engaging in extrospective planning, it is difficult to see how parity for consumers in rural towns, regional cities, and metropolitan cities can be achieved without significant investment in telecommunications infrastructural equality. For Doug Batten,

I'd like to see someone have the same opportunity in Gilgandra as … in Chatswood to utilise technology.

Table 13 Opportunities and challenges for smart technologies in Gilgandra

Opportunities	Challenges
• Generally good quality telecommunications and infrastructure in the centre of town • Smart Policy and digital infrastructure part of council strategic planning • Located next to key transport routes • Less urbanisation making the town suitable for large-scale smart applications such as the smart farms and flying cars examples from Dubbo and Narromine • Ewaste planning part of strategic regional development	• Problems with coverage and limited FTTN outside the direct centre of town • Strategic planning requires infrastructural investment to be achieved • Local Aboriginal Land Council not integrated into smart policy planning and data sharing arrangements

Case Studies: Peak Hill

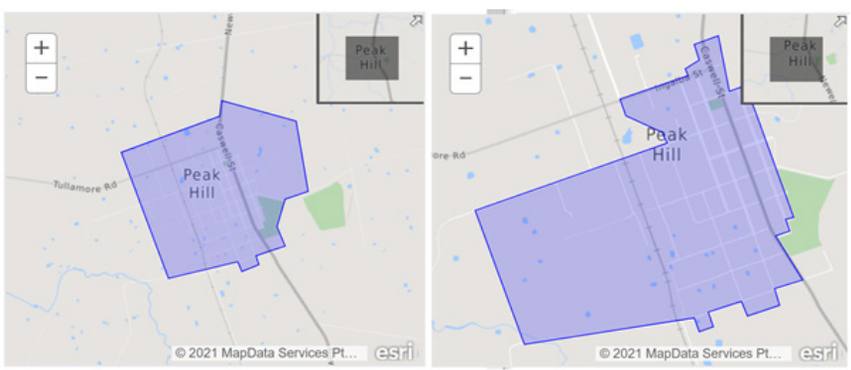
Peak Hill operates under the Parkes Shire Council. Parkes Shire has a population of 14,608 as of the 2016 census (ABS, 2020m) and Peak Hill has a population of 1,106 (ABS, 2020q). Approximately 24% of the population is First Nations (ABS, 2020q) and the town is located on Wiradyuri Country. Peak Hill was the site of Australia's first upright bulk wheat silo in 1918 (Peak Hill, 2012). The top industries of employment in Peak Hill are sheep and beef cattle farming, grain growing, gold ore mining, and hospitals (ABS, 2020q). The population of Parkes is growing[29] but Peak Hill is in a stable, slight decline (see Table 13). The boundaries of the Peak Hill area changed between 2006 and 2011, with the town now covering a smaller area (see Image 8). Parkes is included in both the NSW Government initiative, the Regional Digital Connectivity Program (NSW Government, 2021c), and the Federal Government's Regional Connectivity Program (Mark Coulton MP, 2021). An NBN tower was established in the southern part of Parkes which has helped internet speeds for businesses in the area (Coote, 2015). Rugby league footballer and coach Graham Murray was born in Peak Hill.

Table 14 Demographic statistics for Peak Hill. Sourced from ABS QuickStats[30]

Year	Population	Median age Narromine	Median age Australia
2001	965	NA	NA
2006	946	42	37
2011	755 (N.B. boundaries changed)	45	37
2016	722	48	38

Note: The statistical area 'Urban Centre/Locality (UCL)' was used for these statistics because it remained present from 2001–2016

[30] Statistics compiled from the QuickStats pages for 2001 (ABS, 2020n), 2006 (ABS, 20200), 2011 (ABS, 2020p), and 2016 (ABS, 2020r).



Peak Hill UCL 2006 Peak Hill UCL 2011

Image 8 Boundary changes for Peak Hill township. Note: The 2011 image is zoomed in closer than the 2006 image.[31]

What are the telecommunications capacities of Peak Hill?

Central Peak Hill, particularly near the Newell Highway, has fibre to the node, according to NBN maps. Outside the town, residents can access the internet by satellite and fixed wireless, according to NBN maps. Louise O'Leary, Parkes Shire Councillor, describes the telecommunications quality in the town in the following way:

> I think yes, it's very much improved from what it was years ago. Could it be better? Obviously. There are definitely black spots, especially between here and Dubbo. There's around that Momo Forest there's a black spot. If you're going from Peak Hill in through to Yeoval, there's obviously black spots.

Louise O'Leary identified the following challenges for digital infrastructure and smart planning:

> Well, Peak Hill's a smaller village of the Parkes Shire Council. The issues that we have is we have probably an aging population. We also have a high proportion of low socio-economical population.

Like Gilgandra, there is population drift to large towns and regional cities for job opportunities. Farming is the main business that uses smart and digital technologies in the area, according to Louise O'Leary. As with other interviewees, O'Leary says that telecommunications impact on liveability and growth:

> It's important for Parkes and the shire to actually have great technology to be able to bring these other businesses into our community to actually help strengthen our community. That then also has a flow on from, to the smaller communities.

Digital infrastructure is also important for residential and businesses services. For instance, O'Leary mentions there are no banks in Peak Hill so people rely on ATMs [automated teller machines] for banking. Social media is also important for organising community events and planning due to the distance of some residents from town. In 2021, Parkes was one of '240 Business Fibre Zone locations to receive NBN Co's premium business-grade fibre Enterprise Ethernet at reduced wholesale prices' (Little, 2021).

[31] Source: 2006 Census QuickStats (ABS, 20200) and 2011 Census QuickStats (ABS, 2020p).

As with other towns with an ageing population, telehealth is becoming increasingly important for the area. Louise O'Leary saw strengths in regions having more experience with distanced health services, 'the city doesn't do it as well as … the country does it.' Telework is also a possibility with digital technology as noted in the Key Themes section:

> Because we have the technology now, you can be living in Peak Hill and still working … I think working from home, having that technology to be able to then work from home, which you could do in a very small community but still be connected to the likes of the world.

What digital policy and planning is taking place?

The Parkes Council website does not appear to have any publicly available digital policies or strategies despite having an array of plans for other infrastructure related to transport, community, and the environment. In the 'Business Investment' section of the Parkes Shire Council website, it is stated that Parkes has 'an extensive fibre optic telecommunications infrastructure' which is connected to grids in Brisbane and Sydney, which 'provides a high level of communications security' (Parkes Shire Council, n.d.[c]). The *Parkes Shire 30+ Community Strategic Plan* mentions the 'Council is also looking to embrace the emerging and exciting developments in digital and fibre optic technologies' (Parkes Shire Council, n.d.[a], p. 15) and plans to embrace the 'digital economy' based on the transport nexus brought about by the Inland Rail (p. 22).

The *Peak Hill Community Strategic Plan 2018/19* (Parkes Shire Council, n.d.[b]) emphasises the town's location near the National Logistics Hub facilitated by the south Inland Rail transport route. As part of this transport infrastructure development, the first Special Activation Precinct will be established in Parkes (Parkes Shire Council, 2021a). The Precinct leverages the Inland Rail's interconnections with other transport routes to deliver infrastructural projects to the region. Aside from influencing the development of business portfolios to service the area, there may be the potential for smart and digital infrastructure projects like the Renewable Energy Zone mentioned in the Dubbo and Wellington case studies.

Louise O'Leary mentioned that SnapSendSolve is used in Peak Hill and Parkes. In addition, QR (quick response) codes have helped provide council, businesses, and events a means of information to keep the community safe and track information to assist with alerts for potential health outbreaks.

Table 15 Opportunities and challenges for smart technologies in Peak Hill

Opportunities	Challenges
• Generally good quality telecommunications and infrastructure in the centre of town • Located next to key transport routes and major infrastructural regional development • Less urbanisation making the town suitable for large-scale smart applications such as the smart farms and flying cars examples from Dubbo and Narromine • Strengths and experience in distanced telehealth, education, business and community organising	• Problems with coverage and limited FTTN outside the direct centre of town • Unclear if specific digital, smart, and ewaste policies are being developed by Parkes Shire Council • Local Aboriginal Land Council not integrated into smart policy planning and data sharing arrangements

Recommendations and Conclusion

The project investigated local examples of smart technologies, applications, and planning. The data gathered in this report can help promote the inclusion of regional and rural consumer understandings of smart potential in research and policy agendas for state, national, and global developments of digital infrastructure. As the Case Studies and project data indicate, there are key challenges for smart and digital regional development and planning related to the quality of telecommunications infrastructure. **Quality infrastructure requires parity with digital and smart ability – the knowledge and ability to use digital technologies in ways that benefit the diverse communities that make up regional and rural towns. This means drawing on the strengths and opportunities enabled by community knowledge of regional cities and rural towns.**

Recommendations include:

Recommendation 1

Further information should be provided to rural and regional communities promoting consumer rights regarding smart technologies and applications and clarifying councils' role in relation to these right

Recommendation 2

Further opportunities should be found for all community stakeholders to trial the use of smart technologies and applications to increase familiarity and trust of the technology

Recommendation 3

Local councils should develop opportunities for identified smart technology champions to promote smart tech benefits among the community

Recommendation 4

Local councils and other stakeholders in smart development should identify the opportunities from engagement with Local Aboriginal Land Councils and First Nations in the development of smart regions

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Appendices

Appendix 1: Questionnaire

Consumer understandings of smart technologies and their applications in North West NSW regional and rural communities

Participant Information

Australian Communications Consumer Action Network (ACCAN)
School of Indigenous Australian Studies, Charles Sturt University

Researcher: Dr. Holly Randell-Moon, Senior Lecturer, School of Indigenous Australian Studies, Dubbo Campus

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You are invited to participate in a study on the digital experiences and smart literacy of regional and rural telecommunications consumers to better understand how smart services can be applied.

This study is being conducted by the above researcher from the Charles Sturt University School of Indigenous Australian Studies. This project was funded by a grant from the Australian Communications Consumer Action Network (ACCAN). The operation of the Australian Communications Consumer Action Network is made possible by funding provided by the Commonwealth of Australia under section 593 of the Telecommunications Act 1997. This funding is recovered from charges on telecommunications carriers.

Before you decide whether or not you wish to participate in this study, it is important for you to understand why the study is being done and what it will involve. Please take the time to read the following information carefully and discuss it with others if you wish.

What is the purpose of this study?
Focusing on regional and rural communities in the North West of New South Wales, this project will identify consumer understandings of smart technologies and their applications, engagement with digital infrastructure, increasing digital trends towards

data monitoring, and the impact of smart services on social relations. This data will provide information on the digital experiences and smart literacy of regional and rural telecommunications consumers to better understand how smart services can be applied.

Why have you been invited to participate in this study?
5 towns have been identified for the project: Dubbo and the surrounding areas of Narromine, Gilgandra, Wellington, and Peak Hill. All residents of these towns have been invited to participate in the study.

What does this study involve?
If you agree to participate, you will be asked to answer a questionnaire consisting of approximately 20 questions that will take you around 5-15 minutes to complete, depending on how many questions you want to answer! You will not be required to identify yourself. You will be asked about your knowledge of smart applications and technologies, how often you use them, how they can benefit consumers and the community, what you know about remote data monitoring, how you would assess your digital literacy, and how you engage with civic and community planning. Don't worry if you don't know much about these topics, we want a diversity of views and perspectives.

Are there any risks and benefits to you taking part in this study?
We anticipate there is no risk to participants associated with this research. This study has been endorsed by the Australian Communications Consumer Action Network (ACCAN) and approved by the Charles Sturt University Human Research Ethics Committee. The study will place regional and rural consumer experiences and perspectives front and centre in smart policy and telecommunications development. These experiences and perspectives are particularly important because regional and rural communities are typically excluded from the evidence base for smart technologies and services.

How is this study being paid for?
This study has been funded in full by ACCAN and with in-kind support from Charles Sturt University. All researchers involved in this study are staff members of the University.

Will taking part in this study cost you anything, and will you be paid?
There are no financial costs to you associated with participating in the questionnaire. Participants who complete the entire questionnaire (i.e. every question) will go into a draw to win either a $200 Woolworths or JB Hi-Fi voucher. To go into the draw, participants must provide a valid contact email or phone number.

What if you don't want to take part in this study?
Participation in this study is entirely your choice. Only those people who give their informed consent will be included in the project. Whether or not you decide to participate, is your decision and will not disadvantage you.

What if you participate and want to withdraw later?
You are being asked to contribute your data anonymously, so it will not be possible for you to have the data you contribute withdrawn from the study once you have

submitted your questionnaire. If you do not wish to have your answers included in the study, then do not submit your questionnaire.

How will your confidentiality be protected?
You will not be asked to identify yourself by name so all questionnaire data is anonymous. There is an option in the questionnaire for participants to be informed of any research being written for research publication. There is also an option for participants to participate in a follow up interview with the researcher. In both cases, where participants have supplied their email address, these sections will be automatically de-linked and separated from the rest of the questionnaire. This means the researcher will not be able to view the completed questionnaires with any email addresses included as the latter will be automatically be sorted into a separate file.

What will happen to the information you give us?
The information you share through this questionnaire will be combined with the results of all other components of the study such as interviews and case studies (which focus on the telecommunications policy and infrastructure in each of the 5 towns) to support the generation of a report on the digital experiences and smart literacy of regional and rural telecommunications consumers. This report will be used to better understand how smart services can be applied. Peer-reviewed journal articles on the report and project findings will be submitted to journals such as *Regional Studies* and *Geoforum*. If you would like to be notified of the project results there is an option in the questionnaire for the researcher to notify you when the results are published. You can also contact the researcher at any time at hrandell-moon@csu.edu.

Who should you contact if you have concerns about the conduct of this study?
Charles Sturt University's Human Research Ethics Committee has approved this project [Protocol number: H20316]. If you have any complaints or reservations about the ethical conduct of this project, you may contact the Committee through the Ethics and Compliance Unit via the following contact details:

The Governance Officer
Human Research Ethics Committee
Ethics and Compliance Unit
Locked Bag 588
Wagga Wagga NSW 2678
Tel: (02) 6933 4213
Email: ethics@csu.edu.au

Any issues you raise will be treated in confidence and investigated fully and you will be informed of the outcome.

Support services
Although we do not anticipate that participating in this questionnaire will cause any distress, should you require support as a result of your involvement we identify the following services that may be of use:

· Beyond Blue – https://www.beyondblue.org.au/ or 1300 224 636 (24 hours, 7 days)

· SANE Australia – https://www.sane.org/
· MensLine Australia – https://mensline.org.au/ or 1300 78 99 78 (24 hours, 7 days)
· Your local General Practitioner

Conclusion
Thank you so much for considering this invitation to complete the questionnaire. We really appreciate your time and interest in the questionnaire. You may tear the first 4 pages from the questionnaire to keep a copy of this information if you wish.

Consent and Questionnaire Information

By completing and submitting the questionnaire you are indicating that you are agreeing to participate in the above study and you will be freely providing your informed consent to have your responses to the following questionnaire questions gathered and included in the study that has been described in the previous pages. You are agreeing that you have had the opportunity to have your questions answered to your satisfaction. If you do not consent to have your data gathered and included in the study, please do not submit this questionnaire.

As you complete the questionnaire you will be provided with some interesting facts about Dubbo, Narromine, Gilgandra, Peak Hill, and Wellington. Remember to complete the full questionnaire to get all the interesting facts!

To be eligible for the $200 JB Hi-Fi and Woolworths voucher draw, you must complete the entire questionnaire.

An asterisk is placed next to questions that require an answer.

Consumer understandings of smart technologies and their applications in North West NSW regional and rural communities

Questionnaire

*** 1. Do you reside in any of the following towns: Dubbo, Narromine, Gilgandra, Wellington, and Peak Hill?**

☐ Yes
☐ No

If you answered No, sorry we are only interested in the views of the residents from the above towns. Please do not complete and submit this questionnaire if you do not reside in one of the above towns.

*** 2. Which of the following towns do you primarily reside in?**
Tick all that apply.

☐ Dubbo
☐ Narromine
☐ Gilgandra
☐ Wellington
☐ Peak Hill

*** 3. How many years have you lived in selected towns (if less than 1 year, write 0)?**

*** 4. Have you heard of smart technology and smart applications?**

☐ Yes
☐ No

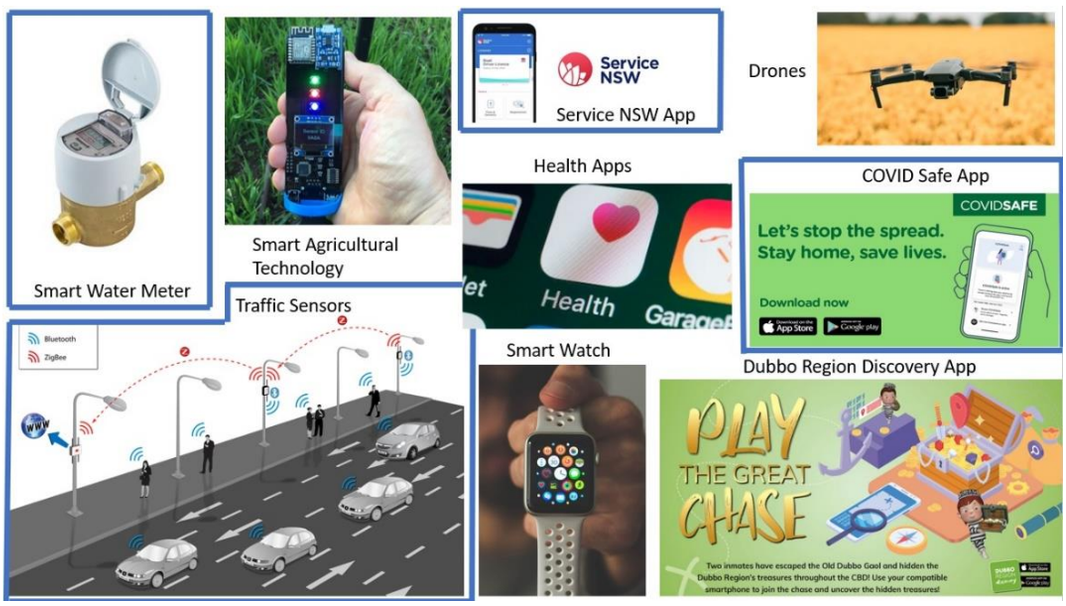
5. If yes, can you list any here?

*** 6. Which of the following smart technologies and applications are you familiar with? Tick all that apply.**

- ☐ Smart Water Meters
- ☐ Smart Agricultural Technology
- ☐ Service NSW Mobile App
- ☐ Drones
- ☐ COVID Safe App
- ☐ Dubbo Region Discovery App
- ☐ Smart watches
- ☐ Traffic Sensors
- ☐ Health Apps for smart phone
- ☐ None of the above

Hyperlinks for image sources:
- Smart Water Meter Image Source: https://www.dubbo.nsw.gov.au/our-region-and-environment/water-sewerage-anddrainage/smartmeters
- Smart Agri Tech Image Source: https://www.csiro.au/en/Research/Drought-resilience/Smart-agriculture
- Traffic Sensors Image Source: https://www.libelium.com/libeliumworld/vehicle_traffic_monitoring_bluetooth_sensors_over_zigbee/
- Health App Image Source: https://www.smh.com.au/healthcare/why-the-growing-number-of-health-apps-might-not-be-a-goodthing-20191031-p536ay.html
- Dubbo Region Discovery App Image Source: https://dubbo.com.au/discoveryapp
- COVID Safe App Image Source: https://www.indigenous.gov.au/news-and-media/stories/new-covid-19safe-app-now-available
- Service NSW App Image Source: https://www.service.nsw.gov.au/campaign/service-nsw-mobile-app

Examples of smart technologies:



7. How often do you use these technologies and applications? Tick the box.

	At least once a day	A few times a week	A few times a month	Once every few months	A few times a year	Never
Smart Water Meters						
Smart Agricultural Technology						
Service NSW Mobile App						
Drones						
COVID Safe App						
Dubbo Region Discovery App						

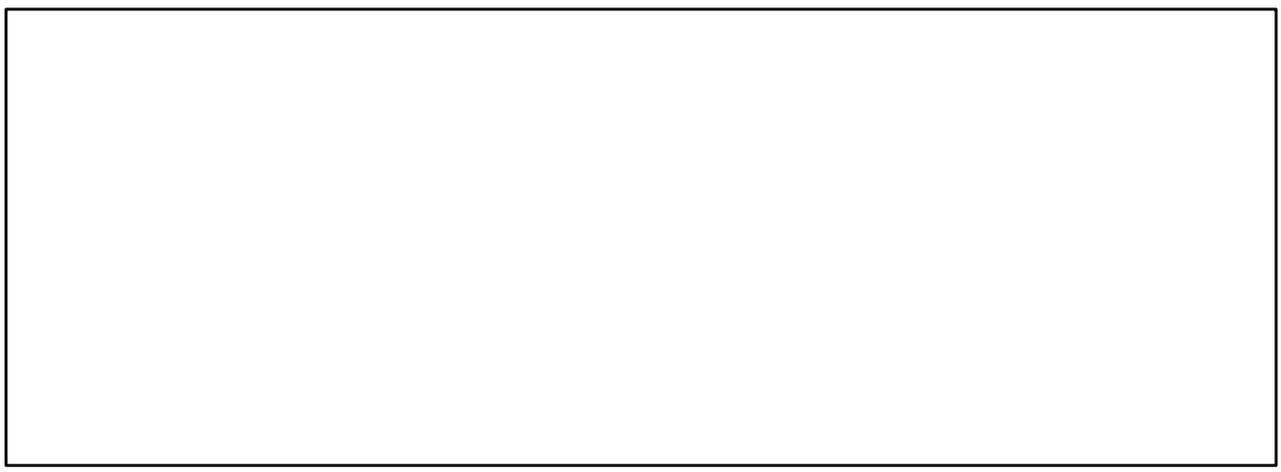
Smart watches						
Traffic Sensors						
Health Apps for smart phone						
None of the above						

Have we missed any smart technologies and applications that you use?

8. Where do you think smart technologies and applications can be used? Tick all that apply.

☐ Health
☐ Council services
☐ Government services
☐ Community
☐ Education
☐ Leisure
☐ Agriculture
☐ Tourism
☐ Planning and infrastructure

Are there further applications for smart technologies and applications?



Just 1 one question to go and you'll get your first interesting fact!

10. How would you assess your digital literacy?

Great	Good	Fair	Not great	Poor
☐	☐	☐	☐	☐

FACT 1!

Other than Australia, the country of birth for Dubbo residents is: England, India, New Zealand, Nepal, and Philippines

11. How helpful is the remote monitoring enabled by smart technologies and applications?
Remote monitoring means the ability to monitor in real time (as it is taking place) water usage or traffic from a smart phone or computer rather than checking in person.

Very Helpful	Helpful	Neither helpful or unhelpful	A little unhelpful	Unhelpful
☐	☐	☐	☐	☐

12. How accurate do you think remote monitoring is?
- ☐ Flawless, it's using technology!
- ☐ Pretty good but can be prone to errors like all technologies
- ☐ Neither accurate nor inaccurate
- ☐ Somewhat inaccurate
- ☐ Inaccurate

*** 13. Who owns the data created by smart technologies and applications?**
Tick all that apply.
- ☐ You
- ☐ The manufacturer of the technology or application
- ☐ The government
- ☐ The local council
- ☐ The third party to whom the data has been sold

*** 14. What can you do if you wish to report a complaint about the data/ information produced by a Council operated smart technology?**
Tick all that apply.
- ☐ Go to your local regional Council
- ☐ Go to your local Aboriginal Land Council
- ☐ Go to your local Member for Parliament
- ☐ Go to Australian Communications Consumer Action Network
- ☐ Go to the Information and Privacy Commissioner NSW

Your next interesting fact is coming up!

*** 15. Does Dubbo Local Council have a remote data monitoring policy?**
- ☐ Yes
- ☐ No
- ☐ Not sure

Fact 2!

Narromine reportedly comes from the Wiradyuri word ‘ngarrumayiny’, meaning ‘honey people’

16. Do you prefer to meet people in-person or through telephone and online?

17. How often do you attend local council meetings in person?

☐ Regularly, usually whenever they are on
☐ Semi-regularly, every few months
☐ Once or twice on issues of importance to me
☐ Never, I got stuff to do!

18. Would you engage more frequently with local council through a smart application?

☐ Yep sign me up please
☐ About the same
☐ It would make no difference to my engagement

*** 19. How would you asses the quality and reliability of telecommunications infrastructure in the town/s you reside in?**

Great	Good	Fair	Not great	Poor
☐	☐	☐	☐	☐

Fact 3!

There are 39 cities named Wellington in the world, 20 of these are in the United States

Nearly there, only a few more questions to go!

20. What is your age?

21. Are you a recent migrant to Australia (within last 5 years)?

☐ Yes
☐ No

22. Do you have children?

☐ Yes
☐ No

*** 23. Are you Aboriginal and/or Torres Strait Islander?**

☐ Yes
☐ No

24. Write in your Nation or language group here:

25. Are you a person living with disability?

☐ Yes
☐ No

26. How would you define your gender?

*** 27. How many hours does it take you to travel to work (if less than an hour write 0)?**

Fact 4!

The Gilgandra region is home to the Gamilaraay, Wiradyuri and Wayilwan peoples. According to the Warrumbungle National Park Guidebook, archaeological evidence indicates Aboriginal peoples have lived in the area for around 25,000 years and in the Warrumbungle Ranges for around 17,000 years.

28. Would you like to:
(tick all that apply)

- ☐ share your thoughts further in a follow up interview?
- ☐ be notified of any publications arising from your answers to this questionnaire?
- ☐ go into the draw to win a $200 JB Hi-Fi voucher or a $200 Woolworths voucher?
- ☐ None of the above

29. Please provide your email or phone number contact for a follow up. This question sheet will be separated from the questionnaire so the researcher will not be able to link your answers in the questionnaire to your contact details.

Thank you for your input, your time is appreciated.

Here's your final fact!

Rugby League footballer and coach Graham Murray was born in Peak Hill.

Appendix 2: Definitions of 'smart' provided by respondents in questionnaire

Following is a list of direct quotes taken from responses to the question: "What do you understand the 'smart' in smart technology and application to mean?"

- Does the work for you
- I understand the smart to mean that we're are using our own initiative to be kept up to date on current circumstances and data.
- It is self monitoring, as well as analysing and reporting on technology programs for hard drives.
- AI or automated responses.
- Smarter than me (humans)
- Technology that is "smarter than the average bear". Ability to analise collected data and resulting in legible answers or decisions.
- Clever AI
- Digitised app or device that assists to make data more readable and thus understandable and or make life easier.
- Device self manages
- Artificial intelligence
- Computer-assisted applications
- Internet everything is connected big brother is watching
- Monitoring analysis and reporting technologies
- Time reduction
- User friendly for all educational levels
- Made to make life easier
- IT services and infrastructure
- Artificial intelligence
- Using linked technology.
- Not sure, I suppose government apps etc are readily available on smart phones & enable quick check ins
- Smart means that it takes the hard work out of it for the end user
- Self-Monitoring analysis and reporting technology

- Using technology and automated functions to identify problems and challenges, improve service delivery, and make the customer's easier
- The word "SMART" refers to "self-monitoring, analysis, and reporting technology" as pointed out by Netlingo. It is a technology that uses artificial intelligence, machine learning, and big data analysis to provide cognitive awareness to objects that were in the past considered inanimate.
- Ease
- It does all the thinking for you.
- Making living a little bit easier
- That it is easily accessible and able to be used with Smartphone technology
- Smart = moving to digital, whether that be online, to applications or technologically advancing a manual system
- Able to cover a variety of elements that previously would require multiple pieces of equipment or more time. Eg. Smart watch able to read SpO_2 levels, HR, pedometer all in the one device rather than applying oximeter and attaching a pedometer. Plus being used as a watch at the same time
- Have knowledge of things
- Taking the underlying data and creating information out of them
- Intuitive of the user & environment to integrate between various avenues of society.
- It could detect the needs the owners want.
- automation, simpler access to data,
- They can gather large amounts of data, use algorithms to track usage and what people "need", interact with users, recommend actions
- adaptive control of a situation powered by software that analyses automated data collection from all relevent data inputs to arrive at the most efficient solution for a required outcome as conditions change
- Use of technology to mimic human function
- It means that data regarding my usage patterns is collected, stored, collated and analysed without my express consent or knowledge. It means that I am required to purchase, maintain, know how to operate, and carry with me an expensive piece of technology in order to fully participate in society. It means that the people selling it to me feel justified in charging obscene prices because they successfully rebranded the term "simple algorithm" into an implication that technology can make my life easier, when all it really does is remove decisions.
- More interactive
- Remote telemetry to monitor measure and manage onfarm water and weather

- Smart to me is high tech applications that are generally Computer controlled or generated and operate through telemetry
- It does more then 'regular' technology that we've come to expect
- It stands for self monitoring analysis and reporting.
- they interpret the data
- That is remembers information
- It has an 'intelligence' built in through the technology to give information and outcomes
- Self-monitoring, analysis and reporting technology that uses artificial intelligence, and machine learning analysiso to provide awareness to objects that in the past were inanimate.
- easy to use, up to date with relevant information that is accessible at your finger tips not having to go into services and or wait online you can access the information from anywhere at anytime.
- the smart technology and functions used for it to function
- Accessible by smart phone
- It collects data and is programmed to analyse it and report back.
- things involving smart phones or appliances
- Automatic assessment and use of background data to send alerts or feedback to a user/consumer
- That it is new and innovative technology that is being used
- improvement
- Access to information in a quick efficient manner.
- Linked to the internet
- Technology that is able to help its user.
- It understands our need
- Smart in technology means it can do things via a command, eg. Count animals in a drone picture, alert people to a cow not eating or losing weight, alerting an operator that a pivot irrigator stopping due to a malfunction
- Data mining as well as using your information, location and behaviours to inform their data
- Automation
- Automated data gathering
- Does a lot behind the scenes... we don't do much... the tech does it

- Not sure, maybe easier way to access what you want
- User friendly easy to access information in layman's terms.
- Data collected and reported electronically to improve a service
- Connected to internet, technology based
- Machine learning, data tracking
- To make things easier and become 'smarter' with it being online all in one place
- Most people can use. There to help.
- As a developer these actually aren't smart devices, more connected that allow communication to servers which enable the smart element
- Not really
- Up to date information
- Able to collect data for use if something were to happen and alert you to said incident
- High functioning technology designed by smart people.
- I did t realise these apps were classed as smart. It's a tad like the smart TVs all the background mechanics are completed for you.
- Provide relevant data on a particular metric
- Not sure
- Automated analysis, digitisation/computerisation of originally separate processes
- Modern form of technology
- Clever
- that it makes it easier
- easier way to manage the use of app
- Self-Monitoring Analysis and Reporting Technology
- automated use of wifi and apps
- Intuitive
- Reacts to your information- location, time, etc and provides an appropriate response.
- It collects and tracks data.

- It is a two way process
- Um, like....clever? The usual meaning of smart in the English language. It's probably short for something, but I don't know that
- I understand it to mean it enables us to be 'smarter' in the way we manage things as the devices do the work for us
- Improved access to services easier, and faster ways of receiving information
- designed to a certain area, i.e. water/covid
- That is has artifical intelligence/computers
- improvement of technology and everyday life
- smart' - sorting out information supplied by data given + relating it back to the person
- I thought it was sharing information 'live' time or without user sending it (like asking Siri) I am not too sure and worry around information being shared