Draft

Analysis of B4BA Survey and case studies assessing the availability, quality, reliability and affordability of internet and telecommunications services in Australia: An evidence-based approach. Final Report.

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Front cover photo: North East Arnhem Land river meets the Arafura Sea.
This photo was taken by NBN Co staff when visiting remote communities in the Northern Territory to look at how internet access can be increased in remote areas.

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Figure 1. Gilat satellite (mining-grade) satellite in remote East Arnhem Land.

This non-NBN satellite system was deployed at three community-controlled health clinics in the Laynhapuy Homelands, East Arnhem. At the commencement of the project (February, 2017) NBN Interim Satellite solution was deemed to be inadequate for telehealth requirements. Remote telecommunications services can vary in reliability. Recognising this, the project partners chose to invest in highly reliable (and expensive) satellite systems to determine if telehealth could be done over satellite internet. The project has demonstrated telehealth can be done via satellite and is "Closing the Gap" in remote Indigenous health in this very remote area. Satellite installation contractor for eMerge Kim Winter, Comcat is pictured with the Gilat satellite.

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Figure 2. Welcome to Country by Ali Mills.

Ali Mills welcomes delegates to the Broadband for the Bush Indigenous Focus Day Showcase. Broadband for the Bush (B4BA) is an alliance of organisations advocating for improved digital resources for regional, rural and remote (RRR) Australia.

Figure 3. Delegates at the Indigenous Focus Day, Darwin, 2018.

B4BA convenes an Indigenous Focus Day (IFD) every year to discuss specific telecommunications and associated issues related to RRR Aboriginal Australians. This year the IFD was held at Charles Darwin University, Casuarina Campus, Darwin in June, 2018.

Executive Summary.

This document provides an overall analysis of data obtained through the Broadband for the Bush (B4BA) national survey and the associated case study research. The research investigated the availability, quality, reliability and affordability of telecommunications services experienced by consumers from alliance member organisations and associated networks. The research also investigated how consumers use their telecommunications services. In-depth case studies with volunteer consumers provided a much richer data set of consumers' stories in the use of telecommunications services. This research addresses specific research needs identified by B4BA's Strategic Business Plan, B4BA Indigenous Focus Day (2016, 2017, 2018) and B4BA Fora V, VI and VII.

> *"I noted the press release when the news was released regarding "unmetered" additions with SkyMuster Plus. Well done to all those working behind the scene to make this happen. Strangely, although we are by nature grateful people, the fact that so much lobbying has to go into acquiring these changes makes you feel that* ***rural people are second class citizens.*** *If only governments could realise the economic and environmental potential of excellent internet access to the whole of Australia. Trade is no longer generated by factories next to highways, it is now generated through intellectual property being marketed worldwide. Rural people have plenty of ability which is being restrained by access to good communication and online education."*
>
> *Case Study Participant.*

Demography of survey and case study participants.

Survey respondents were distributed across Australia in a similar distribution as the ABS reports (ABS, 2018) except there was a larger number of responses from the NT. The majority of respondents to the survey and volunteers for the case study component of the research were from the RRR (rural, regional and remote) areas and only a few from Urban. For the survey 83% were from the RRR category and less than 17% from the Urban (ie Urban/capital city, Capital city fringe). For the case studies only one participant was from Urban, the other 11 were from the RRR category. This is probably due to the B4BA Network having a RRR focus and many of the B4BA Network Members are from these location categories. Additionally, with the Forum being held in Darwin (a regional centre) volunteers for the research identified themselves through B4BA activities in the NT.

There were demographic similarities between survey respondents and case study participants. Survey respondents were primarily from the RRR category (83%). The case study distribution was 92% RRR and 8% Urban. A number of survey participants (10) classified themselves as Urban or Urban fringe, but were from the NT. Therefore, these 10 people could have been classified as Outer Regional by the ABS classification. This would then make the survey respondents 87% RRR and 10% Urban. Consequently, it is concluded that the distribution between RRR and Urban for both the survey and case studies are similar.

Telecommunications services used.
The research indicates that mobile phones are the most used device including being used for wifi and wifi calling on satellite and fixed wireless internet services. Landlines (including radio phones) are still important, particularly to RRR people. There is clearly a need to have two alternative technologies in RRR areas, so if one technology fails, the other can be used to log a fault, for general communications or to get assistance in an emergency. Wifi calling may be a game changer for remote people on satellite services, however, there is still the need for two technologies to be available. It is important the Universal Service Obligation is reviewed and enforced to ensure RRR people have adequate access to basic communications services.

This research did not specifically investigate the need in remote Aboriginal communities, however, while working on this and related projects, the researchers have seen a range of communications services fail in remote areas and in one case, a radio phone and the NBN Satellite service were not functioning for over 8 weeks at a very remote clinic in East Arnhem Land. The researchers have also visited communities where the Telstra public phone is the only service available at all times to the community. These remain critical services for remote Aboriginal communities.

Many people in remote Aboriginal communities have smart or other phones, but not necessarily access to reliable and affordable internet. Some communities have access to Telstra mobile services and are typically on prepaid plans. Whilst visiting remote communities the researchers paid $100 per Gb on a pre-paid plan. As part of this research there were a number of discussions with people on remote communities with a view to do case study interviews, however, time and logistics did not allow these interviews to occur in time for this report. These case studies will be done in future research that can specifically address availability, importance, reliability and affordability of telecommunications in remote Aboriginal communities.

From case study analysis, it is critical that regional and remote people have access to two different communications technologies so if one fails, they can still access communications and emergency services.

Overall primary uses of internet:
Many people use internet for entertainment, but some case studies participants indicated they did not use the internet for entertainment due to data allowance and reliability issues. It is suggested survey participants may have also had these issues.

Entertainment: A large number of survey respondents (138) indicated they used the internet for entertainment. Nine of the case study participants reported using the internet for entertainment but three indicated they had issues with downloading.

Video conferencing: Video conferencing is used widely: Half of case study participants reported using video conferencing and less than 28% of survey respondents reported not using video conferencing. One case study participant indicated they used video conferencing

far more than expected including communicating on a regular basis with an aging parent in a different state. The parent described video conferencing with family as their favourite activity (next to Netflix) and the participant communicated with nieces and nephews regularly using video conferencing.

> *"Video conferencing is far more important in my life than I thought! Family members FaceTime or Skype from the age of 1!"*

Other primary uses of internet

The primary uses of internet from both the survey and case study analysis were:

- Business/work: including working from home, marketing, stock brokering, accessing Industry specific databases.
- Communications: Keeping in touch with family and friends, emails.
- Banking/ Finance: Paying bills, banking, accessing accounts.

Other frequently used services were:

- Social Media.
- Accessing information services including news and weather.

Other services used frequently by survey participants were shopping, accessing government services and booking travel. Case study participants reported using a range of services including wifi calling. It may have been useful to include wifi calling use in future research.

Unmet needs: What services would people like to use the internet for?

Access to entertainment was a priority need that is not currently being met by current internet services. Access to education, business (including being able to work from home), health and government services were also important. Some people are unable to access these services due to restrictions on data allowance.

People use the internet for a wide variety of purposes including entertainment, business/work, communications (including keeping in touch with family, friends and community, finance/banking, accessing information (including news), social media, accessing government services, education/training, shopping, health/medical and video conferencing. Wifi calling over internet is also being used in areas where satellite services are available and other technologies (eg radio phones) are less reliable. From both the survey and the case studies it is clear entertainment is the most frequently sought after additional service through the internet. Business, education and health were other services people would like to have better access to via internet.

Two of the main reasons people were unable to access entertainment and other services were because the quality of their internet was not adequate and restrictions on data allowance. It is understood NBN Co is addressing these issues by endeavouring to provide better quality services and additional wholesale products with increased data allowances. B4BA has called on telecommunications services to provide unmetered access to a range of services such as government services (B4BA 2017; B4BA 2018). It is enlightening to that NBN Co are

planning to implement some of these services and it is hoped other telecommunications services (such as Telstra) implement similar strategies, particularly in the prepaid mobile phone market. (Many remote Indigenous people only have pre-paid mobiles services and therefore can spend a significant amount of their limited income on data B4BA (2018)).

Internet services used at home:

Main service: The main services used at home were fixed line services (including radio phone, cable and ADSL), satellite and mobile services. Fixed wireless would have also been included in the fixed internet, as it was not specifically differentiated in that question. However, 25 survey respondents indicated having NBN fixed wireless. A small number of RRR and Urban people used internet via modem or phone as their main internet service at home. Approximately 20% of survey respondents and 40% of case study participants indicated they used satellite services as their main internet service. Two RRR participants reported using ADSL and a third was based in an urban area in a major city used a cable system (HFC).

NBN: Approximately 30% of survey respondents reported they did not have NBN. NBN Co continues its roll out but there are still a number of people who are either unable to access NBN or are choosing to remain with another service. Most survey respondents were well educated regarding the type of internet they use with only three responding they did not know if they have NBN. The most frequent service accessed by survey respondents was SkyMuster. Most case study participants had access to NBN (either SkyMuster, Fixed wireless and Fibre to the premise) with five accessing SkyMuster and three accessing fixed wireless. All three of the case study participants not having NBN would consider an NBN solution when it became available to them as they were not content with their current internet service. For the RRR case studies, SkyMuster and Fixed wireless are the dominant types of internet used at home.

Importance of different types of telecommunications services.

Devices used for telecommunications: Survey respondents indicated they used laptops and smart phones as their main devices for video conferencing, followed by tablets and desktops. Case study participants also indicated they used smart phones and laptops as the primary devices followed by tablets and desktops.

Mobile phone services are important across all areas, followed by fixed internet and fixed line services. Fixed line services are less important in urban areas (where there are other types of services available) but are still important in RRR areas as a primary form of communication. In the RRR areas, satellite is important and some case study participants indicated satellite services were more reliable than the radio phone. However, it was critical to have the two modes of communication so if one service failed, the second service provided a backup service. Wifi calling is being used more frequently with people using satellite and fixed wireless services indicating wifi calling was better than using the poor quality landlines (ie standard exchange servers through copper, radio phones and ADSL).

Affordability of different types of telecommunications services.
Overall, there seems to be mixed responses to affordability. Survey respondents indicated there was a general trend to services being more affordable in urban areas and less affordable in RRR areas. Mobile phone and fixed internet were considered affordable in urban areas. From the case studies there were also mixed responses and some indication consumers would be prepared to accept the cost, if the product delivered the services expected.

There were some positive comments regarding NBN increasing its allocations for the same price. RRR people indicated the cost of services they access should be in line with those paid by their counterparts in urban areas. Clearly there are issues regarding affordability, particularly in RRR areas. In future research, it would be useful to investigate affordability by measuring actual costs as a percentage of income rather than perceived affordability. It would be useful to investigate the percentage of income allocated to telecommunications for lower socio-economic groups in RRR areas.

Speed of internet services.
Generally, urban respondents indicated the speed of their services was good, but RRR survey respondents indicated speed was poor. Case studies indicated services varied with a number of participants reporting mobile, ADSL and HFC services being poor. The only urban case study participant reported issues with the quality of service of both the mobile and Hybrid Fibre Coaxial (HFC (cable)) services. The quality of satellite services varied and this could be due to different expectations from consumers or real differences in performance of the SkyMuster service. There were many references by case study participants to frequent drop outs on the SkyMuster service. It is suggested the next step in this research is to do speed testing in a number of areas and across a number of services. It is also suggested there should be more education about how consumers can extend their mobile coverage as a number of case study participants indicated difficulties in getting reception inside their homes.

Reliability of different types of telecommunications services.
In urban areas services used tended to be reliable with mobile phone services and fixed internet being highly reliable. In RRR areas there was a tendency for services to be considered unreliable. Indications about the reliability of satellite services are mixed and this is supported by the case studies. The survey did not differentiate between radio phones and other fixed phone services. The game changer has been wifi calling particularly for people in RRR areas using satellite or fixed wireless services. These services are providing better voice services through internet than fixed line services (eg radio phone, ADSL).

In future research, these two services should be differentiated. Case study participants clearly indicated radio phones were unreliable and often of poor quality (ie unclear). ***However, it was essential to have two different telecommunications technologies available, so if one technology failed, they had another that could be used for general communications, reporting the fault and for emergencies.***

Case studies: What telecommunications are working well?
Of the 12 case study participants, 11 indicated at least some of the telecommunications services worked well for them. The most positive comments were about NBN SkyMuster. Given that only 5 of the case studies were people whom had SkyMuster as their primary source of internet, this is a positive indicator. There were a number of positive comments about SkyMuster and using wifi calling: SkyMuster being stable, wifi calling being of better quality and more reliable that radio phones, SkyMuster working well even in stormy weather, the ability to do video conferencing with rare dropouts (SkyMuster), SkyMuster being "fairly reliable" as it does not fail for long periods, mobile coverage being good.

Given that the majority of case study participants were RRR, and only 5 used SkyMuster it is suggested **internet services by satellite can be relatively reliable**. However, there were also a number of comments regarding frequent drop outs, slow download and contention on SkyMuster services. A number of case study participants reported being able to work from home because of the internet service.

Redundancy (Having two forms of communication: Wifi calling over internet, including SkyMuster, is a useful alternative (but not a replacement) for fixed line services such as the radio phones. Some participants commented that having 2 services (eg radio phone and satellite service) gave them a level of security. *"Having internet as back-up is good."* That, if one technology fails, they still can communicate with the other technology. There are concerns raised if participants lost the second technology *"If we moved to satellite phone – have some concerns. Now we have 2 different technologies, so that's good".*
For people in RRR areas, having access to two telecommunications technologies is of critical importance.

Fault rectifications.
Fault rectification is a major issue with case study participants reporting experiencing poor service from Retain Service Providers (RSPs) and two resorting to the Telecommunications Ombudsman. A third indicated they knew of two local cases where issues were only resolved by the intervention of the Ombudsman. Two case study participants reported by-passing the RSP and going directly to nbn local. Dealing with RSPs by phone is difficult, stressful and frustrating and some participants indicated on-line chat or email is a better mechanism for getting a fault logged. Generally, RSPs failed to keep customers advised of progress on their issue with one participant indicating they needed to continually chase the RSP (Telstra) to get faults rectified. Response times for rectification can vary with RRR people sometimes waiting for up to 6 weeks for their fault to be rectified.

The **interface with the RSP** was described as:

- Terrible.
- Stressful.
- Frustrating.
- Hanging up on customer.
- Unresponsive ie not returning calls.
- Time consuming ie on hold a long time.

- Unavailable ie support centre only open Eastern states working hours.

Examples of **poor service** included:

- Making customer go through basic trouble shooting after they had already done those tasks.
- Not advising customer of the status of the job.
- Long time frames for repairs.
- Lack of response/follow through regarding reported issue.
- Not listening to the customer.
- RSP requesting speed tests when the internet was not working.
- Lack of technical expertise of the RSP.
- Needed to chase RSP to get the fault fixed.
- Methods of accepting fault reports not meeting with customer's needs.
- Having to resort to the Ombudsman to get the fault rectified.

The most frequently named providers were Telstra and NBN. However, apart from the two case study participants who went to nbn local directly all of the others were dealing with an RSP. In most cases this was Telstra. In one case, Telstra provided a contractor with the wrong phone number for the customer, when Telstra were contacting the customer on the correct number. One case participant reported very negative experiences with Optus. The exception was Telstra RRadio service which one case study participant indicated was good due to having a dedicated contact person to support that service.

There are a number of layers between NBN and the RSP with contractors being employed by both the RSP and NBN. Clearly, nbn local is making a difference in getting positive outcomes for consumers, however, this service is not available for non-NBN products.

There is clear evidence fault rectification is a major issue and there needs to be some action to improve the customer service by RSPs. Many people continue to struggle accessing support to troubleshoot problems. People do not know who to contact and are often not informed of the progress of their issue rectification and not knowing if it is the responsibility of the wholesaler (eg NBN/Telstra/Vocus/etc.) or the RSP to rectify their issues.

The evidence suggests the need of a centralised point of contact so consumers can access assistance in a timely manner. This will alleviate consumers' dissatisfaction, improve efficiency and significantly reduce number of complaints. It is recommended specialised teams be established based on the common types of issue raised by end-users to act as an information conduit and mediator. That is, a case manager should systematically be allocated so liaison between wholesale providers (eg Telstra, NBN Co) and RSPs can occur and accelerate resolution of issues on behalf of the consumer. B4BA is of the view that nbn local is well placed to fulfil this role in the case of NBN issues, however, many other service providers such as Telstra and Optus do not have a similar system in place. If all telecommunications providers resourced a solutions-based body similar to nbn local, service

issues could be dealt with in a less stressful and more timely manner, without resorting to the ombudsman.

Case studies: Issues raised about telecommunications.
The issues raised by participants included:

- Poor quality of telecommunications services with respect to reliability and performance.
- Poor fault rectification processes.
- Contention issues at peak times and where the local population increases with seasons.
- Access to telecommunications services.
- Data allocation limits and the need for additional data allowance for people with special needs.
- Problems with the installation of services and accessing the most suitable service.
- Lack of backhaul infrastructure.
- People experiencing long term poor service (in one case study – for 10 years), poor information and incorrect information provided by RSPs.
- Concern over the enforcement of consumer and quality of service guarantees.
- Poor technical knowledge by RSP.
- Inability to receive SMS messages over wifi calling.
- Poor latency/ping.
- Monitoring of priority customers.
- Performance of services and lack of accurate information in emergencies.
- Monitoring and fault lodgement for priority customers.

Case studies: How can telecommunications be improved?
Telecommunications can be improved by:

- Improving quality, consistency and reliability of services including upload ability. These are clearly the primary issue for both RRR and Urban people.
- Fault rectification processes need to be improved.
- Improving access to services – equity in access to service, provision of accurate information and the availability of at least two different technologies are required.
- Increasing data allowance, including increased allocations for people with special needs.
- Addressing longevity of services particularly in relation to radio phones and NBN.
- Providing RRR people access to 2 different technologies, so if one fails, they still have some form of communication to report the fault, maintain communication and for emergency situations.
- Ensuring emergency services being advised of the caller's real location, not the RSP's location.
- Better governance/management.
- Reducing costs.

Minimum standard of internet service provided to all citizens: It was suggested a minimum standard of internet connectivity be made available to all citizens and publicly funded. If other consumers want improved connectivity they can purchase products to meet that need. It has been recommended (eg B4BA, 2017, 2018) that a number of services such as access to government, health and education services be un-metered. ***This would allow all citizens to access basic services regardless of financial capabilities and location.***

Video conferencing.
Approximately 70% of survey respondents used video conferencing with Skype and FaceTime being the most frequently used. The most frequently used devices for video conferencing were laptops, iPhones and iPads, followed by desktops, other smart phones and tablets. Half of the case study participants reported they use video conferencing. This may be an underestimate, as many of the case study participants had smart phones including seven with iPhones so it is possible a number of these participants used FaceTime or some other social-media based video conferencing tool. Some case study participants reported their internet was not adequate for entertainment and these people may not have adequate internet to maintain a video conferencing call. One case study participant owned a medical practice and used video conferencing for telehealth. They reported their ADSL was not always adequate for video conferencing for telehealth, resulting in failed telehealth consultations.

Telehealth conclusions.
Awareness of telehealth: With the publicity surrounding the implementation of My Health Record it is not surprising the public are becoming more aware of electronic health systems. Also, B4BA Network Members have been participating in the annual B4BA Forum and the last three Fora have had Telehealth Workshops, so generally, people involved in the B4BA network may be more aware of telehealth than the general public. Approximately three quarters of survey and case study participants were aware of telehealth.

Use of telehealth: Approximately 25% of survey and case study participants reported using telehealth.

Would like to use telehealth: Approximately half of survey and case study respondents would like to use telehealth services.

Funding of telehealth services: Funding of telehealth through Medicare was strongly supported. Additionally, the current funding model does not provide patient end support and this should be rectified to increase equity of access to services.

Benefits of telehealth: Telehealth can generate savings from reducing travel, reducing time away from home/work as well as other associated expenses. There is an issue about clinicians being able to charge telehealth services to Medicare. In some cases, although savings were made in terms of travel and time, the cost of the consult was not billable to Medicare and therefore was an additional expense. Telehealth may also improve diagnostic capabilities. One case study participant reported that Australia has poor diagnostic

capabilities with respect to cancer: "*Diagnosis in Australia is quite poor generally – often don't detect cancer."*

Barriers to accessing telehealth: Many of the survey and case study participants were unaware they could access telehealth services. There were also a number of barriers identified in the comments from survey respondents: Inadequate internet service and data allowances, consultations not being billable to Medicare, some clinicians (including specialists) not providing services via telehealth, freeing up the ability for clinicians to provide telehealth from a regulatory perspective and the lack of funding for patient end support. The most frequently mentioned barrier was the lack of adequate internet. It is also clear there is a lack of Medicare item numbers for telehealth consultations (including GP consultations), and this is a major barrier to uptake to telehealth.

Increasing access to telehealth:
Increasing access to telehealth services can be assisted by:

1. Improved internet connectivity to meet the requirements of video conferencing.
2. Educate the public about its availability.
3. Increase data allowances and not metering video conferencing and telehealth services.
4. Increase availability.
5. Assist clinicians to deliver telehealth without onerous training requirements.
6. Increase Medicare item numbers.
7. Fund patient end support.

Additional suggestions for telehealth:

1. Using video-conferencing by **Emergency Services** could improve triage, management of emergency situations and reduce callouts.
2. Telehealth phone **applications for homeless people** for management of their health issues with free access to a relevant video conferencing support system.

Linkages to current issues reported by B4BA in its submission to the 2018 Review of Telecommunications in Australia.
The outcomes of this research support the following recommendations made by B4BA (B4BA, 2018) in the submission to the 2018 Review of Telecommunications:

> 6. That the Mobile Black spot program being maintained and broadened and the 5G rollout be prioritized as a key technology.
> 7. That Internet Service Providers (ISPs) and Telco's be encouraged/required to provide clarity in product promotion to reduce market confusion.
> 8. That key Australian, state and territory government services including access to government services as delivered through MyGov, education and health be unmetered to allow equitable access.
> 11. That through COAG the Australian government takes a leadership position to ensure data is affordable for regional and remote Australians.
> 12. That the Australian government commission further research to understand data needs and technology trends to help plan for future industries and businesses that could be successfully developed and/or re-located in regional and remote Australia.

17. That the Australian government commission the development of a set of social and economic measures to guide investments in better broadband and mobile coverage for community benefit.

19. That the Australian government urgently undertake work to define the necessary market interventions required to support competition, where economically viable, in regional and remote Australia.

Figure 4. Telstra payphones are still used and required in remote communities.

Many people in remote Aboriginal communities do not have access to fixed voice or internet and use the payphones extensively. It is important that these phones are maintained and continue to be available to these very remote people as part of the Universal Service Obligation. It is well received by B4BA that the Regional Telecommunications Review has recommended these services be continued and maintained.

Recommendations from survey and case study participants:

Two technologies for Rural, Regional and Remote (RRR) people: The government ensures regional and remote people have access to two different communications technologies so if one fails, they can still access communications, emergency services and report the fault.

Investment in developing improved technologies: With the concern expressed regarding possible negative health impacts of mobile phone services, resources should be invested into developing more efficient, effective and in newer technologies (eg light technologies) to continue to improve internet and telecommunications services for all areas particularly RRR.

Increase Mobile phone coverage and wifi calling options: Mobile phone coverage should continue to be expanded and access to wifi calling and SMS messaging by wifi be made available by all mobile services (eg Telstra, Optus, Vodaphone, etc).

Expansion of services by NBN Co: NBN Co to be supported to expand coverage and increase data allocations and continue to improve internet services for all areas particularly rural, regional and remote. Access to cable and fixed wireless services should be expanded and ensure people in these footprints are encouraged to take up these options rather than SkyMuster. NBN local to be supported and expanded as necessary.

SkyMuster services: An audit of SkyMuster services to be done to ensure consumers are getting a reliable service and investigate why some consumers are experiencing frequent drop outs. This information should be made publicly available with suggested trouble shooting processes outlined so issues relating to the SkyMuster services and other issues (eg home based internal networking problems) are differentiated.

Unmetering of critical services: All telecommunications companies to facilitate unmetered access to key services such as government, health, education and banking services including video conferencing services for telehealth.

Costing of services: Basic communications services provided to RRR areas should not be more expensive than services in Urban areas.

Minimum standard of internet service provided to all citizens: It was suggested a minimum standard of internet connectivity be made available to all citizens and be publicly funded. If other consumers want improved connectivity they can purchase products to meet that need. It has been recommended (eg B4BA, 2017, 2018) that a number of services such as access to government, health and education services be un-metered. ***This would allow all citizens to access basic services regardless of financial capabilities and location.***

More accurate information to be made available and easy to access for consumers:
Clearly, there is a need for more accurate information to be made available to the public and RSPs to provide more accurate information to consumers. This may require RSPs to educate their staff in a wider range of skills, rather than just having a very limited knowledge base. It

is critical that the public have access to accurate information about the best alternative for their situation and not be misled by telecommunications providers.

Mediation between RSPs and consumers to address fault rectification: Specialised teams be established by all telecommunications companies to act as an information conduit and mediator. A case manager could be systematically allocated as a liaison between wholesale providers (eg Telstra, NBN Co, Vocus, etc) and retail service providers (RSPs) to accelerate resolution of issues on behalf of the consumer. B4BA is of the view that nbn local is well placed to fulfil this role in the case of NBN issues, however, many other service providers such as Telstra and Optus do not have a similar system in place. If all telecommunications providers resourced a similar solutions-based body similar to nbn local, service issues could be dealt with in a less stressful and more timely manner, without resorting to the Telecommunications Ombudsman. These services could also act as an advisory body providing accurate and up-to-date information about service availability in a similar manner to nbn local. Another option would be to fund a not-for-profit organisation such as BIRRR to act as a mediator between consumers and telecommunications companies.

Development of new technologies: It was suggested that more investment should be made into light technologies rather than mobile phone. Particularly given that mobile phones can increase the rate of cancers.

Development of a Remote Telecommunications Policy and Strategy: B4BA have called for the development of a strategy to address telecommunications issues for regional and remote areas for a number of years (eg B4BA, 2018). It is suggested many of the issues outlined in this report and the associated recommendations could be better facilitated under such a strategy.

Funding of telehealth:
Increased Medicare Item numbers: Additional Medicare items for telehealth to be made available to RRR people including for GP services.
Fund patient end support: Adequate funds for patient end support should also be funded through Medicare.

Awareness of telehealth: The Australian Digital Health Agency (ADHA) to implement an education program about the availability and use of telehealth, possibly contracting organisations such as B4BA, BIRRR, RRRCC and ACCAN to disseminate information and supporting resources.

Streamline training required by clinicians to deliver telehealth services: Ensure clinicians who are prepared to deliver telehealth services are supported by streamlined training and regulatory requirements including using recognition of current competencies.

Additional suggestions for telehealth:

- Using video-conferencing by **Emergency Services** could improve triage, management of emergency situations and reduce callouts.

- Telehealth phone **applications for homeless people** for management of their health issues with free access to a relevant video conferencing support system.
- Provide priority access to telecommunications services for health providers and consumers accessing health and telehealth services.

Figure 5. Telehealth is 'Closing the Gap" in remote Indigenous Health.
John Kelly, GP/Physician doing a simulated Telehealth consultation at his workplace in Sydney.
John often uses the video conferencing equipment to share images and videos with patients and staff in the very remote Laynhapuy Homelands to address diagnostic and treatment issues. He has the clinical database open on his laptop (test patient) and the hand is a picture obtained from the internet. He has used video clips to demonstrate to staff examination and treatment techniques. Telehealth is "Closing the Gap" in remote health service delivery in the Laynhapuy homelands (St Clair, et al, 2018).

Figure 6. John Kelly doing a spear wound telehealth consult.
John Kelly simulating a consult regarding a spear wound on a hand via face time at his home in Sydney. In this case, the patient was able to stay in the community and be treated with medications. However, due to freezing and pixilation of the video stream the initial decision was to evacuate the patient as there was concern regarding which parts of the hand were infected. After an extensive examination via facetime and a careful assessment of the wound it was determined that it was safe to treat the patient in the community. This saved the health service significant expense and the patient was able to stay in the community with family and friends.

Introduction.

The Broadband for the Bush Alliance (B4BA) is a group of organisations that are committed to the digital inclusion of regional, rural and remote (RRR) Australia. The Alliance brings together a range of stakeholders with expertise in communications, remote service delivery and community engagement. For the last seven years the B4BA has held an annual Forum initially based in the NT. In 2016 B4BA moved to a more national focus by taking the forum and Indigenous Focus Day interstate (Queensland) and in 2017 to Fremantle, WA. The annual Forum offers regional, rural and remote (RRR) stakeholders' opportunities to engage with key decision makers to build collaboration, assisting in driving the best possible policy outcomes and to expand access to telecommunications services for rural, regional and remote (RRR) people.

The 2017 B4BA Forum Communiqué identified specific research required:
• Expand the data collection for the Digital Inclusion Index
(Digital Inclusion Alliance, 2018) to include remote and Indigenous Australia and the development of a Social Capital metric.
• Improved data collection is needed to measure digital inclusion in remote and rural Australia including Indigenous communities. (B4BA 2017).

There are a number of surveys that have, or are being done, (e.g. by Better Internet for Rural, Regional and Remote Australia (BIRRR), Regional, Rural and Remote Communications Coalition (RRRCC)). To increase the validity of this work B4BA, with the assistance of ACCAN has entered into a rigorous, Ethics Committee approved data collection and analysis covering the range of issues already identified anecdotally. This project aims to provide base line data collected within the auspices of a university approved research design ethics method. Many investigations are based in urban areas and there is a distinct lack of scientific investigation into telecommunications services in RRR areas.

A number of organisations are actively highlighting issues raised by consumers (individual, families, businesses and communities (e.g. NFF: https://www.farmers.org.au/getinvolved/campaigns/rrrcc-data-drought.html, Better Internet for Rural, Regional and Remote Australia: https://birrraus.com/, and B4BA: http://broadbandforthebush.com.au/)). Bandias and Ram Vemuri (2005) identified that telecommunications in rural and remote Australia impact more disproportionately on regional communities particularly in the delivery of education and health services. Services such as telehealth have been difficult to implement in the Northern Territory due to a lack of adequate infrastructure and connectivity (Murtagh, et al, 2017).

The next few years will see a significant number of changes to internet and communications services throughout Australia. It will be important to establish a baseline service quality index to help measure the impact of programs (e.g. the NBN and the mobile phone Blackspot initiative) have on quality, cost and effectiveness of internet and communications services to the Australian public.

The overall aim of this research is to provide a scientifically based data set and report on consumers' experiences of internet and telecommunication services, including telehealth. Data regarding the current status of internet and telecommunications availability, quality, reliability and affordability as well as how consumers currently use, and how they would like to use, the services were collected. This research will inform priorities for future research as well as policy and strategic activities of B4BA, Indigenous Remote Communications Association (IRCA), Australian Communications

Consumer Action Network (ACCAN), Northern Institute – Charles Darwin University (NI – CDU) and Regional, Rural and Remote Communications Coalition (RRRCC).

Although the research has been designed to cover Australia wide internet quality and telecommunications services, B4BA is keen to compare internet quality, reliability and cost across remote and urban environments. It is anticipated there are different types of internet users and an evaluation of how those types of users are being serviced across urban, regional and remote Australia was done.

Specifically, the research investigated consumers' experiences of communications services regarding:

- Availability.
- Quality.
- Importance.
- Reliability.
- Affordability.
- How consumers access internet.
- How consumers use internet.
- Access to telehealth services.
- How consumers would like to access internet and other telecommunications services.
- How consumers would like to use the internet.

The second phase of this research included case studies and their analysis, providing quantitative and qualitative analyses of consumers' access to internet, telecommunications services, how consumers use these services, reliability and affordability of services. Case studies commenced in mid-September and concluded in December 2018.

This research has been generated from discussions with B4BA Directors, participants of the B4BA Indigenous Focus Day (2016, 2017, 2018) and B4BA Forum V, VI and VII, a range of Industry stakeholders and is specifically in line with recommendations from the B4BA Forum and Strategic Plan (B4BA 2017). This research will inform future research to be undertaken by B4BA and NI, CDU in collaboration with a range of organisations.

This project has been supported by a grant of $51,005 from ACCAN and has been undertaken as a collaboration between B4BA and the Northern Institute, Charles Darwin University.

Methods.

The research comprised of a national survey distributed through the B4BA Network and commenced in February, 2018. The survey aimed to develop a baseline data set of users' telecommunications experiences. The second phase of the research was using detailed case studies to provide more in-depth perspectives on consumers' experiences with telecommunications.

Survey:

The first phase of the project produced data about consumers' experiences with telecommunications services, how they use the services and how they would like to use the services. The survey was developed in collaboration with B4BA, IRCA, ACCAN and RRRCC (see Appendix A). The survey was based on a range of issues that have been identified by the B4BA and its member organisations. The survey was loaded into Survey Monkey 16/2/18 and 27/6/18. The first survey was done using the Aboriginal Medical Service Alliance NT Aboriginal Corporation's (AMSANT's) Survey Monkey Account. However, with changes to staffing at AMSANT, the project team purchased their own Survey Monkey account and reloaded the survey which went live on 3/7/18.

The survey was initially distributed through the B4BA Network and associated industry networks such as the Australian Women in Agriculture, Seafood Industry networks, National Farmers Federation, RRRCC, Isolated Children's Parent's Association (ICPA), Aboriginal Medical Service Alliance NT Aboriginal Corporation (AMSANT), Australian College of Remote and Rural Medicine (ACCRM), Aboriginal Community Controlled organisations and regional business networks (e.g. Regional Development Northern Territory, Regional Development North Western Queensland), etc. The survey was designed to be anonymous and the Survey Monkey settings were installed that did not permit a respondent to complete the survey twice from the same computer using the same browser. Every effort was made to de-identify respondents' answers, so information provided would be private and confidential, i.e. if data indicated a particular location specifically, that data set would be pooled. Survey respondents were asked to self-identify their locality in various ways to avoid the use of physical residential addresses and postcodes.

The survey included a section where respondents could self-identify as a volunteer for case studies as well as identifying if the respondent would like to receive updates or reports on the survey.

This project has been discussed at a number of industry meetings and a number of B4BA Network people/organisations volunteered to be case study subjects and distribute the survey through their networks.

The project activities have been overseen by a project steering committee comprising of ACCAN staff, the B4BA Chair (Mrs Apolline Kohen) and Deputy Chair (Dr Rob Starling).

All data, drafts, etc were continuously backed-up to a secure data centre.

A total of 100 surveys were completed during the first phase of the survey (AMSANT's account) and 183 at the time of collection in the second phase of the survey. These data were

pooled on the 24th September and data cleaned to harmonise a number of data inconsistencies (e.g. missing spaces and slight variations of spelling between the two surveys). The data were then imported into Microsoft Power BI and graphs prepared. Some additional graphs were prepared using Excel.

This report is based on the data generated prior to the 24th September with a total sample size of 283 responses. Additional data can be imported into graphs in future research reports. One medical based organisation only sent the survey out in its newsletter at the end of September and requested responses be included in the research as a result of the newsletter be included. Details of the survey are included in Appendix A.

Case Studies: Volunteers for the case study component of the research were obtained through the B4BA national survey (first component of this research), the B4BA Network and other B4BA activities (such as the Forum). Volunteers from the survey were emailed information about the research (see Appendix B). If they responded, the researcher followed up with an email or phone call to discuss the project, and if they agreed to do an interview, a suitable time and location was arranged. A number of people were informed about the research through B4BA and researcher activities and offered or requested to be interviewed for the case study.

Semi-structured interviews (Flyvbjerg, 2011; Bryman, 2012) were done face to face when possible and, otherwise, by phone. Notes were taken by the researcher/researchers during the interview, typed up and returned to the interviewee/s for approval. Once approved, the interviews were formatted into a structured form (see Appendix B) with comments from the interviewer highlighted in yellow. A summary of each case study was then produced with key points and quotations presented in a one-page format (see Appendix B Case Study Portfolio).

Figure 7. David Murtagh at B4BA Forum VI in Fremantle, 2017.

Results and Discussion.

General notes regarding results and graphs.

Abbreviations – RRR and Urban: The combined categories of rural, regional and remote have been abbreviated to RRR throughout this document. Urban/capital city and Capital city fringe were pooled and identified as Urban throughout this document.

Survey indicators of locality and remoteness: A series of four questions were developed to gain an understanding of respondents' location and remoteness whilst also maintaining confidentiality and anonymity about location. A number of surveys have used postcode as an indication of location. Many people use post boxes or other postal services that are not indicative of their place of residence. Additionally, many people in remote areas (eg in the Katherine region) have private mail bags at the local (eg Katherine) Post Office. This postcode is the postcode associated with the post office and does not necessarily reflect where the people live. Mail can be sent out once a week by plane or truck as some of the people maybe over 700 kms from the township. Therefore, post code is not a reliable indication of remoteness. Some of the remote Australian postcodes cover areas larger that some countries and therefore do not give a clear sense of remoteness and can cross over between multiple remoteness categories (Jones, et al 2003).

The graphs generated in this report are primarily exported from Power BI to PDF format or produced in Excel. Power BI uses numerical and alphabetical characters to determine the order of axes, that is, there is little control over the order the data are presented. Blank responses were removed from the data set so the sample size is different for each of the graphs, reflecting the number of respondents to that particular question.

Design of survey questions and extended analysis through data analytics tools.
The project team used an additional data analysis tool (i.e. Microsoft Power BI). Survey Monkey's internal reports functionality was used to validate initial single dimension analysis and respondents' demographic classification eg rural, regional and remote (RRR). Graphs presented in this report are a combination of survey respondents' initial individual question response and early question responses. The survey was designed to build on multiple question analysis and presentation.

A number of recommendations made by survey respondents will inform future survey design. Key suggestions include refining question series to allow questions to be ignored when previous questions are answered to negate further need for respondents input, (e.g. Have you used Telehealth? Multiple questions could be skipped once a respondent has answered this question negatively).

NBN vs other satellite services: This survey was primarily aimed at home not business services, so it is assumed satellite services were NBN and not mining grade satellite. The current satellite internet market has very few providers and cost differences are considerable. However, individual responses were checked for the final analysis to determine if any respondents have indicated they are using non-NBN satellite services. There are 3 respondents who claim to have satellite internet but did not say they had NBN satellite (i.e. SkyMuster). This may indicate their use of another satellite provider or just an oversight when completing the survey. There are a number of cross referenced questions throughout the survey which have revealed other inaccuracies in survey responses.

Sample size: This report is based on the sample size of 283 for all graphs. However the survey was designed to allow respondents to choose which questions they responded to, that is, all questions were optional. Therefore there are a number of blanks responses to some of the questions. This may be

due to the question not being relevant to the respondent or possibly "survey fatigue" (Egleston et al., 2013). In some cases, blanks have been omitted from the data set. The sample sizes for each graph (n values) are included in all graphs in the survey report.

Case studies: Twelve interviews were done with individuals or couples for the case study component of this research. Of these, 11 were RRR and only one participant was from an Urban area. Participants also came from a number of different states and remote classifications including some from very remote areas.

Demographic similarities between survey respondents and case study participants. Survey respondents were primarily from the RRR category (83%) and less than 17% were Urban. The case study distribution was 92% RRR and 8% Urban. A number of survey participants (10) classified themselves as Urban or Urban fringe, but were from the NT. Therefore, these 10 people would have been classified as Outer Regional by the ABS classification. This would then make the survey respondents 87% RRR and 10% Urban. Consequently, it is concluded that the distribution between RRR and Urban for both the survey and case studies are similar. There were 3% of survey respondents that classified themselves as "other".

Descriptions: Fixed line internet service was defined as "where internet access is received via a physical line or cable connecting your home to the internet". The mobile internet included accessing the internet by dongle or modem, but not by mobile phone.

Figure 8. Northern Institute, CDU Telehealth team.

Demography of respondents.

Survey respondents predominately rural, regional and remote (RRR): The survey was designed to measure all areas of Australia without preferencing rural, regional and Remote (RRR). Many of the B4BA Member organisations are based in capital cities other than Darwin. However, of the 283 respondents, 235 (83%) identified themselves as being RRR while less than 17% identified themselves as being from the Urban/capital city or Capital city fringe (classified as Urban throughout this document). Of the respondents that identified themselves as Urban, 10 were from the Northern Territory (NT), and therefore would be classified as Outer Regional by the ABS remoteness classification. Therefore, the 83% of RRR is probably an underestimate of the real proportion of RRR. More than 54% of respondents live greater than 50 kms from a major centre. It is interesting to note that people's perception of remoteness may vary with the standard ABS classification. People living in an urban area in the NT (Darwin or possibly Alice Springs) that have identified themselves as being Urban or Urban fringe are clearly Regional.

For future surveys it may be useful to include links to ABS classifications so that people could identify accurately their remoteness status, without compromising their privacy by needing to enter an exact street address. However, this needs to be weighed against "survey fatigue" (Egleston et al., 2011) and increasing the time to complete the survey. A number of people (18) reported living greater than 500 kms from a major centre - which could mean they would be classified as Very Remote under the ABS categories. In future surveys, it may be useful to include the Very Remote category to allow for more accurate geographic aggregations.

Larger proportion of survey responses from NT, otherwise well distributed across states: Survey respondents were distributed across Australia in a similar distribution as the ABS reports (ABS, 2018) except there was a larger number of responses from the NT. The majority of respondents to the survey and volunteers for the case study component of the research were from the RRR areas and only a few from Urban. For the survey 83% were from the RRR (Rural, Regional and Remote) category and less than 17% from the Urban (ie Urban/capital city, Capital city fringe). For the case studies only one participant was from Urban, the other 11 were from the RRR category. This is probably due to the B4BA Network having a RRR focus and many of the B4BA Network Members are from these location categories. Additionally, with the Forum being held in Darwin (a regional centre), volunteers for the research identified themselves through B4BA activities in the NT.

The larger proportion of NT respondents may be due to a number of factors:

1. B4BA evolved in the NT.
2. Many of the B4BA founding Member organisations were based in the NT (eg Desert Knowledge Australia, Aboriginal Medical Service Alliance NT and Indigenous Remote Communications Association.
3. B4BA's 2018 Forum and Indigenous Focus Day were held in Darwin in June 2018, and a number of other B4BA activities (such as presentations at conferences, public seminars) were held in Darwin in the previous 12 months.

4. The researchers are based in Darwin and distributed the survey through the College of Indigenous Futures, Arts and Society (CIFAS), Charles Darwin University (CDU). Many CIFAS staff are based in Darwin or Alice Springs.

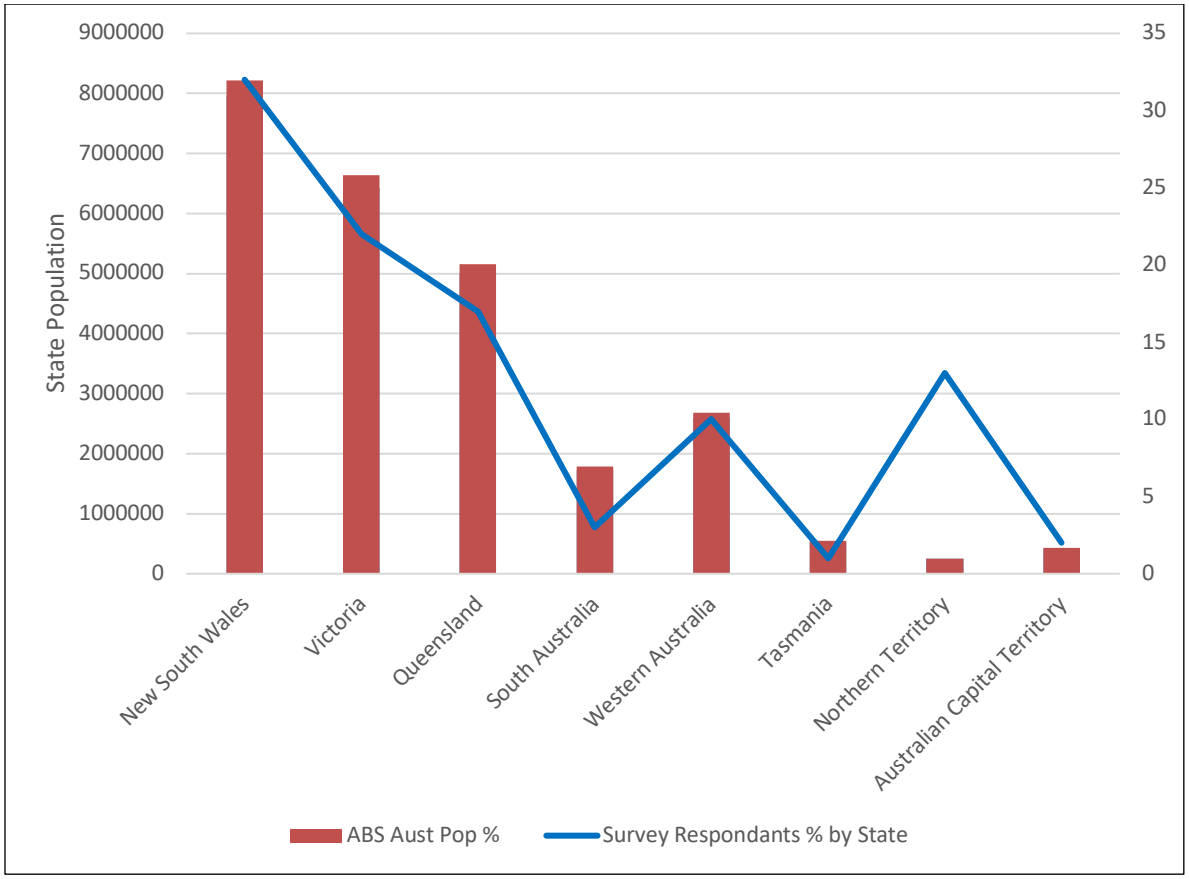

Figure 9. Distribution of respondents compared to the Australian population.
The distribution of respondents by state/territory compared to that of the Australian population (ABS, 2018). Note the increased percentage of respondents in the NT. This may be due to the initial distribution being done through the B4BA Network which has a number of key member organisations based in the NT or B4BA activities in the NT.

Conclusions: Demography of survey and case study participants.

Survey respondents were distributed across Australia in a similar distribution as the ABS reports (ABS, 2018) except there was a larger number of responses from the NT.

The majority of respondents to the survey and volunteers for the case study component of the research were from the RRR (rural, regional and remote) areas and only a few from Urban. For the survey 83% were from the RRR category and less than 17% from the Urban (ie Urban/capital city, Capital city fringe). For the case studies, only one participant was from Urban, the other 11 were from the RRR category. This is probably due to the B4BA Network having a RRR focus and many of the B4BA Network Members are from these location categories. Additionally, with the Forum being held in Darwin (a regional centre) volunteers for the research identified themselves through B4BA activities in the NT.

There were demographic similarities between survey respondents and case study participants. Survey respondents were primarily from the RRR category (83%). The case study distribution was 92% RRR and 8% Urban. A number of survey respondents (10) classified themselves as Urban or Urban fringe, but were from the NT. Therefore, these 10 people

would have been classified as Outer Regional by the ABS classification. This would then make the survey respondents 87% RRR and 10% Urban. Consequently, it is concluded that the distribution between RRR and Urban for both the survey and case studies are similar. There were 3% of survey respondents that classified themselves as "other".

Figure 10. Roads viewed from the air in remote East Arnhem Land, NT.

Remote and very remote people often need to drive long distances to gain access to services and in some instances (eg the wet season in the tropical North) travel is only possible via air transport or barge. Variable quality roads are the norm in rural, regional and remote (RRR) Australia.

Telecommunications Services Used.

Survey respondents were asked: ***Which if any of the following types of telecommunications services do you have? With the options being:***

- **Landline phone.**
- **Mobile phone** - *not including satellite phones.*
- **Satellite phone.**
- **Fixed line internet** service - *where internet access is received via a physical line or cable connecting your home to the Internet.*
- **Fixed wireless internet** service - *where internet access is received via an antenna on your home.*
- **Fixed satellite internet** service – *where internet access is received via a satellite dish on or nearby your home.*
- **Mobile internet** service - *where internet access is received via a portable wireless device (3G/4G modem or laptop dongle/adapter) and not including mobile data simply accessed via your mobile phone.*
- **None of the above.**

Figure 11. Marianne St Clair presenting at B4BA forum 2018.

From the figure below it can be seen that the majority of survey participants have a mobile phone and slightly more than half have a landline, including 147 RRR respondents. The survey did not offer the option of identifying landlines via copper or HCRC (High Capacity Radio Concentrator, see Telecom (1985) for further information) ie "radio phones" and it is likely that a number of the respondents who indicated they had a landline phone may have had a radio phone. That is, some respondents may not have differentiated HCRC radio phones from landlines. In future surveys it would be useful to provide the capacity to isolate

the two different voice technologies. From the case studies (see figure below) it can be seen that three of the twelve case study participants used radio phone. Many survey respondents used fixed line services as well as mobile internet, with less people using fixed satellite, fixed wireless and only 17 respondents using satellite phone.

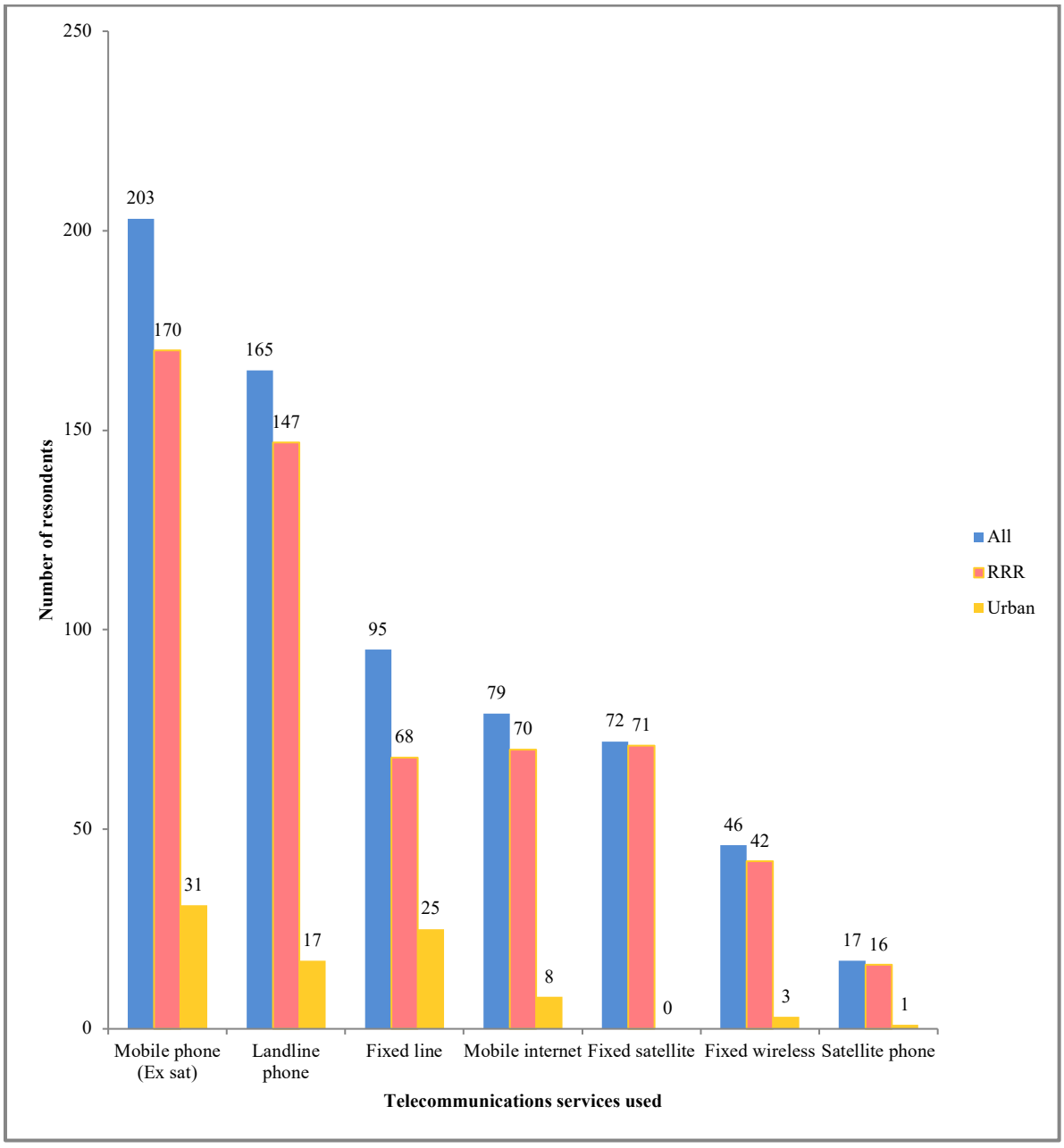

Figure 12. Survey: Telecommunication services used.

From the case studies (see figure below) it can be seen most participants used mobile phone services although some used them only when away from the home eg visiting towns, major centres or travelling. Wifi calling is becoming an alternative voice communication tool with one participant indicating wifi calling (over SkyMuster) was used in preference to the radio phone as it was clearer, better quality and more reliable. A number of RRR people also had satellite phones and VHF/2 Way radio for emergency and/or local communication on their property. Only three participants had landlines (excluding radio phones) with only one of

these being Urban. Of the five RRR participants that potentially could have had a landline phone for voice communication, only two had a landline, indicating a preference to use mobiles rather than landline phones for voice communication.

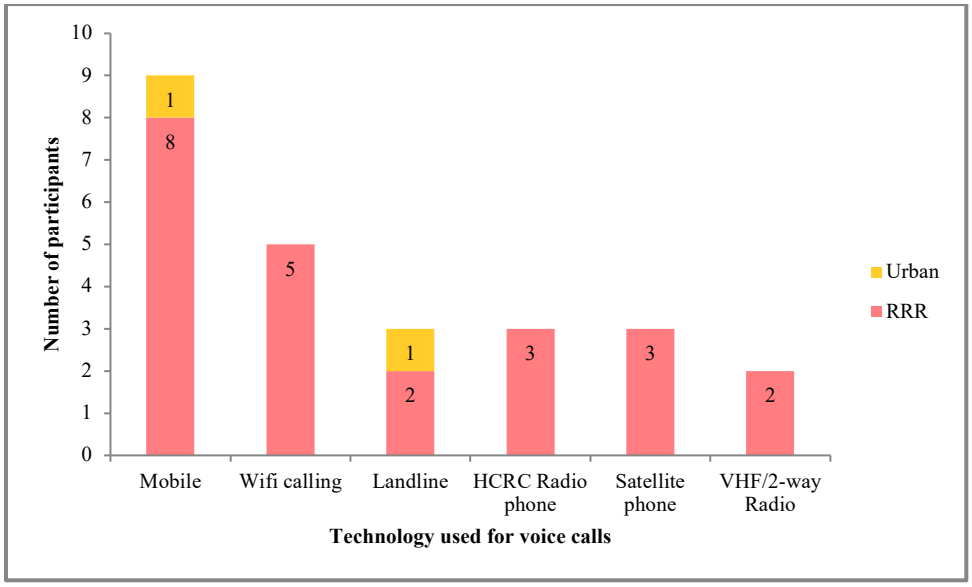

Figure 13. Case studies: Technology used for voice calls
Mobile services and mobile phones are widely used, including by people on satellite or fixed wireless internet, n = 12.

From the figures above it is clear that mobile phone services are the most prevalent and many people are now using wifi calling as a supplement to using mobile services where they have internet connectivity but no mobile service. Additionally, fixed and landline services (including radio phones) are still used widely. It would be interesting to investigate if more people move to mobile services into the future, including moving away from radio phones (which are reported to have reliability issues and will possibly be phased out) and using wifi calling or other forms of voice/video conferencing rather than a fixed line service. As long as there is a need and no alternative, these services need to be maintained. There are concerns the Universal Service Obligation will not be enforced and cover the situation if the technology fails before new technologies are implemented.

Two case study participants reported they had a landline service purely for the ability to access ADSL. One of these participants reported that when the new tower is activated nearby they would disconnect the ADSL service and move to an NBN Fixed Wireless solution. That individual currently uses wifi calling on the ADSL service and would presumably move to wifi calling on the Fixed Wireless service. Another case study participant reported that they had their landline disconnected as mobile phones met their needs and they *"don't want people selling me things on the phone"*. There is anecdotal evidence that people in areas that have good mobile coverage or other fixed services are moving away from landline (including radio) phone services. It may be useful to explore this question in the future research.

Conclusions: The research indicates that mobile phones are the most used device including being used for wifi and wifi calling on satellite and fixed wireless internet services. Landlines (including radio phones) are still important, particularly to RRR people. There is clearly a need to have two alternative technologies in RRR areas, so if one technology fails,

the other can be used to log a fault, for general communications or to get assistance in an emergency. Wifi calling may be a game changer for remote people on satellite services, however, there is still the need for two technologies to be available. It is important the Universal Service Obligation needs to be reviewed and enforced to ensure RRR people have adequate access to basic communications services.

This research did not specifically investigate the need in remote Aboriginal communities, however, while working on this and related projects the researchers have seen a range of communications services fail in remote areas and in one case, a radio phone and the NBN Satellite service were not functioning for over 8 weeks at a very remote clinic in East Arnhem Land. The researchers have also visited communities where the Telstra public phone is the only service available at all times to the community. These remain critical services for remote Aboriginal communities.

Many people in remote Aboriginal communities have smart or other phones, but not necessarily access to reliable and affordable internet. Some communities have access to Telstra mobile services and are typically on prepaid plans. Whilst visiting remote communities the researchers paid $100 per Gb on a pre-paid plan. As part of this research there were a number of discussions with people on remote communities with a view to do case study interviews, however, time and logistics did not allow these interviews to occur in time for this report. These case studies will be done in future research that can specifically address availability, importance, reliability and affordability of telecommunications in remote Aboriginal communities.

From case study analysis, it is critical that regional and remote people have access to two different communications technologies so if one fails, they can still access communications and emergency services.

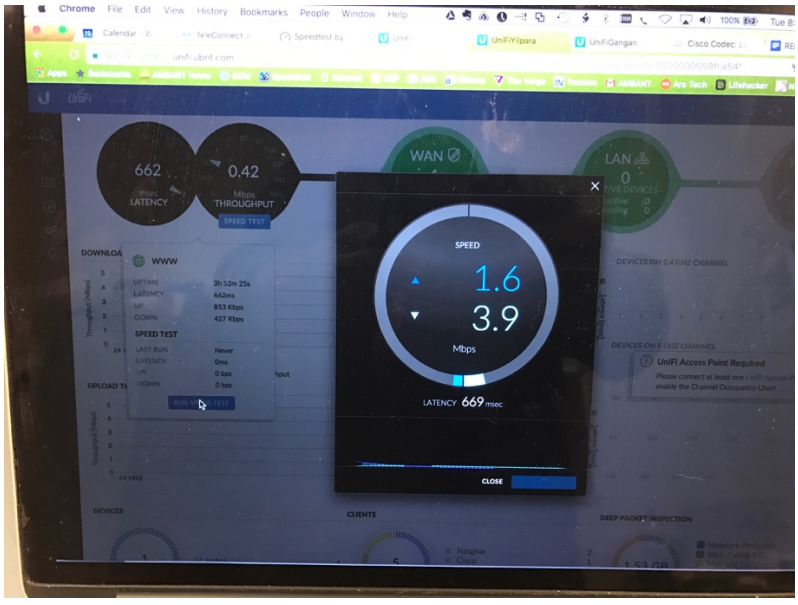

Figure 14. Speed test indicating upload and download capacity.

Speed testing of internet showing 1.6 megabits per second (mbps) up and 3.9 mbps down with a possible threshold of maximum 2 mbps up and 4 mbps down. There is a latency (ping) of 669 msec, which is typical of a satellite internet.

Uses of internet case study analysis.

Survey: Survey respondents were given a list of activities and asked "what types of activities do you use the internet for? The most frequently used are listed below with descriptors provided in the survey form.

Banking.

Keeping in touch with family and friends.

Business/work.

Information: Finding information about socially relevant things such as weather, movie times, what events are on in the community.

News: *Keeping up to date with news and current affairs.*

Social Media: Including social network sites.

Booking travel.

Government services: Accessing government services (eg Centrelink, Medicare, Australian Tax Office).

Shopping.

Education: Including training.

Entertainment: Accessing entertainment (eg movies, Netflix, music, radio, YouTube, games, TV)

Community: *Participating in the community (eg public forums, consultation/feedback* processes).

Health/medical.

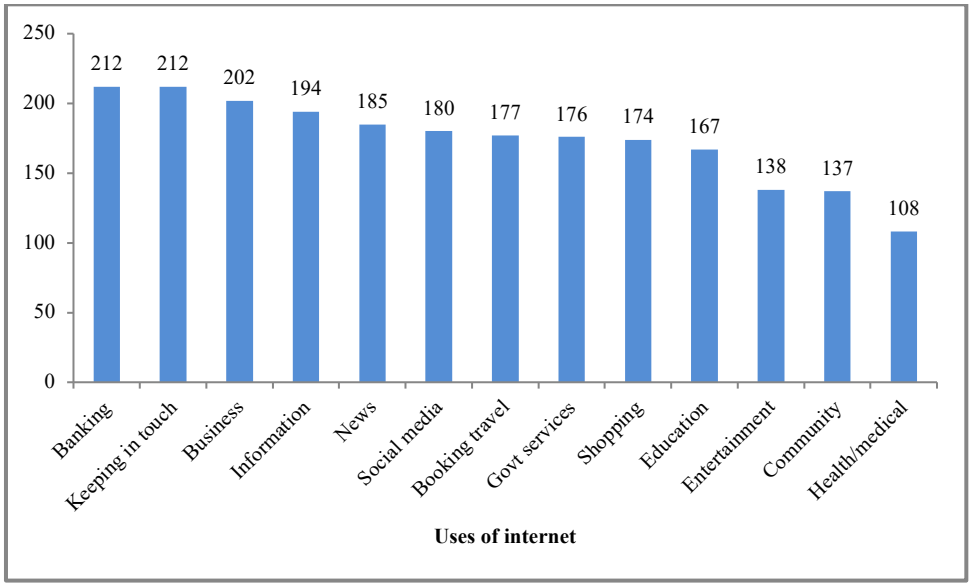

Figure 15. Survey: Uses of internet.

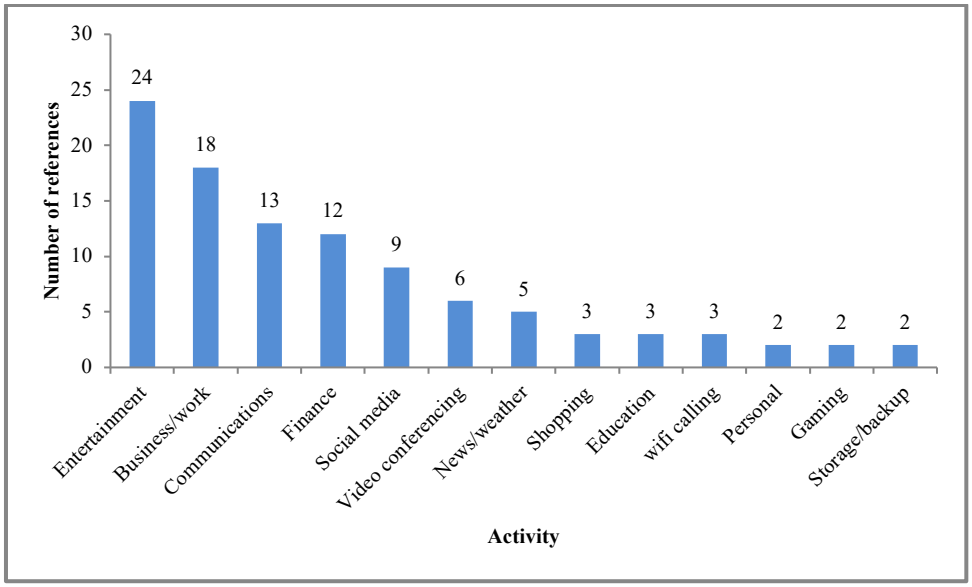

Figure 16. Case study: Uses of internet.

Figure 17. Case studies: "What do you use the internet for?" word cloud.

The word cloud is an indication of the frequency of each word. Words under three letters were not included.

Case studies: Case study participants were not given a tick sheet to complete so their responses are based on what came to mind at the time of the interview and may be an under representation of activities undertaken. Participants reported accessing the following by internet (in order of frequency):

Entertainment: Netflix, TV, Music, Ted Talks, iView,Stan, browsing.
Business/work*:* Including working from home, marketing, stock brokering, accessing Industry specific databases.
Communications: Keeping in touch with family and friends, emails.
Finance: Paying bills, banking, accessing accounts.
Video conferencing: Includes telehealth.
News/weather: Includes getting fire updates.
Social Media: FaceBook, Messenger, Snapchat, Instagram, social media for business.

Quotes from case studies:

> *"Business, study, personal, social media for business, on it all the time other than when we're in the paddock or doing something else. It's our primary form of communication."*

> *"We use the iPad for telehealth. Its just easier to move around the clinic with the iPad. Its an iPad pro. We're in process of getting a sim card for it so we can go over the 4G network for telehealth. I've just got an iPhone 8+."*

> *When you want to buy something you have a choice of buying it on the internet therefore having more choice, or researching what you want and purchasing it through a local supplier. The days of turning up to the shop, asking advice and then taking whatever was in stock are over. We can obtain exactly what we want in farm supplies (e.g. equipment) and spend less energy, time and fuel getting it."*

> *As long as we have electricity and SkyMuster is working we can get fire and weather updates as well as making calls. In large fires there's a lot of phone usage so can be difficult to get connected. If we go into the city and use iPads on free WiFi so that's our backup plan in an emergency. If SkyMuster isn't working, we use data from phones (hot spots).*

The survey respondents indicated that business and communications (including social media were frequently used. This is consistent with the case study analysis which shows it is clear that business and communications (including social media) are frequently used.

Conclusions: Overall primary uses of internet:
Many people use internet for entertainment, but some case studies participants indicated they did not use the internet for entertainment due to data allowance restrictions and reliability issues. It is suggested survey participants may have also had these issues.

Entertainment: A large number of survey respondents (138) indicated they used the internet for entertainment. Nine of the case study participants reported using the internet for entertainment but three indicated they had issues with downloading.

Video conferencing: Video conferencing is used widely: Half of case study participants reported using video conferencing and less than 28% of survey respondents reported not using video conferencing. One case study participant indicated that they used video conferencing far more than expected including communicating on a regular basis with an aging parent in a different state. The parent described video conferencing with family as their favourite activity (next to Netflix) and the participant communicated with nieces and nephews regularly using video conferencing.

"Video conferencing is far more important in my life than I thought! Family members FaceTime or Skype from the age of 1!"

Other primary uses of internet

The primary uses of internet from both the survey and case study analysis were:

- Business/work: includes working from home, marketing, stock brokering, accessing Industry specific databases.
- Communications: Keeping in touch with family and friends, emails.
- Banking/ Finance: Paying bills, banking, accessing accounts.

Other frequently used services were:

- Social Media.
- Accessing information services including news and weather.

Other services used frequently by survey participants were shopping, accessing government services and booking travel. Case study participants reported using a range of services including wifi calling. It may have been useful to include wifi calling use in the survey.

Figure 18. Video conferencing equipment in a remote clinic.

The video conferencing equipment at Gan Gan Clinic in remote East Arnhem Land. Note the camera at the top of the screen. The network box housing the router, firewall and UPS and the control panel (iPad looking device) mounted on the pin board. Video conferencing has been a positive impact on telehealth services by providing increased diagnostic ability and increasing access to a range of specialist and other clinical services. Video conferencing is becoming a "business as usual" tool in many situations.

Activities people would like to access via internet.

Survey participants were asked "What would you like to use internet for?"
From the survey it is clear that entertainment is the most sought after service, followed by education, health/medical, communications, business, access to government services, social media, community communications, shopping, accessing information services, banking, booking travel and accessing emergency services.

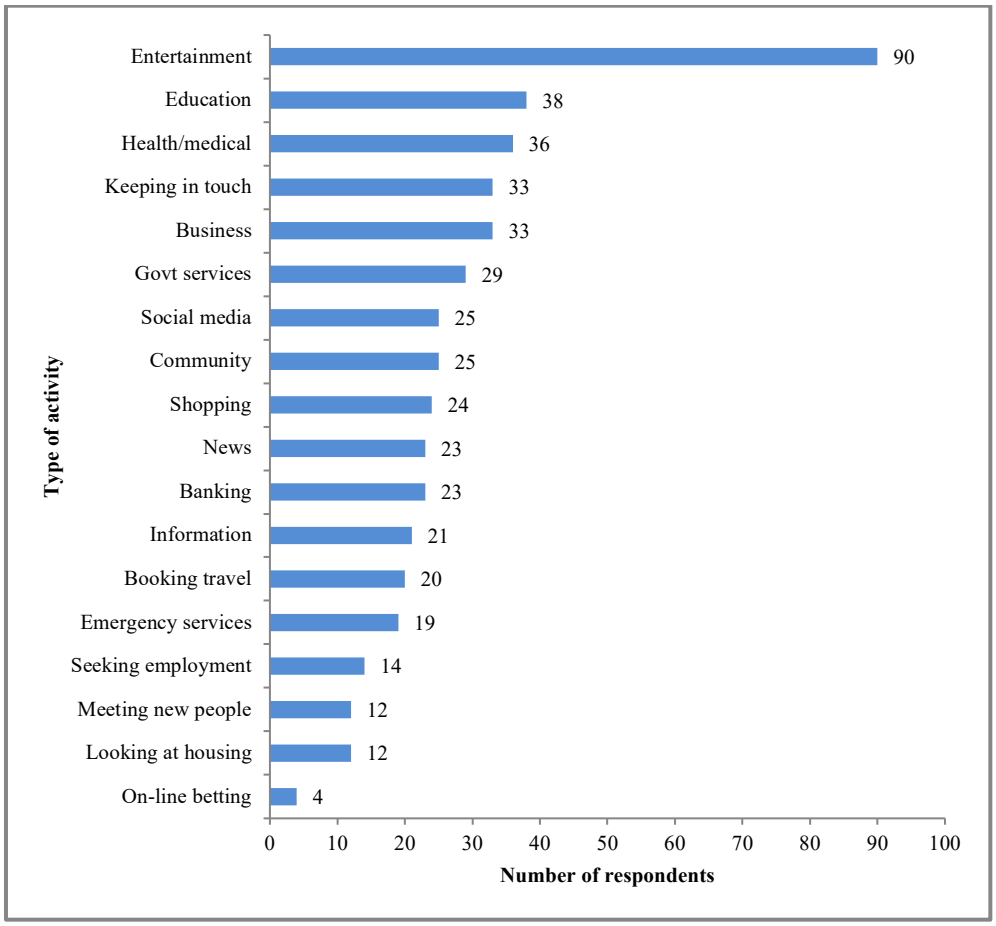

Figure 19. Survey: Type of activity people would like use internet.

Case study participants were asked: What do you want to use the internet for that you can't at the moment? Entertainment and business (including working from home more efficiently) were the services case study participants identified as being unable to access with their current service.

Entertainment was clearly the most sought after activity from both the survey and the case studies.

Business services were rated highly by cases study participants and relatively highly by survey participants.

Education was rated moderately by survey participants and two case study participants.

Health/medical was rated moderately by survey participants and one case study participant.

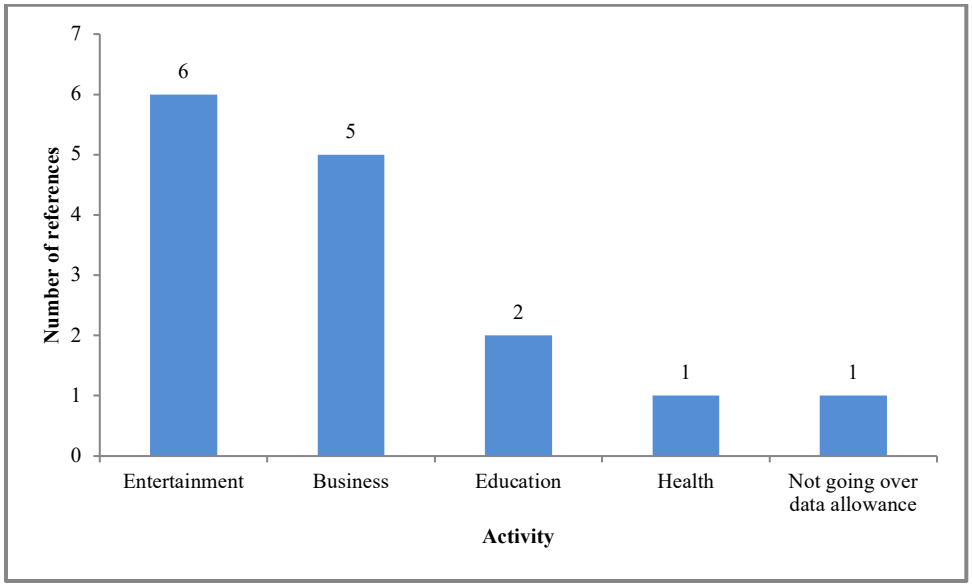

Figure 20. Case Studies: Type of activity people would like to access via internet.

Communication (including social media and finding out what was happening in the local area), accessing government services were all moderately rated by survey respondents.

One issue raised by the case study participants was the problems associated with ***going over their data limit.*** This may also be an issue for survey participants and possibly could be included in a future research.

On-line betting: Fourteen survey respondents indicated they used internet for on-line betting and another four indicated they would like to do on-line betting with better internet. No case study participants indicated they used or would like to use the internet for on-line betting.

Comments from case study participants:

> *"Ok at the moment when things are working. But it regularly gets a bit dodgy – sometimes so dodgy I can't even run the Telstra speed test! But has been better more recently. It's my link to the rest of the world and the community. I keep in contact with people all over the world, keeping in contact with friends is really important."*
>
> *"Netflix! Steaming of entertainment".*
>
> *"Netflix! I should be using it! More entertainment."*
>
> *"Can't really conceive all that we could do with it."*
>
> *"We would also take up an entertainment option if available – but don't know what we could do because we can't access it at the moment."*
>
> *"It should be noted communities use social media they way they use to use the local pub. Most communities have a closed Facebook page set up and this displays relevant information immediately – everything to road and bridge closures, accidents, fires, social occasions, lost dogs, stock on road and general information to benefit the community."*

Figure 21. Case Studies: "What can't you do on the internet at the moment?" word cloud.

The word cloud is an indication of the frequency of each word. Words under three letters were not included.

Case study participants were asked: If you had better, faster, more reliable and cheaper internet, how would you use it?

Responses included:
Business: Accessing cloud-based services and improving efficiency.
Entertainment: Includes VR gaming.
Education: Includes accessing webinars.
Virtual reality: Work (attending meetings virtually thereby reducing travel) and keeping in communication with family.

The results are indicated below with entertainment and business being the most sought after services.

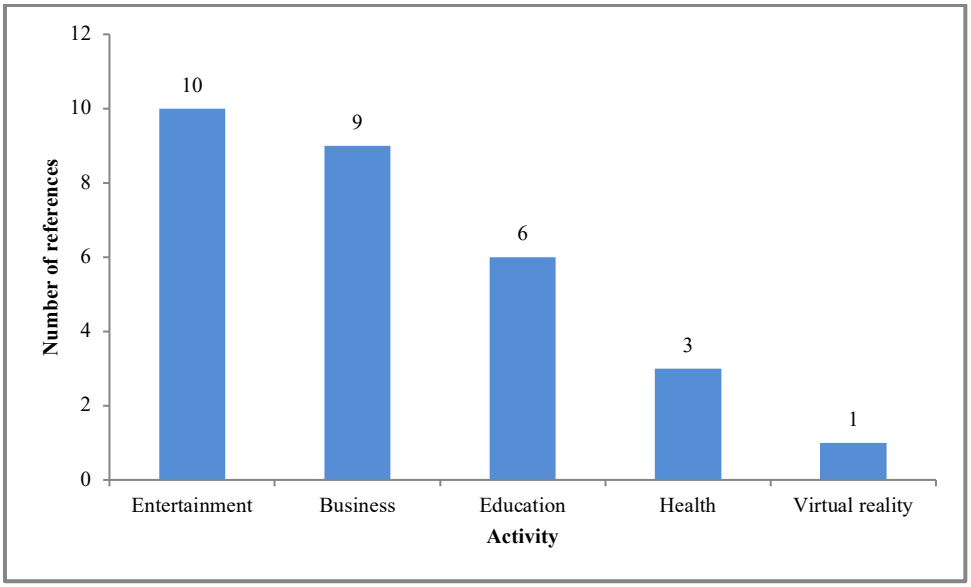

Figure 22. Case studies: How would you use better internet services?

Comments from case study participants included:

"Probably wouldn't have to be nearly as particular when doing downloads, software updates, etc. I currently have to strategize when I do the downloads. I sometimes set them off in the evening and try to get the download done at home (when there is less contention) so I'm not relying on the internet (working adequately) on Saturday morning. I have to plan to do updates, but don't necessarily know that the download will work. Would be good if I could pull it off on the Saturday afternoon reliably. We could be more efficient. But currently its really hit or miss."

"We often watch a family movie on the weekend, but its not fun watching the little circle going round. Sometimes we just give up on the movie and go to bed. Home experiences would be better."

"Our desire to download is increasing as our ability increases."

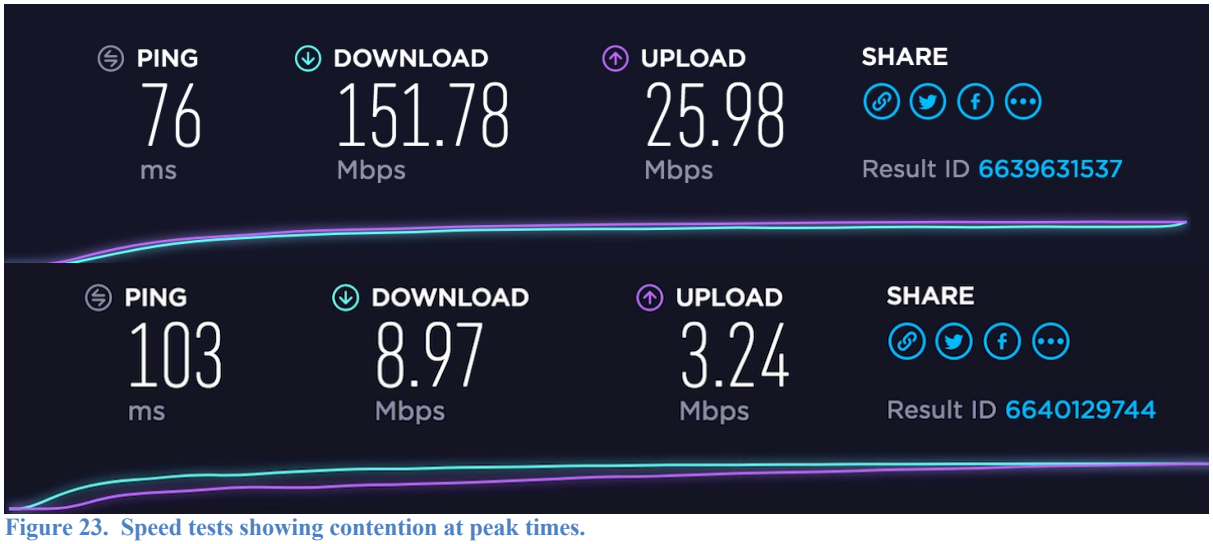

Figure 23. Speed tests showing contention at peak times.

These two speedtest.net results were measured on the same day in the same 4G coverage area (remote East Arnhem). The second result occurred during mid evening when a greater number of people were accessing the internet resulting in contention.

Conclusions - Unmet needs: What services would people like to use the internet for?
Access to entertainment was a priority need that is not currently being met by current internet services. Access to education, business (including being able to work from home), health and government services were also important. Some people are unable to access these services due to restrictions on data allowance.

People use the internet for a wide variety of purposes including entertainment, business/work, communications (including keeping in touch with family, friends and community, finance/banking, accessing information (including news), social media, accessing government services, education/training, shopping, health/medical and video conferencing. Wifi calling over internet is also being used in areas where satellite services are available and other technologies (eg radio phones) are less reliable. From both the survey and the case studies it is clear entertainment is the most frequently sought after additional service through the internet. Business, education and health were other services that people would like to have better access to via internet.

Two of the main reasons people were unable to access entertainment and other services were because the quality of their internet was not adequate and restrictions on data allowance. It is understood NBN Co is addressing these issues by endeavouring to provide better quality services and additional wholesale products with increased data allowances. B4BA has called on telecommunications services to provide unmetered access to a range of services such as government services (B4BA 2017; B4BA 2018). It is enlightening that NBN Co are planning to implement some of these services and it is hoped other telecommunications services (such as Telstra) implement similar strategies, particularly in the prepaid mobile phone market. (Many remote Indigenous people only have pre-paid mobiles services and therefore can spend a significant amount of their limited income on data B4BA (2018)).

Figure 24. Fixed wireless antenna.

Figure 25. Tower at Gawa Community, very remote Elcho Island.
Gawa community is very remote with approximately 50 (mostly Aboriginal people) in the community, people. Apart from the internet connectivity at the school, people need to climb up to high levels to access very limited mobile coverage.

Main internet service used at home.

The survey asked the question: Which internet is the main service you use at home? The options provided were:

- Fixed internet service (eg ADSL, NBN, Dial-up, etc).

- Mobile internet service using mobile phone data.
- Mobile internet service using laptop dongle or 3G/4G modem.
- Satellite service.
- Other.

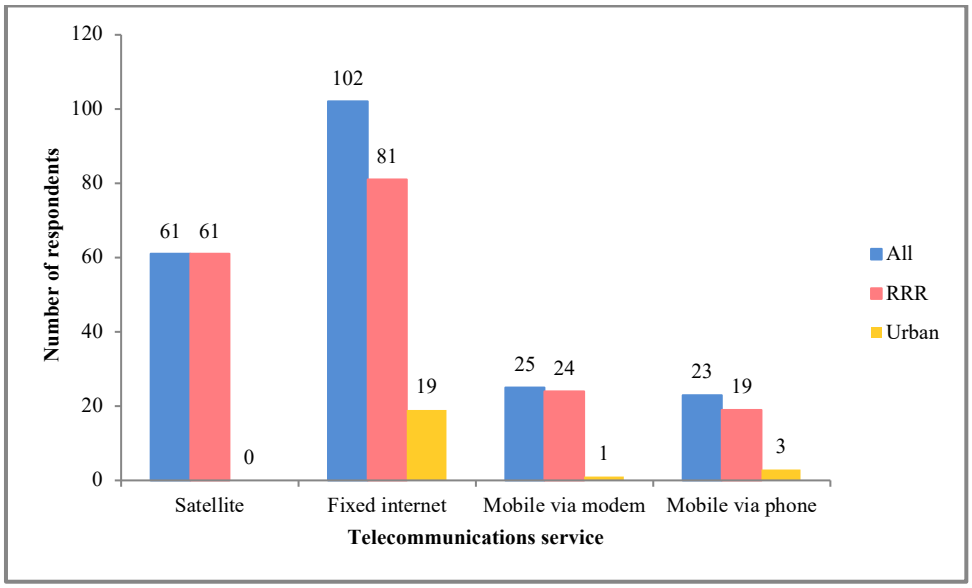

Figure 4. Survey: Main type of internet used at home.

From the survey (above figure) it can be seen fixed internet services (eg ADSL, NBN, Dial-up, cable service) are dominant. A number of RRR respondents used fixed line services and these probably included the various types of NBN (fixed wireless, fibre to the node and fibre to the premise) as well as other services provided by a fixed line solution. A small number of RRR and Urban people used internet via modem or phone as their main internet service at home with 61 respondents indicating they used satellite services as their main internet service. Five RRR case study participants reported they had SkyMuster satellite as their main service at home. Additionally, many people use mobile services as an additional internet service (see figure below). Of the twelve case studies, seven indicated they used the mobile service as a back-up when the primary internet source failed and a further four used mobile phone services when away from home or travelling. A fifth case study probably used mobile phone services when "in town" as they were based on a remote farming property. One case study participant reported they used satellite phone (iridium satellite phone – separate plan) for internet in areas where there was no other coverage at a cost of $1 per Mb. This case study participant reported that this was the most expensive internet, but as they worked in areas where there were no other sources of internet, were prepared to pay those costs.

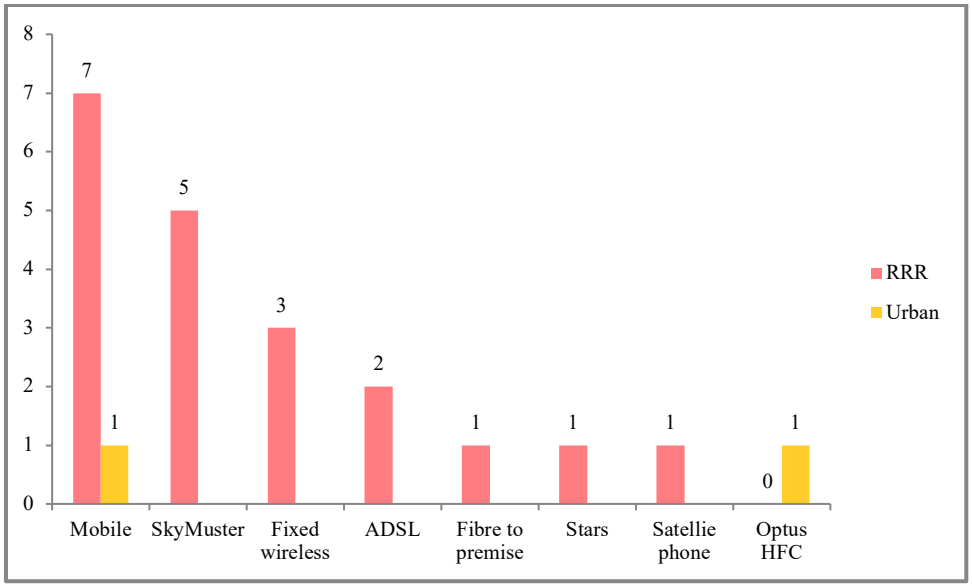

Figure 26. Case studies: Services used for internet.

Type of NBN service used

From the survey over 30% (89) of respondents reported that they did not have NBN (see figure below. NBN Co continues its roll out but there are still a number of people who are either unable to access NBN or are choosing to remain with another service. Most survey respondents were well educated regarding the type of internet they use with only three responding that they did not know if they have NBN.

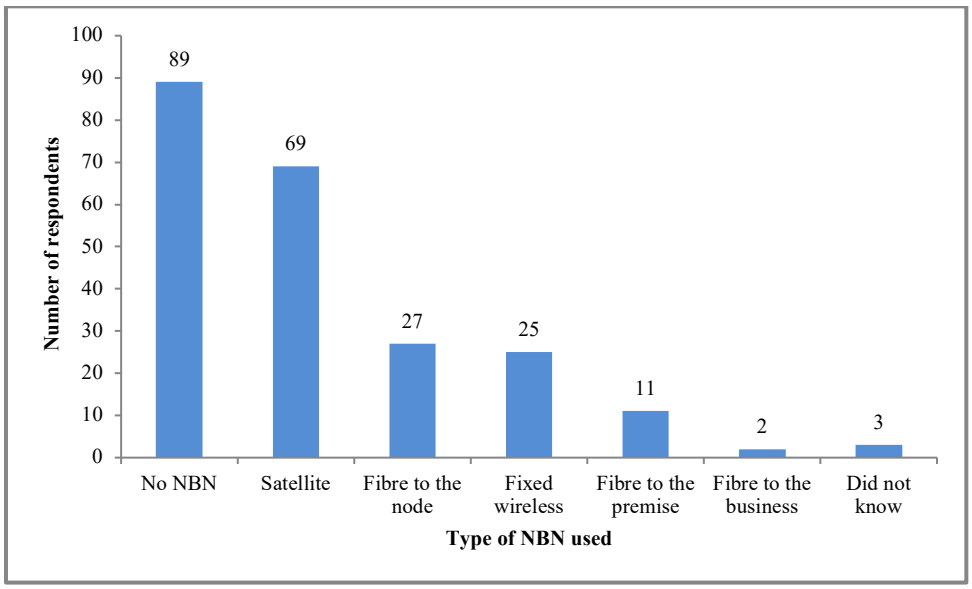

Figure 27. Survey: Type of NBN service used.

Case study participants were predominantly from the RRR areas and nine of those had access to NBN (either SkyMuster, Fixed wireless and Fibre to the premise). Two RRR participants reported using ADSL and a third was based in an urban area in a major city and used a cable system (HFC). All three would consider an NBN solution when it became available to them

as they were not satisfied with their current internet service. For the RRR case studies SkyMuster and Fixed wireless are the dominant types of internet used at home.

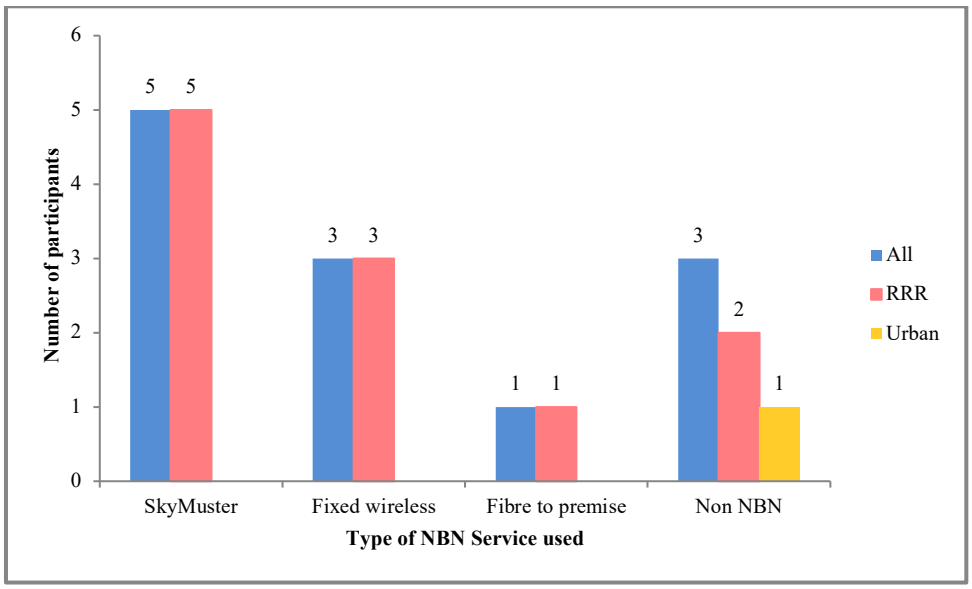

Figure 28. Case studies: Type of NBN used.

People living in RRR areas often do not have a choice of service and are often limited to either SkyMuster or Fixed Wireless, whereas Urban counterparts have access to a variety of options (eg cable, fibre to the node, fibre to the premise, mobile, etc). One case study participant ran a medical practice in a regional town and reported they struggled with the poor quality and reliability of ADSL as well as having limited access to new connections. When they employed a new registrar (trainee GP), ***that medical practitioner was unable to get an ADSL connection for four months (one third of their contract period) so was unable to access the required training for that period of time.***

Conclusions: Internet services used at home:

Main service: The main services used at home were fixed line services (including radio phone, cable and ADSL), satellite and mobile services. Fixed wireless would have also been included in the fixed internet, as it was not specifically differentiated in that question. However, 25 survey respondents indicated having NBN fixed wireless. A small number of RRR and Urban people used internet via modem or phone as their main internet service at home. Approximately 20% of survey respondents and 40% of case study participants indicated they used satellite services as their main internet service. Two RRR participants reported using ADSL and a third was based in an urban area in a major city used a cable system (HFC).

NBN: Approximately 30% of survey respondents reported they did not have NBN. NBN Co continues its roll out but there are still a number of people who are either unable to access NBN or are choosing to remain with another service. Most survey respondents were well educated regarding the type of internet they use with only three responding they did not know if they have NBN. The most frequent service accessed by survey respondents was SkyMuster. Most case study participants had access to NBN (either SkyMuster, Fixed

wireless and Fibre to the premise) with five accessing SkyMuster and three accessing fixed wireless. All three of the case study participants not having NBN would consider an NBN solution when it became available to them as they were not content with their current internet service. For the RRR case studies, SkyMuster and Fixed wireless are the dominant types of internet used at home.

Devices used for internet and voice communications.

The survey asked, "What video conferencing do you use?" and "If you use video conferencing, which devices do you use?". Case study participants were specifically asked what devices they used for voice and internet services with all but one case study reporting they had mobile phones. As that person was very remote, it is probably that they had a smart phone for use when away from their property. These results are summarised in the figures below. The survey indicated 72% of respondents that use video conferencing reported using a smart phones. Clearly mobile phones (smart phones) are the dominant device for a variety of telecommunications services including voice communications via video conferencing or some form of wifi calling.

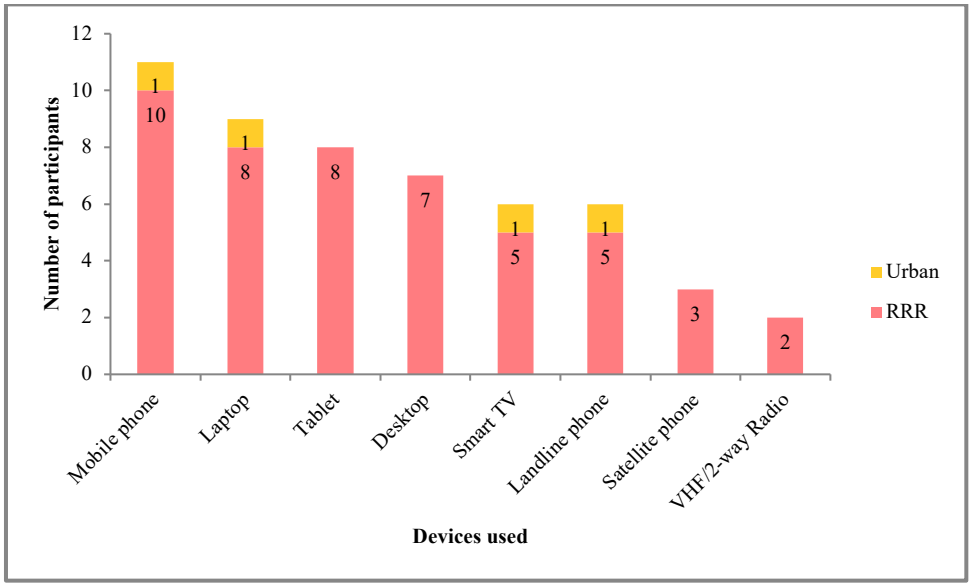

Figure 29. Case Studies: Devices used.

Survey and case study participants were specifically asked if they used apple products (eg iPhone or iPad) as there seems to be high levels of iPhones and iPads used with fewer other smart phones and tablets. Both the survey and the case studies indicated the dominance of apple products in the smart phone and tablet market, but computers were distributed between apple products and Microsoft platforms. Many of the case study participants reported having laptops or a combination of laptops and desktops, as well as having a combination of Mac and Microsoft computers (see figures below). Other technologies used were Smart TVs (6 case study participants reported having a Smart TV) and a Sonos Speaker system. However, two case study participants indicated that their Smart TV was not connected to the internet. This was due primarily to data usage issues. Two case study participants (one Urban and one RRR) had phones that could be used when there were power outages (old Telstra phones).

Other technologies used in remote areas.

It is important to note that a number of other devices are used either when living in remote areas, or working in remote areas. These include: Satellite phones, VHF/2 way radio, private mesh networks and satellite internet connectivity via iridium phone. The case study participant that reported using the private mesh network used a small device that clipped onto a backpack or clothing and would allow communication via text messaging within a specified distance between the couple when they were working in remote areas. It is also reported by the same participant the private mesh technologies are becoming cheaper. By using IP networks embedded in mobile smart phone and tablet devices, private mesh networks reduce the need for satellite phones and provide another option for emergency situations. They will not replace the need for EPIRBs (Emergency Position Indicating Radio Beacons) however, they will provide another mechanism for communicating in very remote areas and may be more affordable that satellite phones.

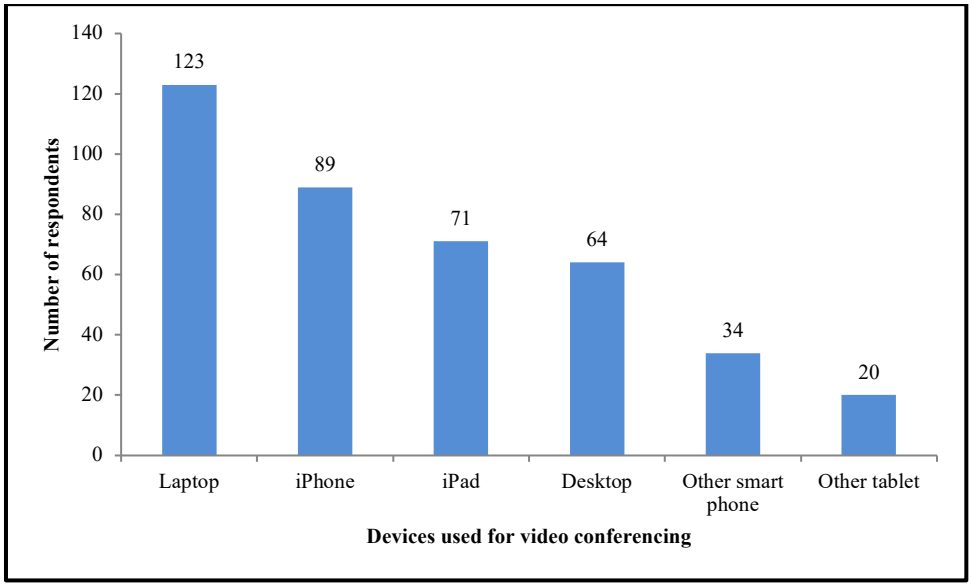

Figure 30. Survey: Devices used for video conferencing.

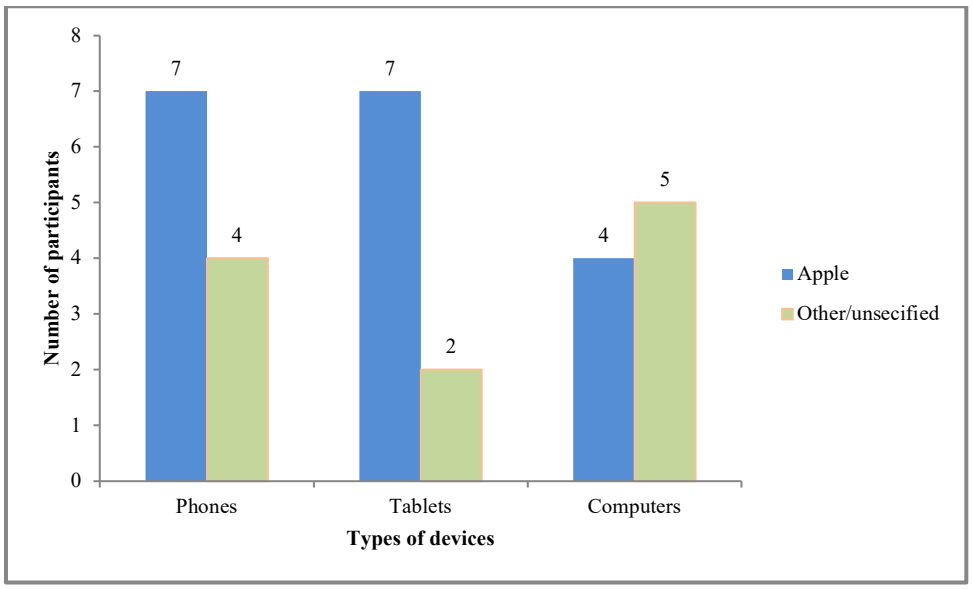

Figure 31. Case Studies: Types of phones, tablets and computers used.

Industry specific technologies.
There were some Industry specific technologies used for bore telemetry, stock monitoring and for use in marine environments such as the AIS system:

> "AIS locator beacon on my ship – Active and passive AIS tracking. Tracks all commercial assets at sea by satellite. Ship and crew have beacon when on ship. Beacon can notify helicopter if necessary for rescue purposes. Australian registration is amazing. A vessel sank off South Africa – and Australia rescued them, towed them to safety."

Telecommunications services most urgently needed.

It is clear from the survey mobile phones have not replaced fixed telecommunications services and are still needed in many areas (see figure below). Telstra provides HCFC phone systems ('radio phones') which is an ongoing wireless phone technology. Some case study participants (3) reported they would take up NBN when it became available to them and a number of them (3) reported their current HCRC phones were unreliable, of poor quality and out-dated technology. However, they still valued these services and a number of case study participants indicated that it was useful having two forms of communication as a redundancy.

There were no Urban survey respondents who indicated they needed additional services.

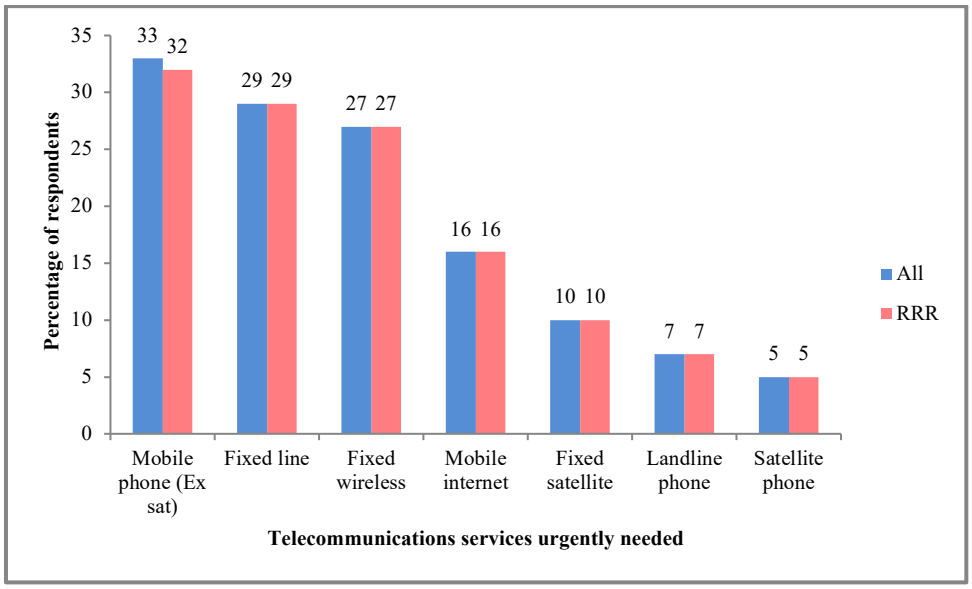

Figure 32. Survey: Telecommunications services most urgently needed.
There were no Urban survey respondents who indicated they needed additional services.

Of the three participants indicating they wanted to take up NBN, one was intending to connect to the Fixed Wireless service when it became available. Another participant was forced to take up satellite when they thought they would be in a fixed wireless footprint. It is clear the maps made available by NBN are a "work in progress" and a number of people (including one case study participant) were told by a Retail Service Provider (RSP) that they would not be able to get fixed wireless. However, with assistance from nbn local it was determined that fixed wireless would work at the participant's home. That participant was very pleased with their fixed wireless service except for issues related to power outages, fault resolution and modem deliveries. From a B4BA perspective, it is recommended to reduce the

loading on the satellite services by ensuring people that do have access to fixed wireless are given that option. In some cases, the RSP should consult with NBN to determine if fixed wireless can be provided to that site.

Recommendation: More public awareness and RSP education needs to be done to ensure more people can access the best NBN alternative for their situation.

Figure 33. Telecommunications tower in rural Australia.

Telecommunications towers are now seen throughout urban and rural Australia. This photo is taken just outside the small township of Clayton Bay in South Australia.

Importance of different types of telecommunications services.

Important: From the survey, clearly mobile phone services are an important telecommunication service, (see figure below) with 98% RRR and 100% Urban respondents indicating that mobile services were important or very important to them. Fixed internet services were also important (84%) as well as internet by phone (74%). There are differences between Urban and RRR regarding fixed phone and internet by modem. No Urban respondents indicated that satellite services were important to them.

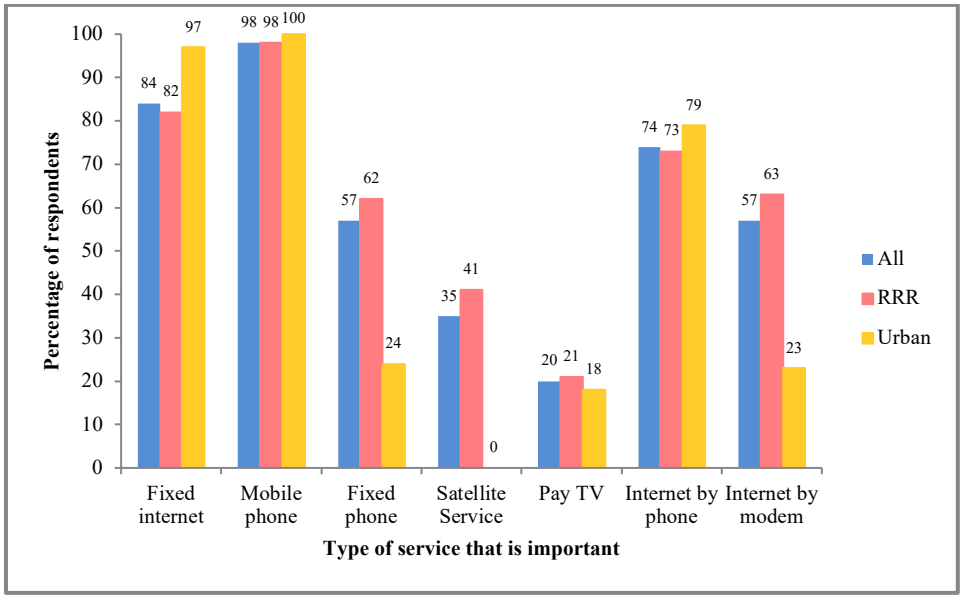

Figure 34. Survey: Importance of telecommunications services.

Not important: Responses varied between Urban and RRR for Fixed phone (RRR 66%, Urban 28%), satellite services (RRR 37%, Urban 82%) and internet by modem (RRR 23%, Urban 43%). This is not unexpected as Urban people have many more options for voice and internet services, where many RRR may be restricted to fixed lines (including radio phones), fixed wireless or satellite services. There were no Urban respondents who indicated mobile internet or fixed internet were not important.

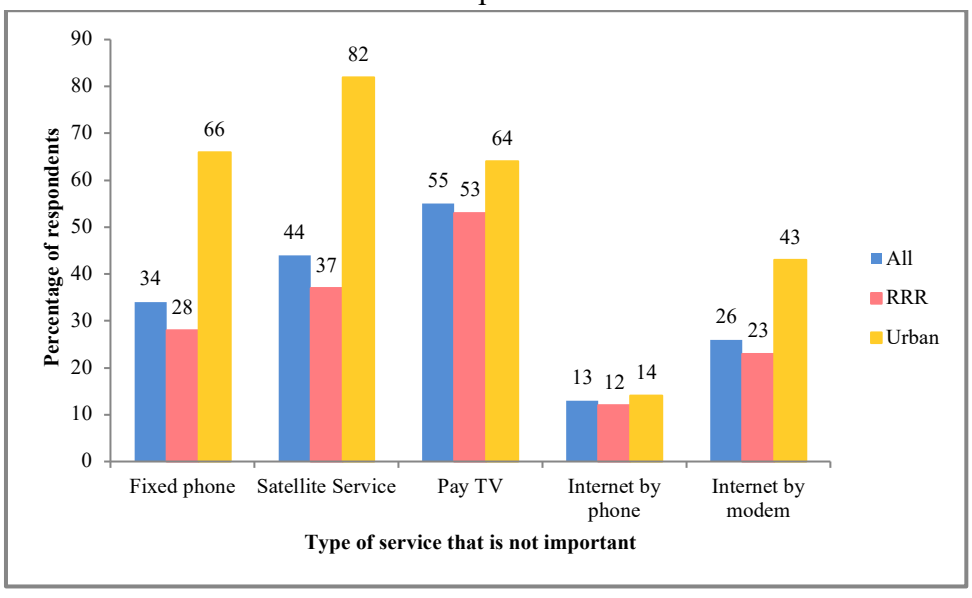

Figure 35. Survey: Type of service that is not important.

Case study participants were not specifically asked how important various services were. However, it is clear from the survey and the case studies that mobile phones are important as a communication tool, even if it is not the primary communication tool at home especially for RRR people. A number of case study participants indicated they used wifi calling on their smart phone over their satellite or fixed wireless service, some reporting this was more reliable and of better quality than the radio phones.

Fixed wireless: In the survey, Fixed wireless (NBN) was not specifically identified as a service in its own right and given such a large proportion of survey respondents (83%) are from the RRR category, it may have been useful to have this as a unique category in the survey. This is supported by the case study interviews where a number of participants (2) indicated they would like NBN Fixed wireless instead of ADSL services and another participant indicated they did not understand why they could not get fixed wireless and were forced to access SkyMuster by the RSP rather than fixed wireless. In discussion with another case study participant, they were in a fixed wireless footprint. However, after initial testing by the RSP, were told they would have to get satellite. It was only through intervention of nbn local that this person was able to get fixed wireless.

B4BA has identified it is preferable to have people in fixed wireless areas on fixed wireless rather than satellite to reduce the risk of contention adversely affecting users' ability to download on the satellite system.

Pay TV generally does not seem to be important but may be an alternative source of entertainment for remote people who cannot access other mechanisms for downloading entertainment due to restrictions on data allowances or poor-quality internet services. However, some respondents to the survey and case study participants reported that Pay TV was important to them.

Comparison of importance between Urban and RRR.

Importance of services – Urban.

Mobile phones are the most important service to Urban people.

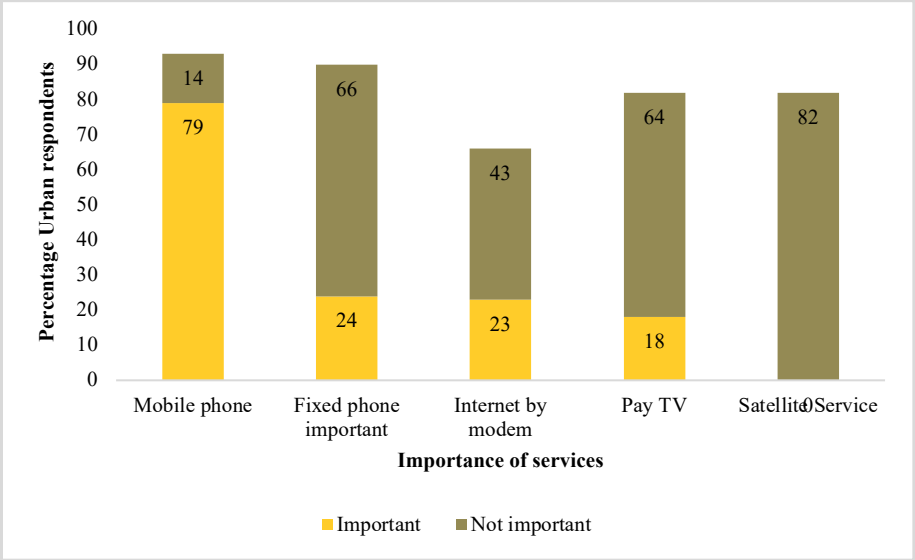

Figure 36. Importance of services - Urban.

Importance of services – RRR.

Mobile phones, fixed lines, modems are all important to RRR people. Satellite services are important to a substantial (41%) of RRR people.

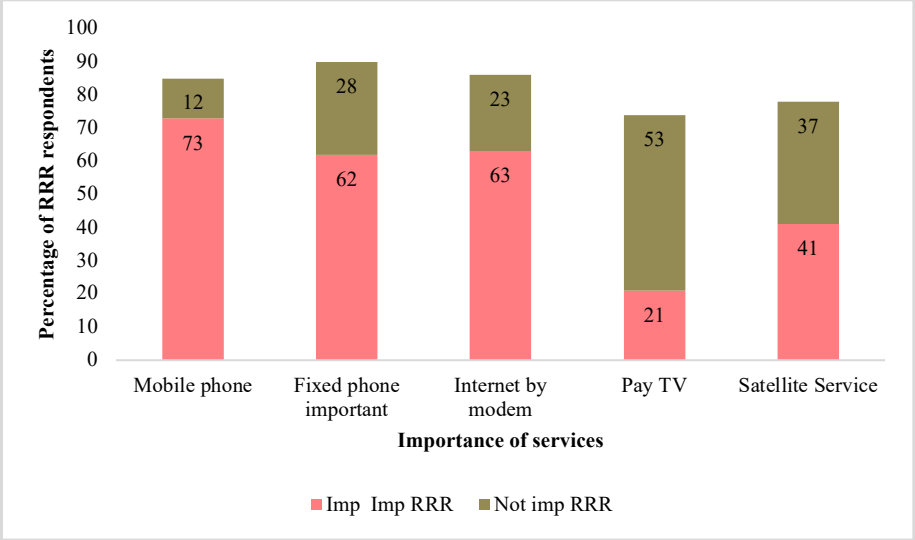

Figure 37. Importance of services - RRR.

Conclusions:

Devices used for telecommunications: Survey respondents indicated they used laptops and smart phones as their main devices for video conferencing, followed by tablets and desktops. Case study participants also indicated they used smart phones and laptops as the primary devices followed by tablets and desktops.

Mobile phone services are important across all areas, followed by fixed internet and fixed line services. Fixed line services are less important in urban areas (where there are other types of services available), but are still important in RRR areas as a primary form of communication. In the RRR areas, satellite is important and some case study participants indicated satellite services were more reliable than the radio phone. However, it was critical to have the two modes of communication so if one service failed, the second service provided a backup service. Wifi calling is being used more frequently with people using satellite and fixed wireless services indicating wifi calling was better than using the poor quality landlines (ie standard exchange servers through copper, radio phones and ADSL).

Affordability of different types of telecommunications services.

Survey: From the survey, Urban respondents tended to perceive that most services (fixed internet, mobile phones, internet by phone and internet by modem) were affordable. In contrast to this, RRR respondents tended to indicate that some services were not affordable (internet by modem, internet by phone and pay TV). A number of RRR respondents may have been outside of the mobile services range at home but used these services when away from base. Satellite services were considered affordable by 21% of RRR, but unaffordable by 41% RRR indicating a trend for services to be less affordable for RRR consumers.

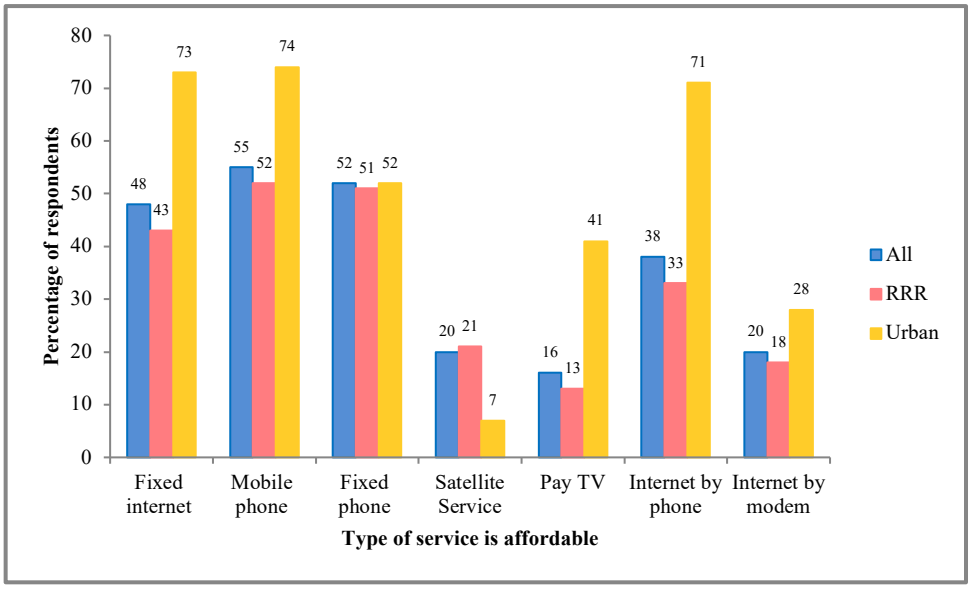

Figure 38. Survey: Affordability of services.

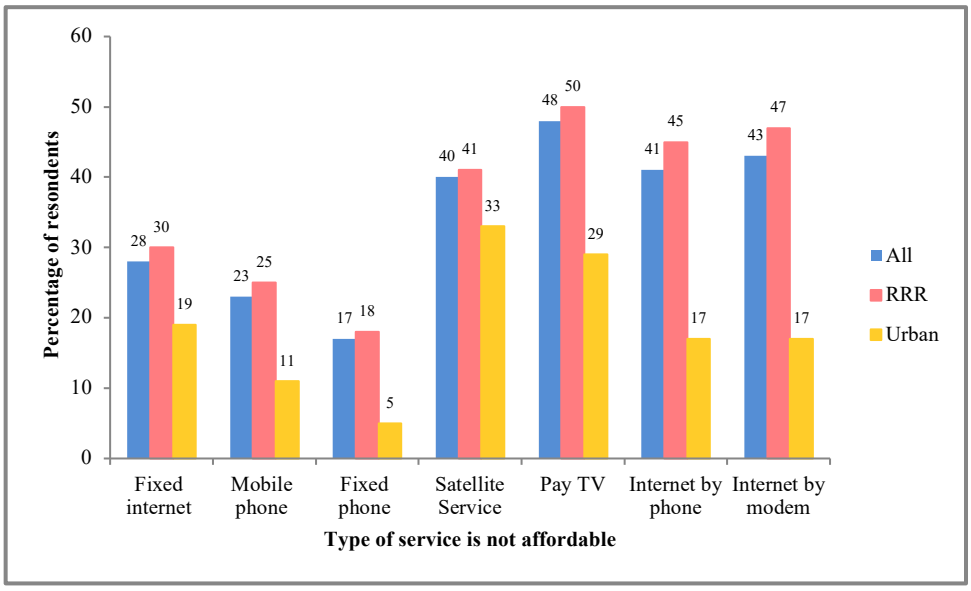

Figure 39. Survey: Services are not affordable.

Case Studies: Case studies participants were asked "Do you think these services are value for money". Responses were varied with 7 positive responses and 6 negative responses. It

was also reported that the services were essential, and the associated costs were not discretionary.

Affordability: Qualifying statements:
There were a number of qualifying factors included with some statements:
A number of case study participants indicated that costs were acceptable if the service delivered the advertised/contracted services, was reliable and of good quality.

Some qualifying quotes from case study participants include:

> *"Yes, I suppose."* This person raised the issue about the higher cost of satellite compared to other services available 'in town'.
>
> *"Cost would be ok it if was a good and reliable service."*

Some positive comments were:

> *"NBN figured out how to deliver more data and speed – doubled for same price – I was pretty happy with that."*

There was a very interesting response from a young adult (18 years) living in a regional area greater than 50 kms from the major centre. This young person was on an apprentice's wages and reported *"Yes, I'm only spending $144 a month and get 120 Gb of data!"* It is anticipated that this amount was a significant proportion of their monthly income.

Some of the negative comments were:
Very remote family farm: *"Comparatively over-priced."*

Very remote family farm*: "No" (particularly in reference to phone. "With wifi – we're on the biggest plan you can get – getting more bang for my buck with NBN!"*

Rural regional couple: *"SkyMuster should be cheaper as its not comparative to what we'd be paying in metro area."*

Rural regional couple: *"No, because the speed isn't efficient enough. We don't get what we pay for."*

Comparison of affordability between Urban and RRR.

Affordability of services in Urban areas.
Fixed internet and mobile phone were generally considered affordable, followed by fixed phones. Overall, there were smaller proportions of Urban respondents considering services were not affordable with the exception of satellite services and Pay TV.

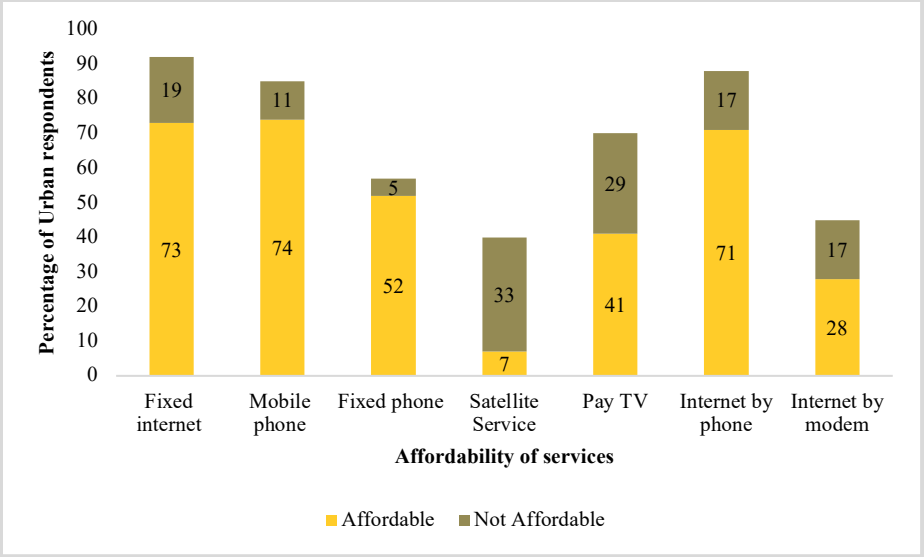

Figure 40. Survey: Affordability of services - Urban.

Affordability of services in RRR areas.

The survey found that mobile phone services, fixed phones and fixed internet were considered affordable by approximately half of respondents. Satellite services, Pay TV, internet by phone and internet by modem were not considered affordable by approximately half of respondents. There is a trend for RRR respondents to consider services to be less affordable that Urban respondents.

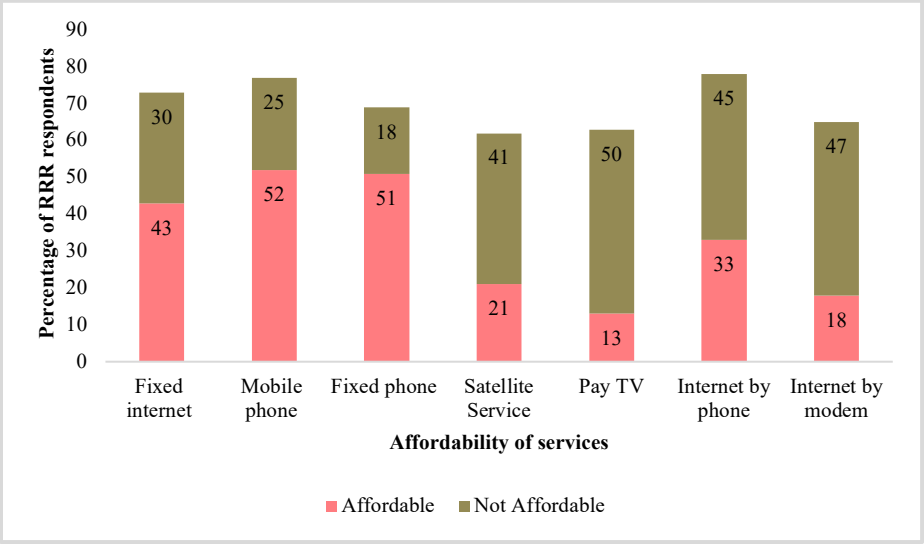

Figure 41. Survey: Affordability of services - RRR.

This is supported by case study investigation where a number of case study participants indicated that their services were less value for money compared to their Urban counterparts. Some case study participants expressed frustration that they were forced to pay 'more money for less' in terms of services provided. RRR people are also provided with less options in the type of services they can access. One case study participant reported having to install their own satellite dish and equipment for their Pay TV Service and that it was very unreliable, dropping out frequently in poor weather.

Conclusions: Overall, there seems to be mixed responses to affordability. Survey respondents indicated there was a general trend to services being more affordable in urban areas and less affordable in RRR areas. Mobile phone and fixed internet were considered affordable in urban areas. From the case studies there were also mixed responses and some indication consumers would be prepared to accept the cost, if the product delivered the services expected.

There were some positive comments regarding NBN increasing its allocations for the same price. RRR people indicated the cost of services they access should be in line with those paid by their counterparts in urban areas. Clearly there are issues regarding affordability, particularly in RRR areas. In future research, it would be useful to investigate affordability by measuring actual costs as a percentage of income rather than perceived affordability. It would be useful to investigate the percentage of income allocated to telecommunications for lower socio-economic groups in RRR areas.

Figure 42. NBN Co and the researchers visiting Gawa community, very remote Arnhem Land.

Gawa is a small and very remote community in Arnhem Land. NBN Satellite expert Rocco Buzzo, nbn local SA/NT Manager Tim Saul and the Northern Institute Telehealth Team (including Senior Research Fellow Dr. Payi Linda Ford) visiting local community members to discuss potential telecommunications solutions that may meet the community's needs. A community wifi system using SkyMuster seems to be the most effective and affordable solution.

Speed of internet services.

Survey respondents were asked: "How would you rate the speed of your internet services?" Urban respondents indicated they were satisfied with the speed of their services (fixed internet 71%, mobile phone 74%, internet by modem 75%). The exception was satellite service. From question 5 of the survey, there were no Urban respondents who indicated they had satellite. Therefore, the Urban respondents indicating that speed of satellite was good may be related to their experience of this service in other locations eg work, friend's homes, etc. Generally, RRR respondents were not satisfied with the speed of their internet services. RRR respondents tended to indicate the speed of their internet service was poor (fixed internet 55%, mobile phone 54%, satellite 47% and internet by modem 54%).

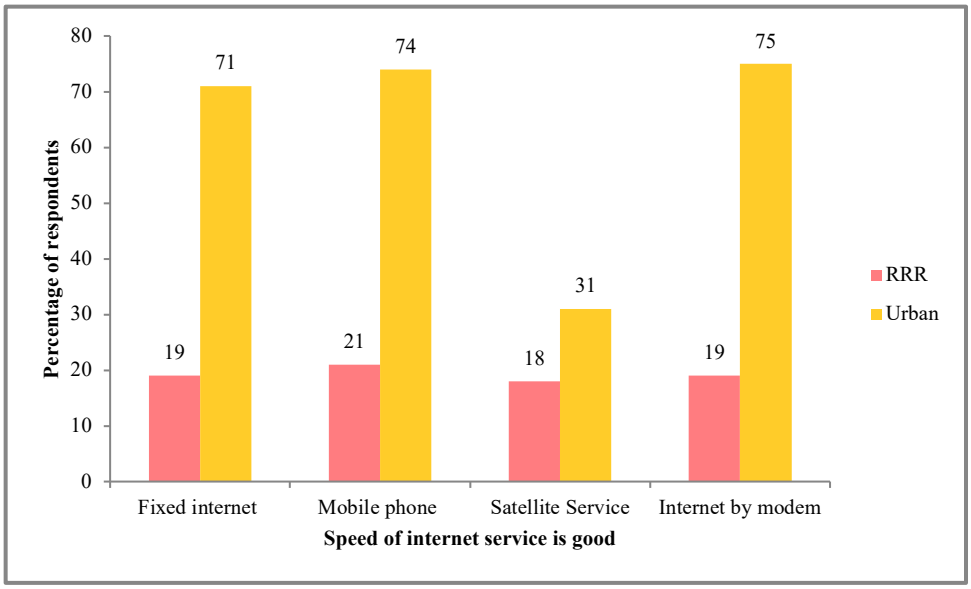

Figure 43. Survey: Speed of internet service is good.

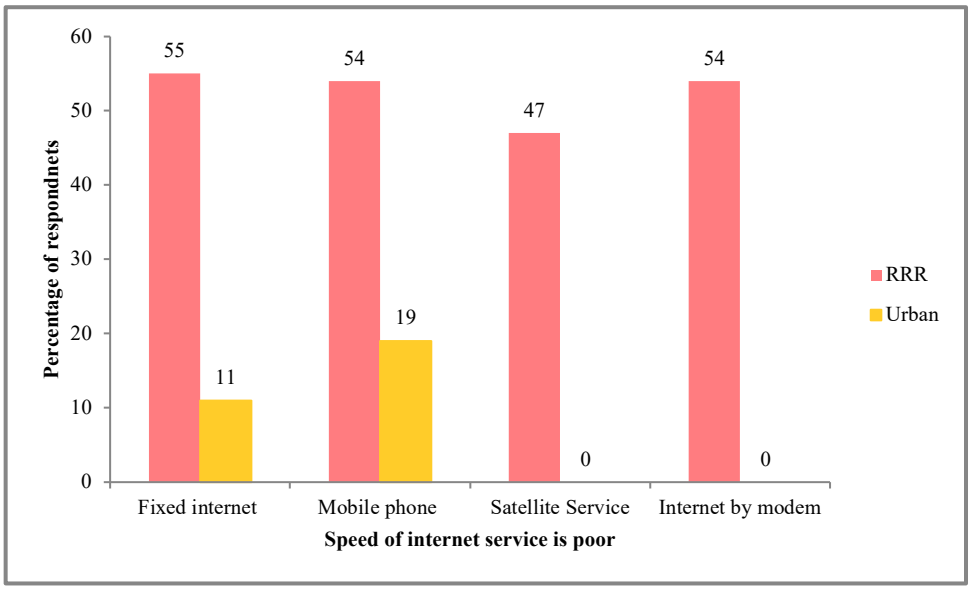

Figure 44. Survey: Speed of internet service is poor.

Case study participants were not specifically asked about the speed of their internet services. However, half (6) indicated they could not download entertainment. Latency was an issue for case study participants in RRR areas for gaming and telehealth. Medical practitioners reported a number of failed telehealth sessions on their ADSL service. There were also a number of references to poor quality services. However some of these related to voice communications services, not internet. These are outlined below:

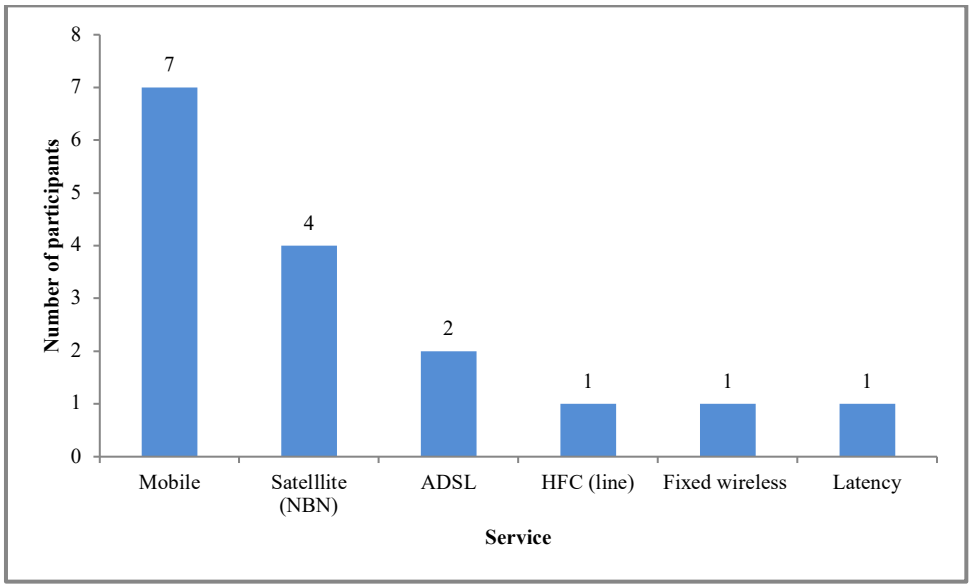

Figure 45. Case studies: Participants reporting poor quality services.

Comparison of speed of services between Urban and RRR.

Speed of internet services – Urban.

Fixed internet, mobile phones and internet services were generally considered as having good speeds by Urban respondents. Overall, there were smaller proportions of Urban respondents considering services were poor in terms of speed.

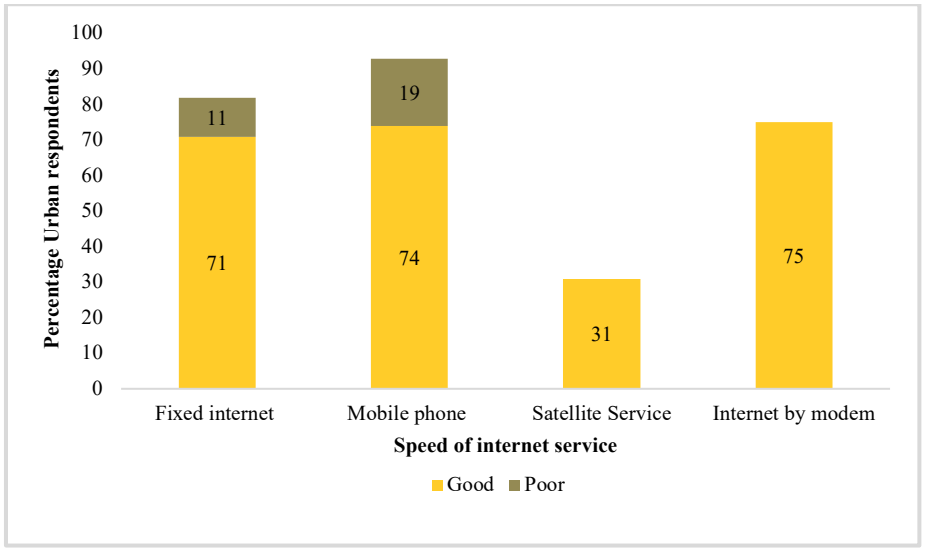

Figure 46. Survey: Speed of services - Urban.

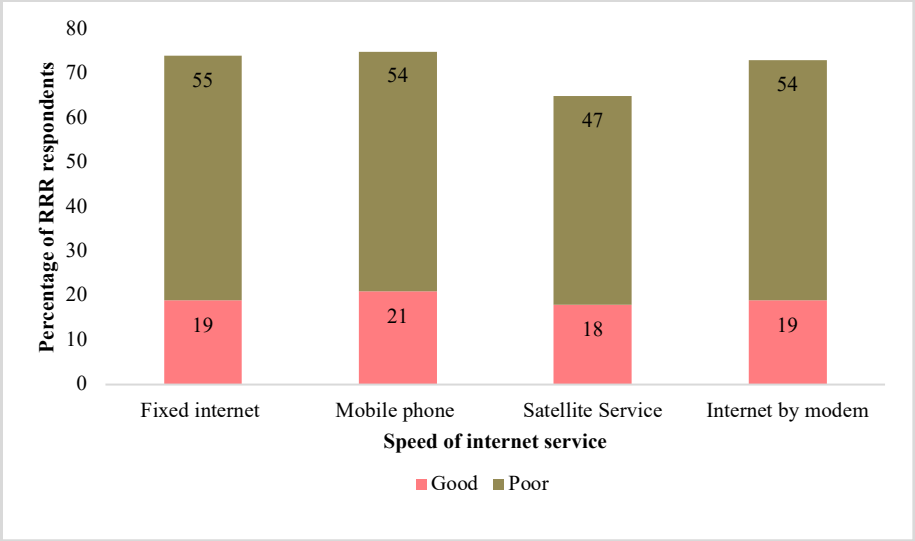

Figure 47. Survey: Speed of services - RRR.

There were a percentage (31% respondents) that reported satellite services performing at good speeds. Some of the people who indicated themselves as being Urban or Urban fringe may have been in regional areas such as the Darwin Rural area. These respondents may have had experiences with satellite services either at home, at work, or while travelling in remote areas. Some businesses in the Darwin area have had non-NBN satellite services available. Additionally, some people in regional areas may have been provided satellite when other services such as fixed wireless may have been available. One case study participant reported that they were advised by their RSP they would need to have a NBN satellite service and not fixed wireless as originally agreed. It took intervention from nbn local to obtain fixed wireless for this person.

Speed of internet services – RRR.

Generally, RRR respondents reported services to be poorer with respect to speed than Urban counterparts.

Conclusions: Generally, urban respondents indicated the speed of their services was good, but RRR survey respondents indicated speed was poor. Case studies indicated services varied with a number of participants reporting mobile, ADSL and HFC services being poor. The only urban case study participant reported issues with the quality of service of both the mobile and Hybrid Fibre Coaxial (HFC (cable)) services. The quality of satellite services varied and this could be due to different expectations from consumers or real differences in performance of the SkyMuster service. There were many references by case study participants to frequent drop outs on the SkyMuster service. It is suggested that the next step in this research is to do speed testing in a number of areas and across a number of services. It is also suggested that there should be more education about how consumers can extend their mobile coverage as a number of case study participants indicated difficulties in getting reception inside their homes.

Reliability of different types of telecommunications services.

Generally, survey respondents indicated telecommunications services are mostly reliable in the Urban areas and unreliable in RRR areas. However, the only Urban based case study participant (their home being 8 kms from a major Australian city and their work place in the CBD) reported issues with reliability with their fixed line internet service and their mobile. It is suggested reliability is a major issue that needs to be addressed by telecommunications companies. The figures below clearly indicate there are differences between perceptions of reliability between RRR and Urban respondents.

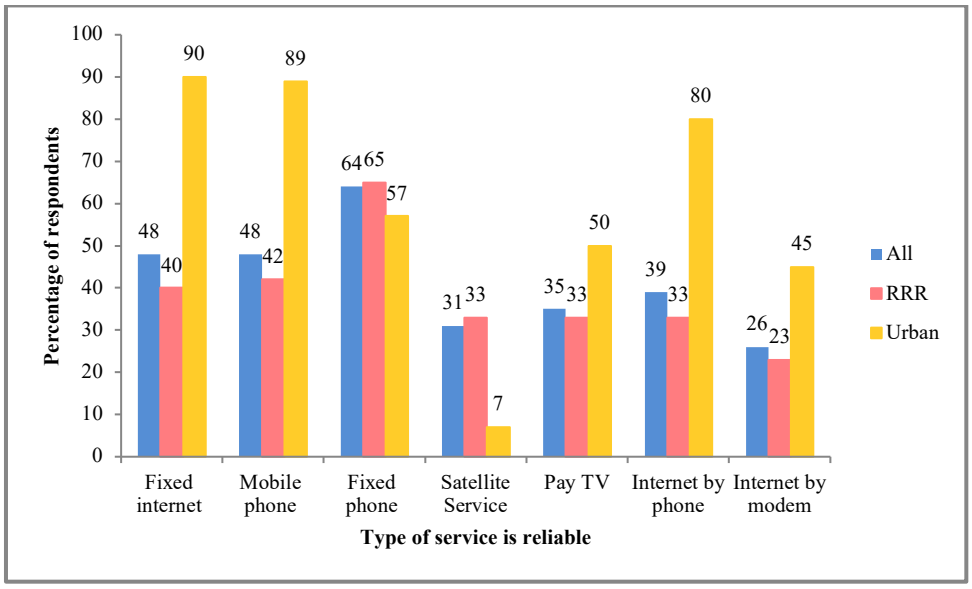

Figure 48. Survey: Reliability of services.

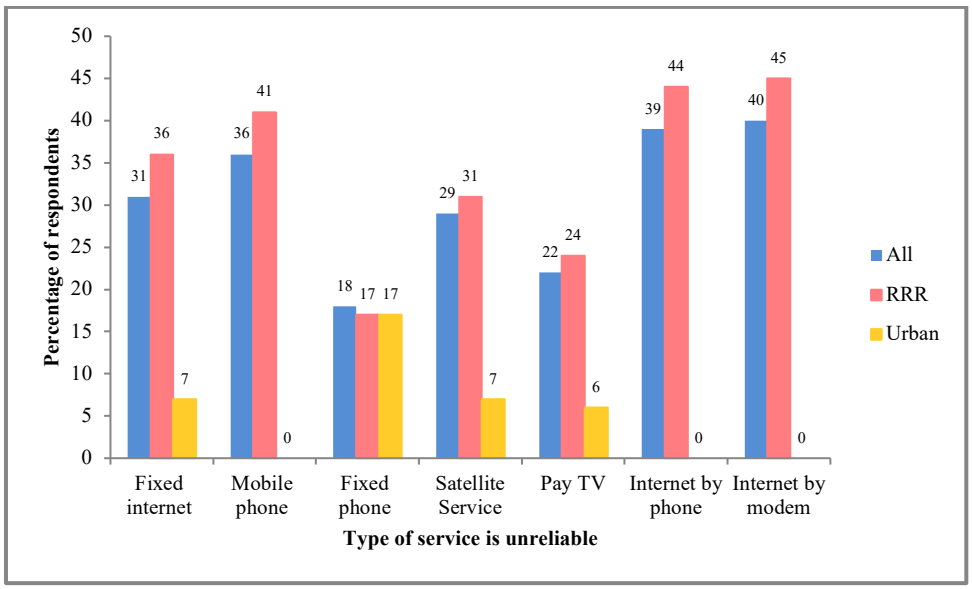

Figure 49. Survey: Type of service that is unreliable.

Reliability of services from case studies.

Quality of telecommunications services were investigated in the case studies. Of the 12 case studies all participants recorded issues with reliability of services such as poor coverage, drop outs, slow download and upload speeds, contention, poor reception and seasonal contention

due to large influxes of population into the town in holiday periods. These are summarised in the figure in the Issues section of the case study report but are also listed in the table below.

Table 1. Poor quality of telecommunications services reported by case study participants.

Service	Number of Participants
Mobile phone	7
Satellite	4
Radio phone	3
ADSL	2
Landline	1
Fixed wireless	1

Comparison of reliability of services between Urban and RRR.

Reliability of services – Urban.

Generally, Urban respondents considered services reliable particularly fixed internet, mobile phone and internet by phone. Fixed phone, Pay TV and internet by modem were less reliable.

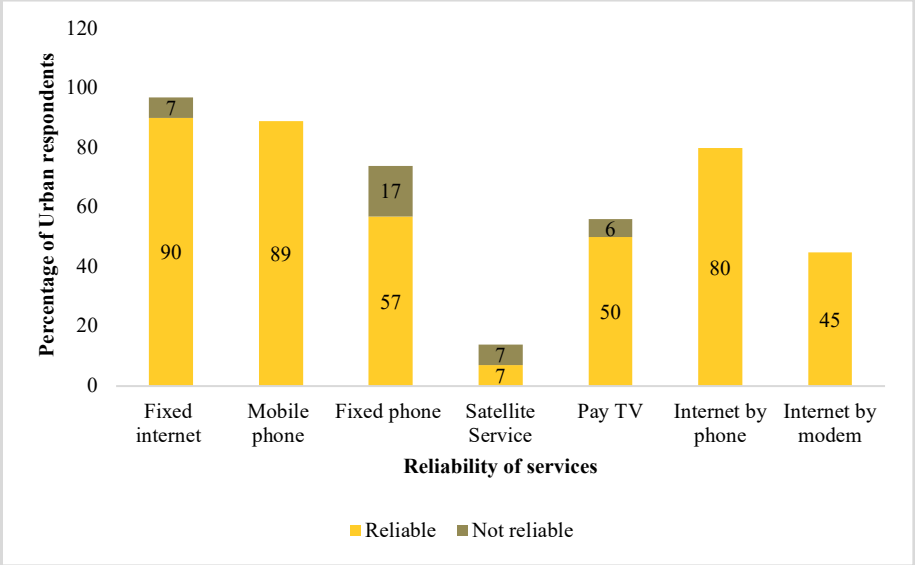

Figure 50. Survey: Reliability of services - Urban.

Reliability of services – RRR.

Generally, RRR respondents indicated their services were less reliable than Urban with the exception of fixed phone where 65% of RRR survey respondents indicated their service was reliable.

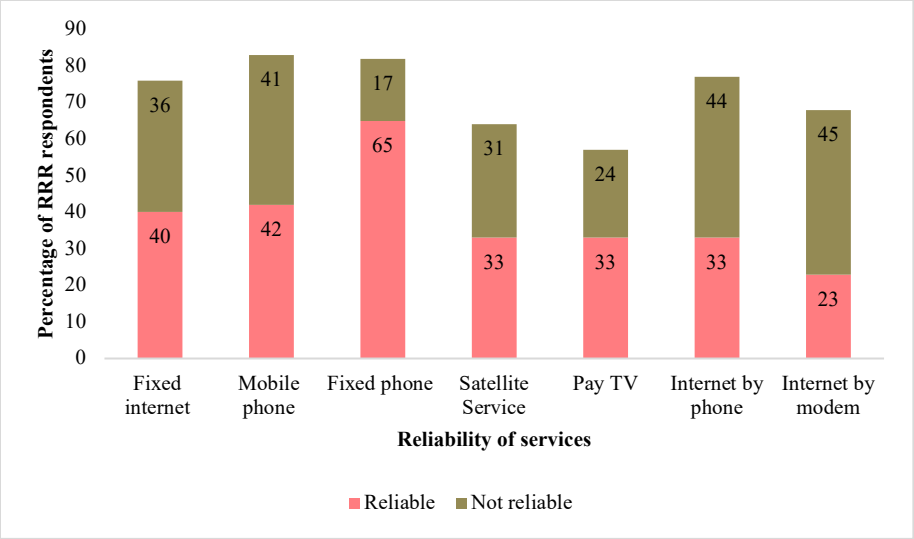

Figure 51. Survey: Reliability of services - RRR.

Conclusions:

In urban areas services used tended to be reliable with mobile phone services and fixed internet being highly reliable. In RRR areas there was a tendency for services to be considered unreliable. Indications about the reliability of satellite services are mixed and this is supported by the case studies. The survey did not differentiate between radio phones and other fixed phone services. The game changer has been wifi calling particularly for people in RRR areas using satellite or fixed wireless services. These services are providing better voice services through internet than fixed line services (eg radio phone, ADSL).

In future research, these two services should be differentiated. Case study participants clearly indicated radio phones were unreliable and often of poor quality (ie unclear). ***However, it was essential to have two different telecommunications technologies available, so if one technology failed, they had another that could be used for general communications, reporting the fault and for emergencies.***

Case studies: What telecommunications are working well?

Of the 12 case study participants, 11 indicated that at least some of the telecommunications services worked well for them.

Figure 52. Case studies: "What's working well" word cloud.

The word cloud is an indication of the frequency of each word. Words under three letters were not included.

The most positive comments (18) were about NBN SkyMuster. Given that only 5 of the case studies were people that had SkyMuster as their primary source of internet, this is a positive indicator. Some of the positive comments about SkyMuster and using wifi calling are:

> *"SkyMuster very stable – phone drops in and out a lot. I use my wifi calling more than the landline."*
>
> *"My daughter livestreams 6-7 hrs a day and we haven't had a day that it (SkyMuster) hasn't worked!"*
>
> *"We even had storms here the other day, and storms at the other end and we didn't lose connectivity at all!"*
>
> *"Internet is really reliable and now that we have wifi calling its fantastic".*
>
> *"I use video conferencing often and very rarely do I drop out."*
>
> *"SkyMuster on the whole is fairly reliable – doesn't break down for days at a time like ADSL. Mobile is good, we're lucky. We're picking up the main highway coverage."*

There were 9 references to mobile phones working well, but there were some qualifying statements about internet generally:

"When the internet is working well, its fantastic!"

"All the features that I use except when reception drops out. Everything really works well."

"We're happy with the phones, but not broadband (ADSL)".

"NBN tend to have short outages".

There were some positive statements about **ADSL**:

"Internet more reliable because of landline".

"ADSL good, mobile not good"

One case study participant had fibre to the premise:

"NBN connection continues to improve and surprise me!"

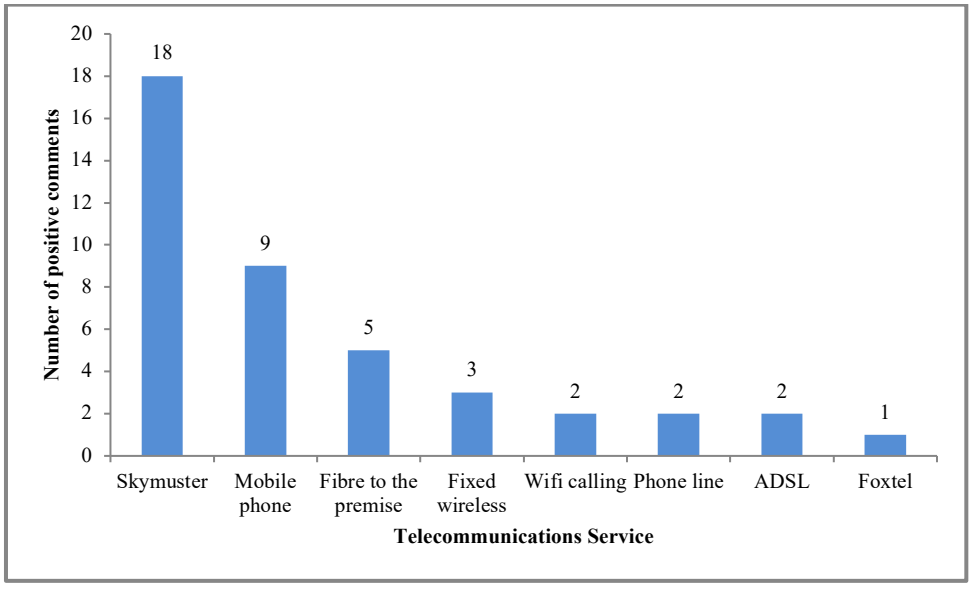

Figure 53. Case studies: Summary of positive comments about services.

Case study participants reported 18 positive comments about SkyMuster (5 case study participants). There was one participant that had fibre to the premise, 3 with fixed wireless and 2 with ADSL.

Conclusions:

Of the 12 case study participants, 11 indicated at least some of the telecommunications services worked well for them. The most positive comments were about NBN SkyMuster. Given that only 5 of the case studies were people whom had SkyMuster as their primary source of internet, this is a positive indicator. There were a number of positive comments about SkyMuster and using wifi calling: SkyMuster being stable, wifi calling being of better quality and more reliable that radio phones, SkyMuster working well even in stormy weather, the ability to do video conferencing with rare dropouts (SkyMuster), SkyMuster being "fairly reliable" as it does not fail for long periods, mobile coverage being good.

Given that the majority of case study participants were RRR, and only 5 used SkyMuster it is suggested **internet services by satellite can be relatively reliable**. However, there were also a number of comments regarding frequent drop outs, slow download and contention on

SkyMuster services. A number of case study participants reported being able to work from home because of the internet service.

Redundancy (Having two forms of communication: Wifi calling over internet, including SkyMuster, is a useful alternative (but not a replacement) for fixed line services such as the radio phones. Some participants commented that having 2 services (eg radio phone and satellite service) gave them a level of security. *"Having internet as back-up is good."* That, if one technology fails, they still can communicate with the other technology. There are concerns raised if participants lost the second technology *"If we moved to satellite phone – have some concerns. Now we have 2 different technologies, so that's good".*
For people in RRR areas, having access to two telecommunications technologies is of critical importance.

Figure 54. Mainoru store on the road to Nhulunbuy.

Mainour Store is the only source of supplies between Bulman and Nhulunbuy. The HCRC tower and various iterations of satellites can been seen on the roof of the store..

Types of video conferencing used.

Survey: There were a number of people (78) that did not use video conferencing, 71 were RRR and 6 Urban. From the survey results it can be seen that Skype (n = 102) and Facetime (n = 95) are more frequently used, and this is consistent with iPhones (n = 89) and iPads (n = 71) being more prevalent.

The case study participants were not specifically asked which video conferencing system they used, but were asked "**How do you use the internet?** Six of the case study participants reported they use video conferencing. This may be an underestimate, as many of the case study participants had smart phones including seven with iPhones so it is possible that a number of these participants used FaceTime or some other social-media based video conferencing tool. Some case study participants reported their internet was not adequate for entertainment and these people may not have adequate internet to maintain a video conferencing call. One case study participant owned a medical practice and used video conferencing for telehealth. They reported their ADSL sometimes was not adequate for video conferencing for telehealth resulting in failed telehealth or poor quality telehealth consultations.

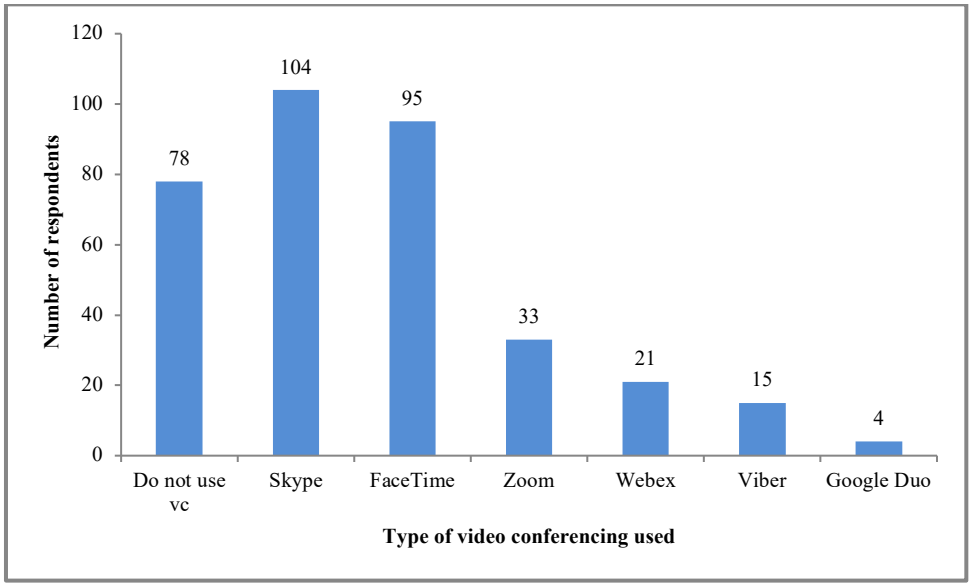

Figure 55. Survey: Type of video conferencing used.

Conclusions:

Approximately 70% of survey respondents used video conferencing with Skype and FaceTime being the most frequently used. The most frequently used devices for video conferencing were laptops, iPhones and iPads, followed by desktops, other smart phones and tablets. Half of the case study participants reported they use video conferencing. This may be an underestimate, as many of the case study participants had smart phones including seven with iPhones so it is possible a number of these participants used FaceTime or some other social-media based video conferencing tool. Some case study participants reported their internet was not adequate for entertainment and these people may not have adequate internet to maintain a video conferencing call. One case study participant owned a medical practice

and used video conferencing for telehealth. They reported their ADSL was not always adequate for video conferencing for telehealth, resulting in failed telehealth consultations.

Figure 56. NBN Co staff photographing the flight into a very remote community.
NBN Co staff are working with B4BA and the Northern Institute to improve access to internet based services in remote areas (B4BA, 2018).

Case studies: Fault rectification.

Figure 57. Case studies: Positive fault rectification word cloud.

The word cloud is an indication of the frequency of each word. Words under three letters were not included. In this case NBN was not mentioned.

Case study participants were asked "**If something goes wrong, what happens?**

Positive comments.

There were a total of 8 **positive comments** (although some had qualifiers included) to this question by 6 case study participants. These are summarised below:

> *"I call the service provider, but then call nbn local – then the problem is fixed."*
>
> *"We don't really have any problems. But I'm also fairly tech savvy so I'm able to deal with a number of problems myself."*
>
> *"With current provider only had to ring them once in a year."*
>
> *"SkyMuster – reported a number of outages to service provider – they are quite good. 4 days is the longest we've been out – they did something remotely and fixed it. That was a while ago."*
>
> *"I can email the RRadio support people – if you get someone good they get back to you in a couple of days and keep you updated…. I'm not too worried, but my husband gets very frustrated….Telstra RRadio people are very good… I do basic trouble shooting myself". SkyMuster: "At moment, I haven't had cause to contact them. If I did, I'd call them, tell them it's out and ask "what's going on?"*
>
> *"Have a pretty good relationship with Telstra."*

"No issues with phone, except with phone itself. It's with Telstra – they have the wider coverage…so happy except for the cost. Never had an issue with my phone on Telstra except the cost."

Of the positive comments 3 were referring to SkyMuster, (3 different people) and 2 were about Telstra RRadio (same person). Two case study participants indicated they contacted nbn local if there was a problem.

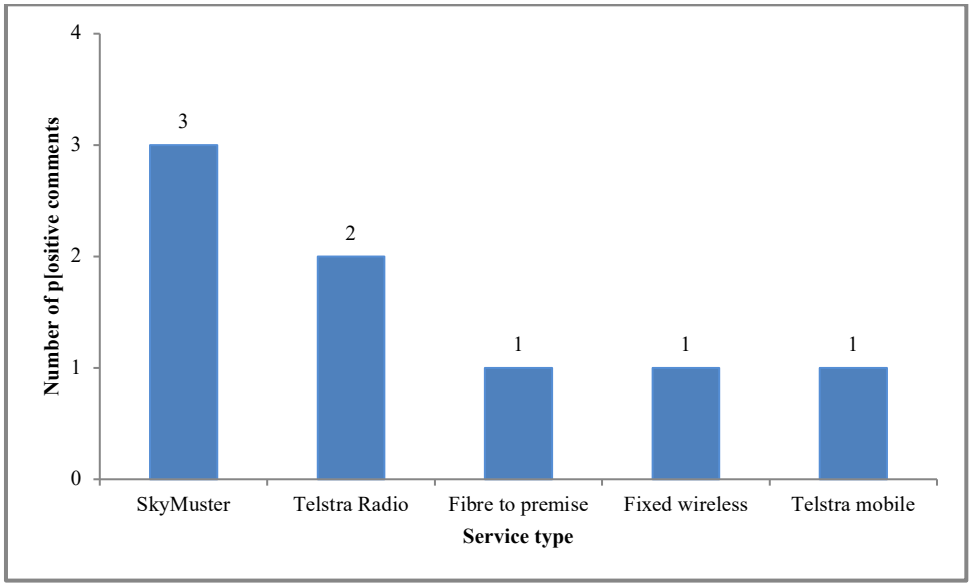

Figure 58. Case studies: Number of positive comments regarding fault rectification.
There was a total of 8 positive comments from 6 participants with 3 different people referring to SkyMuster and 2 (same person) referred to Telstra Radio. Two people reported they contacted nbn local rather than going through the RSP.

Negative comments.

There were a range of negative comments, most were about the service provision by the RSP (see figure below). Two participants reported that they had to resort to the Telecommunications Ombudsman to resolve the situation and another two participants advised that they contacted nbn local to resolve issues. There were 11 references to Telstra in this section of the transcripts.

Two participants reported installation and modem replacement issues with their NBN Fixed Wireless service/installation. One participant reported waiting for 24 hours for the new mobile phone service to be activated (Regional area).

Clearly, there are issues with the quality of service provided by RSPs.

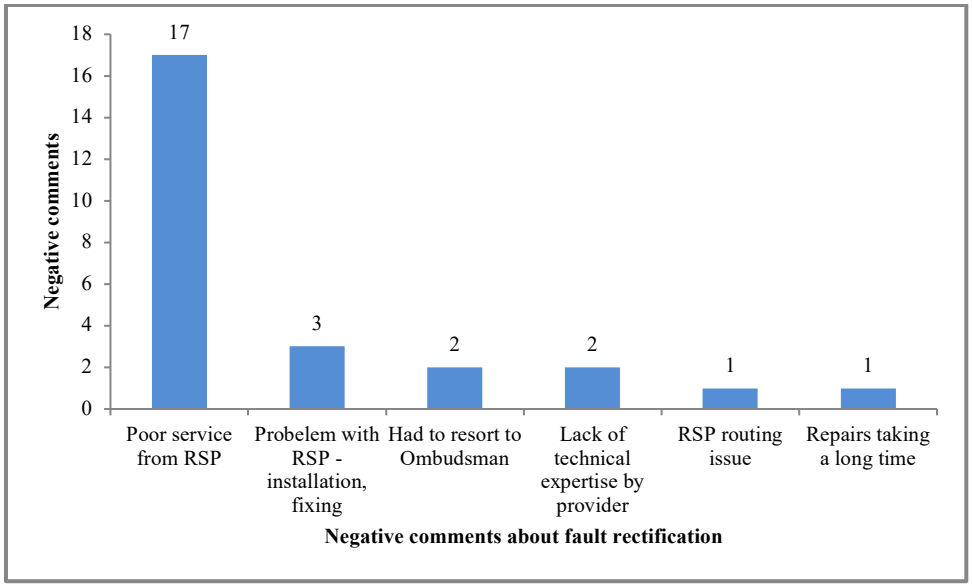

Figure 59. Case Studies: Negative comments on fault rectification.
There were 17 negative comments regarding poor service provision from the RSP, 2 participants reported using the Telecommunications Ombudsman and 2 participants contacted nbn local to resolve issues.

Figure 60. Case studies: Negative fault rectification word cloud.

The word cloud is an indication of the frequency of each word. Words under three letters were not included. In this case NBN was mentioned three times and would appear in small letters is it had been included.

The **interface with the RSP** was described as:

- Terrible.
- Stressful.
- Frustrating
- Hanging up on customer.
- Not returning calls.
- On hold a long time.
- Support centre only open Eastern states working hours.

Examples of **poor service** included:

- Making customer go through basic trouble shooting after they had already done those tasks.
- Not advising customer of the status of the job.
- Long time frames for repairs.
- Lack of response/follow through regarding reported issue.
- Not listening to the customer.
- RSP requesting speed tests when the internet was not working.
- Lack of technical expertise of the RSP.
- Needed to chase RSP to get the fault fixed.
- Methods of accepting fault reports not meeting with customer's needs.
- Having to resort to the Ombudsman to get the fault rectified.

Quotes and examples of poor fault rectification are outlined below:

> *"I call the service provider, but then call nbn local – then the problem is fixed. Still have the problem with the RSP about getting modem deliveries."*
>
> *"Interface with service provider is terrible."*
>
> *"I've given up trying to speak to a human so have to go to on-line chat. That's a problem if the internet is not working!"*
>
> *"Contacting the service provider is impossible by phone. Have resorted to on-line chat."*
>
> *"I usually take deep breath, call the help centre at Telstra - and that's usually frustrating. They ask me to go through the whole process…reboot the modem, the computer, etc. I know the drill, I know to check those basic things, but they don't accept the fact that I've done that trouble shooting. I have to do it all over again! I've been asked to run a speed test…and its been slow…and they ask why is it taking so long to download the page! I respond "that's why I'm having this conversation with you!" It's ridiculous! ….Sometimes it can be a week before its fixed…"*
>
> *"Standard procedure with ISP – starting a job – not reliable, stressful reporting faults…– its stressful."*
>
> *It very frustrating. If its the landline, I try to contact Telstra using mobile (prefer email or live chat). I don't want to talk to Telstra – they don't want to put information in email and they do not want to provide information. I have been to the Telecommunications Ombudsman about the poor service from Telstra. The situation was rectified after contacting the Ombudsman and I was happy with the result."*

"ADSL was out for about 2 weeks after the cyclone. It was 2 weeks before the ADSL was fixed. They're not technically competent. They kept asking me "are you sure your light is on?" and other basic questions which indicated that they were not technically skilled. They wanted me to stay on the phone while they tested the ADSL rather than ringing me back. It is dreadful service. I have to put my phone outside (to get reception) while I use the hotspot – its not easy."

"Phone – there's no phone communication at all. We usually have to wait anywhere up to 4-6 weeks to get it fixed."

"I usually get on to internet - go to Facebook, log a fault and give them a location and phone number or I'll email/wifi call family and they'll log a fault with Telstra. Often have to get family members to log the job for us. Usually they will ring whoever has logged the complaint, to tell them what is happening, and then they don't necessarily contact us. After 2 -3 weeks, we have to get a family member to ring up and find out what's going on. We're not advised in a timely manner about the progress on the repairs."

"My main concern is around customer service. Moved to iinet as I can call up and get a person on the other end who is technically competent. With the other service I had (Optus) got an Indian call centre and the guy didn't want to listen to my problem – asked me how many internet connected devices I had – told him 20 and he literally screamed at me! I recorded it. He also accused me of running an illegal business. I asked to speak to a manager who also yelled at me for running an illegal business. I tried to explain that we live in the world of IoT and have a lot of devices connected. After recording this I politely hung up. I called back and kept asking to speak to an Australian until they put me through to one. I played the recording and they offered me a full refund – which I took. I then moved to iinet."

"Telstra reporting on faults is an issue…if you're a rural or priority customer – …they instruct us to ring them…but we can't because we can't use the landline and don't have any other phone service to ring them on! There needs to be an online fault report capability so we have another method for logging a fault. Have reported a fault on a Thursday and still haven't had an acknowledgement the following week. We need a different Icon in the system – they need to have an alert on the system, so they can action that fault report immediately instead of 4 days later. If someone dies because Telstra aren't picking up on the fault – Telstra would be liable."

"Landline…is more trouble. Reporting is an issue. ..the system doesn't allow priority customer logging of jobs via email/web."

Conclusions:

Fault rectification is a major issue with case study participants reporting experiencing poor service from Retain Service Providers (RSPs) and two resorting to the Telecommunications Ombudsman. A third indicated they knew of two local cases where issues were only resolved by the intervention of the Ombudsman. Two case study participants reported by-passing the RSP and going directly to nbn local. Dealing with RSPs by phone is difficult, stressful and frustrating and some participants indicated on-line chat or email is a better mechanism for getting a fault logged. Generally, RSPs failed to keep customers advised of progress on their issue with one participant indicating they needed to continually chase the RSP (Telstra) to get faults rectified. Response times for rectification can vary with RRR people sometimes waiting for up to 6 weeks for their fault to be rectified.

The **interface with the RSP** was described as:

- Terrible.
- Stressful.
- Frustrating.
- Hanging up on customer.
- Unresponsive ie not returning calls.
- Time consuming ie on hold a long time.
- Unavailable ie support centre only open Eastern states working hours.

Examples of **poor service** included:

- Making customer go through basic trouble shooting after they had already done those tasks.
- Not advising customer of the status of the job.
- Long time frames for repairs.
- Lack of response/follow through regarding reported issue.
- Not listening to the customer.
- RSP requesting speed tests when the internet was not working.
- Lack of technical expertise of the RSP.
- Needed to chase RSP to get the fault fixed.
- Methods of accepting fault reports not meeting with customer's needs.
- Having to resort to the Ombudsman to get the fault rectified.

The most frequently named providers were Telstra and NBN. However, apart from the two case study participants who went to nbn local directly all of the others were dealing with an RSP. In most cases this was Telstra. In one case, Telstra provided a contractor with the wrong phone number for the customer, when Telstra were contacting the customer on the correct number. One case participant reported very negative experiences with Optus. The exception was Telstra RRadio service which one case study participant indicated was good due to having a dedicated contact person to support that service.

There are a number of layers between NBN and the RSP with contractors being employed by both the RSP and NBN. Clearly, nbn local is making a difference in getting positive outcomes for consumers, however, this service is not available for non-NBN products.

There is clear evidence fault rectification is a major issue and there needs to be some action to improve the customer service by RSPs. Many people continue to struggle accessing support to troubleshoot problems. People do not know who to contact and are often not informed of the progress of their issue rectification and not knowing if it is the responsibility of the wholesaler (eg NBN/Telstra/Vocus/etc.) or the RSP to rectify their issues. The evidence suggests the need of a centralised point of contact so consumers can access assistance in a timely manner. This will alleviate consumers' dissatisfaction, improve efficiency and significantly reduce number of complaints. It is recommended specialised teams be established based on the common types of issue raised by end-users to act as an information conduit and mediator. That is, a case manager should systematically be allocated

so liaison between wholesale providers (eg Telstra, NBN Co) and RSPs can occur and accelerate resolution of issues on behalf of the consumer. B4BA is of the view that nbn local is well placed to fulfil this role in the case of NBN issues, however, many other service providers such as Telstra and Optus do not have a similar system in place. If all telecommunications providers resourced a solutions-based body similar to nbn local, service issues could be dealt with in a less stressful and more timely manner, without resorting to the ombudsman.

Figure 61. Taking telehealth equipment to Laynhapuy Homelands.

David Murtagh wondering where to put the final supplies for a trip to Laynhapuy Homelands when loading in Katherine.

Case studies: Issues raised about telecommunications.

There was no specific question asking participants about issues they had with their telecommunications services. However, through the interviews case study participants raised a number of issues and these were collected and coded with NVivo. A summary was then produced manually.

Quality of telecommunication services. – technical, not RSP service provision.

There were issues raised about the coverage, reception, slow speed, contention, reception and drop outs. These were grouped together for each type of service. The results of this analysis are presented in the figure below. There seems to be very high levels of concern about the reliability and performance of radio phones. One remote faming participant stated:

> *"when its raining, phone doesn't work. Phone is crap. Tonight we have a good line, but usually its sounds like its 10ft under water and drops out."*

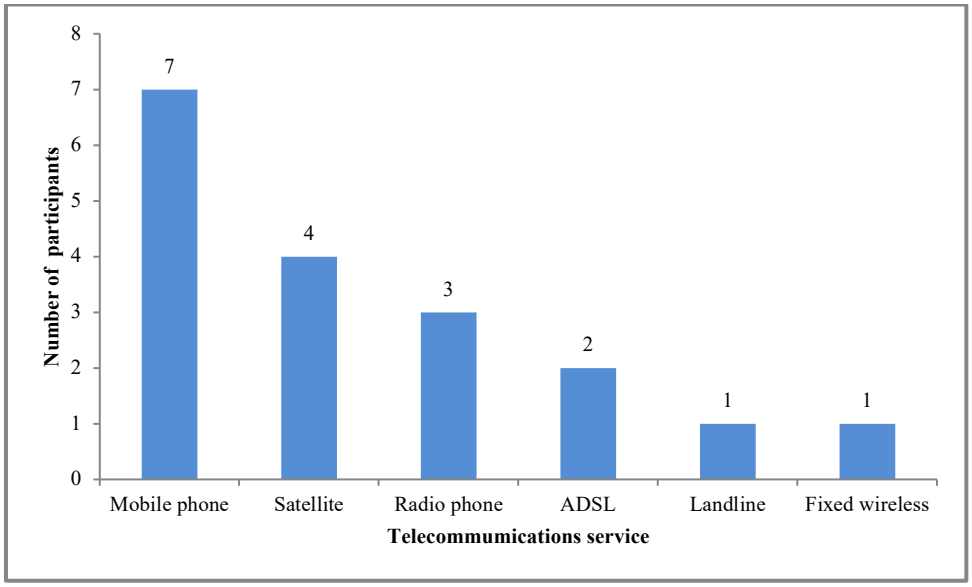

Figure 62. Case study: Poor quality services.

RRR people rely on their communications services and can be isolated if their communications fail and therefore unable to seek emergency or support services.

A number of case study participants emphasised the importance of having at least two different technologies available to them:

> *"Internet – we have nothing to the outside world if both go down together. Sometimes both go down."*
>
> (referring to radio phone and SkyMuster).

There were a number of other issues reported by case study participants. These are listed in the Table below.

Table 2. Other issues reported by case study participants.

Other issues reported by case study participants
Access to telecommunications services
Additional data allowance for special needs people
Backhaul
Bad History
Customer guarantees
Data limits and management of limits
Installation of services
Inability to receive SMS messages via wifi calling
Inaccurate information from Telstra
Keeping email addresses when changing RSPs
Lack of information
Lack of SMS on wifi calling
Lack of technical knowledge by RSP.
Latency
Monitoring of priority customers
Power outages
Quality of service guarantees
Seasonal contention issues
Services in emergency situations.
Unexpected fault repair costs

More details about some of these issues are outlined below.

Access to services.

There were a number of issues raised about access to services including:

Inability to get bundle because consumers were not in a mobile area: Telstra would not provide this regional couple who have 2 mobile phones and a landline with the opportunity to obtain a bundled service because they were not in an area with mobile phone coverage.

***Lack of options*:**

> *"This area would be suitable for wireless broadband but in the end the provider advised that "If you want to be connected need to have satellite dish - SkyMuster". We don't have a landline as we cancelled this after SkyMuster was installed. The deal was that we had to give up the landline and move to internet/phone – it was cheaper. The land line phone was very expensive to have stand alone."*

Additional data allowance for special needs people.

> *"We have an autistic grandchild in the family and he is brilliant in IT/communications. Being on-line is his life! If he can't use the tools available to him on-line he is cut off from*

the world. He can't do the things he needs to do to develop. He can't cope with classroom situations but does very, very well on-line."

Concerns about the longevity of services.
All of these examples come from regional or remote people.

Radio phones: *"The life of the technology for HCRC phones is coming to an end. Landline infrastructure only has approximately 5 year life span left. In 5 year's time major failures are expected. They won't be setting up any more radio phones. Working on replacement system, but don't know what they are and if it should be better."*

Landlines*: "28 Faults on the line in 2012 – it was lead cabling – not copper – so probably pre 60's technology."*

Future of NBN: *"We have been told by Politicians NBN is the 'be all' and 'end all' (what you've got now is what you will have – there's no other plan for the future)."*

Concern regarding migrating to a satellite phone: *"If we moved to satellite phone – have some concerns. Now we have 2 different technologies, so that's good."*

"Have neighbours down the road who are just as remote, they had clicking on the line all the time – their phone was replaced with a satellite (with dish) phone. Sometimes the longer the conversation the less the delay – but there is a delay, then you talk over each other, its ok, but very annoying."

Costs.
A number of case study participants referred to issues related to costs of services. Case study participants were also asked: **Do you think these services are value for money?** This is addressed in the Affordability section of this report.

Backhaul in Australia.

"The problem now is our backhaul – connecting to other countries and our overseas cables.
Our systems are routed through Guam – behind states firewall in Guam – we (Australia) can't afford our own firewall – we don't have our own internet management system.
Google has bought a lot of the under-sea internet backbones (100 year lease). But don't own Australia – Guam cable. Cheaper for Australia if Google buys and then manages those assets. If legislation comes in restricting what it (Google) does, it can move out on to under-sea cables in international waters."

Emergency services.
Emergency services basing location on ISP rather than customer's location:

"When I google information about fires– the ISP is based in Sydney…so it assumes we are in NSW." I raised this issue with Emergency Services WA – tells where bush fires are in the area. Whenever you go on satellite – it flags location as NSW – and

reports there are 'no fires in your area. This is a problem with satellite. Both operators we've had based your address where the server is, rather than where we actually are! ***Emergency services 000 – we need to make sure that the address is the real address not where their internet service is."***

Communications in bushfires:

"If we have bushfires and we have power outages we can still use iPads on SkyMuster to make calls with a phone app. We often lose phone towers in bushfires. As long as we have electricity and SkyMuster is working we can get fire and weather updates as well as making calls. In large fires there's a lot of phone usage so can be difficult to get connected. If we go into the city and use iPads on free WiFi so that's our backup plan in an emergency. If SkyMuster isn't working, we use data from phones (hot spots)."

History of poor service, information and access.

A professional woman in a rural/regional area more than 50 kms from the regional city:

"A lot of problems in the past. After many years of asking for internet from Telstra– told it was possible, then it wouldn't be possible. Have been trying to get hooked up for 10 years! I lost confidence. It took a friend to advocate on my behalf with her technical knowledge to refute their statements. A lot of problem solving involved. It took intervention from Regional Manager (nbn local) to get connected to fixed wireless. It was an adapted model. Took a lot of patience and someone with know-how and persistence as I didn't understand nbn and telcomms. So I would have given up."

Inability to receive SMS messages via wifi calling.

"This is a problem as we are often required to receive a SMS message for security and verification purposes – so this is a serious issue for us. We're not the only people complaining about this issue. It came up at a recent conference. iMessage may work sometimes, but ordinary texts do not."

Inaccurate information from Telstra and the consequent poor mobile phone coverage.

"One of the local towers was only facing 2 ways (North/South Tower)…but supposed to be 360 degrees. Telstra said that it wasn't supposed to be 360 degrees! Telstra said they weren't going to do anything about. I did 3 years of chasing to get it rectified! I'm in the fire brigade and many people complained about the range of the tower…but something had to be done…and I usually follow up for the community."

Installation of NBN SkyMuster and associated communication and safety issues.

"The installation was a pain. SkyMuster installers were given a list of places to go – and they weren't grouped into an area. Another property had 4 different installers to do 4 installations on the property! That is, installation was not coordinated. That's wasted time, fuel, and there were more people on the roads. There were also cancellations. We had 3-4 cancellations over 6 months. They'd say they'd be out next week…but then the appointment would be cancelled. We had someone come to do the installation from a coastal town in another state. They came out in a 2 wheel

drive ute. We weren't told what sort of vehicle they would be travelling in, no communication with them about specific road issues in our area. We should have been able to contact the installers directly so we could explain about crossings, etc and keep in contact with them for safety reasons. They were not told of the road conditions they were traversing across. Logistically the installations were not well planned (the installation was done in 2016). A lot of people complained about the installation process."

Latency.

Latency is the delay due to the time it takes for data to get to where it has been sent. Satellite internet is generally described as highly latent because it takes the data about half a second to travel 36,000kms to the satellite orbiting the earth and back. The round trip on this journey is about 72,000kms. Internet services using ground-based fibre, cooper or radio signals may only need to travel hundreds of kilometres.

Latency is an issue for high end video conference, telehealth and VR gaming.

Lack of information provided to customers.

"We are not informed regarding all the alternatives available – people need to be more informed about these. These no collective person that you can talk to regarding what's available in your local area."

Monitoring of Priority Assistance Customers in rural areas.

"IoT – could possibly be used for fault reporting…Telstra don't monitor lines to see if they are working…it's a big issue in rural areas…you could put IoT modem on last customer on line…could pick up a fault…Telstra would know if their phones are working – would cover Telstra legally for Priority Assistance customers. Priority assist could be easily fixed…with IoT. If they did a pulse test down the line they can tell where the fault is – eg so precise it can pick up to a meter away from the house."

Quality of services (QoS) guarantee.

There are concerns about QoS guarantees, including in relation to preferencing between satellite and 5G services as well as:

"What guarantees can be provided for us as consumers?"

Conclusions: The issues raised by participants included:

- Poor quality of telecommunications services with respect to reliability and performance.
- Poor fault rectification processes.
- Contention issues at peak times and where the local population increases with seasons.
- Access to telecommunications services.
- Data allocation limits and the need for additional data allowance for people with special needs.
- Problems with the installation of services and accessing the most suitable service.
- Lack of backhaul infrastructure.

- People experiencing long term poor service (in one case study – for 10 years), poor information and incorrect information provided by RSPs.
- Concern over the enforcement of consumer and quality of service guarantees.
- Poor technical knowledge by RSP.
- Inability to receive SMS messages over wifi calling.
- Poor latency/ping.
- Monitoring of priority customers.
- Performance of services and lack of accurate information in emergencies.
- Monitoring and fault lodgement for priority customers.

Figure 63. David Murtagh and John Kelly at the NBN Discovery Centre.

David Murtagh (Research Fellow, Northern Institute, Charles Darwin University) and John Kelly (GP/Physician, Laynhapuy Health Service) at the NBN Discovery Centre evaluating learning more about NBN services and some diagnostic tools on display.

Case studies: How can telecommunications be improved?

NVivo coding resulted in 39 comments and suggestions regarding improvements to telecommunications.

Figure 64. "How can telecommunications be improved?" word cloud.

The word cloud is an indication of the frequency of each word.

There is a high focus on internet throughout the study with one case study participant stating, "Internet is the primary communication tool". It is evident from the survey that people are using a variety of tools on the internet and moving towards using internet for voice communications as well (eg wifi calling and video conferencing such as Skype and FaceTime). One case study participant summarised:

> *"Every device becomes a multi-device once connected to the internet."*

Two case study participants suggested that a minimum connectivity allowance should be made available to all citizens, with people who needed increased allowance paying for them. It was suggested that a Medicare type system be established to do this"

The five most frequent suggestions for improvement are listed below. The number of references to each factor are indicated in brackets:

- Improve speed and bandwidth (19).
- Improve reliability (11).
- Improve upload ability (7).
- Better governance/management (7).
- Reduced costs (6).

From these data it is clear that reliability, speed and bandwidth (including upload ability) are key factors in improving telecommunications. Governance/management and affordability are also areas that need to be improved to ensure better telecommunications services.

One case study participant suggested that fibre can be upgraded as cheaply as mobile and that there are a number of issues (including increasing rates of cancer) if we 'push the mobile network further'.

New technologies: It was suggested that more investment should be made into light technologies rather than mobile phone.

> *"**Light based – ie fibre is in its infancy** – we're just starting to explore what's possible. Data transmission and speed in theory could connect entire world with a ping of under 100!"*

It was also indicated that the future of satellite is low **orbit satellite and mesh grid satellite networks**.

> "*Access to big data and real-time spatial technologies "could make a real difference in productivity for Australia – especially making use of Australia's remote areas".*

5G Network vs high speed fibre: Requirements for high end video conferencing and VR gaming: It was reported that the "super speed 5G network" will be unable to support VR gaming because ping is wireless based. Therefore, a solution will need to be found for VR gaming on the mobile network if it is to be the primary internet source.

Case study participants advised that telecommunications can be improved by:

- Improving quality, consistency and reliability of services including upload ability. These are clearly the primary issue for both RRR and Urban people.
- Fault rectification processes need to be improved.
- Improving access to services – equity in access to service and provision of accurate information.
- Increasing data allowance, including increased allocations for people with special needs.
- Addressing longevity of services particularly in relation to radio phones and NBN.
- Providing RRR people access to 2 different technologies, so if one fails, they still have some form of communication to report the fault, maintain communication and for emergency situations.
- Ensuring emergency services being advised of the caller's real location, not the RSP's location.
- Better governance/management.
- Reducing costs.

A minimal standard of internet should be made available to all citizens
"NBN is socialism with front facing capital skin!" Like Medicare – only works if everyone is forced to buy in. Cannot replace with provider product and expectation. Everyone needs to contribute – its huge. NBN needs minimum level of connectivity (bandwidth) for citizens and government services – need access to a basic service for everyone. Wouldn't mind if there was a levy like Medicare – and if a person wants better services they pay extra. This is a digital inclusion conversation." "Costs too much especially for people on communities – are governments going to fund it?…for the wider community? It can't be provided for free because Telstra would go under…ACCC should look into this."

Conclusions:
Telecommunications can be improved by:

- Improving quality, consistency and reliability of services including upload ability. These are clearly the primary issue for both RRR and Urban people.
- Fault rectification processes need to be improved.
- Improving access to services – equity in access to service, provision of accurate information and the availability of at least two different technologies are required.
- Increasing data allowance, including increased allocations for people with special needs.
- Addressing longevity of services particularly in relation to radio phones and NBN.
- Providing RRR people access to 2 different technologies, so that if one fails, they still have some form of communication to report the fault, maintain communication and for emergency situations.
- Ensuring emergency services being advised of the caller's real location, not the RSP's location.
- Better governance/management.
- Reducing costs.

Minimum standard of internet service provided to all citizens: It was suggested that a minimum standard of internet connectivity be made available to all citizens and publicly funded. If other consumers want improved connectivity, they can purchase products to meet that need. It has been recommended (eg B4BA, 2017, 2018) that a number of services such as access to government, health and education services be un-metered. ***This would allow all citizens to access basic services regardless of financial capabilities.***

Telehealth Services.

Telehealth services use information and communications technologies (ICTs) to deliver health services. It is possible to use video-conferencing to talk remotely to a doctor, therapist or other clinician. Instead of having to travel to a major city to see a doctor or therapist, an increasing number of patients are using video-conferencing.

The facility may be offered by a local GP or local healthcare clinic. It uses cameras and diagnostic tools to transmit sound, images and information from the patient to a clinician somewhere else. In this way people in remote locations can access specialist diagnostic and treatment services without having to travel long distances.

There are a variety of Australian, internet based, and Medicare funded health services available.

With the publicity surrounding the implementation of My Health Record it is not surprising that the public are becoming more aware of electronic health systems. Over the three previous years, the B4BA Forum has held Telehealth Workshops so it may be that the survey and case study participants are more aware of telehealth than the general public. People involved in the B4BA network may also be more aware of telehealth than the general public due to communications and information provided to network members. This is consistent with results from the case study where 8 of the 12 participants were aware of telehealth.

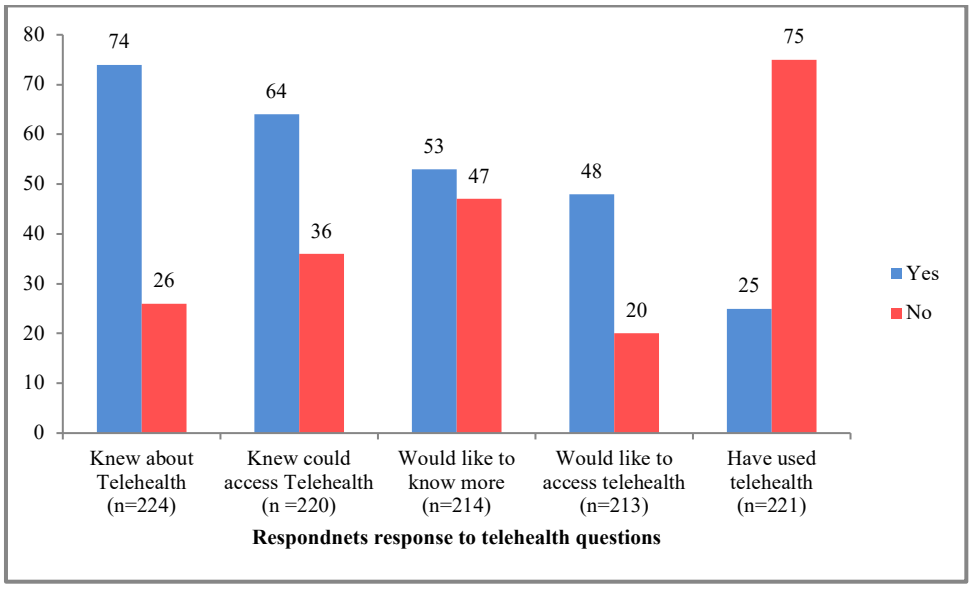

Figure 65. Survey: Summary of responses to Telehealth questions.

The figure above shows the results from the telehealth questions in the survey. These questions were:

- Have you heard of telehealth services?
- Do you use telehealth services?
- Tell me about your telehealth experience?
- Would you like more information about accessing telehealth services?
- How can access to telehealth be improved?

Knowledge and use of telehealth.

From the survey it seems that the majority (74%) of respondents knew about telehealth but only 64% knew they could access telehealth. Case study participants were asked: **Have you heard of telehealth services?** Some case study participants did not know about telehealth before being contacted for this project or through other B4BA activities. It would be useful to do a survey of the general public to gain an understanding of the public's knowledge of telehealth and their ability to access it, especially in RRR areas. Case study participants were recorded as knowing about telehealth unless they specifically indicated they did not know about telehealth until the case study processes. (People that identified they would be prepared to be participants in the case study were sent information about the project and the interview questions before the interview.) A number of case study participants had been involved in B4BA activities (in particular the Forum held in Darwin in 2018) and had become aware of telehealth through those activities. These people were recorded as having known about telehealth.

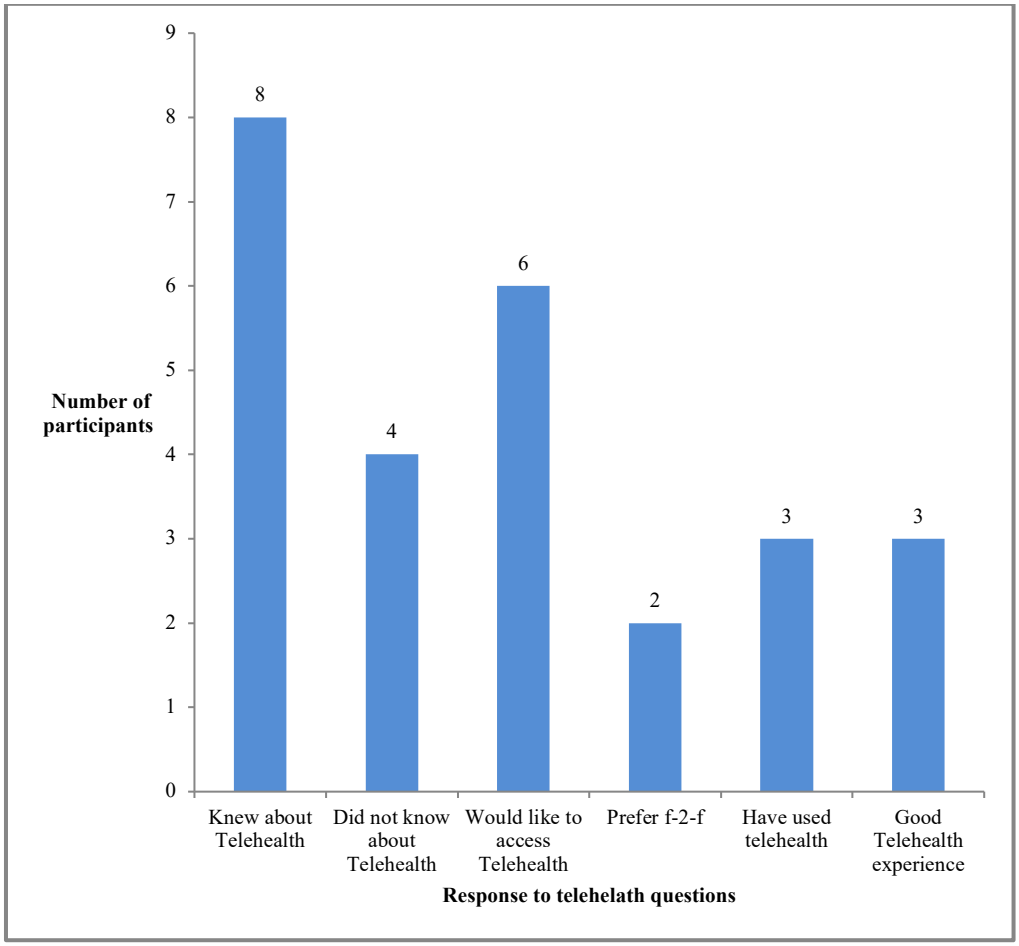

Figure 66. Case Studies: Responses to telehealth questions.

Case Study: Responses to telehealth questions.

Two-thirds (8) of the case study participants knew about telehealth and four did not. The quote below captures some of the sentiment expressed by the cohort of participants that did not know about telehealth:

"No, not before I read the information sheet about this research from you. Then I Googled it and America uses a lot of telehealth. I feel that we should be able to access our own doctors using telehealth. It would save going to town (very significant drive especially if you are unwell). When you feel sick – you need to get yourself up and drive into town. I also see specialists in town. It's a safety issue driving when you are not well. We're still in drought and didn't know that we might be able to see a GP by telehealth and have it billed to Medicare. I posted the information about the web based fee for service GP on our community Facebook page and people were thrilled to know that this option existed. More needs to be done about telehealth."

Of the survey respondents 25% reported having used telehealth. From the case studies, only 3 participants had accessed telehealth, all being RRR and all had good experiences with telehealth. Two of these participants had accessed specialist services in major cities. One case study participant stated:

"*Pretty happy – just want it to work!"*

This participant had positive experiences with telehealth and had approached two specialists interstate to access telehealth, but both refused. The third case study that used telehealth was a couple running a medical practice in a regional town. Telehealth was a day-to-day model of service delivery for that practice. Of the 9 case study participants who had not used telehealth, 6 reported they would like to access telehealth and two indicated they preferred face to face consultations. One of these was based in a large Urban area and the other in a regional area with access to services in a nearby large regional town (50,000 people 100 kms from their farming property). This participant indicated that they had good medical services in their local towns. The participant did not seem aware that there is a well established emergency telehealth service in that state (WA) and may not have had cause to use those services.

Some participants provided insightful examples where telehealth could improve health services delivery, patient safety and reduce travel.

"Would be great for migraines. Getting scripts and medications. When have a migraine, have to call up the GP - he knows me and will provide the relevant script, but it's a long way to drive to the GP when you have a migraine. If I could do the GP consult at home and then have the script sent to the pharmacy, I could possibly pick up the script (pharmacy is a lot closer than the GP) or organise someone to pick up the script for me. Its getting to the GP that's the problem – it's a long way."

"Son had a knee reconstruction – I had to take a week off – drive 9 hours to town and back. So 3 days round trip each time we had to go into town for a follow up appointment with doctor or with allied health."

"It should be a compulsory thing for us all to have access to. We have an Indigenous community with 4 nurses nearby…even though they see to our needs, they have a big enough workload with the Indigenous community…we're not seen as a priority… We could use telehealth to save travelling to GPs and specialists. For me to go to the city…have to drive, then fly, stay overnight. I usually book a few extra days before….I lose a week over the working week. Have up to 10 staff – they often need scripts. That means I have someone go all the way into town for a 5 minute appointment!"

Improving access to telehealth.
Case study participants provided a number of suggestions for improving access to telehealth:

> *"Telling people about it would be useful!"*
>
> *"Having a pool of specialists/GPs, hearing, eyesight, early childhood specialists. Getting on email/website and organise a video conference would be very useful. That would be incredible for remote cattle stations or any remote people."*
>
> *"Would be good but I don't know about it. I'm under a specialist as well as GP. The specialist is wonderful. Will ask them about the option to do consult via internet (would save a trip to town)."*
>
> *"Telehealth should be free for communities and rural people."*
>
> *"Access to telehealth could be improved by having willing, distant doctors who are motivated to form relationships with communities and be available."*
>
> *"Support for the patient end, coordination, facilitation and a clinician at the patient end. This allows the patient and distant doctor to know what is happening. It important that there is support for communities to take up telehealth at the patient end."*

Suggestions from case study participants:

Emergency 000 calls – improving triage and reducing ambulance call outs:

> "Being on a video conference rather than phone - 000 would be much better – the person could see what was going on using Telehealth! Would be a much faster service – they wouldn't have to ask so many questions to work out what is wrong with the patient! The person calling 000 is often distraught and panicking - diagnosis would be much more accurate and faster using telehealth – they don't have to ask the distraught person what's going on, while their person is dying! Person panicking wouldn't necessarily be able to listen because they're panicking. If we used telehealth there would be a lot less waste of ambulance services. Services talking to each other would be good! Would be a lot less Ambulance calls out as the videoconferencing would provide better information."

Telehealth app on phone for homeless people with medical conditions.
One rural regional participant suggested that there should be mobile phone applications to support homeless people with their medical conditions and linking to a video conferencing support facility:

> *"What about people that live on the street? – all they've got is their phone…if they had a medical condition there should be an app on their phone to videoconference to whomever they need to."*

Funding Telehealth.

It was suggested by a number of case study participants that telehealth should be publicly funded:

> *"Telehealth should be free for communities and rural people."*

"In remote Aboriginal clinics they already have a heavy workload eg having to deal with emergencies, etc. So the patient end needs to be resourced properly for telehealth to work."

Figure 67. Video conferencing in use in local health clinic.
In this case, video conferencing was used to trouble shoot ICT issues. Telehealth required significant ICT support resources.

Telehealth and Medicare.

Almost all (98%) of survey respondents indicated that telehealth should be Medicare billable. Case study participants were not asked about Medicare but a number made comments in reference to Medicare. A rural/regional person (greater than 50 kms from a major regional centre) indicated that telehealth should be linked to bulk billing. Another RRR participant indicated there should be more Medicare item numbers for telehealth:

"Most of the issues are around the Medicare number availability not the technology. Especially for regional and remote. We need to ensure a government supported model that can make a real difference. Consults should be bulk billed and work with a couple of good researchers on pilots."

The same participant also raised the issue about the training requirements for clinicians delivering telehealth:

"To qualify to get Medicare Telehealth item numbers – the clinician needs to do 1 week training course – and who is going to pay for that week of training? Need to do a whole week to be registered to do telehealth and get Medicare!"

One last message about ensuring telehealth is successful from the couple that ran a medical practice in a small regional town:

> *Telehealth is disruptive to the clinic. More funding for local services for support staffing is needed - this is really important. It's the difference between failing and successful telehealth. If you want it to work it has to be coordinated. Hospitals have a huge mandate to provide telehealth, but doesn't matter how well resourced the hospital end is, for it to work you need to resource the patient end. A lot of places haven't understood that resourcing need"*

Telehealth conclusions.

Awareness of telehealth: With the publicity surrounding the implementation of My Health Record it is not surprising the public are becoming more aware of electronic health systems. Also, B4BA Network Members have been participating in the annual B4BA Forum and the last three Fora have had Telehealth Workshops, so generally, people involved in the B4BA network may be more aware of telehealth than the general public. Approximately three quarters of survey and case study participants were aware of telehealth.

Use of telehealth: Approximately 25% of survey and case study participants reported using telehealth.

Would like to use telehealth: Approximately half of survey and case study respondents would like to use telehealth services.

Funding of telehealth services: Funding of telehealth through Medicare was strongly supported. Additionally, the current funding model does not provide patient end support and this should be rectified to increase equity of access to services.

Benefits of telehealth: Telehealth can generate savings from reducing travel, reducing time away from home/work as well as other associated expenses. There is an issue about clinicians being able to charge telehealth services to Medicare. In some cases, although savings were made in terms of travel and time, the cost of the consult was not billable to Medicare and therefore was an additional expense. Telehealth may also improve diagnostic capabilities. One case study participant reported that Australia has poor diagnostic capabilities with respect to cancer: "*Diagnosis in Australia is quite poor generally – often don't detect cancer."*

Barriers to accessing telehealth: Many of the survey and case study participants were unaware they could access telehealth services. There were also a number of barriers identified in the comments from survey respondents: Inadequate internet service and data allowances, consultations not being billable to Medicare, some clinicians (including specialists) not providing services via telehealth, freeing up the ability for clinicians to provide telehealth from a regulatory perspective and the lack of funding for patient end support. The most frequently mentioned barrier was the lack of adequate internet. It is also clear there is a lack of Medicare item numbers for telehealth consultations (including GP consultations), and this is a major barrier to uptake to telehealth.

Increasing access to telehealth:

Increasing access to telehealth services can be assisted by:

- Improved internet connectivity to meet the requirements of video conferencing.
- Educate the public about its availability.
- Increase data allowances and not metering video conferencing and telehealth services.
- Increase availability.
- Assist clinicians to deliver telehealth without onerous training requirements.
- Increase Medicare item numbers.
- Fund patient end support.

Additional suggestions for telehealth:

- Using video-conferencing by **Emergency Services** could improve triage, management of emergency situations and reduce callouts.
- Telehealth phone **applications for homeless people** for management of their health issues with free access to a relevant video conferencing support system.

Figure 68. Yirrkala fire management.

Controlled burn off in Yirrkala with a full moon. Yirrkala is a very remote community with approximately 800 (primarily Aboriginal) people and a range of services including the Ranger Office, the East Arnhem Shire Council Animal Management Office, Laynhapuy Head Office, Art Centre and a number of homes. This is a 'cool' fire and lasted about 10 minutes. Telecommunications in this area have been variable. At about 11pm September 2017 the 4G internet speed test result surprised and pleased our research group with very good download and upload speeds..

Future research into telecommunications and telehealth.

Telecommunications.

1. How can fault rectification processes be improved thereby improving services and reducing stress to consumers?
2. How reliable are NBN satellite services?
3. How affordable are telecommunications services in terms of percentage of income?
4. Are people moving from fixed line services to mobile phones for the main communications services?
5. What impacts are data limits on SkyMuster services to RRR people?
6. How many RRR people in fixed the wireless foot print on nbn satellite services?
7. What are the speeds of the various telecommunications services and the variance between peak and off peak times?

Telehealth.

1. How widespread is knowledge about telehealth in the wider (public) community?
2. Can NBN satellite be successfully used for telehealth?
3. Can affordable and reliable diagnostic smart tools (cameras, sensors) be developed and integrated into small, remote communities?
4. Can solar power improve telehealth reliability?
5. Can simple solutions be developed for secure messaging using existing email infrastructure?
6. How do telehealth consultations between primary health care providers and specialists improve health outcomes for remote patients?
7. How can we empower patients to create polite demand for telehealth access?
8. Can real jobs be funded on remote Aboriginal communities sustainably by re-directing savings made by implementing telehealth and existing funding?
9. What support mechanisms are needed to maintain workforce sustainability for locally based administrative support staff?
10. What is the unmet demand for health services in the bush and how can health services increase service to people in these areas without increasing costs?

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Appendices.

Appendix A: Survey Report

Appendix B: Case Study Portfolio