The Multi-Layers of Digital Exclusion in Rural Australia

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Abstract

Despite many policy interventions, Australia's rural areas continue to be at a digital disadvantage. With the increasing penetration of information and communication technologies (ICT) into all public and private realms, there is a need to examine the deeply rooted digital divide and how it relates to multiple dimensions of infrastructure, services and demand in rural communities. This paper reports findings from a workshop with seven rural local governments from the State of New South Wales, Australia. The findings suggest that rural digital exclusion results from a multi-layered divide where elements of infrastructure, connectivity and digital engagement are intertwined.

1. Introduction

Australia, like many other developed nations, is rapidly moving towards a highly digitalised society. However, despite policy interventions, rural areas continue to be at a digital disadvantage. Many barriers make it difficult for rural residents and organisations to participate in and benefit from the growing digital economy. This paper presents evidence from rural Australia to outline components of digital exclusion.

Digital exclusion in rural areas arises from distance, density and population characteristics. Remoteness results in a delay in technology provision because the distance of the delivery site from dense urban centres raises the costs associated with providing infrastructure [42]. Furthermore, people living in rural areas are already disadvantaged by other social exclusion parameters such as age, income and educational level [14]. Potential users must recognise a need, see possible benefits and be able to afford new technology in order to adopt. However, rural residents often do not understand beneficial outcomes and lack the facilitating conditions of technology adoption [22]. These characteristics are often compounded with lack of infrastructure. While the first and foremost issue of digital exclusion is poor infrastructure, these other factors are important to address in order to facilitate digital inclusion.

This paper examines the multiple layers of digital exclusion in rural Australia that were identified from a workshop held with seven local governments[i] in New South Wales (NSW) and experts in the field. From the discussion, we were able to identify three layers of digital exclusion: availability, adoption and digital engagement.

2. Digital divides in the rural context

National level digital divide policies usually aim at equal provision of infrastructure in all geographic areas and to all segments of the population. Laying infrastructure where it may not be economically viable or providing easy access for disadvantaged groups are initial steps towards enabling digital inclusion. However, provision does not automatically lead to adoption. In order for connectivity to be beneficial, individuals must be able to engage in effective uses.

Beyond access, the way people use the internet can result in a second-level digital divide [23, 40]. The second level digital divide is a concept that captures the interplay between levels of access and the mediating role of existing socioeconomic factors that influence digital engagement. Even with the same type of access, divergent circumstances and uses may lead to yet another gap [37]. These divides can result from other factors such as motivation, skills, untargeted policies and the local environment [18, 22, 38, 41]. To better understand rural digital exclusion, we must examine the various divides that

exist or are emerging and how they relate to other circumstances.

Existing social exclusion factors interact with the digital divide, creating a double jeopardy among rural citizens and organisations. Moreover, disparities in service levels already experienced by rural communities may be further exacerbated as the digital economy advances. To implement effective intervention policies, further outreach programs such as public education campaigns must follow infrastructure development [29]. Rural communities must recognise needs and potential benefits, and acquire the necessary skills in order for connectivity to result in digital engagement.

Digital inclusion is the realisation of the potentials offered by internet access, and not just the basic act of connecting the population [39]. Therefore, we need an integrated approach to digital engagement that account for the interrelations between infrastructure, adoption and usage of ICT in rural areas.

3. Research objective and methodology

This study undertook a participatory approach by involving rural communities as research partners [2]. This participatory component empowers communities to achieve change through applying the evidence gained for the development of digital engagement at the community level.

A full-day workshop with seven local governments from the NSW Southern Inland region and experts in the field was held on 13 May 2014 in Canberra, Australia. Participants from the local governments included two mayors, one councillor, one general manager, five economic development officers, two information/system operators, one marketing officer and one corporate service officer (N=12). For the purposes of anonymity, the participants' comments in this paper are labelled as L1~L12. In addition to the local governments, two officers from Regional Development Australia (RDA) Southern Inland, one senior government official from the federal Department of Communications, one commercial mobile app provider, one representative from Australia's Information and Communications Technology Research Centre of Excellence (NICTA), and six academics participated in the discussion (N=11). These participants were labelled as R1~R11.

The objective of this research workshop was to identify the specific multi-layers of digital exclusion that exist within the context of these seven rural areas, with an underlying assumption that providing access to digital networks does not automatically lead to effective uses. The range of topics discussed at the workshop include the state of the rural digital divide in Australia and the NSW Southern Inland region, technological and policy issues surrounding internet connectivity, and potential areas to develop digital engagement strategies.

In the next two sections, the state of the digital divides in rural Australia is summarised, putting the Southern Inland area of NSW into context. Then a qualitative analysis of the workshop discussion is presented in the subsequent section.

4. The urban-rural divide in Australia

In Australia, about 30 per cent of the population lives in rural areas [4]. Telecommunications have always been a part of rural policy discourse because they are considered key tools for community development and economic participation, which justifies the concern for equitable ICT access. However, in reality, inadequate infrastructure and lower levels of services in rural areas are persistent problems [13].

The National Broadband Network (NBN) is Australia's wholesale-only access plan to wire the nation with high-speed broadband, mainly through fibre optic cable. The original NBN plan announced in 2009 made a commitment to provide a minimum peak download speed of 12 megabits per second (mbps) to all Australian premises. Fibre optics would initially provide download speeds of up to 100 mbps and rising to 1 gigabit per second with fibre to the premise (FTTP) connections in 93 per cent of dwellings. The remaining 7 per cent were to be served by fixed wireless and satellite capabilities offering a 12 mbps guaranteed download speed [34].

A modified plan announced by the newly elected federal government in 2013 proposed a multi-technology design to provide 25 mbps to all premises and at least 50 mbps to 90 per cent of fixed line premises as soon as possible [15]. However, as uncertainty surrounding the new plan remains, the proposed network redesign will further delay rollout and disadvantage rural Australians as providers are unwilling to invest in infrastructure upgrades to existing facilities.

According to a 2013 Department of Communications report, approximately 1.6 million households and businesses across Australia are in areas that have no or limited access to fixed broadband [16]. In areas with inadequate telecommunications infrastructure, fewer than 40 per cent of the population can access fixed broadband

services and most of this population resides in rural areas. Accessibility depends largely on the distance to local telephone exchanges, which determines the quality of xDSL services. In rural areas with xDSL connections, the download speed is much lower than in metropolitan areas. According to the *2011–12 Regional Telecommunications Review*, rural citizens have a limited choice of broadband providers, connection speeds are lower than in urban centres, prices are higher, and there is limited mobile broadband availability [1].

While there has been a consistent increase in home internet penetration over time, the gap between urban and rural areas has not been reduced (Figure 1).
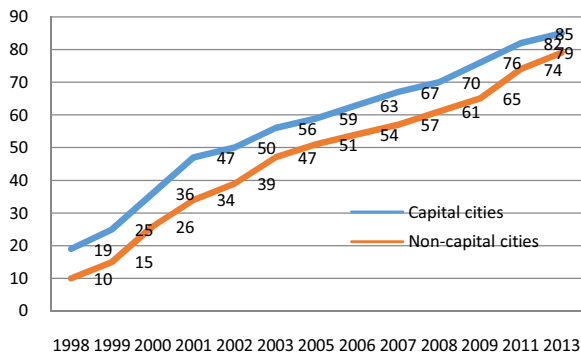
Sources: ABS [5,7,8]

Figure 1. Rural-urban digital divide in Australia

The same pattern applies to businesses. Agriculture, forestry and fishing are the main industries in rural areas. Among these primary industries, only about 10 per cent had an online presence compared to the national average of 44.6 per cent across all industries in 2012 (Figure 2).
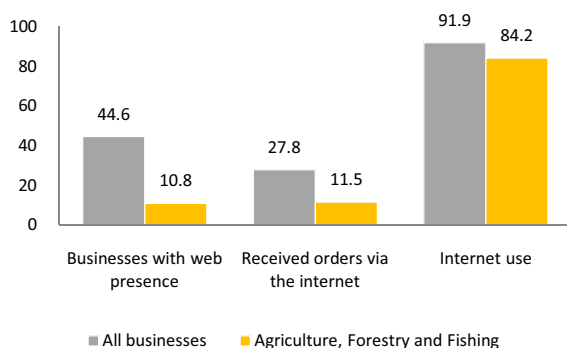
Sources: ABS [9]

Figure 2. Business use of the internet (%)

In terms of services, non-metropolitan areas are systematically disadvantaged in education, employment and community service opportunities [24]. The most recent Australian Bureau of Statistics (ABS) data show that education levels were highest in major cities where 15.6 per cent of the population has a bachelor's degree. In non-metropolitan areas, this figure is 8.5 per cent. An aging population and its potential to reduce the rural workforce is another problem in advancing the digital economy in rural areas. The median age in major cities is 37 compared to 40 in non-metropolitan areas, with population growth higher in cities. Furthermore, median age rates rise with remoteness [6].

5. NSW Southern Inland region

The complex nature of rural digital exclusion issues requires a refined and contextual investigation into rural communities. National policies can be effective in laying equitable infrastructure. However, at the level of adoption and usage, a localised approach that examines the context of users and organisations is necessary [20].

The research site selected for investigation in this study is the Southern Inland region in New South Wales, Australia. This region consists of 13 local government areas (LGAs) surrounding Canberra, the nation's capital city in the Australian Capital Territory (ACT). Approximately 79 per cent of the Southern Inland region is agricultural land and less than 1 per cent is classified as urban. The populations in these local government areas range from 2,500 to 46,000 [6, 36].

As of 2011, employment in agriculture, forestry and fishing industries was as high as 33.5 per cent among the working populations within the region. LGAs that are closer to the ACT have a lower proportion in the agricultural sector. Similar to other rural areas in Australia, LGAs in the NSW Southern Inland region have a higher median age of 42 compared to the national average of 37, and a lower rate of working population at 63.3 per cent compared to the national average of 67.5 per cent. The median age increased by 3.4 years between 2007 and 2011, whereas the overall average across Australia increased by 1.4 years in the same period. In terms of education, 9.5 per cent in the area have a bachelor's degree compared to the 15.6 per cent urban average.

In sum, the region has a high proportion of agricultural industries, lower education attainment, less employment opportunities and an aging population in comparison to major cities.

Successive Australian governments have failed to deliver improved infrastructure to rural areas. In the Southern Inland region, the average household internet adoption rate was 67.2 per cent and the broadband adoption rate was 59.8 per cent in 2011. This was significantly lower than the major cities' average of 77.3 per cent and 70.8 per cent, respectively. More importantly, there were varied degrees of connectivity among the 13 communities, with broadband penetration ranging from 49.2 per cent to 72 per cent (Table 1). Except for a limited number of townships, the majority of this region is not included in the immediate NBN plan for wiring the nation with fibre optic and other alternative high-speed broadband options [33].

Table 1. NSW Southern Inland population and internet adoption rates (2011)

	Population	Density (per km^2)	Internet (%)	Broadband (%)
Bombala	2,458	0.6	60.0	54.1
Boorowa	2,469	1.0	62.8	56.3
Cooma-Monaro	10,086	1.9	69.3	61.0
Goulburn Mulwaree	28,285	8.8	66.5	58.7
Harden	3,680	2.0	59.1	52.1
Palerang	14,835	2.9	79.5	72.0
Queanbeyan	39,826	231.1	75.6	67.9
Snowy River	7,752	1.3	59.0	49.2
Tumut	11,272	2.5	62.1	55.1
Upper Lachlan	7,378	1.0	65.5	58.2
Wingecarribee	46,042	17.1	75.0	68.2
Yass Valley	15,516	3.9	77.1	69.5
Young	12,514	4.6	61.9	55.0
Major cities average	-	1843.1	77.3	70.8

Source: ABS [6]

6. Multi-layered rural digital exclusion

From the workshop discussion, three layers of digital exclusion were confirmed: availability of infrastructure, adoption and digital engagement.

First, the fundamental issue of inadequate infrastructure was perceived as the most critical issue of digital exclusion in rural areas, with particular concern in relation to emergency communication and access to basic services. The second layer of digital exclusion was internet and broadband adoption issues, where there was a mismatch between user motivation and available services. The final layer of digital exclusion was the lack of digital engagement, with many citizens not experiencing the beneficial outcomes obtainable through digital opportunities.

Without appropriate infrastructure and services, rural users and businesses are less likely to adopt new technologies. This hinders the process of developing services tailored to their specific needs, creating a vicious cycle. The three layers were closely connected with each other and were perceived to be "multi-levels of issues and not just connectivity or communication issues" (L2).

6.1. Availability of infrastructure

6.1.1. Downgrading of telecommunication services

Rural areas in Australia are particularly vulnerable to inadequate infrastructure during the transition from copper-based services to fibre optic networks. Copper networks are expensive to maintain and, with the anticipation of upgrading to fibre optics, there is little incentive for incumbent telecommunications companies to continuously upgrade existing copper lines. During transition, a lag in the network upgrade results in poorer quality connections in rural areas. The uncertainty surrounding the NBN rollout in local areas was perceived by participants to be deterring the maintenance of the existing copper lines.

> "The network providers are currently very reluctant to upgrade any of their infrastructure with the expectation that that would become redundant at some point in the not too distant future. That really is impacting the residents of our community. They can't get good quality access." (L2)

This situation also affects landline telephone services and not just the internet. In some areas, the copper lines have deteriorated to the point where connection was, at best, intermittent.

> "[The] telephone network is breaking down. Every time it rains they [local citizens] don't have a telephone service and they don't have a mobile service." (L1)

The interim satellite service provided under the NBN (intended to offer a reliable 6 mbps connection) was also regarded as a downgrade among users.

> "In our rural remote areas we have no mobile and no internet. I think it's gone backwards in the last five years than moving forward with the NBN. I have connected onto the NBN [through the interim satellite service]. I find it extremely slow. In a time where we're

all encouraged to be online - do everything online - oh, just pop online and fill out that and email it to me - there is a greater divide. It becomes harder for us to move with the times." (L9)

Another problem with satellite is the unreliability of speed and quality, particularly during times of peak demand.

"We do have a lot of people within our community that rely on satellite. With the oversubscription that has happened in the past, it does mean that it's extremely variable in quality depending on the time - timeframes around when people are looking to use that." (L2)

Most local government participants perceived the internet to be a fundamental communication tool that links people to society. They agreed that before discussing the benefits of digital engagement, issues of basic access to infrastructure must first be resolved.

"I think in a rural community the internet and mobiles in whatever capacity they are, the thing comes down to being connected. That connectivity has such a huge impact on people's social wellbeing and their mental wellbeing and I don't think that that aspect of it should be overlooked in any shape or form." (L11)

Among the various functions of the internet, one is to fulfil the communication needs of users. The most urgent issue identified at the workshop was that some rural areas are not covered by reliable telecommunications services.

6.1.2. Broadband as public utility

The internet is a multi-dimensional, multi-faceted technology. While the internet affords various services, workshop participants generally perceived the internet as a basic form of telecommunications that connects people to others as well as provides emergency communication services. This is why the discourse surrounding rural disadvantage in ICT access compared to the metropolis is emphasised, while inconvenience in other services such as retail, health and education are an assumed part of rural life.

"The disadvantage of having to drive very long distances to go to supermarkets or travel for fuel, whilst uncomfortable and annoying is nevertheless kind of integrated with people's lives in the bush and they kind of go okay well I live with that and I don't necessarily like it but I accept it as part of being where I am. Whereas the internet seems to have brought out a kind of demand for equivalence which I think is legitimate but what is it about that technology?" (R9)

Values and drawbacks associated with everyday life in rural communities were separated from issues of digital connectivity as participants reiterated that the internet is fundamentally a communications technology, which brings associated convictions surrounding reasonable access regardless of location.

This perception is particularly crucial to Australians because the migration to fibre optic cable for landline services is part of the NBN plan. Telstra, Australia's incumbent fixed line provider, is to migrate its copper and cable customers in fibre-connected areas to NBN connections once the area is determined as "ready for service". Customers can choose a phone-only NBN service if they prefer not to have a broadband internet connection.

According the *Telecommunications Universal Service Management Agency Act 2012*, the policy objectives of public interest telecommunications services are that standard telephone services are to be reasonably accessible to all people in Australia on an equitable basis, wherever they reside or carry on business, and will be supplied to people in Australia on request. However, the universal service obligation (USO) guarantee applies only to areas where there is no NBN connection and only to phone services [32].

While the policy aims to provide a seamless transition from landline telephone customers to NBN's voice only service, we must consider that every household should be able to connect to a stable, ubiquitous telecommunication network. A commitment to providing a voice service is not enough for rural Australia today; rural citizens require high quality, accessible, affordable internet access as well. There is an increasing expectation that broadband is a public utility, and that it must be included under the USO. The question remains whether the NBN can or should fulfil that obligation.

6.1.3. Diversification of infrastructure

In 2013, Australia's newly elected federal government changed the NBN design from 93 per cent FTTP connections to a mix of fibre to the node (FTTN) and other alternative high-speed broadband

technologies in order to reduce costs and time [30]. While there have been debates surrounding whether this is a cost-effective option, it has certainly opened up the discussion to include various connection methods before the transition to fibre.

> "[Fibre optic] isn't going to happen overnight. The alternatives are that you run optical fibre part of the way and then use different media for the final connection." (R7)

Using multiple technologies including fixed wireless, satellite, FTTN, HFC (cable) and mobile networks can expedite the migration to high-speed broadband access. Workshop participants emphasised the need to have flexible and tailored approaches to providing broadband in their local areas.

Another option to consider is mobile connectivity, which is not included in the current NBN plan. Australia has the highest mobile broadband penetration rate in the world [35]. Australia's mobile phone penetration reached 82.3 per cent in 2012 and the 25.94 million mobile broadband subscriptions indicate a 114 per cent penetration rate [27]. While 21 per cent of the adult population aged 18 and over were estimated to be without fixed-line telephone services in their homes, 94 per cent of adults use a mobile phone, and 64 per cent own a smartphone [3]. Demand for mobile connectivity in rural Australia is very strong [1], however the gap in rural mobile connectivity was also perceived to be an area where intervention was necessary.

> "If you put mobile towers up in the city, [we can mandate] that you need to put one in remote areas." (L1)

The Department of Communications is currently reviewing the spectrum allocation for more efficiency and has announced a *Mobile Black Spot Programme* to extend mobile phone coverage and competition in areas where there is low or no mobile connectivity [17].

Mobile penetration may partly remedy digital inequalities between urban and rural areas. However, there have been concerns regarding the divergent services and uses of mobile platforms leading to a further gap among users [31]. Further investigation is warranted on how mobile internet usage influences, complements, or replaces fixed-line internet usage among various groups of the population. For example, pricing differences make mobile broadband networks an expensive substitute for fixed line connectivity.

There is a strong need for intervention to improve service availability because telecommunications is "not a question of market economics [but rather], communication is a basic right" (L12). "[Not] having numbers to be able to put towers in our area… because it won't cover their [telco's] costs" should not be a barrier to serving the community (L1).

In densely populated markets, infrastructure-based competition may be viable. But in rural areas where there is not sufficient customer spending to support multiple networks, natural monopolies with appropriate intervention are the most efficient approach [19]. Various levels of intervention are therefore necessary to implement an effective "multi-technology mix" strategy.

6.2. Adoption

The concerns of not having internet service in rural areas were mainly in relation to the impact of being socially and economically isolated. This is particularly the case as more services are provided online by default and those who are not able to get appropriate access are systematically excluded from these services.

> "Every government agency now expects that the people they deal with have access to the internet and good quality access. So a lot of the interactions that I guess everyone in this room probably takes for granted that they have with a government agency are done online." (L2)

Participants agreed that strategies to encourage connections to any of the array of mobile, FTTx, HFC, and fibre optic networks should be devised. It is important to get more people connected to lower quality networks in the near future, rather than to provide high-speed connection in limited areas.

> "[The] suggestion of having a multi-technology mix and of involving other players I think provides a greater degree of flexibility for the future." (R1)

This is because the number of people connected determines the value of a network. The development of services, content, and applications in a networked economy depends on the number of users.

> "[Network effects] is a dimension of rural digital exclusion that's much less discussed in policy discourses… In rural [areas] this

comes into play... and creates another vicious cycle of digital disadvantage." (R5)

Participants were open to innovative and diverse approaches to providing internet and broadband in their communities, such as public-private partnership models. Involving private telecommunications companies opens up opportunities of multiple funding sources to build networks tailored to local communities' needs.

"Multiple funding sources are very important for rural communities." (L2)

One of the communities was in the process of building wireless infrastructure using a public-private investment model.

"There's a public-private - well, it's a private shared risk [infrastructure investment] in Harden-Murrumburrah. There is a commercial provider that is providing free Wi-Fi down the main street on the basis of getting a certain subscription of commercial clients." (R10)

Participants were conscious of the uniqueness of their communities because "different councils have different scenarios depending on what sorts of places they've got" (L8). The model in Harden worked because there was a broadband infrastructure backbone available within the vicinity.

"[There was] relatively low capital investment required to make that work. They had a reasonable quality pipe running just outside of town. So it's something that we've looked at and were considering as an option… I think it is because of the low capital cost that someone was willing to take the risk there." (L2)

Community-focused strategies can aid getting competitive high performance bandwidth into each community. However, adoption and usage must be considered concurrently with infrastructure, in order to avoid widening digital divides [37].

A commonly identified problem was the inconsistencies in the level of demand and the provision of services in the communities.

"[In the library] we have 10 public computers, we have free wireless and they're busy all the time. It's not well-advertised but the word has gotten around." (L8)

There were also disparities in the available applications tailored to meet local users' demand.

"There are a significant amount of people accessing the internet through mobile phones. The problem is of course having the content that's right and ready, and using the right tools." (R4)

While user uptake of mobile internet has risen rapidly in recent years, the private sector is not yet ready to accommodate this increase in demand.

"Only about 14 per cent of businesses in Australia are mobile-ready… One of the things that I found is lack of information - lack of informed decisions by decision-makers." (R4)

Furthermore, services currently available often do not adequately meet users' needs.

"In terms of digital services, there seems to be a lot that are implemented without considering what it is that citizens actually need. There needs to be services that actually fit that happy medium between what the government wants to achieve and what the citizens want." (R6)

Participants recognised the importance of adequate infrastructure, but equally important is enabling adoption through easy access, awareness and skills, which was regarded as the key to narrowing the digital divide [22, 23, 37].

"Individuals and organisations need easy access. They need to be aware of the benefits, and they need to acquire digital skills." (R8)

6.3. Digital engagement

The most commonly recognised benefits of rural connectivity are overcoming the barriers of distance through online services, increasing the levels of social capital among community members, and achieving economic gains by participating in the digital economy. However, in order to reach that level of digital engagement, several preconditions must be met.

"A lot of new technology is coming out to assist farmers - like new apps - but they just don't have the opportunity to use them because they don't have any sort of internet access at all." (L2)

Connectivity is not always an issue of costs but also of motivation, perceived benefits and the availability of services tailored to users' needs.

"There are certainly lots of people who might have a computer, might have a tablet, might have a mobile phone, but don't really know how to use it." (R8)

For people to engage with digital technologies there must be a motivation to learn. "Unless there is a very specific pre-existing and intrinsic motivation" (R9), "people don't change until they're uncomfortable with the current situation" (R11) but "once they figure out the benefit, they prioritise" (R8).

Digital engagement also requires seamless and ubiquitous access. School-aged children living in rural areas with poor connectivity are disadvantaged by not having home internet access.

"The schools do have access to the internet but they also are having more and more of a focus on sending students home to do assignments that are very research based… They [rural students] just can't necessarily do the same things as those students within the township do." (L2)

The quality of service is also important because some online activities require high-speed connections. Having continuous and high quality access is crucial for digital engagement [31].

"Our high school students are extremely stressed because they come home - they're doing senior studies and assignments and they can't get them done because they can't get fast internet access. I know myself, I do a lot of mobile banking, I can't get on because the access isn't fast enough to go through the security steps." (L9)

The lack of infrastructure leads to missed opportunities in areas of education, business and health services.

"We've actually got a doctor living within our community out in the rural area on a

farm. She started a family with her husband. She would really love to be able to continue consulting as a health professional but at the moment she just can't get access to the information about her patients that she was previously getting from outside the area. So there are real life examples for us within our community that do have big impacts. A lot of people in regional centres just take those services for granted and for us they're not available." (L2)

This may result in longer-term consequences of inequalities in many dimensions of people's lives.

"To an extent it is about access to the shops and it's access to being able to be part of a community. But it's also, through a period of time where various levels of government are taking advantage of the rollout of internet, access to broadband, generally, that allows them to consider and implement education, health and other significant lifestyle services and that's where the disparity, that's where the inequality starts to hit home." (R11)

There are many policy gaps to address in order to enable remote access to services. For example, telehealth practices can be provided only if the Medicare Benefits Schedule is modified accordingly (R2). Cultural changes in the workplace must precede any telework arrangements in order for it to be successful (L8). A cultural change is necessary for users – both individuals and organisations – to be able to realise the benefits of digital connectivity in their everyday lives. Only when they realise the benefits will they be motivated to learn and change.

"You cannot simply put the infrastructure in place and expect that people will use it, but also you cannot educate them without them having the internet. So the two things need to be combined… there are a lot of things that can be done with the current speed, and many people mentioned it today, that it's the culture." (R3)

In dealing with the complex issue of digitally engaging communities, a multi-faceted approach is necessary where policies deal with all layers of the system, including infrastructure, services, content and end-users. The potential benefits of broadband can only be realised through investment beyond infrastructure [19].

7. Conclusion

An innovative, community approach that strengthens the link between internet infrastructure, connectivity and digital engagement was proposed through a workshop with rural local governments in NSW, Australia. Conceptually, separating these three layers of digital exclusion is important in understanding the nature of the problem. Equally important is to identify the links between these interrelated layers.

Issues of digital exclusion in rural areas often intertwine with existing social exclusion parameters, creating a vicious cycle of inadequate infrastructure and being deprived of the means to use technologies effectively.

Policies that focus on infrastructure in rural areas are important, but can only serve as a precondition for digital inclusion. Participants acknowledged that rural digital inclusion policies should take a systematic approach that includes not only the macro-level accounts but also a locale-based examination.

"There are multi-levels of issues and… they can't be looked at separately." (L2)

The rural communities participating in the workshop varied in their population and spatial characteristics, and internet connectivity. However, the need to diversify the deployment of high-speed broadband infrastructures, develop innovative models of infrastructure investment, and use strong intervention policies to provide equitable ICT access were commonly suggested.

LaRose et al. found that government-subsidised broadband infrastructure does not guarantee adoption [29]. Further support such as education campaigns are needed to stimulate adoption and usage. This is particularly the case in rural communities where citizens and organisations typically lack necessary skills [38]. Holistic outreach programs with inbound strategies to attract people to communities, and with continuous digital literacy training programs, can improve digital engagement in rural communities [28]. Local institutional contexts affect both the development and likely success of initiatives to increase digital engagement [21]. The need for a localised approach was confirmed at the workshop.

Community development is an outcome that results from local decision-making, where community residents must be engaged in order for any program to be successful in achieving "self-sufficient and socio-economically viable regional communities" [23, p. 326], and ensuring the specific needs of locales and their citizens drive policies and plans. This partnership will significantly enhance links between the research team, the local governments, the rural communities, and their networks.

"How to be enthusiastic and energetic to try to address the issues? ... Is there a level of negativity or even despair that needs to be overcome to encourage engagement from people in the community?" (R11)

We emphasise that a community-led approach is crucial in the success of building social and intellectual capital for digital inclusion and engagement. This can be achieved through a refined investigation of rural areas within the context of each local community. In order to overcome the rural digital divide, infrastructure provision must be followed by participation in the digital economy at the community level. The next step of the research is to collect localised evidence of infrastructure, connectivity and digital engagement in these rural communities and develop customised strategies to improve digital inclusion.

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i The participating NSW local governments were: Boorowa, Cooma-Monaro, Goulburn Mulwaree, Palerang, Upper Lachlan Shire, Yass Valley and Young Shire.