Understanding the motivations and barriers to adoption and effective use of connectivity technologies by SMEs in RRR Australia

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Statement of Original Authorship

The work contained in this thesis has not been previously submitted to meet the requirements for an award at this or any other higher education institution. To the best of my knowledge and belief, the thesis contains no material previously published or written by another person except where due reference is made.

Carrie-Ann Wilson
18/11/2022

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The following is a statement detailing the contribution of others to my thesis as a whole, including intellectual support, financial support and research support.

Statement of Contribution of Others

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Presentations

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Definitions

Term	Definition
Connectivity	The ability of a computer, program, device, or system to connect with one or more others (Cambridge University Press, 2022)
Digital connectivity	High speed internet and associated technologies.

List of Acronyms

Acronym	Definition
ABS	Australian Bureau of Statistics
ADII	Australian Digital Inclusion Index
ANZSIC	Australian and New Zealand Standard Industrial Classification
ARIA	Accessibility and Remoteness Index of Australia
ASGC-RA	Australian Standard Geographical Classification – Remoteness Area
ASIC	Australian Securities and Investment Commission
ATO	Australian Taxation Office
BIRRR	Better Internet for Rural, Regional and Remote Australia
CSIRO	Commonwealth Scientific and Industrial Research Organisation
DOI	Diffusion of Innovations Theory
ICPA	Isolated Children and Parents Association
ICT	Information Communication Technology
IoT	Internet of Things
ISP	Internet Service Provider
JCU	James Cook University
MATH	Model of Adoption of Technology in Households
P2D	Accelerating Precision to Decision Agriculture Project
PEOU	Perceived Ease-of-Use
PU	Perceived Usefulness
RA	Remote Area
PIM	Purchase Intention Model
PwC	PricewaterhouseCoopers
RRMA	Rural, Remote and Metropolitan Areas
RRR	Rural, Regional and Remote
RTH	Regional Tech Hub
SCT	Social Cognitive Theory
SLA	Statistical Local Area
SMEs	Small and Medium Enterprises

SPSS	IBM SPSS Statistics
SQB	Status Quo Bias Theory
TAM	Technology Acceptance Model
TPB	Theory of Planned Behaviour
TRA	Theory of Reasoned Action
TUM	Technology Upgrade Model
UTAUT	Unified Theory of Acceptance and Use of Technology

Personal Statement

My generation had the unique experience of a relatively analogue childhood and a digital adulthood (I got my first computer and mobile phone at the age of 18). I've experienced both worlds and for a long time, I've been fascinated by the intersection between design, technology, and society. Much can be learnt from studying the evolution of the internet, arguably one of the most transformational technological advances of all time. The internet captured my attention as soon as I had the opportunity to try it at the age of 12 at my father's office, during the "First Wave" of the internet (Case, 2016). Shortly afterwards I eagerly delivered a presentation about the internet to my classmates, many of whom had not heard about it before. I was in awe of it back then, and still am. Early in my career I had the privilege of witnessing a pivotal moment for the "Second Wave" of the internet (Case, 2016), seeing Steve Jobs launch the first iPhone at MacWorld 2007. During the subsequent years, smartphones were rapidly adopted, and mobile internet usage increased dramatically, leading to an uptake in social media and the app economy. I saw the transformation to society and computing unfold in my job as an IT Specialist in the tertiary sector, before moving to a rural property.

A few years later, a book reignited my desire to be a part of the technological space. Case (2016) argued that we were entering the "Third Wave" of the internet, defined not by the Internet of Things, but the Internet of Everything, where the internet will be integrated into every part of life (Case, 2016). While I questioned if this was necessary or meaningful, an element that captured my attention was "the rise of the rest" and the diversification of opportunity. In other words, there was greater potential for entrepreneurial businesses in regional areas to participate in building and benefiting from future technology – and making it more meaningful.

It is said that creative insights happen at the boundaries between disciplines. I believe that understanding technology adoption is a fundamental aspect of exploring the intersection between design, technology, and society. Throughout my career I've enjoyed helping individuals, businesses, and organisations with technical solutions. In part, my work is driven by curiosity and a desire to deepen my understanding of

technology adoption and transformative technologies. In recent years I specialised in supporting small business owners in regional areas and experienced first-hand the complexities of running an online business from a rural property. As a result, I have a deep appreciation for both the opportunities and challenges that the internet presents for businesses in rural, regional, and remote (RRR) Australia.

I embarked on this research project during the early stages of the Covid-19 pandemic with the firm belief that reliable connectivity will be critical for the future of RRR businesses and their local economies, and the desire to contribute to the understanding of technology adoption in this space. As I reflect on what I've found, and look ahead at emerging technologies and trends, I know that there will continually be more to discover and contribute.

> *"We shall not cease from exploration*
> *And the end of all our exploring*
> *Will be to arrive where we started*
> *And know the place for the first time."*
> —T.S. Eliot, Little Gidding, Four Quartets (Eliot, 1943)

Abstract

This thesis is an of connectivity technology adoption by RRR SMEs. Employing a methodological foundation of pragmatism, participatory design, and mixed methods research, it focusses on relevant and practical problems that lead to beneficial outcomes. The thesis consists of three studies, each exploring an important component of the topic. It concludes that there is an increasing need for reliable connectivity in RRR SMEs. This study reveals that connectivity problems are negatively impacting on participants' businesses. Significantly, many of the owner-managers that participated in the study find it difficult to develop the connectivity literacy required to establish and maintain reliable connections. This is exacerbated by pervasive misinformation and misperception that causes inertia in technology upgrades. Better support is needed to empower business owners with relevant knowledge and skills, and to overcome barriers to connectivity technology adoption. The findings are of potential interest to the RRR community, policy makers, researchers, and training providers.

Keywords:

Technology adoption, connectivity, RRR SMEs, digital, internet, broadband, telecommunications, agriculture, digital inclusion, digital culture.

Australian and New Zealand Standard Research Classifications (ANZSRC)

Fields of Research (FoR) Classification:

FoR 1: 1005 Communications Technologies

FoR 2: 0701 Agriculture, Land and Farm Management

Chapter 1 Introduction

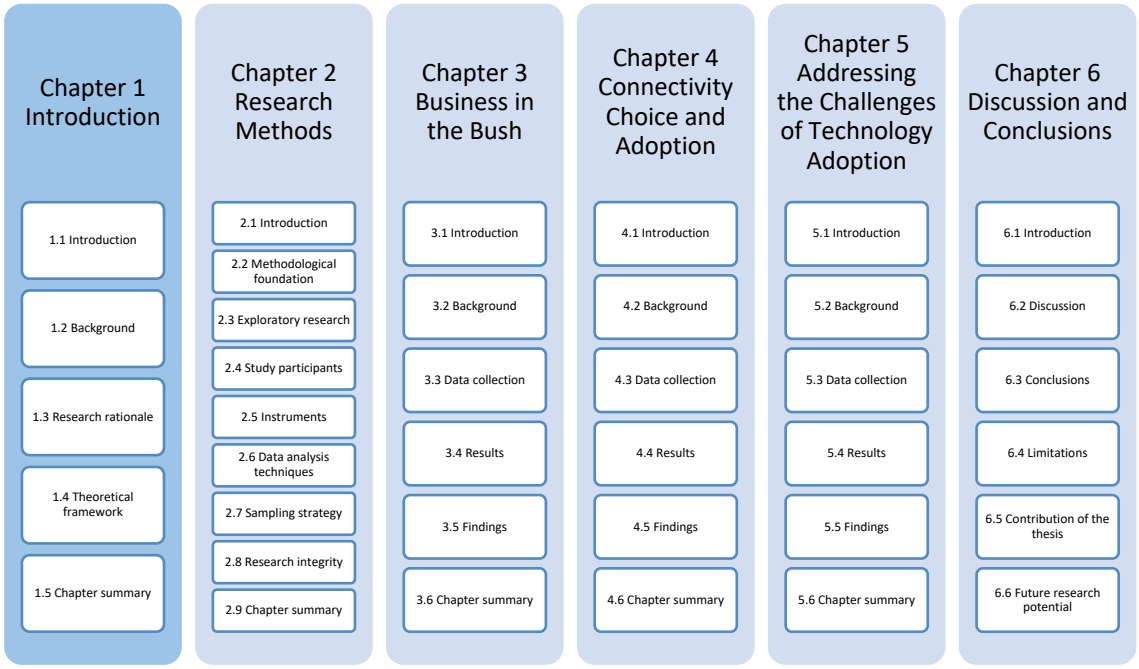

Figure 1.1: Outline of the Thesis - Introduction

Chapter 1 provides an overview of the thesis. First, it will provide a contextual background of the importance of digital connectivity for small and medium enterprises (SMEs) in rural, regional and remote (RRR) Australia. Second, the research gaps, aim, objectives, outcomes, and overarching research questions are established. Third, the theoretical foundation of the thesis will be discussed, including an overview of prominent theoretical frameworks and explanation of the approaches that will underpin the work.

1.1 Introduction

This research seeks to explore human factors in interaction with connectivity technology adoption by small and medium enterprises (SMEs) in rural, regional and remote (RRR) Australia. It is based on a methodological foundation of pragmatism, participatory design, and mixed methods research. Pragmatic inquiry focussed the research on practical problems and outcomes. This was strengthened by participatory research design and involving key stakeholders in the development of the research questions, which led to relevant and beneficial outcomes. Data was collected and analysed using a mixed methods approach, including both qualitative and quantitative data. An online survey produced a breadth of data that generated a thorough

understanding of the target population's characteristics and factors that influence connectivity-technology adoption. Survey responses include a total of 127 businesses represented by 91 business owners. Additionally, 3 online focus groups were held, with a total of 8 participants. The conversational style employed in the online focus groups, along with small group sizes, resulted in rich data that expanded on the survey findings to provide meaningful insights and a deeper understanding of connectivity technology adoption in RRR SMEs. The thesis consists of three studies, each exploring an important component of the topic.

Study 1, Business in the Bush, aims to clearly define SMEs within the context of RRR Australia. The characteristics of RRR SME decision makers in Australia have not been widely studied within the context of technology adoption, making this study a necessary contextual foundation for the research. Results include a demographic analysis of participants, in addition to analysis of business types, business owner roles, and business connectivity needs. The findings for this study form 4 themes: profile of RRR SMEs, importance of connectivity, geographical inequity, and women and unpaid labour. Key contributions for this study include knowledge of the characteristics of RRR SME business owners, confirmation of the importance of connectivity for RRR SMEs, and the factors that influence RRR SME decision-making.

Study 2, Connectivity Choice and Adoption, aims to clearly define the human factors that interact with the adoption and implementation of connectivity technology in RRR SMEs. Results include analysis of the participants' technology adoption categories, connectivity technologies and providers used, how participants select their plans and equipment, and their approach to connectivity management. The findings include 3 themes: inertia in technology adoption, motivation and connectivity literacy (an emerging concept that is different to digital, technical or media literacy – it encompasses the unique set of skills and knowledge required to establish and maintain an internet connection (Australian Government: Regional Telecommunications Review, 2021)), and technological fatigue. Key contributions for this study include knowledge of a significant level of inertia in connectivity technology adoption by RRR SMEs, and the negative impact of attitudinal barriers on connectivity literacy and technology adoption.

Study 3, Addressing the Challenges of Connectivity Technology Adoption, aims to explore the motivations and barriers that impact the effective use of internet connectivity in RRR SMEs. Results include analysis of connectivity issues and support, business impacts of poor connectivity, sources of information, and troubleshooting approaches. The findings relate to 3 themes: connectivity challenges, business impacts, and sources of information and support. Key contributions for this study include knowledge of the complexity of connectivity technologies and sources of information and support, in addition to confirmation that connectivity literacy (unique connectivity skills and knowledge) (Australian Government: Regional Telecommunications Review, 2021) is required by RRR SMEs.

Overall, the thesis is an exploration that contributes to the literature on the complexity of connectivity technologies in SMEs in RRR Australia with important implications for the RRR community. It concludes that there is an increasingly important requirement for RRR businesses to have reliable internet connections, and that unreliable connectivity is negatively impacting on participants' businesses. However, many owner-managers that participated in the study find it difficult to develop the connectivity literacy (Australian Government: Regional Telecommunications Review, 2021) is required to establish and maintain connections, indicating that better support for SMEs is needed. Poor connectivity literacy is worsened by misinformation and misperceptions that contribute to inertia in technology upgrades.

1.2 Background

Collectively, rural, regional, and remote (RRR) Australia makes a significant contribution to the nation's economy. This study considers RRR Australia to encompass all Remoteness Areas (RA) except for Major Cities of Australia, as defined by the Australian Statistical Geography Standard (ASGS) Remoteness Structure framework (Australian Bureau of Statistics, 2017), refer to Section 3.2.2 for more detail. It represents one third of the national workforce and accounts for approximately 40% of Australia's total economic output (Regional Australia Institute, 2015). RRR businesses also play a vital role in their local economies (Bosua et al., 2013; Hettihewa & Wright, 2018). The

potential economic benefit of effectively using digital technologies in agricultural and RRR businesses is significant. Economic modelling by the Accelerating Precision to Decision Agriculture Project (P2D) in 2017 indicated that the implementation of digital agriculture across all Australian production sectors could increase the gross value of Australian agricultural production by $20.3 billion, a 25% increase over 2014-15 levels, with major flow-on effects to the wider economy (Australian Government: Department of Agriculture and Water Resources, 2016). Research by NBN Co, which expanded on the P2D study, found that internet connectivity will be required to achieve some 75% of the increased production attributable to the unconstrained adoption of digital agriculture, such as livestock monitoring, water and energy management, virtual fencing, asset tracking, and carbon measurement (*Connecting Australian Agriculture*, 2021). Looking beyond the agricultural sector, PwC modelling suggests that Australian small businesses could unlock an additional $49.2 billion of untapped economic potential by making better use of digital technologies (such as engaging in social media to increase sales, using online advertising, and employing cloud based bookkeeping services to reduce administration time), and that 53% of this benefit could be realised in rural and regional Australia (PricewaterhouseCoopers Australia (PwC), 2015).

Digital connectivity (high speed internet and associated technologies) is a critical enabling factor in realising a digital future for RRR small and medium enterprises (SMEs) in Australia. The speed and extent to which technologies are adopted will have a significant impact on unlocking the potential benefits in these communities. However, delivery is problematic, specifically in terms of access and adoption (Townsend et al., 2013).

Survey results published by Better Internet for Rural, Regional and Remote Australia (BIRRR) from 2016-18 indicate that people in RRR Australia are severely disadvantaged in terms of access, speeds, costs and reliability of internet and telecommunications (Hay, 2018). Previously, RRR business owners could run their businesses without the internet, but increasingly, they need reliable connectivity to be a part of the economy and remain competitive (Park et al., 2019). Digital connectivity is becoming just as important as other utilities such as electricity, water, and gas (Salemink et al., 2017).

While rural residents acknowledge that living in rural Australia comes with inconveniences, a sentiment of deprivation has been expressed when essential services such as communication were not accessible, which is worsened by increasing expectations by organisations to use digital services (Park et al., 2019). Townsend highlights a key challenge – high speed internet (i.e., broadband) has significant potential to benefit rural communities socially and economically. However, a lack of access to broadband is a key social and economic problem for these communities (Townsend et al., 2013).

Over the last five years, access to reliable internet has improved in RRR Australia, as documented by the Australian Digital Inclusion Index (ADII) (Thomas et al., 2019). However, a lack of adoption and effective use of the internet still exists and finding solutions is becoming an important issue among this population. For example, a common complaint seen in online discussion groups such as the Better Internet for Rural, Regional and Remote Australia (BIRRR) Facebook group (2022), is insufficient data allowance. While data allowances have improved, in many cases accessing increased data can be easily solved by upgrading from SkyMuster™ to SkyMuster Plus™, however many choose not to upgrade. Digital connectivity is a complex area that encompasses an array of rapidly changing technologies, including computers or devices, telecommunications equipment, and content, which result in complex patterns of adoption behaviour (Willis & Tranter, 2006). Some scholars have suggested that a lack of understanding of ICT adoption behaviour has contributed to high failure rates of projects aimed at reducing the digital divide (Yu et al., 2017). In addition, there is emerging evidence suggesting that there are significant attitudinal barriers to the adoption and usage of digital connectivity technologies in RRR Australia (Thomas et al., 2019). However, this has not been widely studied within the context of SMEs. The scientific study of attitudes towards technology is part of a broader field of scientific study, human factors, which could be used to gain a deeper understanding of the underlying motivations and barriers that influence technology adoption.

Approximately one third of Australian businesses are based in regional or remote areas (Australian Bureau of Statistics, 2021c). These businesses make a vital contribution to

both their local economies and the broader economy. In particular, agribusiness SMEs are critical for regional prosperity in Australia (Alam & Adeyinka, 2021). RRR SMEs in Australia have distinctive attributes, behaviour, and needs that differ significantly from that of urban small businesses (Hettihewa & Wright, 2018). While regional small businesses have been found to be more durable than the average, there are concerns that they may be at risk because they are slower to adopt new technology (Hettihewa & Wright, 2018). Regional small businesses tend to be less growth-oriented than their urban counterparts (Galloway & Mochrie, 2005) and their approach to business innovation has been found to be more of a reactive process rather than a proactive process (Kotey, 2014). However, it has been found that regional businesses are open to the adoption of technology when they can see practical applications for their situation (Dobson et al., 2013). They encounter numerous difficulties including limited access to expertise and resources (Bosua et al., 2013). This population has not been studied widely within the context of digital connectivity adoption.

1.3 Research rationale

1.3.1 Research gaps

There is an increasing need for reliable connectivity in RRR SMEs. However, there is a dearth of literature on the factors that influence technology adoption in this population. The characteristics of RRR SME decision makers in Australia have not been widely studied within the context of technology adoption, and more research is needed to provide a contextual foundation for further studies in this area. Additionally, a better understanding of the kinds of businesses that operate in RRR Australia, and their business connectivity needs is required. More research is needed to understand the selection of internet plans, providers and equipment by RRR SMEs, and the factors that influence such decisions. Finally, there is a gap in the knowledge surrounding the motivations and barriers that impact on the effective use of internet connectivity, and how RRR SMEs address connectivity challenges. It will be difficult to future-proof digital connectivity for this sector without a clear understanding of human factors and their influence on SMEs pathway to adoption.

1.3.2 Research aim

This project aims to explore human factors in interaction with connectivity technology adoption and usage by SMEs in RRR Australia, to identify what support is needed for RRR SMEs to unlock the economic and innovative potential of emerging digital technologies.

1.3.3 Research objectives

See Table 1.1 for the Research Objectives in context with the Research Questions and the Associated Research Studies. The three core research objectives are:

1. To clearly define SMEs within the context of RRR Australia.
2. To clearly define the human factors that interact with and influence the adoption and implementation of connectivity technology in RRR SMEs.
3. To explore the motivations and barriers that impact the effective use of internet connectivity in RRR SMEs.

Table 1.1: Research Questions and the Associated Research Studies

Study	Research Questions	Theme	Research Objective
Study 1: Business in the Bush (Chapter 3)	RQ1: What types of SMEs are operating in RRR Australia? RQ2: What are the characteristics of SMEs (and their owners) in RRR Australia?	Who are they and why do they need to be online?	To clearly define SMEs within the context of RRR Australia.
Study 2: Connectivity Choice and Adoption (Chapter 4)	RQ3: What factors influence the choice of internet connectivity tools, providers, and solutions by RRR SMEs?	Getting online	To clearly define the human factors that interact with and influence the adoption and implementation of connectivity

			technology in RRR SMEs.
Study 3: Addressing the Challenges of Technology Adoption: How SMEs seek connectivity support (Chapter 5)	RQ4: Where do RRR SMEs go to find information and support on internet connectivity?	Staying online	To explore the motivations and barriers that impact the effective use of internet connectivity in RRR SMEs.

1.3.4 Outcomes

This study contributes to existing knowledge on connectivity technology adoption by RRR SMEs. It reviews the historic factors (e.g., deficits in infrastructure) that have impacted on the adoption of connectivity in rural populations, and highlights the emerging complexity of connectivity literacy, the problem of inertia in technology upgrades, and key motivations and barriers to adoption. The findings have practical implications that are of potential interest to stakeholders who seek to improve connectivity adoption and usage and provides useful insights for planning and intervention. The study identifies gaps in connectivity literacy support for RRR SMEs and considerations for delivering this support. The research also has potential to benefit the wider community by aiding the sustainable development of RRR SMEs in Australia in the digital era.

1.3.5 Overarching research questions

Five potential research questions were identified during the exploratory research phase (see Chapter 2 for more on the research method). The research questions were subsequently revised and prioritised to better achieve the research objectives and naturally fell into 3 research studies (see Table 1.1). Research questions 1 and 2 aim to define SMEs in the context of Australia, research question 3 aims to identify factors that

influence choice of connectivity, and research question 4 aims to explore how they seek information and support. These questions will be the focus of this study. However, while question 5 was identified in the exploratory study, its reach is outside of the scope of this project and will therefore be used for future research.

- RQ1: What types of SMEs are operating in RRR Australia?
- RQ2: What are the characteristics of SMEs (and their owners) in RRR Australia?
- RQ3: What factors influence the choice of internet connectivity tools, providers and solutions by RRR SMEs?
- RQ4: Where do RRR SMEs go to find information and support on internet connectivity?
- RQ5: What are the implications of RRR SMEs not making effective use of internet connectivity.

1.4 Theoretical framework

Extant literature from the last 10 years is dominated by four central theoretical models for explaining technology adoption: the Diffusion of Innovations Theory (DOI) (Rogers, 1962), the Theory of Planned Behaviour (TPB) (Ajzen, 1985), Technology Acceptance Model (TAM) (Davis, 1986), and Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003). In addition, several other theoretical approaches were explored to help understand the adoption (or not) of digital connectivity technologies by SMEs in RRR Australia. In the next section we discuss some of the main models of adoption, however, none are identified as a singular means to adoption.

1.4.1 Diffusion of Innovations (DOI) or Innovation Diffusion Theory (IDT)

Rogers (1962) Diffusion of Innovations (DOI) theory, also known as Innovation Diffusion Theory (IDT), is drawn from sociology. Developed in (1962) and revised in (2003), the theory, by studying the socioeconomic characteristics of people, examines how new technologies and innovations spread (Rogers, 2003; Salemink et al., 2017). It proposes that new technologies spread gradually through the social practices of diverse social groups, and that this diffusion happens unevenly over time, with initial adoption usually occurring amongst those with higher status, resources, and education (Rogers, 2003; Willis & Tranter, 2006). According to this model, successive groups of users adopt a new technology, and are segmented into five categories of adopters: *innovators, early adopters, early majority, late majority,* and *laggards*. This technology adoption life cycle is typically represented as a bell curve (see Figure 1.2).

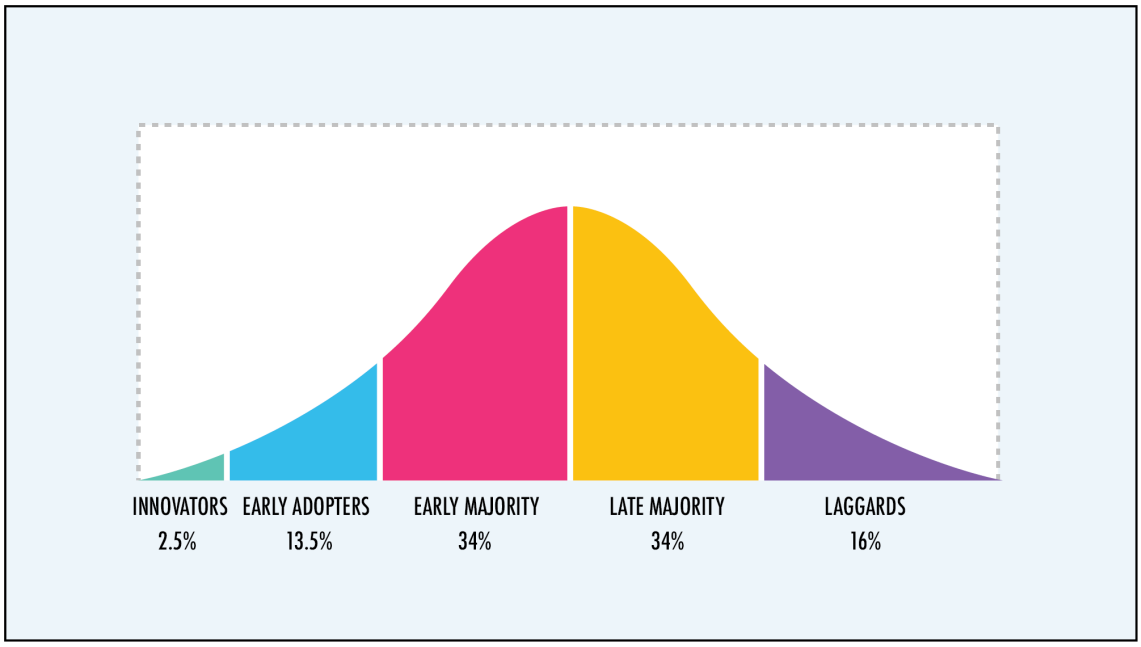

Figure 1.2: Diffusion of Innovations Model (Rogers, 2003)

Five stages form the diffusion innovation process (Rogers, 2003): *knowledge, persuasion, decision, implementation*, and *confirmation*. The model identifies 5 significant predictors of adoption and posits that the rate of adoption can be predicted by an individual's perception of the predictors: relative advantage, compatibility, complexity, trialability, and observability (Rogers, 2003).

Extensions to the DOI model could help understand the adoption of digital connectivity in more depth. In Moore's (2002) revised DOI model, it is proposed that there is a "chasm" in the bell curve between the *early adopters* and the *early majority*, as these segments of users have different expectations (Moore, 2002), see Figure 1.3. The chasm represents a credibility gap and exists because the early majority (Moore, 2002) tends to trust references from other people in their own adopter group more than references from early adopters and innovators (Moore, 2002). The gap also represents the transition from the early market to the mainstream market, which is critical for widespread adoption. Further research on the factors that contribute to the differences in adopter groups may deepen the understanding of the adoption of digital connectivity technologies in the context of SMEs in RRR Australia adding to the value of this research.

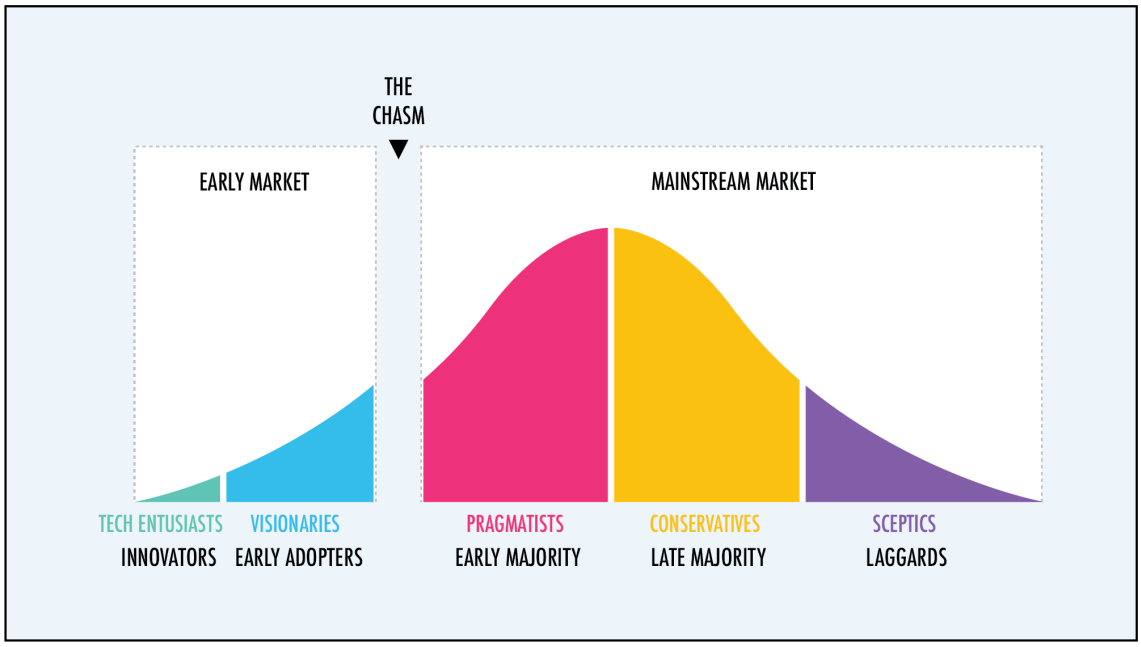

Figure 1.3: The Revised Technology Adoption Lifecycle (Moore, 2002)

1.4.2 Theory of Reasoned Action (TRA) and Theory of Planned Behaviour (TPB)

The Theory of Planned Behaviour (TPB) (Ajzen, 1985) is an extension of the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), which was developed from social psychology. Both theories are concerned with identifying the determinants that influence intentions, and therefore actions (behaviour). In TRA, there are two basic determinants, *attitudes,* and *subjective norms*. *Attitudes* concern a person's positive or negative evaluation towards performing the behaviour (not their attitude towards objects, people, or institutions), which is a personal factor. *Subjective norms* involve a person's perception of social pressures to perform (or not perform) the behaviour, which is a reflection on social influence. The TPB model (Ajzen, 1985) builds on TRA (Fishbein & Ajzen, 1975) by explaining a third determinant, *perceived behavioural control* which examines users' perceived ease of use or difficulty in using the technology (Pedersen & Lind, 2017). This model could be applied in this study to better understand the intentions that drive consumer behaviour when adopting connectivity technologies.

1.4.3 Technology Acceptance Model (TAM)

The Technology Acceptance Model (TAM) (Davis, 1986) is one of the most widely studied and accepted models in the area of technology adoption (Adams et al., 2017; Irani et al., 2009). Drawn from social psychology, it was adapted from the Theory of Reasoned Action (TRA) (Fishbein & Ajzen, 1975), which explains behavioural intention through both attitudinal and normative influences (Adams et al., 2017). TAM (Davis, 1986) is concerned with identifying and testing the relevance of certain factors in influencing users' decisions on how and when to use a new technology (Pierpaoli et al., 2013). This theoretical model hypothesises that two factors (Perceived usefulness (PU) and Perceived ease-of-use (PEOU)) influence attitudes towards technology, and consequently influence behavioural intention to use the technology (Irani et al., 2009). In other words, an individual's perception of a technology is thought to affect their behaviour towards it, therefore influencing their attitude to adopt or their intention to use technology. Consisting of just two core constructs of perceived usefulness and perceived ease of use, some argue that TAM's (Davis, 1986) advantage over other model's is its simplicity, and ability to be applied across different technologies and environments (Rao Hill et al., 2011). However, digital connectivity is a complex service that encompasses an array of technologies, and the simplicity of TAM may be limited in explaining adoption in the context of digital connectivity (Rao Hill et al., 2011).

1.4.4 Unified Theory of Acceptance and Use of Technology (UTAUT)

The Unified Theory of Acceptance and Use of Technology (UTAUT) was proposed by Venkatesh et al. (2003) to understand the drivers behind users' intention to include technologies in their daily work, to inform the design of interventions that promote adoption (Venkatesh et al., 2003). It presents a comprehensive framework for understanding technology adoption by individuals, integrating elements from eight key theoretical models (see Figure 1.4), most of which are derived from social psychology.

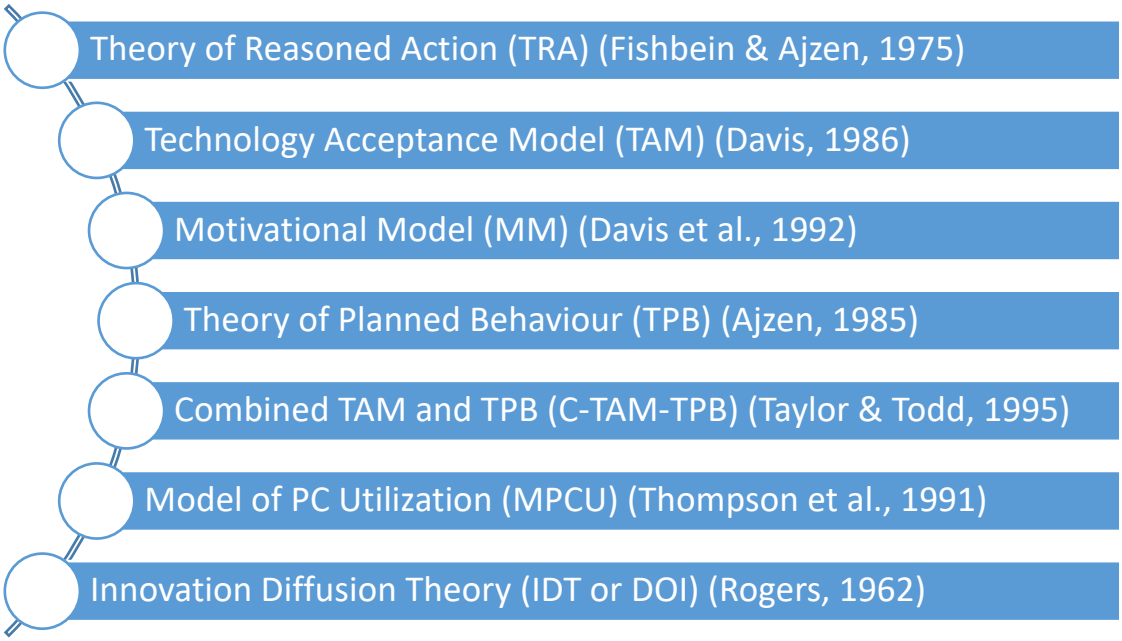

Figure 1.4: Theoretical Models Integrated into UTAUT

Prior to Ventash's study (2003), a comprehensive comparison of these competing models had not been conducted in a single study. The UTAUT framework was empirically validated using longitudinal data from four organisations, and cross-validated using a further two organisations. It was able to explain 70% of the variance in usage intention, outperforming the eight original models and their extensions. As summarised in Table 1.2, four constructs were identified as direct determinants for the adoption of technology: *Performance Expectancy, Effort Expectancy, Social Influence,* and *Facilitating Conditions* (Venkatesh et al., 2003). Additionally, four key moderating factors were defined: *Gender, Age, Experience* and *Voluntariness of Use* (Pedersen & Lind, 2017; Venkatesh et al., 2003).

Table 1.2: UTAUT Constructs and Moderators, Summarised from (Venkatesh et al., 2003)

UTAUT Construct	Related Constructs	Key Moderators
Performance Expectancy: "the degree to which an individual believes that using the system will help him or her to attain gains in job performance" (Venkatesh et al., 2003)	• Perceived usefulness (TAM/TAM2/C-TAM-TPB) • Extrinsic motivation (MM) • Job-fit (MPCU) • Relative advantage (IDT) • Outcome expectations (SCT)	For behavioural intention: • Gender • Age Stronger for men and younger workers
Effort Expectancy: "the degree of ease associated with the use of the system" (Venkatesh et al., 2003).	• Perceived ease of use (TAM/TAM2) • Complexity (MPCU) • Ease of use (IDT)	For behavioural intention: • Gender • Age • Experience Stronger for women, older workers, those with limited experience
Social Influence: "the degree to which an individual perceives that important others believe he or she	• Subjective norm in TRA, TAM2, TPB/DTPB and C-TAM-TPB • Social factors in MPCU • Image in IDT	For behavioural intention: • Gender • Age

should use the new system" (Venkatesh et al., 2003)		• Voluntariness of Use, "the degree to which use of the innovation is perceived as being voluntary, or of free will" (Moore, 1991, p. 195). • Experience Stronger for women, older workers, those with limited experience, and when mandated.
Facilitating Conditions: "the degree to which an individual believes that an organisational and technical infrastructure exists to support use of the system." (Venkatesh et al., 2003)	• Perceived behavioural control (TPB/ DTPB, C-TAM-TPB) • Facilitating conditions (MPCU) • Compatibility (IDT)	For behavioural intention: • None, due to the effect of being captured by Effort Expectancy. For usage: • Age • Experience Stronger for older workers with increasing experience.

Since its inception, the UTAUT framework has been used across a variety of industries (for example, entertainment, telecommunications, banking, financial services, retail electronics, health care, education, government, commerce, and library). A 2016 meta-analysis of 74 studies that applied the UTAUT model confirmed that performance expectancy, effort expectancy, and social influence are reliable predictors of intention to use technology, and that behavioural intention is proven to directly affect usage behaviour (Khechine et al., 2016). However, the facilitating conditions construct was not found to be a direct predictor of intention to use technology. Overall, the study validated 80% of the key relationships in UTAUT in many contexts. However, the UTAUT model has not been widely used in rural contexts and other models are more relevant for the present research.

1.4.5 Technology Upgrade Model (TUM)

The central theoretical models outlined in Sections 1.4.1 to 1.4.4 focus on understanding the adoption of new technologies. However, little is known about technology upgrading behaviour (Wang et al., 2018). A different approach is required to understand incremental upgrades, as the influencing factors may be different. The Technology Upgrade Model (TUM) (2018) was developed to understand IT upgrade behaviours and is based on a combination of status quo bias theory (SQB) (Samuelson & Zeckhauser, 1988) and purchase intention model (PIM) (Warshaw, 1980). SQB suggests that people often prefer to maintain their current situation of behaviour, and PIM suggests that behavioural intentions are influenced by a combination of motivational (perceived need, driven by perceived pressure and own desire) and non-motivational elements (purchase ability, driven by affordability and accessibility) (Wang et al., 2018). Wang et al. (2018) posit that the upgrade decision making process is more complex than first-time/repeat-use adoption behaviours, because it involves comparisons between the current system with benefits of the upgrade (Wang et al., 2018).

Whilst it has not been applied in a large range of contexts such as rural Australian users or connectivity technologies, TUM (2018) does provide relevant insights that could bridge the theoretical gap in understanding incremental upgrades. Figure 1.5 shows the

constructs of the model - all paths represent significant effects. The model proposes that *Perceived Need* has a positive effect on behavioural intention to upgrade, and *Inertia* has a negative effect, causing users to persist with using incumbent systems.

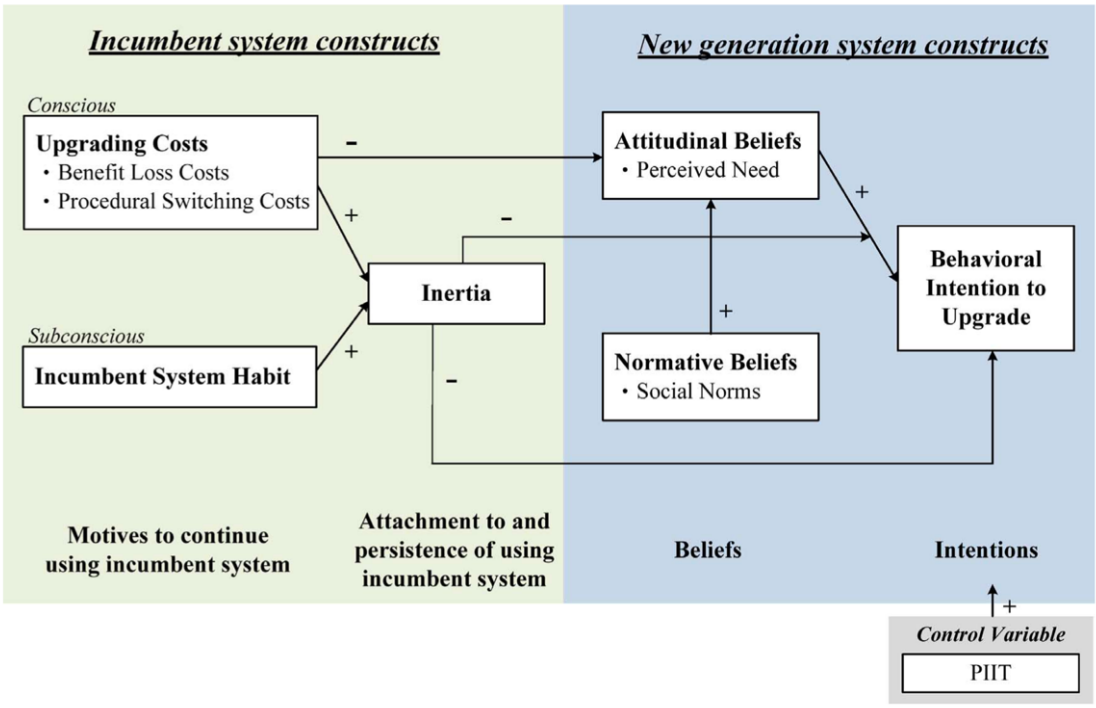

Figure 1.5: Technology Upgrade Model (TUM) (Wang et al., 2018)

The factors that influence *Inertia* are Upgrading Costs and Incumbent System Habit. Upgrading costs involve conscious decision making and are made up Benefits Loss Costs and Procedural Switching Costs (Wang et al., 2018). Benefits Loss Costs are defined as the potential loss of benefits when leaving the current system for another, for example the loss of skills and familiarity with the current system, which may reduce task performance (efficiency, quality, compatibility) (Wang et al., 2018). Procedural Switching Costs are defined as "the time, effort, and hassle of finding and adapting to a new provider" including economic risk costs, evaluation costs, learning cost and setup costs (Wang et al., 2018), see Figure 1.6. Incumbent System Habit involves subconscious motives, and is defined as the predisposition to continue using a current system in an automatic and unthinking manner (Wang et al., 2018).

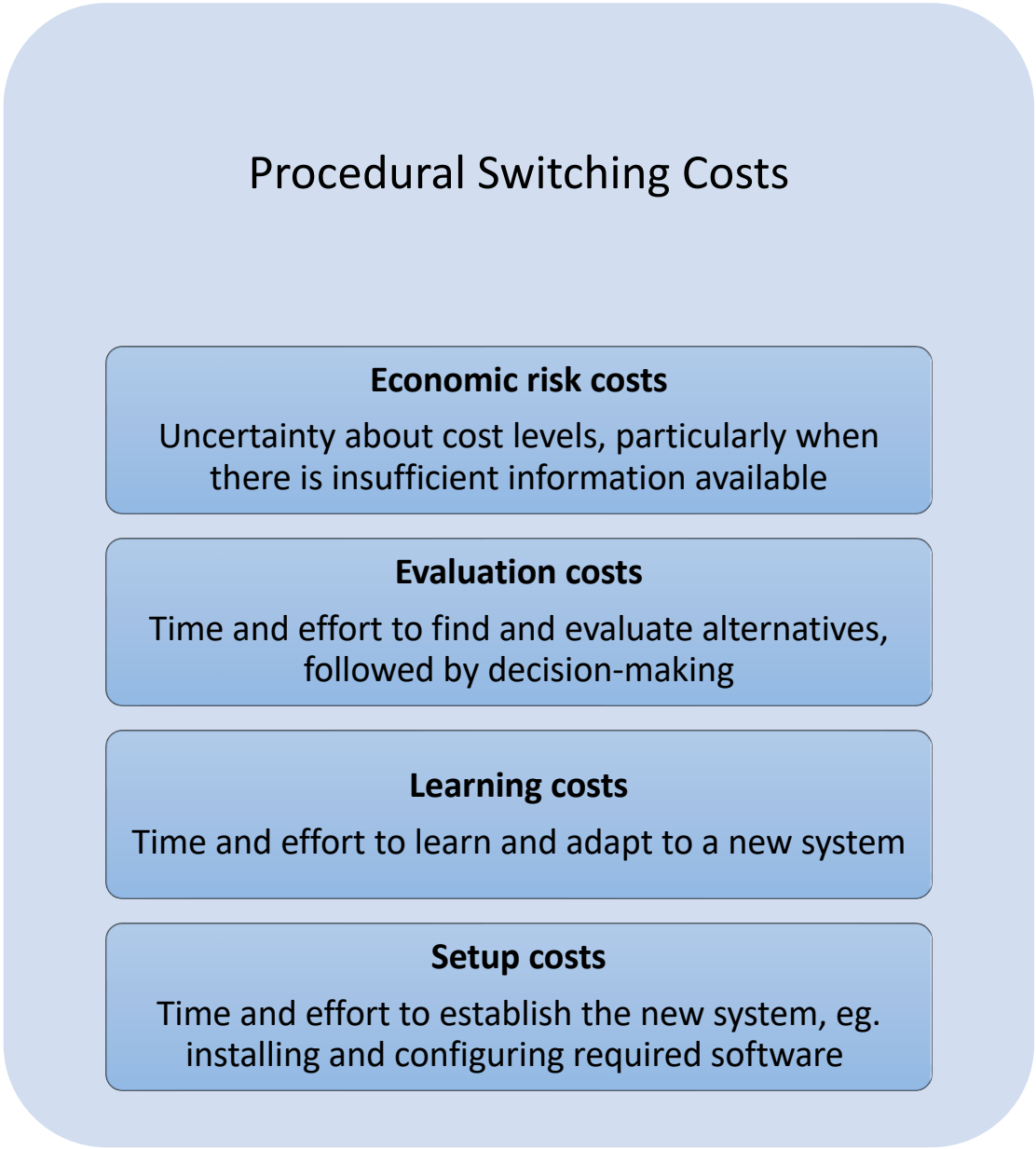

Figure 1.6: Procedural switching costs in TUM (Wang et al., 2018).

1.4.6 Psychological theory

Technology adoption research recognises that those who seek information about new ideas and technology are generally highly innovative individuals (Lu et al., 2005) with positive intentions towards acceptance and the ability to cope with high levels of uncertainty (Rogers, 2003). Many of the dominant technology adoption models are derived from social psychology and focus on social structures more than individuals. However, few studies have integrated personality traits into technology adoption research, particularly in terms of intention to adopt IT innovations (Lu et al., 2005).

Other variables such as political or cultural factors have not been widely studied in the context of technology adoption. The present study acknowledges that individual psychology and personality traits can influence adoption behaviour, however there is insufficient theory to draw from in the specific context of technology adoption in RRR SMEs.

1.4.7 Other theoretical approaches

It is important to consider other theoretical approaches for this study, due to the unique characteristics of RRR SMEs and their owners. Four other models were considered to better understand the digital divide, technology adoption in households, farmer decision making processes, and working with involuntary clients.

Two technology adoption models were explored to understand technology adoption in the context of RRR SMEs. The sequential model of Digital Technology Access (Van Dijk, 2005) was developed by, specifically to understand the digital divide. This model proposes that four factors contribute to digital divide gaps: *motivational access* (attitudes), *material access* (physical access), *skills access* (digital ability), and *usage* (frequency and type of online activities) (Van Dijk, 2005). A study by Van Deursen and Van Dijk (2015) confirmed that attitudes towards the internet had a direct influence on physical access, skills development and usage (Borg & Smith, 2018; Van Deursen & Van Dijk, 2015). This model could help understand differences between RRR and metropolitan businesses. Many RRR SMEs are family businesses that operate from households. The Model of Adoption of Technology in Households (MATH) (Brown & Venkatesh, 2005) proposes that three main constructs can be used to explain technology adoption in the household: *attitudinal beliefs* (influenced by utilitarian outcomes, hedonic outcomes and social outcomes), *normative beliefs* (social influence on behaviour), and *control beliefs* (internal abilities and constraints, or external constraints). Whilst these two specialised models are somewhat relevant to the present study, they are not tailored for exploring the complex issues related to establishing a connection in challenging environments.

Given that a significant proportion of RRR SMEs are agricultural operations, two identified frameworks were found to be relevant to exploring farmers in the study. Pannell et al. (2006) proposes that stages of adoption by farmers consist of: awareness of a problem or opportunity, non-trial evaluation, trial evaluation, adoption, review and modification, and non-adoption or dis-adoption, which is supported by Alexander et al. (2020) who also applied the framework to farmers. The second framework, Working with Involuntary Clients (Trotter, 2015), was developed for social workers challenged with clients who are resistant to assistance. Trotter (2015) argues that the notion that involuntary clients are unmotivated is an oversimplification. In discussing client motivation, Trotter cites a study by O'Hare (1996) in mental health which used a scale with 4 stages-of-change: pre-contemplation, contemplation, action, maintenance – to investigate where clients are on the continuum. O'Hare found that voluntary clients are more likely to engage in the change process than involuntary clients, however nearly one-third of involuntary clients did show an interest in changing (those who had reached the contemplation stage or further). Trotter (2015) adds to this, observing that clients are much more motivated if pursuing their own important goals than someone else's. Trotter's framework is an evidence-based practice model that provides approaches for working in partnership with involuntary clients (Trotter, 2015). The four key principles in this model are role clarification, pro-social modelling, and reinforcement, problem-solving, and relationship. While it was originally developed for social workers, it may be useful in exploring approaches to behavioural change for individuals who lack an interest in digital connectivity.

1.4.8 Theoretical framework selection

The aim of the present study is to explore the human factors that interact with and influence the implementation and adoption of connectivity technology by SMEs in RRR Australia. Whilst many theoretical frameworks have been used to examine technology adoption and usage, few have been used in the context of improving the ICT digital divide (Yu et al., 2017). Digital connectivity is a complex area that results in complex patterns of adoption behaviour (Willis & Tranter, 2006). For example, digital literacy training may lead to improved adoption statistics. However, the actual training or skills may not be the underlying cause of improvement. Instead, the individual's improved

self-efficacy and increased ability to appreciate the opportunities that could result from adoption may be the motivator (Dobson et al., 2013).

Whilst aspects of technology adoption/acceptance models and frameworks explored are relevant to the current study, none have a strong precedent for understanding the complexities of establishing and maintaining connectivity in RRR SME contexts, and the associated adoption decisions. The most relevant to the present study include:

- The DOI model (Rogers, 2003) to understand critical determinants for adoption, as this has been widely studied in rural contexts, detailed in a systematic literature review by Salemink et al. (2017).
- The UTAUT framework (Venkatesh et al., 2003) to understand the impact the social environment has on attitudes and behaviours related to technology adoption.
- The "Crossing the Chasm" extension to the DOI model (Moore, 2002) to understand adopter groups and the innovation diffusion life cycle.
- The Technology Upgrade Model (Wang et al., 2018) to understand technology upgrade behaviour.
- The Working with Involuntary Clients model (Trotter, 2015) for evaluating potential interventions.

The identified models were considered in the development of the survey questions and data analysis but were not tested in the exploratory study.

1.5 Chapter summary

Chapter 1 positioned the study and provided a background overview of the importance of digital connectivity for RRR SMEs. The research gaps, aim, objectives, outcomes, and overarching research questions were established. The theoretical foundation of the thesis was discussed, including an overview of prominent theoretical frameworks and explanation of the approaches selected to underpin the work.

Chapter 2 Research Methods

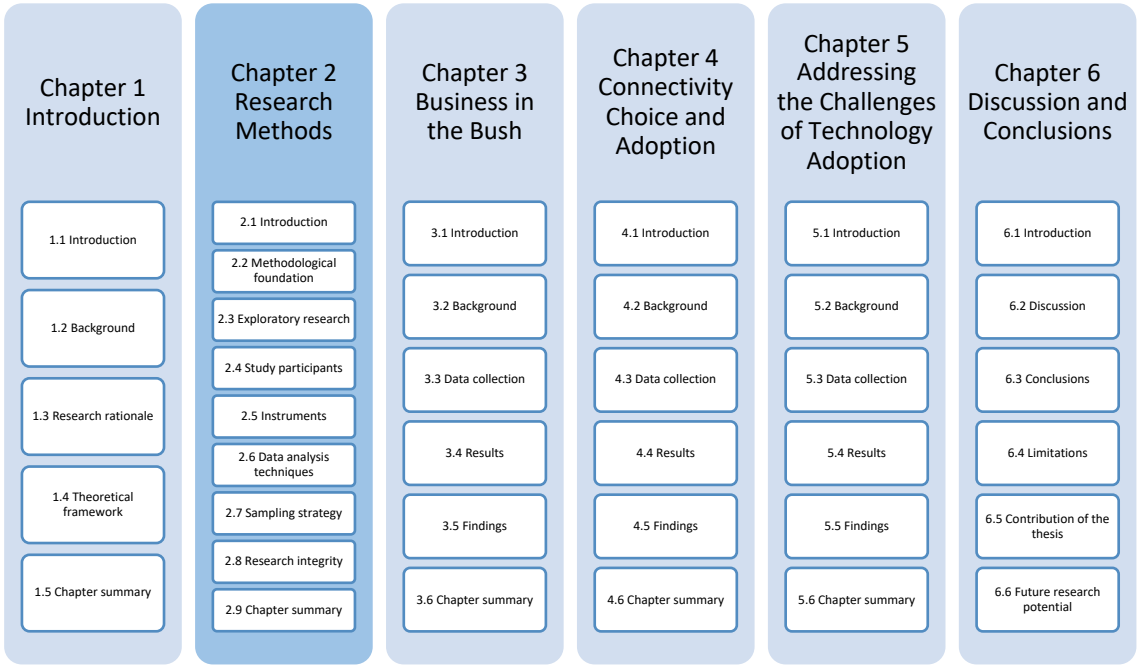

Figure 2.1: Outline of the Thesis – Research Methods

2.1 Introduction

Chapter 2 presents the research methodology and will demonstrate how the theoretical framework guided question development, data collection and analysis. The primary considerations when selecting the methodology for this project focused on research integrity and producing relevant outcomes for the community. In addition, the approaches employed were congruent with the researcher's own experience, values, and philosophical perspectives, both as a design and information technology professional, and a RRR business owner. The project was undertaken in 5 phases, see Figure 2.2.

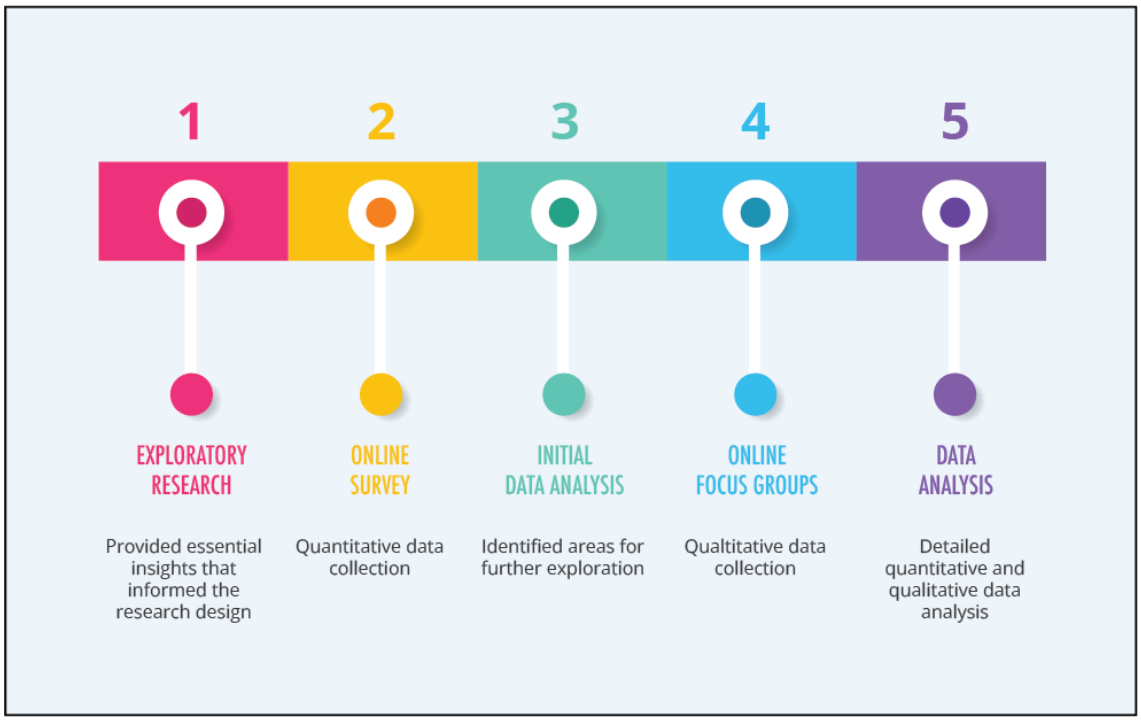

Figure 2.2: Phases of Project

2.2 Methodological foundation

The overarching theoretical framework for this project is pragmatism, which intertwines theory with practice (Saunders, 2019, p. 151). When undertaking pragmatic research, the research problem and questions underpin the research design, with the aim to find practical solutions. Due to the complexities of digital connectivity in RRR Australia, the project engaged key stakeholders with practical knowledge and experience in the area, in a Participatory Design (Bergold & Thomas, 2012) process to co-design the overarching research questions. Mixed Methods was chosen as the most suitable methodological foundation for the project, as it is congruent with pragmatism and participatory design, and it was determined that both quantitative and qualitative data were needed to answer the research questions. In the following sections of this chapter, the methodological foundation of Pragmatism, Participatory Design and Mixed Methods will be discussed in more detail, see Figure 2.3.

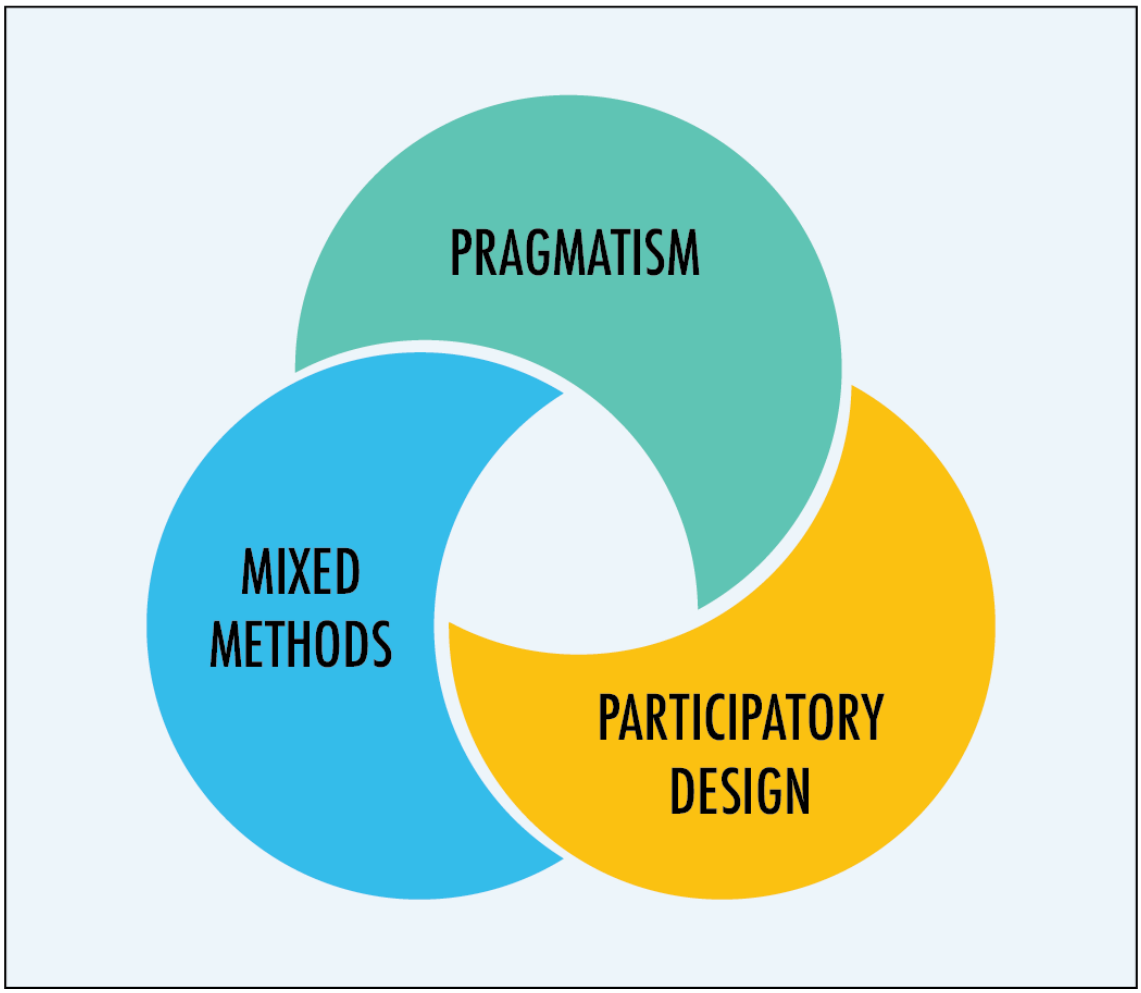

Figure 2.3: Methodological Foundation

2.2.1 Pragmatism as the overarching theoretical framework

Pragmatic researchers recognise that no single point of view provides the entire picture, and that there are different ways of interpreting the world and undertaking research (Saunders, 2019). In this section of the chapter, the value of this philosophy as a research framework is considered. The relationship between the philosophy and the research topic is discussed, establishing the suitability of this philosophy as the overarching theoretical framework for this project.

Epistemologically, pragmatism is premised on the idea that research can concentrate on practical understandings of real-world issues, rather than entering debates about the nature of reality (Kelly & Cordeiro, 2020). One of the central tenants of pragmatism is that concepts are only relevant when they support action (Saunders, 2019). What

distinguishes this philosophy from others, is that theories, concepts, ideas, hypotheses and research findings are considered in terms of practical outcomes in specific contexts (Saunders, 2019). Saunders asserts that when undertaking pragmatist research, the research problem and research questions are the most important determinant for the research design and strategy (Saunders, 2019).

Pragmatist researchers start with a problem, driven by a sense that something is wrong or out of place, and aim to find practical solutions that inform future practice following a reflexive process of inquiry (Saunders, 2019). When developing research questions, the practical outcomes are typically emphasised. Throughout the research process, theory is intertwined with practice.

Pragmatic inquiry recognises that individuals in social settings (including businesses) experience action and change differently (Kelly & Cordeiro, 2020). Research informed by pragmatism in organisational settings (such as businesses), can seek to explore and understand the connections between knowledge and action in context (Kelly & Cordeiro, 2020). This understanding is particularly helpful in business environments, where practice and knowledge are closely linked.

Grounding this research in pragmatism provides multiple benefits as detailed above. In seeking a methodology that is congruent with pragmatism, this project adopted both mixed methods and participatory design, with the overarching research questions central to the research strategy.

2.2.2 Participatory design

Pragmatism tends to underpin and inform participatory research (Saunders, 2019). Participatory design is an approach that directly involves the people who will benefit from the outcomes (often referred to as participants or users) in the design process. It focuses on exploring users' knowledge and taking that into account when designing new systems (Spinuzzi, 2005). Involving potential users in the design process is recognised to provide better insights (Donoso et al., 2014).

Donoso et al. (2014) propose that authentic application of this principle goes beyond simply allowing potential users to participate in the process, and focuses on when, how, and why these methods are used. Ultimately, the people whose activities and experiences will be affected most directly by a project outcome should have significant input into in deciding what that outcome is (Donoso et al., 2014).

The field of participatory design is extraordinarily diverse, with multiple applications (Donoso et al., 2014). When applied in a research context, the participants involvement in a research project moves beyond providing confirmatory interpretations and becomes an essential part of the research process (Spinuzzi, 2005).

Participatory design methodologies can be employed to support and guide the process of designing a research project. Participatory methodology is a research style that values the involvement of research partners in the production of knowledge (Bergold & Thomas, 2012). Participatory research methods involve the people who are under study in the actual planning, design and conducting of the research process (Bergold & Thomas, 2012), drawing upon their experience. As a result, the perspectives of both science and practice are unified to develop the research aims and research questions. This approach helps produce outcomes that are relevant to the population being studied (McKercher, 2020).

This research project employed participatory design methodologies and engaged a diverse group of research partners (stakeholders), as will be discussed in section 2.3, with the aim of producing outcomes that are relevant and beneficial to the community. This approach was congruent with the researcher's background in design thinking, and extensive experience in the application of the co-design process across a variety of contexts.

As established in Chapter 4 Connectivity Choice and Adoption: The Influencing Factors, digital connectivity in rural, regional and remote Australia, is a complex and multifaceted issue that continues to evolve. There is a wealth of valuable on-the-ground knowledge that is not yet documented in the literature but was considered essential to

this project. The group of stakeholders included professionals, volunteers, and users with experience in connectivity in RRR Australia, who contributed their valuable on-the-ground knowledge and feedback on the project and its understanding of the issues, this process will be discussed in Section 2.3.

2.2.3 Mixed methods

Mixed methods research combines both quantitative and qualitative research data collection techniques and analysis (Saunders, 2019). Discussion over the value and validity of quantitative, qualitative, and mixed method approaches persist, and opposing views are contested in the literature. All three approaches are considered typical methods for pragmatic inquiry (Saunders, 2019). However, mixed methods were determined the most appropriate methodological foundation for conducting this research project.

There are two primary reasons that underpin the choice of mixed methods as the methodological foundation for this research project. First, to answer the research questions, the project required both quantitative data to uncover patterns within the target population, as well as qualitative data to explain the reasons behind those patterns. Second, a mixed method approach was selected to increase research integrity, this process will be discussed in Section 2.8.

The mixed methods approach is congruent with participatory research projects. Fetters et al. (2013) identified participatory research as one of the four advanced frameworks (multistage, intervention, case study, participatory) in which mixed methods is common (Fetters et al., 2013). Furthermore, the authors state that researchers often apply specific designs to conduct the four kinds of studies and note that the community often shapes the design of the study in participatory research. This confirms that the combination of mixed methods and participatory research is suitable, and commonly used in research projects.

The study was designed as a sequential exploratory (Ivankova et al., 2006) mixed methods research project, where quantitative data was collected before qualitative

data. The research was conducted in a series of five phases, with each phase building on the findings from the previous phase. In the latter stages, qualitative data was used to explain, clarify and further explore the findings from the quantitative data, as typical in a sequential explanatory design (Ivankova et al., 2006). This process supported the development of theory.

2.2.4 Response to rationale

The methodological foundation of pragmatism, participatory design, and mixed methods research was determined suitable for studying RRR SMEs. The framework of pragmatic inquiry underpinning the research resulted in practical contributions. As established in the thesis, digital connectivity in RRR Australia is a complex and multifaceted issue that continues to evolve. Participatory research design was essential for developing research questions informed by key stakeholders (see section 2.3) that led to relevant and beneficial outcomes. The mixed methods strategy was deemed suitable for studying RRR SMEs. The online survey produced a breadth of data that generated a thorough understanding of the target population's characteristics and factors that influence connectivity-technology adoption. The online focus groups enabled participation from a range of geographically dispersed participants. The conversational style employed in the online focus groups, along with small group sizes, resulted in rich data that expanded on the survey findings to provide meaningful insights and a deeper understanding of connectivity technology adoption in RRR SMEs.

The project supports the research rationale by broadening the understanding of the factors that influence the adoption and effective use of connectivity technologies by RRR SMEs. It answered the three primary research questions, as will be discussed in Chapter 6. As the research project progressed, it became evident that the scope of the original research objectives exceeded the limitations of this project, and thus a number of areas were identified for further research, see Section 6.6.

2.3 Exploratory research

To apply participatory research principles in an authentic manner, the process began in the very early stages, with the design of the research project itself. A series of

exploratory discussions were held with individual stakeholders to identify the most urgent problems pertaining to connectivity in RRR Australia, and to discuss how the project could contribute to finding sustainable solutions.

Stakeholders comprised of representatives from four organisations with knowledge and experience in connectivity in RRR Australia. Better Internet for Rural, Regional and Remote Australia (BIRRR) is a “volunteer support, advisory and lobby group for all bush telecommunications” (2021b). NBN Co was established to “design, build and operate Australia’s wholesale broadband access network” (NBN Co, 2022). Regional Development Australia (RDA) is an Australian Government initiative that “brings together all levels of government to enhance the development of Australia's regions” through a national network of committees (Regional Development Australia, 2022), and was represented by a delegate from Regional Development Townsville and North West Queensland. Wi-Sky is a “broadband provider building our own local networks and delivering fast internet to farmers and people in country areas who are unable to access other options” (Wi-Sky, 2022).

An informal conversational approach (Gubrium et al., 2012) was used to explore the topic and provide contextual background. The research topic, research focus and overarching research questions for the project were evaluated and developed in collaboration with identified stakeholders. The participatory design process engaged key stakeholders to review the draft research focus, and their feedback was used to refine the aims of the research. This was an important phase of the project in seeking to ensure that the outcomes have relevance to the issues faced by SMEs in RRR Australia.

Developing upon the initial exploratory research, a literature review was conducted to clearly define SMEs within the context of RRR Australia (see Section 3.2) to identify gaps in the research (see Section 1.3.1), to identify key concepts and patterns for further exploration in the online survey (see Section 2.5.1).

Following the literature review, a detailed analysis of Australian Digital Inclusion Index (ADII) data from 2016 to 2019 (current at the time of project commencement)

confirmed the themes discussed by stakeholders and supported the research direction. The ADII was developed in 2015 to monitor the level of digital inclusion across Australia (Thomas et al., 2019). The primary researcher corresponded with ADII team regarding the attitude measures in the ADII survey (discussed in Section 4.2.3), with the view to including those five questions in this study to allow for comparison with previous ADII reports. The answer frame from years prior to 2021 was not able to be used, as it was a proprietary data source. However, the ADII revised the Index in 2021 and developed their own instrument, the Australian Internet Usage Survey (AIUS), and permission was granted to use questions from this instrument in the present study allowing comparison between survey responses.

2.3.1 Literature review methodology

Although literature is scarce in the specific area of digital connectivity adoption in the context of RRR SMEs, there are papers from related areas which contribute knowledge that is relevant to the present study.

A scoping review was undertaken systematically (Pham et al., 2014) to locate, critically appraise, analyse and synthesise extant literature. Search parameters were defined, and the inclusion criteria included academic, government and agency publications from the last ten years. Searches were conducted using James Cook University OneSearch, Google Scholar, the database Scopus, and the data sites Australian Bureau of Statistics (ABS) and Better Internet for Rural, Regional and Remote Australia (BIRRR). Search terms included keywords relating to digital connectivity adoption and usage, in the context of business in rural, regional, and remote areas. The searching process was iterative, and a larger initial selection of keywords was adjusted to refine and focus the results. Search terms were selected based on concepts and vocabulary used in the literature from the fields of ICT, sociology and rural development, see Table 2.1.

Table 2.1: Search Terms for Literature Review

Research theme	Search terms
Digital connectivity	Technology, internet, ICT, broadband, digital, telecommunications, connectivity
Adoption and usage	Adoption, use, usage, digital divide, digital literacy
Human factors	Barriers, motivators, factors, psychology, behaviour, perception, attitude
Study context	Australia, rural, regional, region, remote, business, SME, agriculture

A total of 171 sources were identified and added to Endnote. This was followed by an iterative evaluation process. A paper was excluded if it was not dealing with populations in developed countries. Further papers were excluded based on their abstracts, where the content was deemed of low relevance to this study. The remaining 86 papers were included in a systematic reading and analysis process. Recent policy documents and literature were used throughout the review to position the findings.

A thematic analysis grid was used to track research themes and subthemes, from which a commentary was written on emergent issues. Data was extracted to form a table of authors who discussed human factors that may influence digital connectivity adoption in RRR SMEs and categorise a sub-set of themes within this specific context.

2.4 Study participants

Three organisations with relevant membership groups were chosen to distribute the online survey. All of these groups have a significant portion of members that run businesses in RRR Australia, including a diversity of producers, home-based businesses and businesses in regional towns. Due to the limitations of the study, some types of people might have been missed from the study, such as those that are digitally disinclined or those that are perfectly happy with their internet - refer to Section 6.4 for

the discussion on limitation to the research. Figure 2.4 below shows the participants and the collection instruments used in the study. All three groups were invited to participate in the online survey. The final question in the survey asked respondents if they were interested in taking part in online focus groups.

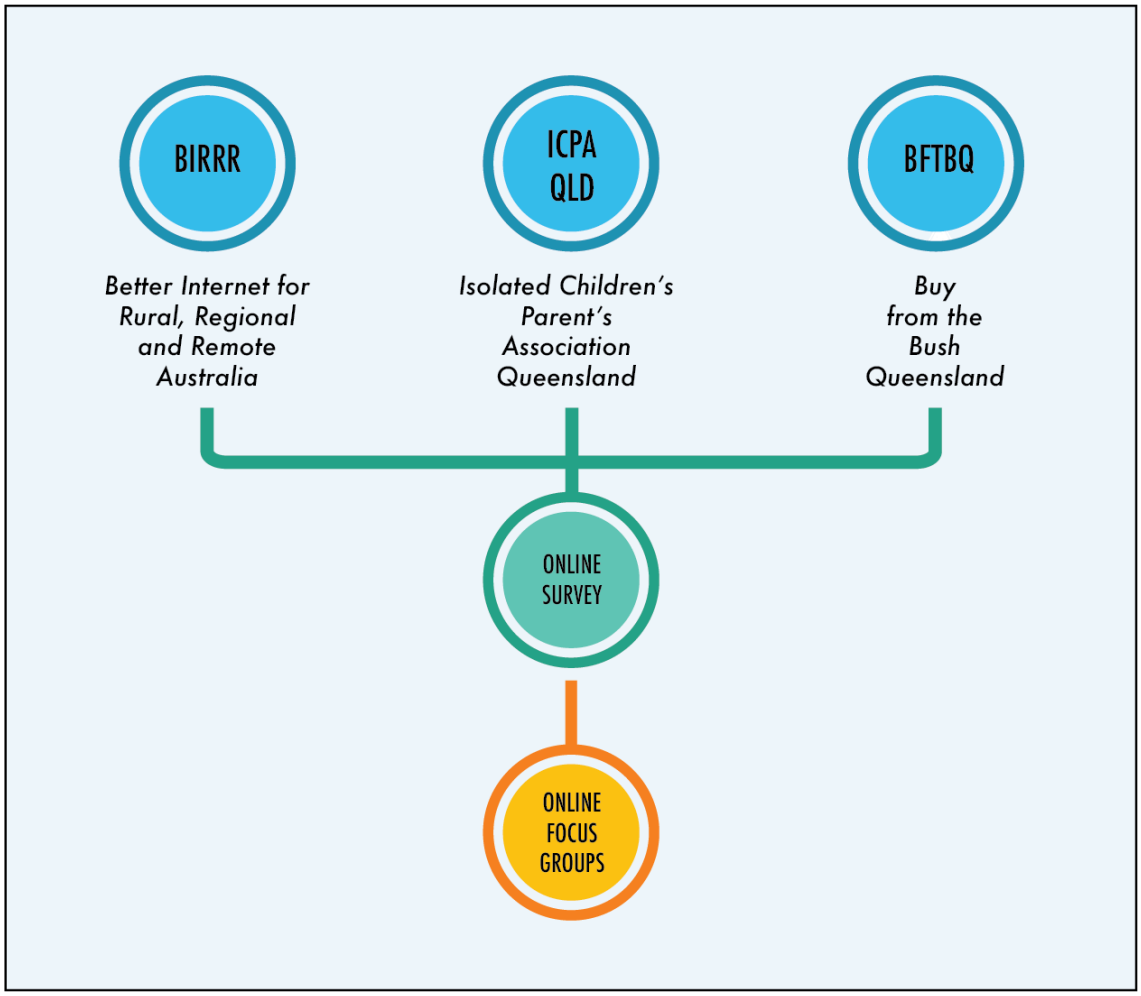

Figure 2.4: Study Participants and Data Collection Instruments

2.4.1 Better Internet for Rural, Regional and Remote Australia (BIRRR)

Better Internet for Rural, Regional and Remote Australia (BIRRR) is a "volunteer support, advisory and lobby group for all bush telecommunications"(Better Internet for Rural Regional and Remote Australia (BIRRR), 2021b). The BIRRR Facebook group was established in October 2014. The volunteer team of administrators offers free support and independent advice to individuals requiring assistance with connectivity options and issues in RRR areas up until November 2020, when these support services were

transitioned to the newly formed Regional Tech Hub (Regional Tech Hub, 2021). Now, the BIRRR team continues their advocacy work, and lobbies "for improved access to communications for all Australians, regardless of where they live in this wide brown land" (Better Internet for Rural Regional and Remote Australia (BIRRR), 2021b).

The BIRRR Facebook group is an active public forum for discussion on all kinds of matters related to connectivity in RRR Australia, and has approximately 13,600 members (Better Internet for Rural Regional and Remote Australia (BIRRR), 2021a). The membership is congruent with the target population for this study, making the selection appropriate for this research project.

2.4.2 Isolated Children's Parent's Association (ICPA) Queensland

The Isolated Children's Parent's Association (ICPA) is a voluntary, non-profit, apolitical body that works for "equity of access to education for all students who live in rural and remote Australia" (2021). ICPA has 92 branches around Australia, and 50 of those are based in Queensland (2021). The ICPA membership base represents a cross-section of Australia's rural communities, and includes primary producers, small business owners, schools, national and state-based organisations, and individuals.

The Queensland State Council for the ICPA has approximately 1,200 members across rural and remote Queensland, and many of their members operate primary production businesses and / or small businesses from their properties (Ostwald, 2020). The ICPA QLD INC - Isolated Children's Parents' Association Queensland Inc Facebook page has over 4,300 followers (ICPA QLD INC - Isolated Children's Parents' Association Queensland Inc, 2021). The membership closely resembles the target population for this study, making the selection appropriate for this research project.

2.4.3 Buy from the Bush Queensland (BFTBQ)

Buy from the Bush Queensland was formed in mid-2018, and supports Queensland farmers and rural businesses by encouraging consumers to buy goods directly from the group's members (Buy from the Bush Queensland, 2021). The public Buy from the Bush Qld Facebook page has over 26,000 followers. The private Facebook Messenger chat

group, BFTBQ BUSINESSES, is a key communication channel for members, and has a membership of approximately 60 business owners. The membership closely matches the target population for this study, making the selection appropriate for this research project.

2.5 Instruments

The two instruments used in this study were an online survey and online focus groups.

2.5.1 Online survey

An electronic survey was distributed via Qualtrics Survey Software. A non-electronic option was considered, however as the study investigates online SMEs and the requirement to move online because of Covid-19 a fully online option was selected. This choice of instrument aligns with current industry practices for surveying business owners, for example the Sensis Business Index moved to a fully digital survey methodology in 2019, reflecting the online shift of enterprises (Clarke, 2019). Electronic surveys are typically used in rural, regional, and remote communities due to the geographical spread of residents. In addition, Covid-19 restrictions on social distancing, lockdowns and uncertainties around events favoured electronic distribution. The survey was distributed to the RRR community, in partnership with the three organisations, as identified in Section 2.4. Social media networks were used to extend the survey, reduce bias, and capture a greater diversity of views. To accommodate individuals with inadequate connectivity who wished to participate, an option was available to complete the survey by telephone with the primary researcher. However, no requests were received for telephone support.

2.5.1.1 Survey development

Information from the exploratory research phase (literature review and participatory research design, as discussed in Section 2.3) was collated into a data requirements table (Saunders, 2019, p. 514) to design appropriate measurement questions and establish validity (Saunders, 2019, p. 517). Uniform Likert scales were used in the survey, to allow for accurate comparisons during analysis. The framework included the following components for each survey question:

- Investigative question (the question text)
- To establish (a summary of what was wanted to be known)
- Measurement (detail in which data measured)
- Relation to theory and key concepts in literature
- Notes and comments from the research team during development
- Notes about survey flows

Whilst undertaking this research, the primary researcher worked as a research assistant for a project which conducted a digital connectivity needs analysis for Far North Queensland (Marshall et al., 2021). Insights from the needs analysis were used to inform the development of the business needs questions in the online survey (see Appendix 2: Online Survey / Questionnaire (Qualtrics) – Question 14).

To encourage a high survey completion-rate the survey was designed to be simple, easy to understand, and easy to fill in (multiple choice options where possible). The survey used flow logic to move through the survey to reduce the survey duration and ensure that only relevant questions were asked. For example, if a respondent answered that they have two businesses, then two sets of questions were presented – one for each business, with a note to specify which business was being addressed.

A representative from BIRRR (Better Internet for Rural Regional and Remote Australia (BIRRR), 2021b) reviewed the draft survey questions and provided input to improve the technical clarity of the questions and suggestion on additional topics to explore – the survey was adjusted accordingly. A pilot survey was developed, and a small group of real business owners participated and provided feedback. Lessons learnt around improving the survey questions included: enhancing the clarity of questions and adding explanations where necessary, to make the questions more easily understood. The results from the pilot survey were used to assess the duration of the survey, check all survey flows, and test the process of exporting data to SPSS.

The final Qualtrics workflow included 3 surveys, a main survey, followed by an optional expression of interest in focus groups, and an optional prize draw entry form.

Refer to Appendix 2: Online Survey / Questionnaire (Qualtrics) for the questions used in the main survey.

2.5.1.2 Survey recruitment

The survey was distributed through a series of social media posts inviting people to participate during September and October 2021, and snowball sampling (Saunders, 2019) occurred as the posts were shared with broader networks.

A series of four posts were distributed in the Better Internet for Rural Regional and Remote Australia (BIRRR) (2022) Facebook Group - three by the researcher and one by the BIRRR volunteer group to encourage further engagement with the survey (see Figure 2.5). Overall, the posts were shared a total of 27 times by individuals, businesses, and groups including Guardian Australia Rural Network, North QLD Small Business, Keep Charters Towers Businesses in Business 2021, and the Regional Tech Hub Community Discussion Board. The post was also distributed on the ICPA QLD INC - Isolated Children's Parents' Association Queensland Inc (2021) Facebook page, and was shared 7 times. A message was distributed in the private BFTBQ BUSINESSES chat group. The researcher also shared the post with her network on LinkedIn, which resulted in 372 views, and 11 reshares. Survey participants had a period of seven weeks to complete the survey, which took an average of 13 minutes to complete. A total of 120 survey responses were collected.

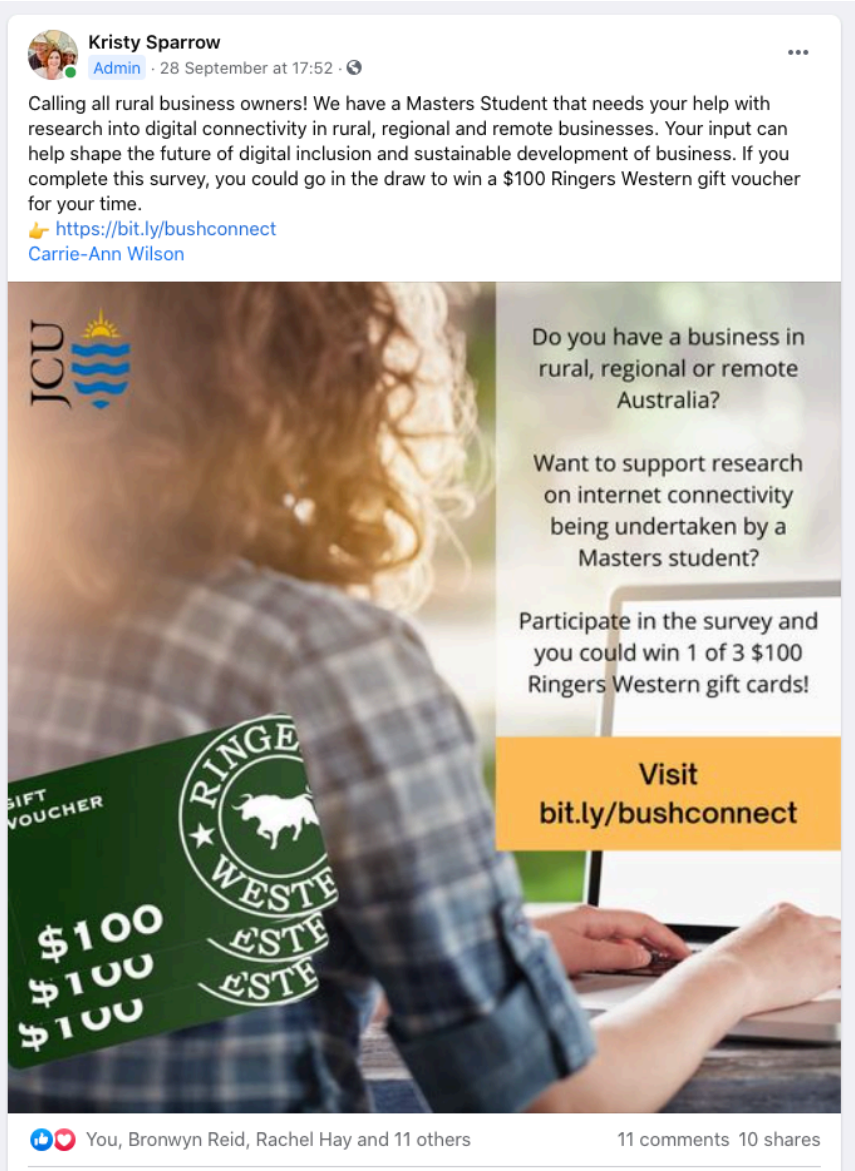

Figure 2.5: Screenshot of Shared Social Media Post

To incentivise participation, a random prize draw was held in conjunction with the survey. The prizes were select to appeal to the target population, three $100 Gift Cards from Ringers Western, a leading Australian country clothing brand. Prize draws of $100 gift certificates have been found to have positive effects on survey response rates, and are easier to implement and more cost effective than other survey incentives (Sauermann & Roach, 2013). The three winners were drawn at random onsite at James Cook University by a staff member and PhD student, and the selection was video recorded. The three winners were sent their electronic gift vouchers by email.

2.5.2 Online focus groups

Focus groups are a specific type of group interview, where the researcher facilitates discussion amongst participants to explore a defined topic (Saunders, 2019, p. 467). In this phase of the research, online focus group sessions were held using a semi-structured interview approach (Saunders, 2019, p. 445). The qualitative interviewing process facilitates an open-ended exploration of the research topic, to both round out and widen the enquiry. The focus groups were used to gain a more in-depth understanding of the range and depth of shared motivations and barriers that influence technology adoption by RRR SMEs. The focus groups were conducted by two members of the research team to improve reliability and validity (Saunders, 2019, p. 214).

Face to face interviews were considered. However, due to the geographic disbursement of the potential participants and challenges related to scheduling in-person events during Covid-19 restrictions, online interviews were deemed a more suitable option.

A set of pre-determined questions were used to stimulate discussion, allowing for new topics to be discussed as they arose. The focus groups were held online using the Zoom video conferencing platform, and the audio was recorded for further analysis. Prior consent was obtained through the ethical research process.

Three online focus groups were held and ran for approximately 90 minutes each. Typically, focus groups include four to 12 participants (Pallant, 2020). However, due to the complexity of the subject matter and the online environment, each focus group was limited to a maximum of five participants. Smaller groups of four to six have been found to be more suitable when the purpose is to gain in-depth understanding, particularly when participants have significant experience with the topic (Propst et al., 2008).

Using the five categories of adopters identified in the Diffusion of Innovations (DOI) theory, *innovators, early adopters, early majority, late majority,* and *laggards* (Rogers, 1962), a mix of participants from each adopter category were selected for each focus groups to ensure diversity. Due to the time of the year (December and very close to the

Christmas break), attendance was lower than expected. A total of 15 participants were scheduled to participate in the focus groups, however only 8 joined. Focus group 1 had 3 participants, focus group 2 had 4 participants, and focus group 3 had 1 participant. The participants were willing to share their thoughts, and conversation flowed well. Although the sample was small (N=8) and could not be considered representative (Saunders, 2019, p. 317), the participants provided valuable insights and a deeper understanding of the barriers to technology adoption was gained. Refer to Appendix 1: Focus Group Guidelines for the questions used in the focus groups.

2.6 Data analysis techniques

2.6.1 Initial data analysis - identify areas for further exploration

Survey data was exported from Qualtrics to Microsoft Excel, and a cleaning process was undertaken by two members of the research team to establish intercoder reliability (Saunders, 2019, p. 214). A total of 120 survey responses were received. ID numbers were allocated to all entries prior to the cleaning process. Cases that did not meet the selection criteria were removed, including three cases that identified as not being SME owners or decision makers, and two that identified as not located in RRR areas. The survey software exited the respondents that did not meet the selection criteria from the survey immediately after completing the initial section, so as not to waste their time completing the survey. Subsequently, 9 cases with 85% or more incomplete data were removed to reduce non-response bias (Saunders, 2019). The locality and postcode of respondents' businesses were cross referenced with ABS data in order to classify each business with the appropriate Remoteness Area category (Australian Bureau of Statistics, 2016). After checking this data, it was found that a further 11 businesses were located in Major Cities of Australia. These cases were also excluded from further analysis, as they did not meet the criteria of being based in RRR areas. After completion of the data cleaning process, a total of 91 cases remained and were used for data analysis, see Figure 2.6. Chapter 3 will discuss the 127 businesses that are represented by these 91 business owners.

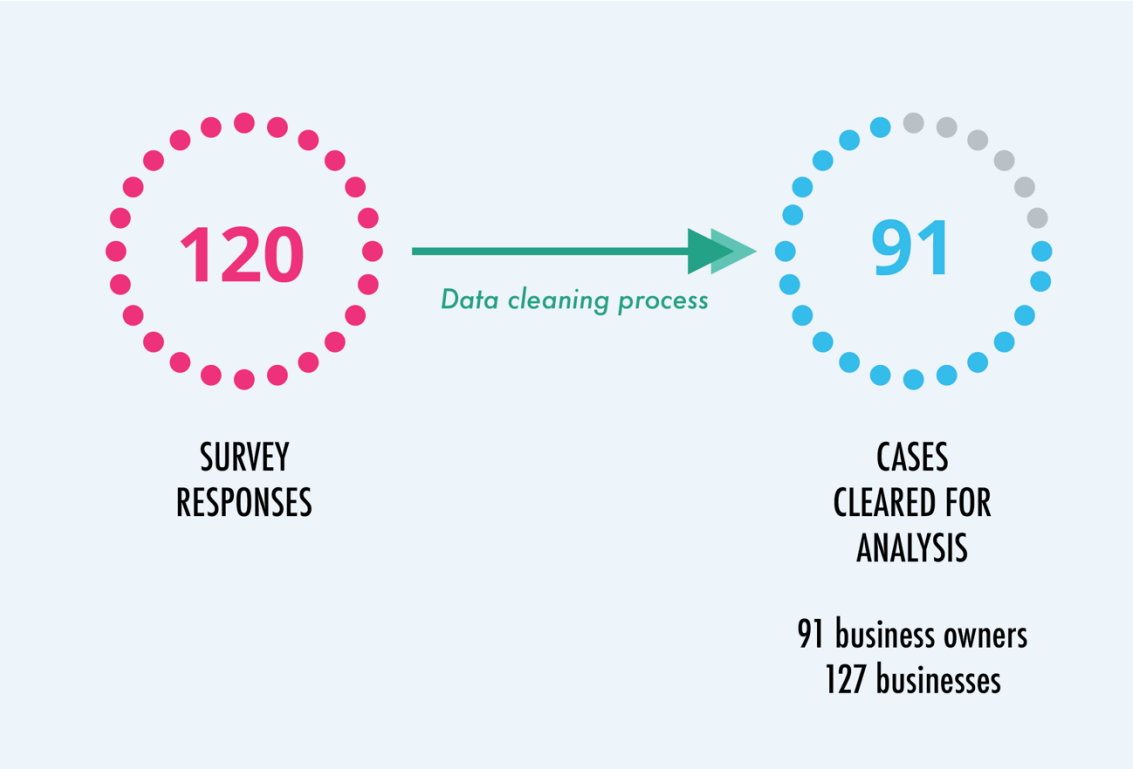

Figure 2.6: Data cleaning process

The open-ended survey question that asked respondents to describe their business as fully as possible, using two words or more, was coded using the ABS Occupation Standard (Australian Bureau of Statistics, 2018) to group the responses and code into categories.

Content Analysis was used together with exploratory factor analysis in this phase of the project. Content Analysis is a technique that involves categorising and coding data collected in the survey in order to enable quantitative analysis (Saunders, 2019). Results were categorised and coded, then imported into the data analysis software SPSS. Exploratory factor analysis, often used in the early stages of research to explore relationships within a set of variables (Pallant, 2020) formed an appropriate foundation for the initial data analysis of the survey data. Frequency analysis and descriptive analysis were used to identify factors to explore in more depth, identify groups of potentially related factors, reveal gaps, develop theories, and inform questions for the focus groups in phase 4 (see Section 2.5.2).

2.6.2 Detailed Data Analysis

In mixed methods research, triangulation is an important validation technique that adds depth, breadth, complexity and richness to research (Saunders, 2019). Triangulation was used by combining data from the online survey and focus groups to gain a greater understanding of the results, and to produce more complete knowledge.

Data analysis incorporated a combination of statistical tests including frequency analysis, descriptive analysis, means analysis, multiple response analysis and cross tabulation analysis. Thematic analysis (Saunders, 2019, p. 651) was used to explore the qualitative data (unstructured comments) and identify key themes and concepts in greater depth. Focus group data was transcribed and manually coded into relevant themes using a spreadsheet. This provided clarification, validation, and correction on components of the earlier analysis.

Confirmatory factor analysis is typically used in later stages of the research process, to confirm specific hypotheses (Pallant, 2020). This set of techniques was used to further explore the relationships between factors that were identified in earlier stages of analysis.

The final analysis phase aimed to clearly define the human factors that interact with and influence the adoption and implementation of connectivity technology in RRR SMEs, and to evaluate their impact on the effective use of internet connectivity in RRR SMEs. The analysis identified gaps in connectivity literacy support for RRR SMEs and considerations for delivering this support.

2.7 Sampling strategy

Given that it would be impractical to collect data for from the entire target population of SME owners in RRR Australia, multi-stage non-probability sampling was used (Saunders, 2019). The sample was initially gathered using volunteer sampling techniques among the three membership groups discussed in Section 2.4. Self-selection sampling (Saunders, 2019, p. 323) occurred when the survey was promoted on social media to the target groups and participants volunteered to be part of the research. This was deemed an appropriate way to answer the research questions and meet the

objectives, as cases that self-select often have strong feelings or opinions about the research topic (Saunders, 2019). Subsequently, snowball sampling occurred, when respondents proceeded to share the survey with their social networks, and in-turn the additional respondents shared the survey with their contacts.

The survey started with four filter questions to assess participant suitability, using RRR and SME descriptors. Exclusion criteria were: Under 18 years of age, not in a decision-making role within a 'business entity', not part of a SME, and/or not located in RRR Australia. For the purposes of this research, the term 'business entity' is used in its widest sense, as per Australian and New Zealand Standard Industrial Classification (ANZSIC) "to include any organisation undertaking productive activities, including companies, non-profit organisations, government departments and enterprises." (Australian Bureau of Statistics, 2006). An additional question verified that the business entity did not exceed the SME limit of 200 employees. When a participant was deemed unsuitable, the survey software exited the participant by sending them directly a thank you page. The data cleaning process described in Section 2.6.1 was used to ensure that the sample was representative of the target population (Saunders, 2019, p. 295) and to reduce non-response bias (Saunders, 2019, p. 302).

2.8 Research integrity

According to Saunders (2019), a mixed methods approach contributes to the validity (p. 218) and generalisability (p. 185) of the research. In the present research, mixed methods enabled the use of triangulation (Saunders, p. 218), as both qualitative and quantitative data was collected. When both sets of data generate comparable findings, this helps confirm the validity of the results.

The project followed and was approved by the JCU Human Research Ethics process, HREC number H8232. The James Cook University Human Research Ethics Committee (HREC) reviewed the project in accordance with the National Statement on Ethical Conduct in Human Research (2007) - Updated 2018 (Australian Government - Australian Research Council, 2018).

In accordance with the requirements for scholarship holders, the primary researcher abided by the National Code for the Responsible Conduct of Research, NH&MRC statement on Human Experimentation: Supplementary Notes 1992 and rulings of the University's Ethics Review Committee and the University's Workplace Health and Safety Committee.

2.9 Chapter summary

Chapter 2 presented the methodological framework for the thesis. With pragmatism as the overarching theoretical framework, this research project values active methods of enquiry, with an emphasis on practical solutions and outcomes. To produce meaningful outcomes, it was crucial to engage in a participatory research process and involve stakeholders in the research design. The mixed methods studies included an online survey and online focus groups to produce quantitative and qualitative data. Participants were recruited from three rural membership groups with relevant constituents. Qualitative and quantitative data analysis techniques were used to address the research questions.

Chapter 3 Business in the Bush: SMEs Operating in RRR Australia (Study 1)

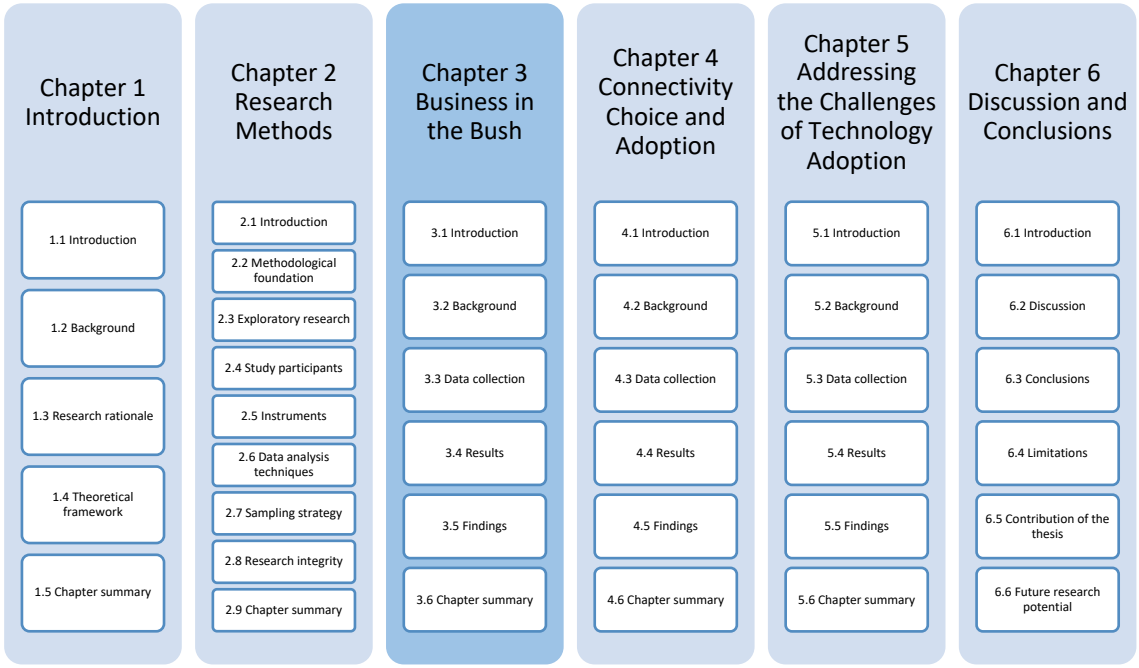

Figure 3.1: Outline of the thesis – Business in the Bush

3.1 Introduction

Chapter 3 presents Study 1 for this project and will explore the theme of Business in the Bush – who the business owners are, and why do they need to be online? It presents a contextual understanding of SMEs Operating in RRR Australia, which is needed to better understand their connectivity needs and challenges. The primary research questions for Study 1 are detailed in Table 3.1.

Table 3.1: Study 1 Research Questions and Theme

Study	Research Questions	Theme	Research Objective
Study 1: Business in the Bush (Chapter 3)	RQ1: What types of SMEs are operating in RRR Australia? RQ2: What are the characteristics of SMEs (and their owners) in RRR Australia?	Who are they and why do they need to be online?	To clearly define SMEs within the context of RRR Australia.

3.2 Background

3.2.1 Defining Small and Medium Enterprises (SMEs) in Australia

There is no universal definition for small and medium enterprises (SMEs) in Australia and the definitions used also vary when compared with other countries. The Australian Taxation Office (ATO) defines a 'small business' as an entity (individual, partnership, company, trust) with less than $10 million aggregated turnover (Australian Government - Australian Taxation Office, 2017). The Australian Bureau of Statistics (ABS) categorises businesses as either small, medium, or large. The ABS defines a 'small business' as a business that employs fewer than 20 people, including the following categories:

- Non-employing businesses (sole proprietorships and partnerships without employees)
- Micro-businesses (1-4 employees)
- Other small businesses (5-19 employees)

A 'medium business' is defined by the ABS as one that has 20-199 employees and a 'large business' is defined as one with 200 or more employees (Australian Small Business and Family Enterprise Ombudsman, 2019).

The Australian Securities and Investment Commission (ASIC) defines companies as either small or large. From July 2019, it defines a 'small proprietary company', as companies with at least two out of the following three characteristics (Australian Securities and Investment Commission, 2020):

- an annual revenue of less than $50 million
- fewer than 100 employees
- consolidated gross assets of less than $25 million

Since many statistics and reports are drawn from ABS publications, the present research will use the ABS definition of small and medium business. Based on this premise,

businesses that employ between 1 and 199 people are considered to be small and medium enterprises (SMEs) for the purpose of this research.

3.2.2 Defining Rural, Regional and Remote Australia (RRR)

The term 'Rural, Regional and Remote' (RRR) is commonly used by industry groups, organisations, and government departments to describe all areas that are outside of major metropolitan cities. Various geographical classification systems have been used to define rural, regional, and remote areas in Australia.

The RRMA (Rural, Remote and Metropolitan Areas) classification system was developed in 1994 by the Department of Primary Industries and Energy. In this system, areas are categorised as metropolitan (capital cities, and other metropolitan areas), rural (large rural centres, small rural centres, and other rural areas), and remote (remote centres, and other remote areas). Zones are allocated based on an index of remoteness, according to Statistical Local Area (SLA). The index score is based on a combination of personal distance index (relating to population density), and distance indices (distance to nearest urban centres) (Australian Institute of Health and Welfare, 2004).

The ARIA (Accessibility and Remoteness Index of Australia) classification system was developed in 1997 by the Commonwealth Department of Health and Aged Care. ARIA categorises areas as highly accessible, accessible, moderately accessible, remote, and very remote. In this system, areas are allocated based on road distance from closest service centre in each of four classes (Australian Institute of Health and Welfare, 2004).

The Australian Standard Geographical Standard (ASGS) classification system was first released in 2011 by the Australian Bureau of Statistics (ABS), replacing the Australian Standard Geographical Classification (ASGC) that had been in use since 1984. At the same time, the Australian Statistical Geography Standard – Remoteness Area (ASGS-RA) replaced the ASGC-RA. This framework is used to define Remote Area (RA) classifications - 5 classes of remoteness are determined according to population and relative access to services, measured using ARIA+, an improved form of ARIA.

Remoteness Areas (RA) are “aggregates of SA1s that are grouped together based on their average ARIA+ score”. The ASGS was updated in 2021 and was titled the Australian Statistical Geography Standard (ASGS) Edition 3. However, changes to Remoteness Structure were not included in the 2021 update. The expected release for the ASGS Edition 3 Remoteness Structure is early 2023 (Australian Bureau of Statistics, 2021d). The most current version the Remoteness Structure is part of ASGS 2016 – “1270.0.55.005 - Australian Statistical Geography Standard (ASGS): Volume 5 - Remoteness Structure, July 2016” (Australian Bureau of Statistics, 2017). As depicted in the map below, Figure 3.2, the Remoteness Area Categories are Major Cities of Australia, Inner Regional Australia, Outer Regional Australia, Remote Australia, and Very Remote Australia (Australian Bureau of Statistics, 2016).

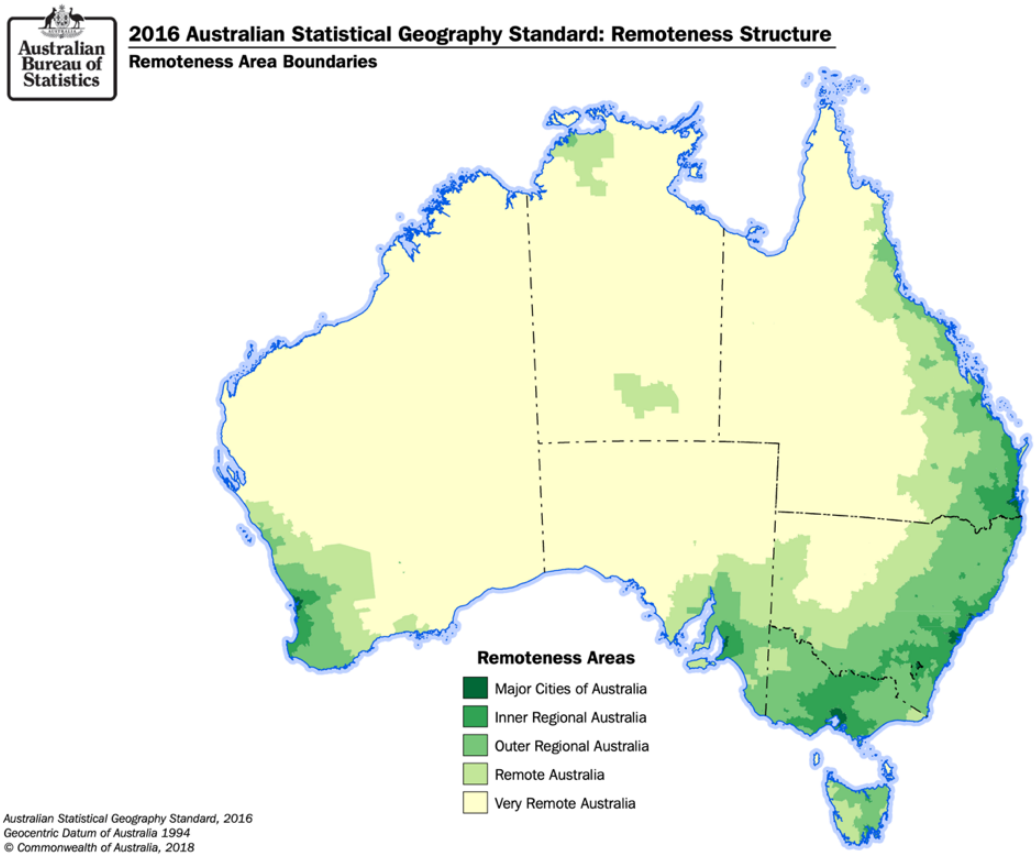

Figure 3.2: Map of 2016 ASGS-RA Remoteness Areas for Australia (Australian Bureau of Statistics, 2016)

Since many statistics and reports are drawn from ABS publications, the present research project will use the ASGS Remoteness Structure framework developed and used by the

ABS. All Remoteness Areas (RA) except for Major Cities of Australia are considered to be 'rural, regional and remote' (RRR) for the purpose of this research. The latest release, ASGS 2016 – "1270.0.55.005 - Australian Statistical Geography Standard (ASGS): Volume 5 - Remoteness Structure, July 2016" (Australian Bureau of Statistics, 2017) was used to define the remoteness categories of participants in this study.

3.2.3 SMEs operating in RRR Australia

The ABS Education and Work dataset from 2021 shows that 28.89% of businesses in Australia are based in regional or remote areas, see Table 3.2 (Australian Bureau of Statistics, 2021c). While this data does not distinguish between SMEs and larger enterprises, the results show that nearly one third (32.26%) of unincorporated businesses are based in regional or remote areas.

Table 3.2: ABS Education and Work Dataset 2021, Whether Business is Incorporated or Unincorporated (Australian Bureau of Statistics, 2021c)

2021: Whether business is incorporated or unincorporated						
	Incorporated		Unincorporated		Total	
	n	%	n	%	n	%
Remoteness areas						
Major Cities of Australia	720.8	75.13	793.2	67.26	1514	70.79
Inner Regional Australia	155.4	16.20	225.6	19.13	381	17.81
Outer Regional Australia	71.6	7.46	138.3	11.73	209.9	9.81
Remote Australia	10.4	1.08	14	1.19	24.4	1.14
Very Remote Australia	0	0.00	2.6	0.22	2.6	0.12
Sub-total Regional and Remote	**237.4**	**24.74**	**380.5**	**32.26**	**617.9**	**28.89**
Total	959.4	100.00	1179	100.00	2139	100.00
Note: Education and Work Dataset. Counting: Persons. # (000's)						

A geographic breakdown of businesses by ASGC Remoteness Area is included in ABS Cat. No. 8175.0, Counts of Australian Small Business Operators (Australian Bureau of

Statistics, 2013). Table 3.3 shows that in 2011, 32.6% of all small business operators were based in regional and remote areas, and 32.3% of all business operators were based in regional and remote areas. These data were collected in the 2011 Census.

Table 3.3: Numbers of Small Business Operators by Remoteness Area, 2011 (Australian Bureau of Statistics, 2013)

Remoteness area	Percentage of all business operators	Percentage of all small business operators
Major Cities of Australia	67.7	67.4
Inner Regional Australia	19.7	19.8
Outer Regional Australia	10.2	10.4
Remote Australia	1.7	1.7
Very Remote Australia	0.6	0.6
Other (includes migratory and no usual address)	0.1	0.1
Sub-total Regional and Remote	32.3	32.6
Total	100	100

The latest release of “Counts of Australian Businesses, including Entries and Exits” (CABEE) from the ABS was in August 2021 (Australian Bureau of Statistics, 2021a). This data is published at four geographical levels: Local Government Area (LGA), Statistical Area Level 2 (SA2), Main State, and Australia totals (Australian Bureau of Statistics, 2021b). However, these boundaries do not align with ASGS Remoteness Areas, which are based on Statistical Area 1 (SA1) boundaries, as discussed in Section 3.2.2. As a result, it is not possible to accurately determine the number of businesses in by ASGS Remoteness Area using the CABEE data.

The Sensis Business Index (Sensis, 2020) measures business outlook and confidence for Australian SMEs. Comparisons of Regional vs Metro Confidence show a shift occurred between August 2019 and August 2020 (Sensis, 2020). In August 2019, metropolitan

businesses were feeling more confident about the future (57%) than their regional counterparts (52%) (Sensis, 2020). In contrast, after the impacts of Covid-19 had begun, the August 2020 report includes a heading "The bush faring better than city businesses" (Sensis, 2020). Whilst regional business confidence dropped to approximately 43%, metropolitan business confidence dropped to approximately 40% (Sensis, 2020). Over the prior three months, 21% of regional businesses reported that Covid-19 had no impact on their business, compared to 12% of metropolitan businesses (Sensis, 2020). Additionally, regional businesses were also more optimistic about the future, with 9% of metropolitan businesses saying they are likely close over the next year, compared with 5% of regional businesses (Sensis, 2020).

Economic diversification is necessary for regional areas in Australia to survive challenges such as periods of drought, the demise of the resources boom and digital disruption (Alam & Adeyinka, 2021). Internet access plays an important role in facilitating diversification, particularly in farming enterprises (Morris et al., 2017). To explore diversification trends and SME growth areas, researchers can investigate newly established businesses in these regions. Young firms are defined by the Organisation for Economic Cooperation and Development (OECD) as those that are aged between 0 and 5 years of age (Hendrickson et al., 2015). Start-ups are a subset of young firms that are 0-2 years old, and mature firms are defined as those that are 6 years and older (Hendrickson et al., 2015). Research by the Australian Government Department of Industry and Science (2015) found that young SMEs (0-5 years) in Australia make a significant contribution to net job creation (40 per cent) (Hendrickson et al., 2015), which reinforces the importance of investigating newly established businesses.

3.2.4 Characteristics of SMEs in RRR Australia

Australian small businesses make a vital contribution to their local economies (Bosua et al., 2013; Hettihewa & Wright, 2018) and constitute the vast majority of businesses in rural Australia (Kotey, 2014). While regional small businesses have been found to be more durable than average in Australia, it is thought that they may be at risk because they are slower to adopt new technology (Hettihewa & Wright, 2018). In fact, there remains a reluctance to maximise the potential of the digital economy in small

businesses across Australia (Australian Small Business and Family Enterprise Ombudsman, 2019).

In small businesses, the owner/manager tends to make key decisions, contribute most of the operating capital, and have close control over business operations (Gilfillan, 2015). They are often responsible for performing principal information technology functions within the business, including installing, managing, and supporting the technology with limited or no dedicated support staff (Evans & Sawyer, 2009).

It is suggested that small business owner/managers typically prefer to rely on intuition, rather than formal strategies to run their businesses (Evans & Sawyer, 2009). Therefore, the motivations of the owner/manager are likely to be a determining factor in technology adoption within the business (Evans & Sawyer, 2009). However, it is not known whether these characteristics apply more broadly across SMEs, as most of the literature in this area is focussed on small businesses alone.

Regional small businesses tend to be less growth-oriented than their urban counterparts, and some could be described more as ‘lifestyle’ than ‘entrepreneurial’ businesses (Galloway & Mochrie, 2005). However, this does not make them less valid. Urban biases known as “geographic narcissism” (Fors, 2018), can result in the subtle devaluation of rural knowledge and conventions. In Australia, many RRR people feel the need to justify their careers and businesses, as there is a perception that they are not as good as their metropolitan counterparts and some find it challenging to be identified as equals (Baker & Hess, 2019). However, some RRR SMEs have to deal with significant challenges that urban businesses do not have to worry about, such as drought. A 2014 study that examined innovations implemented by small businesses in rural Australia to overcome the effects of the drought, found that business innovation was a reactive process rather than a proactive process, perceived as necessary in uncertain, hostile and turbulent environments (Kotey, 2014).

Due to their physical distance from urban areas, many rural residents work from home or run small businesses from home or in their local region (Townsend et al., 2013). As a

result, these businesses are often 'family firms' where ownership and management are concentrated within a family unit (Sirmon & Hitt, 2003). The integration of the family and the business creates unique characteristics, including human capital, social capital, survivability capital, patient capital, and governance structure (Sirmon & Hitt, 2003). Family firms rarely have all of the resources needed to compete effectively and having limited access to human capital outside the family can be problematic (Sirmon & Hitt, 2003).

The 'country way of life' is a dominant cultural structure in farming communities (Dobson et al., 2013), characterised by a strong preference for face-to-face interaction and a desire to maintain existing ways of operating – making digital connectivity technologies less attractive to this population. However, it has been found that these individuals are open to the adoption of technology when they can see a practical component that can be integrated into their mobile lives (Dobson et al., 2013). Digital technologies have the potential to realise new market opportunities, such as diversification (Bowen & Morris, 2019), which could be very important to this sector in order to overcome the challenges of drought, damaging weather events and seasonal income. Rural women who are often isolated by large-scale farming are increasingly playing an important role in diversification of farming businesses through the adoption of technology (Hay & Pearce, 2014). Understanding the types of SMEs operating in RRR Australia to gain a better understanding of their characteristics, while important, is beyond the scope of this study.

3.2.5 Digital connectivity in RRR SMEs

In the past, RRR businesses could operate without the internet. However, to remain part of the economy (Park et al., 2019), there is an increasing need for high-speed internet (i.e., broadband). It enables opportunities for business development and efficiency, and supports innovation, wealth creation, productivity and growth (Townsend et al., 2013). Additionally, it is becoming more essential in order to process and receive payments as the economy moves away from cash.

It is evident that many RRR businesses in Australia recognise the importance of the internet. The Better Internet for Rural, Regional and Remote Australia (BIRRR) Regional Access Survey, showed that RRR residents mostly use their internet for business (Hay, 2016). Lamb (2017) cites a telephone survey of Australian producers conducted by CSIRO Data61 in 2017, which found that 79% of respondents consider internet connectivity to be moderately-to-extremely important for their business, whilst only 7% consider it not important at all (Lamb, 2017, p. 55).

Many RRR SMEs are part of the agricultural sector, where the benefits of digital technology adoption are becoming more evident. Agricultural processes, markets, regulation and policies are transforming, and digital technologies are needed for most of the services and products required to operate in the digital economy (Marshall, 2019). Innovative digital applications that increase production and/or reduce input costs will drive the next generation of agricultural productivity (Szeles, 2018). For example, online sales reduce double-handling of livestock, which has benefits in terms of both animal welfare and profitability (by extending the reach of sales). Australian producers are interested in adopting more agricultural technology, however, this requires reliable digital connectivity both in the paddock and in the homestead (Szeles, 2018).

While growth is not always a priority for adopting technology in rural businesses (Townsend et al., 2015), the failure to adopt digital technologies could become critical to survival. Therefore, increasing usage of digital technologies in RRR populations can be seen as a significant opportunity. By contrast, it can also be seen as a serious threat for SMEs in these areas. Businesses that fail to, adopt technology, embrace opportunities and become actively involved in the digital economy, are also at risk of becoming uncompetitive (Mazzarol, 2015) against increased competition from e-commerce companies outside their local areas (Grimes, 2016).

3.2.6 Research gap

While it is evident that there is a critical need for reliable connectivity in RRR SMEs, the factors that influence technology adoption have not been widely studied in this

population. To provide a contextual foundation for further studies in this area, more research is needed to explore the kinds of businesses that operate in RRR Australia, their business connectivity needs, and the characteristics of the decision makers within these enterprises.

3.3 Data collection

As noted in Section 2.5, data was collected via an online survey and online focus groups. This study draws from selected questions in the survey and relevant discussion points from the focus groups. Refer to Chapter 2 Research Methods for a detailed description of the instruments, recruitment, data analysis techniques, and sampling strategy.

3.4 Results

3.4.1 Demographic analysis

ABS Age Standard was used to group ages (Australian Bureau of Statistics, 2014). However, the scale was adjusted to distinguish those under 18 years of age, as they were not eligible to complete the survey. As a result, the first age category includes only those that are aged 18-19, and the remainder follow the ABS Age Standard five-year increments. These five-year groupings also align with age groups used in ADII data (Thomas et al., 2020), ensuring that the survey data could compared to the ADII data. There was a distribution of ages, with most respondents between 40 and 54 years of age. Table 3.4 shows the breakdown of gender and age of the survey participants. There were 91 participants in total, including 77 who identified as female, 13 who identified as male, and 1 who selected the option “prefer not to say”.

Table 3.4: Cross Tabulation Analysis of Age and Gender of Survey Participants (N=91)

		Female (n)	Male (n)	Prefer not to say (n)
Age	18-19	0	0	0
	20-24	2	2	0
	25-29	0	0	0
	30-34	3	2	0
	35-39	8	0	1
	40-44	19	0	0
	45-49	14	2	0
	50-54	16	2	0
	55-59	9	2	0
	60-64	2	1	0
	65-69	1	1	0
	70-74	2	1	0
	75-79	0	0	0
	80-84	0	0	0
	85 and over	0	0	0
	Missing	1	0	0
	Total	77	13	1

Respondents were asked five questions about the location of their business, including their postcode and locality, from which further analysis was conducted. Postcodes were used to determine the state each business was located in.

Table 3.5 shows that 50% of the respondents' businesses were based in Queensland, 24.4% were based in New South Wales, and a small sample were located in other states.

Table 3.5: Frequency Analysis of Business Location (State)

State	n	%
QLD	45	50.0
NSW	22	24.4
VIC	10	11.1
WA	7	7.8
SA	4	4.4
NT	1	1.1
TAS	1	1.1
Total	90	100
Note: 1 case missing state		

Remoteness Area (RA) categorisations for each business were derived from Australian Bureau of Statistics Postcode 2017 to Remoteness Area 2016 data (Australian Bureau of Statistics, 2017), based on the locality provided by respondents. Localities were used rather than postcodes, as individual postcodes are often split across multiple RA categories. Postcodes were used to validate matches in cases where locality names were not unique. A limitation to this process became evident during analysis - there were six cases where both the business locality and postcode were split across multiple RA categories. In these cases, the distance from the nearest town was used to determine the most likely match. However, this may not be entirely accurate. The RA categorisations are presented in

Table 3.6. A total of 28.1% of respondents' businesses are located in Inner Regional Australia, 38.2% in Outer Regional Australia, 12.4% in Remote Australia and 21.3% in Very Remote Australia.

Table 3.6: Frequency Analysis of Business Location (ABS RA Category)

	n	%
Inner Regional Australia	25	28.1
Outer Regional Australia	34	38.2
Remote Australia	11	12.4
Very Remote Australia	19	21.3
Total	89	100
Note: 2 cases missing locality		

Most respondents run their business on an agricultural property. When asked "What best describes the type of property?", a total of 61.6% answered either "Agricultural" or "Rural residential with agriculture", and a further 17.6% answered "Rural residential without agriculture", see Table 3.7. This data allows farm businesses to be distinguished from other businesses.

Table 3.7: Frequency Analysis of Property Type

	n	%
Agricultural	37	40.7
Rural residential with agriculture	19	20.9
Rural residential without agriculture	16	17.6
Urban residential	13	14.3
Commercial	4	4.4
Industrial	2	2.2
Total	91	100

The distance to the nearest town varied between respondents. Over half (58.3%) of the respondents live more than 15km from the nearest town, including 11% that live more than 60km from the nearest town, see Table 3.8.

Table 3.8: Frequency Analysis of Distance to Nearest Town

	n	%
In town	20	22.0
Less than 5km	6	6.6
5 to 15 km	12	13.2
15 to 30 km	26	28.6
30 to 60 km	17	18.7
More than 60 km	10	11.0
Total	91	100

The survey data identified that the majority of respondents run their business from home. When asked “Is this location also where you live?”, 89% of respondents indicated that they live on the same property that their business is located, see Table 3.9.

Table 3.9: Frequency Analysis of Businesses Run from Home

	n	%
Yes	81	89.0
No	10	11.0
Total	91	100

3.4.2 Business types

To determine those with multiple businesses, respondents were asked “How many SME businesses do you run from this location?”, which also allowed us to ask addition questions to respondents that had multiple businesses. Just over half (54.9%) of respondents run only one business, and just under half (45.1%) run multiple businesses: 28.6% run two businesses, 11% run three businesses and 5.5% run more than three businesses, see Table 3.10.

Table 3.10: Frequency Analysis of Number of Businesses Per Respondent

	n	%
1	50	54.9
2	26	28.6
3	10	11.0
More than 3	5	5.5
Total	91	100

The online survey was set up to ask a repeating set of questions to understand what sort of business each respondent was running – this was capped at a total of 3 businesses per respondent. Respondents were asked to describe their business as fully as possible, using two words or more. The open-ended question was used to give the most detailed information and enable coding to a detailed level. Participants were also asked how many years their business had been running. These responses were categorised according to JP Morgan's business longevity scale (JP Morgan Chase & Co). In Table 3.11, business categories are cross tabulated with business durations. Mixed livestock was the category with the highest number of businesses (n=34), including 9 businesses that have been running for over 26 years. This data indicates the presence of multi-generational farm businesses (family-owned farming enterprises that are operated by multiple generations and often have successive ownership structures) – including one that has been running for 150 years. The category with the second highest number of businesses (n=19) were grouped as marketing, IT, digital and media businesses. Notably, 8 of these businesses have been running for less than 6 years. These kinds of business are more likely to be reliant on connectivity to successfully operate, which may not have been possible previously in these locations. This is an area that warrants further exploration to gain a better understanding of the kinds of new businesses that people in RRR areas are starting, which may be attributed to better connectivity.

Table 3.11: Cross Tabulation Analysis of Business Category and Longevity of Business

Business Category	n	Business Longevity					
		0-5 Years	6-10 Years	11-15 Years	16-20 Years	21-25 Years	26+ Years
Mixed Livestock	34	6	2	3	5	9	9
Marketing, IT, digital, media	19	8	1	4	2	1	3
Consulting and professional services	12	4	3	1	0	3	1
Crops & horticulture	9	2	1	1	1	1	3
Trade services, construction, and manufacturing	9	1	0	4	3	1	0
Agricultural and environmental services	8	5	0	1	1	1	0
Retail - general	7	4	2	0	0	1	0
Retail - agricultural and rural	4	1	0	0	0	0	3
Children's Services	3	3	0	0	0	0	0
Retail - online	3	3	0	0	0	0	0
Animal supplies and services	3	1	1	1	0	0	0
Advocacy and community groups	3	2	1	0	0	0	0

Hospitality, accommodation, and tourism	3	2	1	0	0	0	0
Training and education	2	1	1	0	0	0	0
Handmade products and art	2	0	1	0	0	0	1
Sport, health, and wellness services	2	1	0	0	1	0	0
Total	123	44	14	15	13	17	20

Note: Survey responses include a total of 127 businesses represented by 91 business owners. 4 cases missing business category and/or business longevity

To explore economic diversification trends and SME growth areas in RRR Australia, further analysis was conducted on young firms (businesses aged between 0-5 years), see Table 3.12. The top three categories for new businesses were Marketing, IT, digital, media (18.2% of new businesses), Mixed Livestock (13.6% of new businesses), and Agricultural and environmental services (11.4% of new businesses).

Table 3.12: Cross Tabulation Analysis of Businesses Established 0-5 Years Ago and Business Category

Business Category	n	%
Marketing, IT, digital, media	8	18.2
Mixed Livestock	6	13.6
Agricultural and environmental services	5	11.4
Retail - general	4	9.1
Consulting and professional services	4	9.1
Children's Services	3	6.8
Retail - online	3	6.8
Crops & horticulture	2	4.5
Advocacy and community groups	2	4.5
Hospitality, accommodation, and tourism	2	4.5
Retail - agricultural and rural	1	2.3
Animal supplies and services	1	2.3
Trade services, construction, and manufacturing	1	2.3
Training and education	1	2.3
Sport, health, and wellness services	1	2.3
Transport services	0	0.0
Retail B2B	0	0.0
Handmade products and art	0	0.0
Total	44	100

Respondents were also asked what industry best describes each of their businesses, using the 1292.0 - Australian and New Zealand Standard Industrial Classification (ANZSIC), 2006 (Revision 2.0) (Australian Bureau of Statistics, 2006). The data in Table 3.13 shows that the industries with the highest number of businesses are Agriculture, Forestry and Fishing (n=53), followed by Information Media and Telecommunications (n=13) and Retail Trade (n=13). This adds validity to the findings in Table 3.11.

Table 3.13: Frequency Analysis of Business Industrial Classification

Business industry	n	%
Agriculture, Forestry and Fishing	53	42.4
Information Media and Telecommunications	13	10.4
Retail Trade	13	10.4
Manufacturing	7	5.6
Construction	6	4.8
Other Services	6	4.8
Professional, Scientific and Technical Services	5	4.0
Education and Training	5	4.0
Health Care and Social Assistance	3	2.4
Arts and Recreation Services	3	2.4
Other (please specify)	3	2.4
Accommodation and Food Services	2	1.6
Administrative and Support Services	2	1.6
Wholesale Trade	1	0.8
Transport, Postal and Warehousing	1	0.8
Financial and Insurance Services	1	0.8
Electricity, Gas, Water and Waste Services	1	0.8
Total	125	100

Note: Survey responses include a total of 127 businesses represented by 91 business owners. 2 cases missing business industry.

Next, respondents were asked “Including yourself, family and workers, how many people work in the business?” for each business entity, with a breakdown of family and non-family workers. The answers were categorised to determine the size of the business, see

Table 3.14. The data shows that 26.8% of all businesses surveyed are sole traders, 52% are micro businesses (1-4 employees), 20.3% are small businesses (5-19 employees) and 1 is a medium-sized business (20-199 employees).

Table 3.14: Frequency Analysis of Business Size

	Business Size	n	%
Business 1	Sole Trader	18	20.9
	Micro business (1-4 employees)	46	53.5
	Small business (5-19 employees)	21	24.4
	Medium business (20-199 employees)	1	1.2
	Total	86	100
Business 2	Sole Trader	9	40.9
	Micro business (1-4 employees)	12	54.5
	Small business (5-19 employees)	1	4.5
	Medium business (20-199 employees)	0	0.0
	Total	22	100
Business 3	Sole Trader	6	40.0
	Micro business (1-4 employees)	6	40.0
	Small business (5-19 employees)	3	20.0
	Medium business (20-199 employees)	0	0.0
	Total	15	100
All businesses	Sole Trader	33	26.8
	Micro business (1-4 employees)	64	52.0
	Small business (5-19 employees)	25	20.3
	Medium business (20-199 employees)	1	0.8
	Total	123	100

Note: Survey responses include a total of 127 businesses represented by 91 business owners. 4 cases missing business size.

The data was analysed to explore family workers in the businesses, as family firms face unique challenges (see Section 3.2.4), including limited access to human capital outside the family (Sirmon & Hitt, 2003). The analysis found that 35 businesses had 2 or more family workers in addition to the respondent (see Table 3.15), and 31 businesses had 2 or more non-family workers (see

Table 3.16). This confirms that family workers constitute a significant proportion of the RRR SME workforce. Results from Study 3 (see Chapter 5) have identified that many of the participants may have limited knowledge of troubleshooting IT problems. Therefore, we could infer from the results that a limited knowledge of IT within the family unit and hence the work force could contribute to challenges in managing the connectivity resources of the business.

Table 3.15: Number of Family Workers in Business

No. of family workers	n
1	48
2	40
3	20
4	12
5	3
Total	123

Note: 1 family worker in each business is the respondent.

4 cases missing business size.

Table 3.16: Number of Non-Family Workers in Business

No. of other (non-family) workers	n
0	72
1	20
2	9
3	5
4	3
5	2
6	1
7	1
8	3
10	4
12	1
15	1
20	1
Total	123

Note: 4 cases missing business size.

3.4.3 Business owner roles

Respondents were asked “How many hours per week do you usually work in this business?” for each of their business entities. The distribution of hours for business 1, 2 and 3 varies, see

Table 3.17. Looking at all businesses together, the data shows that 47.2% of the businesses are full time jobs for their owners (35 hours or more), whilst 22.8% of owners work 20-34 hours, a further 25.2% work 5-19 hours per week, and less than 5% work under 5 hours per week in the business.

Table 3.17: Frequency Analysis of Weekly Hours Worked by Business Owner

	Owner hours	n	%
Business 1	0-4 hours	3	3.4
	5-19 hours	17	19.3
	20-34 hours	21	23.9
	35 hours or more	47	53.4
	Total	88	100
Business 2	0-4 hours	2	8.3
	5-19 hours	11	45.8
	20-34 hours	5	20.8
	35 hours or more	6	25.0
	Total	24	100
Business 3	0-4 hours	1	6.7
	5-19 hours	4	26.7
	20-34 hours	3	20.0
	35 hours or more	7	46.7
	Total	15	100
All businesses	0-4 hours	6	4.7
	5-19 hours	32	25.2
	20-34 hours	29	22.8
	35 hours or more	60	47.2
	Total	127	100

However, this data does not represent the true working hours of business owners who are running more than one business simultaneously. The survey question asked respondents to select the number of hours worked from pre-defined categories, so the total number of hours works is not exact and can only be estimated using totals of the nominated working windows. However, further analysis found that 11% of participants work more than 70 hours per week, see Table 3.18. This may indicate that these

participants are either unaware or they are not cognisant of a potential work life imbalance, which may be identified as the norm in RRR regions.

Table 3.18: Frequency Analysis of Weekly Hours Worked in All Businesses

Total hours worked per week	n	%
Less than 70 hours	81	89.0
70+ hours	10	11.0
Total	91	100

The business owners were asked “What best describes your job in this business?” for each business entity, see the responses in

Table 3.19. When all entities are viewed together, the data shows that for 50.4% of businesses, the role is the owner's main paid job. In 29.9% of cases, it is paid work that comes in addition to the owner's main job. A further 15% are running the business but are not paid, and the final 4.7% classify their role as volunteer work. When the latter two are taken together, a total of 19.7% are not paid for the work they are doing.

Table 3.19: Frequency Analysis of Business Owner's Job Category

	Business owner's job	n	%
Business 1	This is my main job (paid work)	53	60.2
	I do this in addition to my main job (paid work)	20	22.7
	This is unpaid work	14	15.9
	This is volunteer work	1	1.1
	Total	88	100
Business 2	This is my main job (paid work)	6	25.0
	I do this in addition to my main job (paid work)	11	45.8
	This is unpaid work	4	16.7
	This is volunteer work	3	12.5
	Total	24	100
Business 3	This is my main job (paid work)	5	33.3
	I do this in addition to my main job (paid work)	7	46.7
	This is unpaid work	1	6.7
	This is volunteer work	2	13.3
	Total	15	100
All businesses	This is my main job (paid work)	64	50.4
	I do this in addition to my main job (paid work)	38	29.9
	This is unpaid work	19	15.0
	This is volunteer work	6	4.7
	Total	127	100

Given that nearly 20% of RRR business owners surveyed are not paid for the work they are doing, this area was explored further. A cross tabulation was used to analyse the number of hours worked by these individuals. The data in Table 3.20 shows that the hours worked by those who consider their business role as unpaid work or volunteer work varies. Just over half (52%) of these individuals are working 20 or more hours per week in their unpaid or volunteer role, including 20% that work 20-34 hours and 32% that work 35 hours or more. When unpaid work and volunteer work are taken together, RRR business owners spend a significant amount of time each week doing work that

they do not get paid for. There is a clearly identified gap in research about volunteer hours spent working in RRR areas. As such, it is recommended that further research be conducted in this area, including a comparison with their metropolitan counterparts.

Table 3.20: Cross Tabulation Analysis of Weekly Hours Worked by Business Owner and Job Category

	Main job	Additional job	Unpaid work	Volunteer work	Combined Unpaid and Volunteer Work	
	n	n	n	n	n	%
0-4 hours	0	3	3	0	**3**	**12.0**
5-19 hours	3	20	4	5	**9**	**36.0**
20-34 hours	16	8	4	1	**5**	**20.0**
35 hours or more	45	7	8	0	**8**	**32.0**
Total	64	38	19	6	**25**	**100**

Next, we compared gender with job category, see Table 3.21. The data shows that the business owners who consider their business role as either unpaid work or volunteer work (i.e., the 19.7% of businesses identified in

Table 3.19) are all female. None of the male respondents identified as undertaking unpaid work or working in a volunteer role. However, due to the low response rate from men to the survey, we cannot generalise that men do not complete unpaid or volunteer work, which further identifies that research about the number of volunteer hours worked by RRR people, and especially men, needs more attention.

Table 3.21: Cross Tabulation Analysis of Gender and Job Category

	Female		Male		Prefer not to say		Total	
	n	%	n	%	n	%	n	%
This is my main job (paid work)	55	43.3	9	7.1	0	0.0	64	50.4
I do this in addition to my main job (paid work)	31	24.4	5	3.9	2	1.6	38	29.9
This is unpaid work	19	15.0	0	0.0	0	0.0	19	15.0
This is volunteer work	6	4.7	0	0.0	0	0.0	6	4.7
Total	111	87.4	14	11.0	2	1.6	127	100
Sub-total: Unpaid and volunteer work	25	19.7	0	0.0	0	0.0	25	19.7

3.4.4 Business connectivity needs

The survey asked respondents how much they agree or disagree to two statements relating to the importance of connectivity in their business. The data in Figure 3.3 shows that 98.4% of respondents agree or strongly agree that their internet connection is as important to their business as any other utilities (electricity, water, etc). They also consider the internet to be essential to their business. Only one respondent did not agree to these two statements.

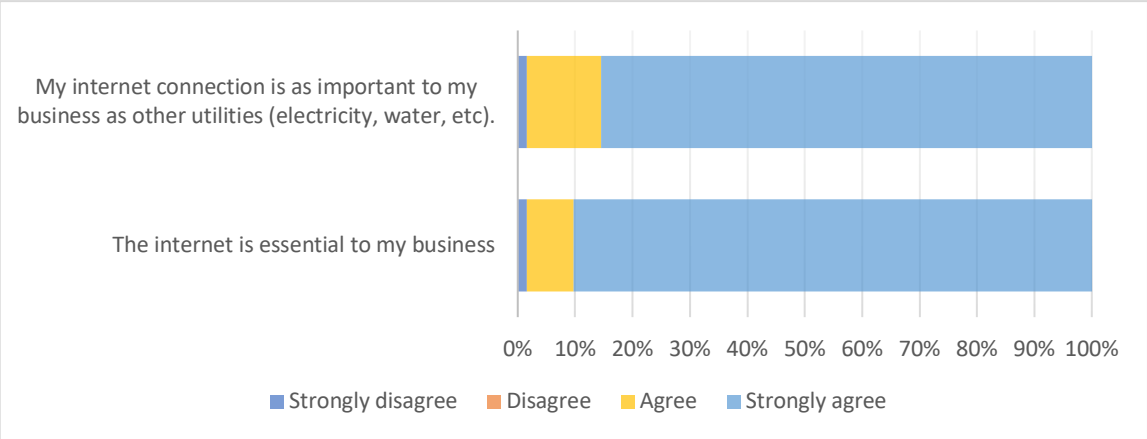

Figure 3.3: Connectivity importance for business

To understand the context of internet usage in RRR businesses and why they need to be online, a needs analysis was undertaken to identify what RRR SMEs most needed connectivity technology for. This work builds on a needs analysis undertaken by Marshall et al. (2021) to identify the telecommunications needs of Gulf Savannah locals in 2021, which included representatives from the business community. SME survey respondents were asked to rate the significance of a categorised list of potential priorities for their RRR SME business, using a 5-point Likert importance scale. A frequency analysis was performed on each of the identified needs, and the results were sorted according to the combined totals for important and very important. This data was then plotted on a chart, see Figure 3.4. The chart shows the importance rankings for each category. Considering the combined totals for very important and important, the highest priorities are basic activities (including email, social media, messenger, banking, government services); cloud-based software (including Canva, Google Docs, Trello, Xero, accounting programs); education, training and workshops; software updates; and ordering goods and services.

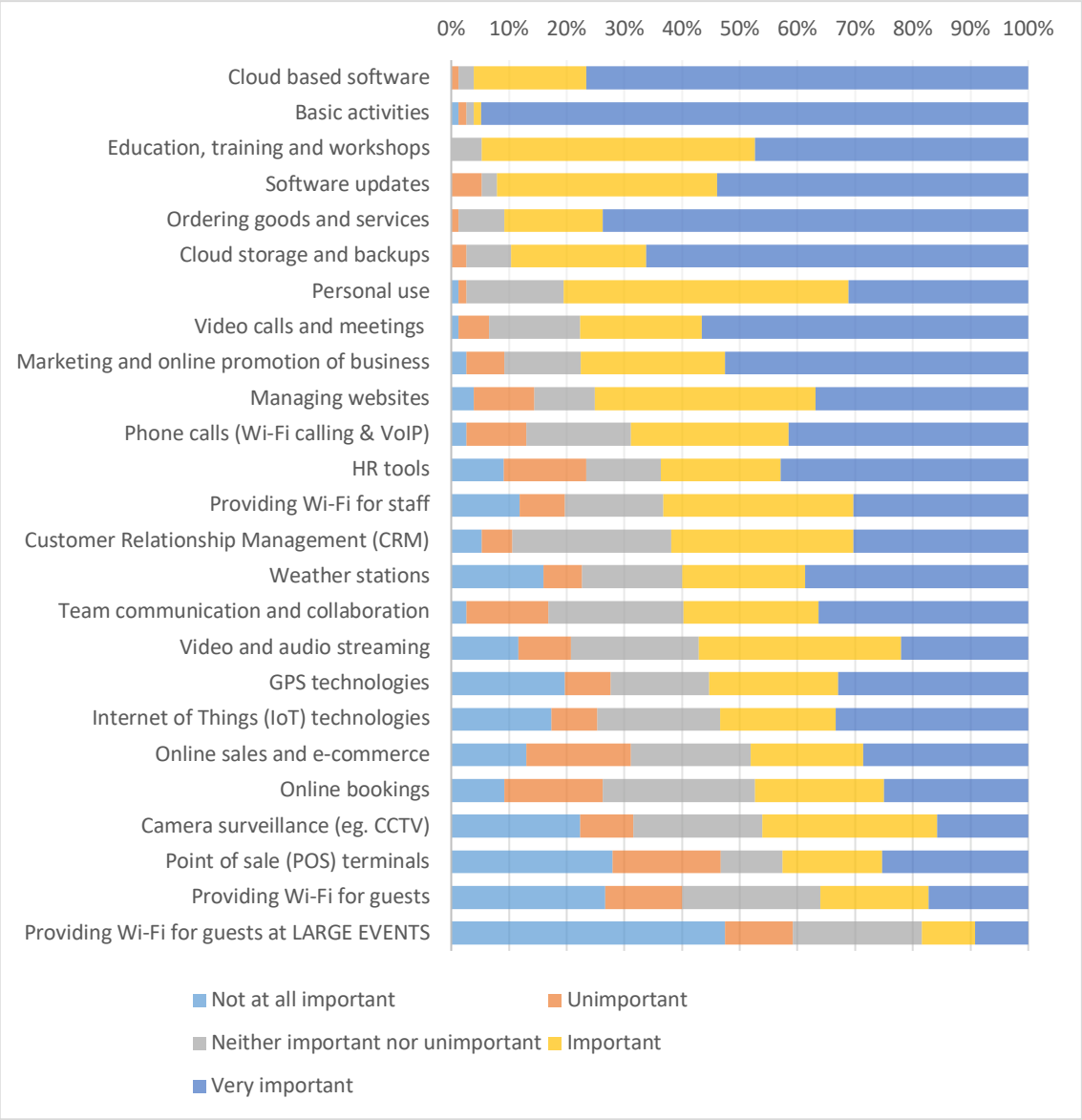

Figure 3.4: Analysis of Business Needs and Prioritisations

Respondents were also given the opportunity to comment on other needs that were not listed in the survey. Other needs identified include Access to accurate weather information to make decisions surrounding fertiliser application etc. - this can impact our business financially in the tens of thousands of dollars; Electronic signing of documents and contracts; Accessing market information/decision making; Payment platforms e.g., Stripe; Submission of large documents remotely; Access to information for research; and Supplies and freight.

RRR SMEs identified business needs that rely heavily on cloud-based software and data storage. Consequently, these businesses require persistent connections with sufficient

bandwidth and data to support uploads and downloads throughout the day. Ideally, redundancy is required to provide alternative service during outages and times of reduced reliability, which are significant problems in RRR areas (Australian Government: Regional Telecommunications Review, 2021). The needs analysis provides essential insights from RRR SME business owners and why they need to be online. This informs the kinds of connectivity tools, providers and solutions they require to pursue the activities of most importance to their businesses, as will be covered in Chapter 4 - Connectivity Choice and Adoption: The Influencing Factors (Study 2).

3.4.5 Thematic analysis of focus group data

A thematic analysis of comments from the focus groups provided additional context to achieve a deeper understanding of RRR SMEs. Three key themes emerged that were relevant to Study 1. Comments were organised according to the themes of business diversification, choosing where to do business, and geographical factors. A summary of relevant comments from the focus groups is provided in the following section, see Table 3.22,

Table 3.23, and

Table 3.24.

Table 3.22: Comments from Focus Group Respondents About Business Diversification

"Connectivity enables access to clients/customers from outside my local area. This has a big impact because there are not enough people in my town so I need to be online to sustain my business."
"The swim school has been in operation for 20 years, the last 5 years has seen large growth with online shops, training and RTO organisation. Without having a digital connection we would not be able to run the three pools that we do, so it would not be viable to have three pools with three admins in our region. It has opened up a workable solution for the industry, but it's difficult."

Table 3.23: Comments from Focus Group Respondents About Choosing Where to Do Business

"When we sold our house and re-purchased, we had to be careful where we moved to. Connectivity is huge for me and my business, creating my own business was the only way to make my work, work."
"I travel with my husband in a caravan, then I go off and do business. I have limited access on my phone because it's costly. I am finding trouble getting access to Wi-Fi in caravan parks. So there is no access in regional caravan parks, they seem to be lacking in providing access to connectivity."

Table 3.24: Comments from Focus Group Respondents About Geographical Factors

"I find it frustrating that we are labelled as RRR, those three words are totally different. Regional areas (e.g., Darwin) are different compared with where I am in a rural area and have more connectivity than someone in a remote area. There is a very big difference between those three and metropolitan areas."
"I heard the term geographical narcissism. Connectivity etc in RRR is considered less important than it is in other areas. Any experience you gain outside of big city is worth less or not as important. Clients in Sydney think what we do is less valid."
"We face that (geographical narcissism) all the time. We love living here. When we say we can't watch Netflix, they say why don't you move to town. It's extremely frustrating."
"I love that term (geographical narcissism), it is so apt. It is a very subtle way that people handle things, you can't put your finger on it but we do face it every day. They say why don't you just move. Of course we are not going to move our farm with 30 years of history. It's just not an option… Maybe we should all go to the cities, but that does not produce food."
"I would like what everyone else gets as normal."
"I know that you choose where you live, so we have to put up with it, but I don't like it. I have two connections so that I can stay connected and that becomes expensive."
"It's about knowing when to do things. You can see how far we have come in the past 18 months, but the equity is still not there."
"I notice the assumption that we have no problems or issues and that we are all on the same level playing field, but that is not the case. People in big cities don't realise it is an issue."
"So it's about the money spent on getting the same thing as city folk, which takes away from the profitability of the business on the whole."

Focus group participants were asked who is responsible for managing the technology in their business – 100% of participants said they were personally responsible. The focus group data indicates that connectivity is enabling business diversification in RRR areas. Additionally, the data shows that business owners are conscious about connectivity options when choosing where to live or travel. A strong theme of geographical inequity was evident. RRR business owners are frustrated that they do not get the same value for money as their urban counterparts, affecting the profitability of their business. One of the participants brought up the term 'geographical narcissism' which sparked a discussion about RRR business contributions not being fully understood or appreciated by urban residents, and the sense that connectivity in RRR areas is considered less important than it is in other areas. Overall, respondents were adamant that the internet was essential to their business.

3.5 Findings

The aim of Study 1, Business in the Bush, was to define SMEs in the context of RRR Australia to establish a contextual foundation for factors that influence technology adoption and usage among this population. The research questions for this study were: *RQ1: What types of SMEs are operating in RRR Australia* and *RQ2: What are the characteristics of SMEs (and their owners) in RRR Australia?* Key themes from Study 1 are presented in Figure 3.5 and are discussed in the following sections.

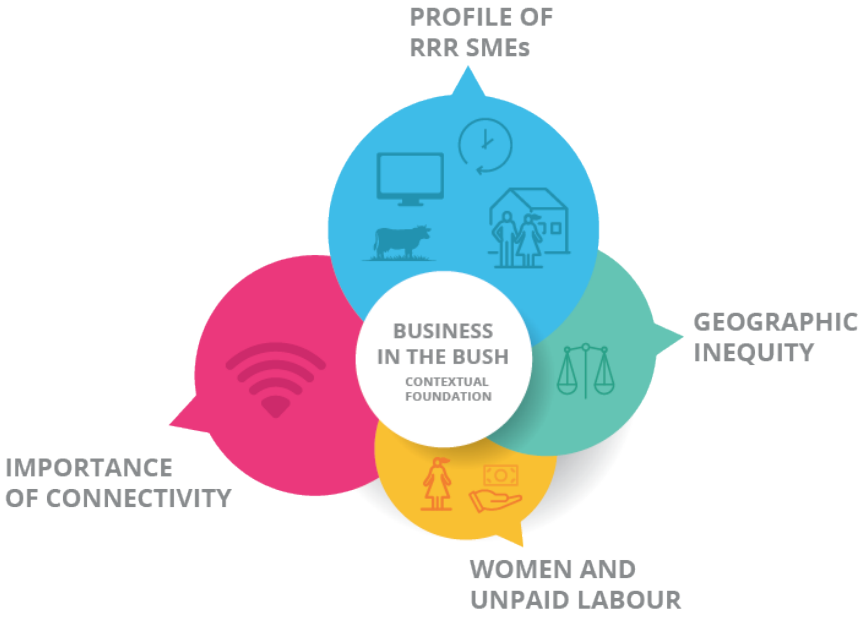

Figure 3.5: Key Themes from Study 1- Business in the Bush

3.5.1 Profile of RRR SMEs

The findings show that respondents' businesses are typically small family businesses run from home. The majority are sole traders or micro businesses with less than 5 employees. Where the businesses have employees, they are more often than not family members.

Given that most of the respondents run their business from home and most live a considerable distance from their nearest town, traveling to a place of employment would be impractical for many. It makes sense that family members stay on the property to work from home, whether it is a role within the agricultural business, or another business that can be run remotely from home.

The top 3 business categories represented a range of industries, including Mixed Livestock; Marketing, IT, Digital and Media; and Consulting and Professional services. Digital connectivity is enabling more these business categories to be run from homes in rural, regional, and remote Australia. The growth of marketing, IT, digital and media businesses is evident when analysing businesses established 0-5 years ago. This finding

potentially reflects increased the access and affordability of the internet in RRR areas in the last 5 years, as documented by the ADII – refer to sections 4.2.3.1 and 4.2.3.2. The top three industries for new businesses were Marketing, IT, Digital and Media, followed by Mixed Livestock, followed by Agricultural and Environmental services.

A strong theme that emerged from the data identified that rural families are juggling many responsibilities and time is scarce. Many business owners are working long hours, and nearly half are running more than one business. Furthermore, the online focus groups confirmed the literature findings that SME business owners take on the role of managing technology. While the sample was small (N=8), 100% of focus group participants stated that they manage the technology in their own business. Due to the sample size, we cannot generalise that all RRR SMEs are the same. However, the data does give some insight into RRR SME management practices around connectivity and other digital technology. Given that time is scarce, and that help is often some distance away, it is very important for RRR SME owners to have good connectivity literacy skills to get connect and stay connected.

3.5.2 Women and unpaid labour

The data revealed that a significant proportion of respondents are not being paid for the work they are doing. Nearly one-fifth of respondents were women in decision-making roles that were not being paid for their labour. This finding supports discussions in the broader literature about gender roles, technology adoption, digital labour and contribution to agricultural enterprises being under-recognised (Alston, 1998; Hay & Pearce, 2014; Marshall, 2021). Initiatives such as the Invisible Farmer Project (The Invisible Farmer Project) have demonstrated the critical roles that women have in rural families, businesses and communities.

Whilst this finding does not relate directly to the research questions for this study, it is worth highlighting as rural women typically take on digital homestead tasks and are driving technology adoption in agricultural enterprises (Hay & Pearce, 2014). The digital expertise they are acquiring is enabling them to pursue new opportunities such as starting their own businesses from home, thereby enabling them to move into paid

roles (Marshall, 2021). Therefore, initiatives that foster digital literacy in rural women represent an opportunity to equip them with skills to automate, streamline, or outsource unpaid work such as bookkeeping, to enable them to pursue more socially and economically rewarding opportunities. For instance, a woman who lives on a farm and was previously not able to easily participate in 'off-farm' employment due to the distance from such opportunities, may now choose to start a new online business to provide additional 'off-farm income'. This may influence the type of RRR SMEs that are being established now and in the future.

3.5.3 Sense of geographical inequity

The online focus group discussions revealed a sense of geographical inequity. One participant used the phrase "geographical narcissism" to describe an attitude they have encountered: "People in cities think what we do is less valid" (Focus Group 1 participant). This received strong agreement from the other participants. Participants acknowledged that they choose to live where they do. However, they find it frustrating when they express their difficulties and metropolitan residents respond by asking: "Why don't you move?". The overall sentiment from this conversation was that they want their contribution as primary producers to be better acknowledged, appreciated, understood, and supported.

Affordability was also brought up within the context of geographical inequity, in reference to the expense of installing additional equipment to receive reliable mobile signal in their home. For example, one participant said: "It's about the money spent on getting the same thing as city folk, which takes away from the profitability of the business on the whole" (Focus Group 1 participant).

Whilst the term "rural, regional and remote" is commonly used by industries and organisations in Australia, one participant expressed: "I find it frustrating that we are all labelled as RRR, those three words are totally different", and suggested that connectivity challenges are likely to differ in each of these three categories. This is a valid point and a limitation to this study (see section 6.4), and more place-based research focussed on sub-sets of RRR Australia could prove beneficial.

3.5.4 Importance of connectivity

The research confirmed that connectivity is extremely important for RRR SMEs. Nearly all respondents agreed that their internet connection is as important to their business as other utilities (electricity, water, etc), and consider the internet essential to their business. However, nearly half of respondents said their connection is not meeting their business needs and more than half of respondents said that the limitations of their connection are preventing them from adopting new technologies.

3.6 Chapter summary

Chapter 3 presented Study 1 and explored the theme of Business in the Bush – who the business owners are, and why they need to be online.

As discussed in Section 3.2.2 there are several definitions of rural, regional, and remote Australia. The data cleaning process at the beginning of the data analysis phase revealed some participants who said their business was in a RRR area, but the postcode was classified as being in Major Cities of Australia by the ASGS Remoteness Structure framework developed and used by the ABS. Importantly, this not only confirmed the importance of collecting and cross-checking multiple demographic factors for studies of RRR populations.

The study confirmed the importance of the internet to RRR businesses, with 98% of survey respondents considering the internet essential to their business. Findings were congruent with themes in the literature. The study confirmed the findings of Evans and Sawyer (2009), that small business owners make key decisions and often manage the technology themselves. Women were very well represented in this group of decision makers, confirming that rural women play an important role in the adoption of technology in farming businesses (Hay & Pearce, 2014). Additionally, the study found that RRR business owners appreciate the need for reliable connectivity to remain competitive, confirming the findings of Grimes (2016), Mazzarol (2015), and Park et al. (2019). The data indicated that personal motivations are a determining factor in the use

of technology, further confirming the work of Evans and Sawyer (2009). This will be explored in more depth in Studies 2 and 3.

Overall, Chapter 3 presented a contextual understanding of SMEs Operating in RRR Australia and their connectivity needs, which provides a foundation for understanding the factors that influence connectivity choice and adoption - which will be explored in Chapter 4, and how they address the challenges of technology adoption - which will be explored in Chapter 5. The progression of the thesis is represented in Figure 3.6.

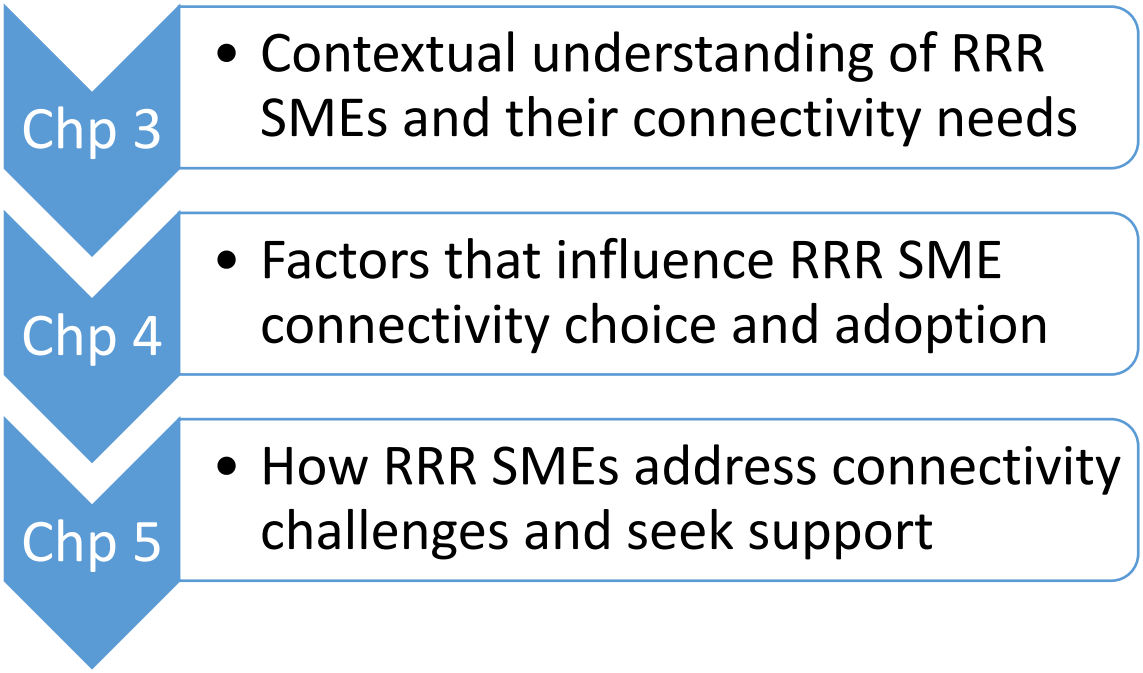

Figure 3.6: Thesis Progression

Chapter 4 Connectivity Choice and Adoption: The Influencing Factors (Study 2)

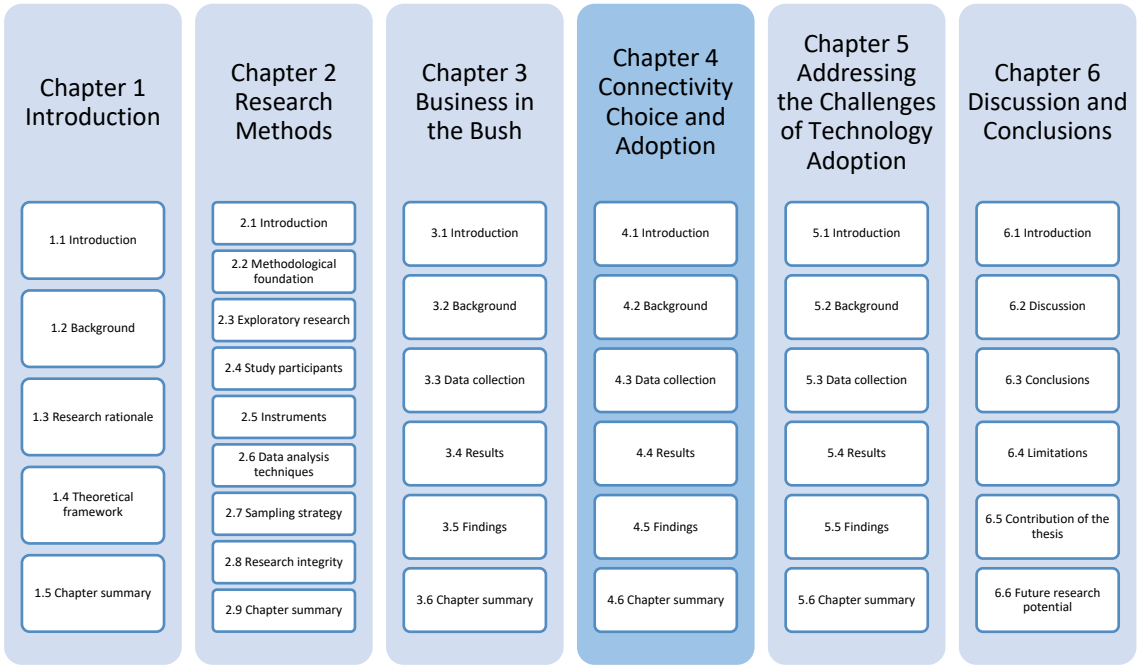

Figure 4.1: Outline of the thesis – Connectivity Choice and Adoption

4.1 Introduction

Chapter 4 presents Study 2 for this project and will explore the theme of Connectivity Choice and Adoption for RRR SMEs. It examines the factors that influence the choice of digital connectivity tools, providers, and solutions for the target population. The research focus for this study is detailed in Table 4.1

Table 4.1: Study 2 Research Question and Theme

Study	Research Questions	Theme	Research Objective
Study 2: Connectivity Choice and Adoption (Chapter 4)	RQ3: What factors influence the choice of internet connectivity tools, providers, and solutions by RRR SMEs?	Getting online	To clearly define the human factors that interact with and influence the adoption and implementation of connectivity technology in RRR SMEs.

4.2 Background

4.2.1 Digital technology usage in RRR SMEs

Reliable digital connectivity enables a broad range of digital technologies in RRR SMEs, including:

- Growing and engaging with professional networks and sourcing new business contacts, through online networking and video conferencing (Townsend et al., 2013)
- Creating and building an online presence that can be used to advertise products and services beyond the local area and engage with a wider market, for example business websites and social media pages (Townsend et al., 2013)
- Collaborating with other SMEs to access support and information, and for the purposes of economies of scale (Townsend et al., 2013)
- Streamlining current operations and increasing business resilience through cloud software, data storage and backup solutions

Australian producers are interested in adopting more agricultural technology such as automation, robotics and data collection solutions (Szeles, 2018). However, the practical application of technology in agricultural SMEs extends beyond the paddock. Hay and Pearce (2014) found that women in agricultural businesses are exploring new business strategies by adopting digital technologies, including building online presences and marketing initiatives.

Digital technology is a rapidly expanding area, and it is critical for RRR SMEs to make effective use of digital connectivity technologies in order to take advantage of current and future possibilities.

4.2.2 The digital divide

The term 'digital divide' is used to describe the phenomenon "*where different groups in society experience different levels of access to (and adoption of) digital technologies*" (Townsend et al., 2013, p. 583). Townsend has highlighted a key challenge in rural internet adoption – broadband has the potential to significantly benefit rural

communities, both socially and economically. However, one of the key social and economic problems for these communities is the lack of access to broadband (Townsend et al., 2013). Over the last two decades, researchers have found that the digital divide goes far beyond the provision of equal access to the internet (Szeles, 2018). Whilst the digital divide between urban and rural areas has slowly narrowed over time, it has stagnated in recent years (Park et al., 2019). Attention has shifted from availability and access, to inequalities of digital skills and usage (van Deursen & van Dijk, 2014).

The concept of the 'second digital divide' has been used to understand gaps in digital literacy, "*a person's ability to perform tasks effectively in a digital environment*" (Jones-Kavalier, 2006, p. 9) and "*differences in ICT or Internet usage through social differences*" (Szeles, 2018, p. 454). Interestingly, it has been suggested that the second digital divide can be influenced by factors such as motivation, skills, untargeted policies and the local environment (Goldfarb & Prince, 2008; Park, 2017). Recently, a 'third digital divide' has emerged in reference to leveraging connectivity (Haight et al., 2014) and *"the inequalities caused by the consequences of the Internet usage*" (Szeles, 2018, p. 454). Offering another perspective, Willis and Tranter contend that the notion of a digital divide is too simplistic and fails to capture the complexity of social barriers to internet use (Willis & Tranter, 2006).

Haight et al. point out that important considerations about the changing nature of the internet have often been neglected in digital divide discourse (Haight et al., 2014). Park et al. (2019) observe that internet access has become a more complex issue, with varied degrees of quality and multiple methods of access available and can therefore no longer be viewed in binary terms of having access or not (Park et al., 2019).

4.2.3 Digital inclusion

'Digital inclusion' is a multi-faceted concept for bridging the digital divide (Thomas et al., 2019), that goes beyond issues of access to the internet (e.g. infrastructure, speed and cost) (Borg & Smith, 2018). It includes other elements such as usage, skills, relevance (Thomas et al., 2019) and outcomes (Park, 2017). Social and economic participation are

central to digital inclusion, including "*using online and mobile technologies to improve skills, enhance quality of life, educate, and promote wellbeing, civic engagement and sustainable development across the whole of society*" (Thomas et al., 2019, p. 8). From a counter perspective, 'digital exclusion' is regarded as "*the inability or choice not to participate in the digital economy*" (Park et al., 2019, p. 139). The shift to this broader concept around what it means to be digitally included, has seen many researchers change their focus towards understanding the different ways in which people use the internet (Borg & Smith, 2018).

The Australian Digital Inclusion Index (ADII) was developed in 2015 to monitor the level of digital inclusion across Australia (Thomas et al., 2019). It measures three key aspects (sub-indices) of digital inclusion – Access, Affordability, and Digital Ability (Thomas et al., 2019). Findings from the 2016 to 2020 reports show that digital inclusion is improving in Australia, with the national average score improving 19.5 points from 42.5 in 2016 to 63 in 2020 (Thomas et al., 2016; Thomas et al., 2018; Thomas et al., 2017; Thomas et al., 2020; Thomas et al., 2019). The gap between urban and rural areas increased from 2016 to 2018, then decreased from 2018 to 2020. However, digital inclusion was still 7.6 points higher in urban areas (65) than rural areas (57.4) in 2020 (Thomas et al., 2020). This gap was evident across all three sub-indices, making it clear that geography still plays a critical role in digital inclusion in Australia. This will be explored in more detail in the following sections.

4.2.3.1 Access

The ADII "Access" sub-index has three components: internet access, technology and data allowance. Rural areas have seen improvements in all three components from 2016 to 2020, as depicted in Table 4.2. A chart of the average for the Access sub-index is shown in Figure 4.2, comparing rural and capitals.

Table 4.2 ADII Access Scores, 2016-2020 (Thomas et al., 2016; Thomas et al., 2018; Thomas et al., 2017; Thomas et al., 2020; Thomas et al., 2019)

ADII Sub-Index: Access		2016	2017	2018	2019	2020
Internet Access	Rural	81.1	80.8	82.5	83.9	84.6
	Capitals	86.2	86.9	88.8	89.3	89.1
	Gap	5.1	6.1	6.3	5.4	4.5
Internet Technology	Rural	65.1	67.1	74.8	77.3	79.3
	Capitals	70.7	74	79.9	81.2	83.1
	Gap	5.6	6.9	5.1	3.9	3.8
Internet Data Allowance	Rural	41.2	44.5	47.9	53.1	54.1
	Capitals	48.3	53.6	56.6	60.5	60.4
	Gap	7.1	9.1	8.7	7.4	6.3
Access Average	Rural	62.5	64.1	68.4	71.4	72.7
	Capitals	68.4	71.5	75.1	77	77.5
	Gap	5.9	7.4	6.7	5.6	4.8
	National	66.3	69.6	73.4	75.7	76.3

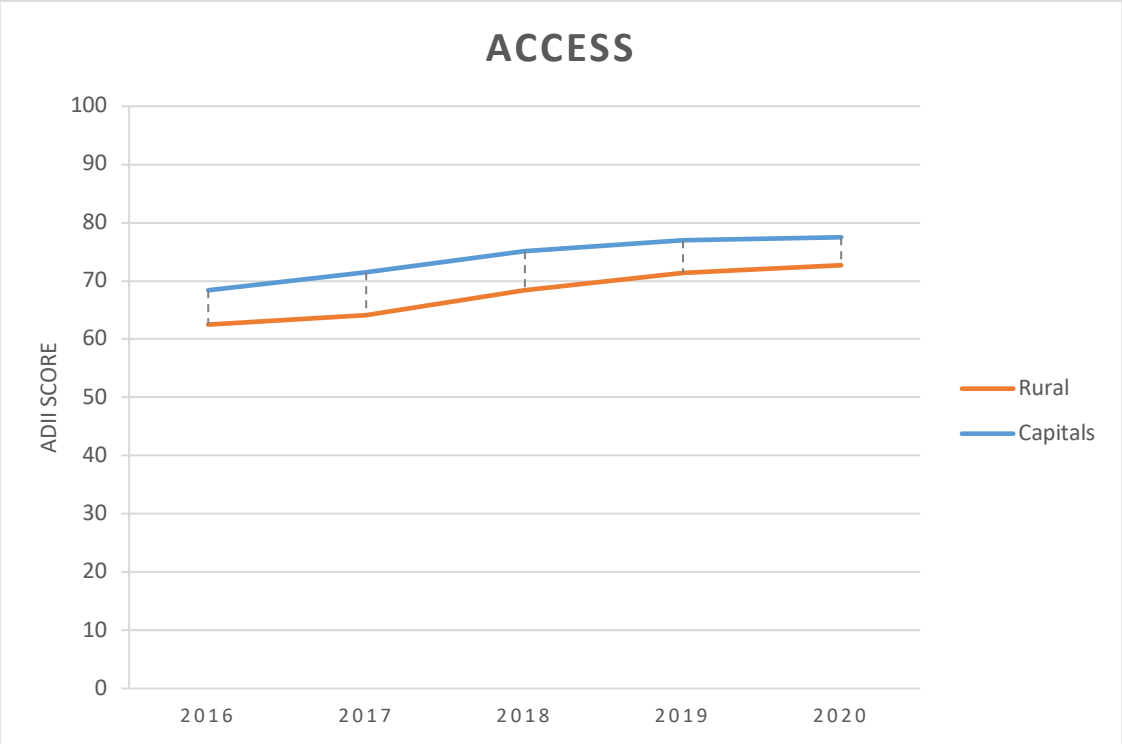

Figure 4.2 Comparison of Rural and Capital ADII Access Scores

Comparing the results for rural and capitals from 2016 to 2020, the digital inclusion gaps for Access are depicted in Figure 4.3. The overall Access gap has reduced, with a reduction in all 3 components of the sub-index.

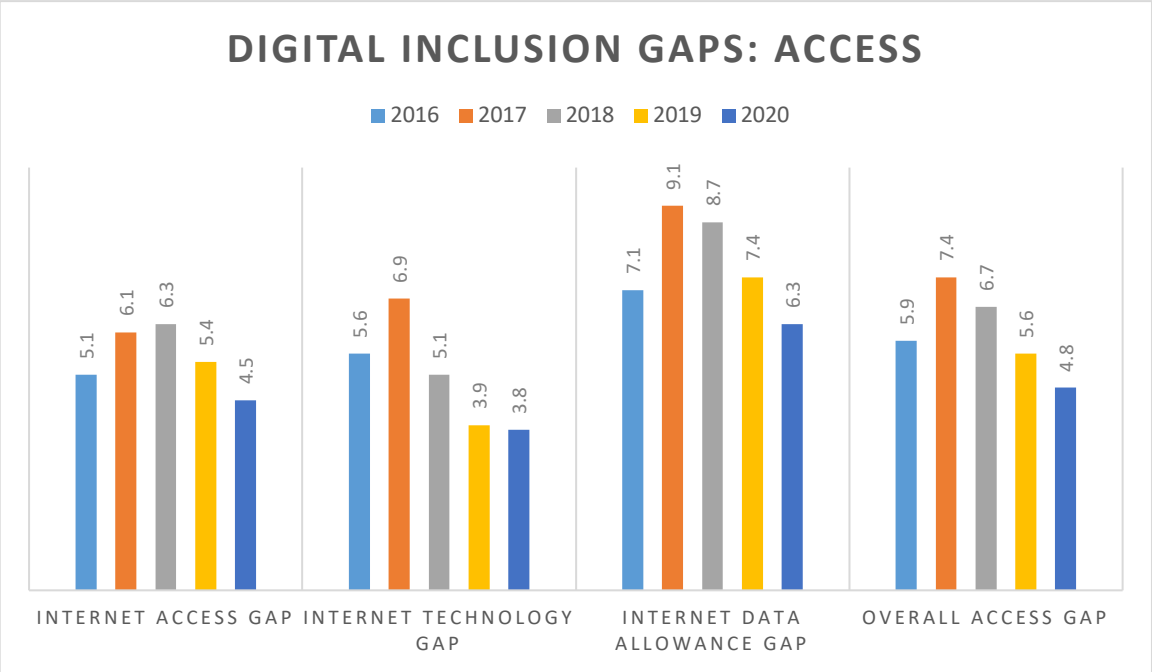

Figure 4.3: Comparison of 2016 and 2020 ADII Access Sub-Index, Identifying Digital Inclusion Gaps between Capital and Rural Areas

4.2.3.2 Affordability

The ADII "Affordability" sub-index has two components: relative expenditure and value of expenditure. Rural areas have seen improvements in scores for Value of Expenditure from 2016 to 2020, as shown in

Table 4.3. However, scores for Relative Expenditure improved from 2016 to 2018, then declined by 1.9 points from 2018 to 2020. A chart of the average for the Access sub-index is shown in Figure 4.4, comparing rural areas and capitals.

Table 4.3 ADII Affordability Scores, 2016-2020 (Thomas et al., 2016; Thomas et al., 2018; Thomas et al., 2017; Thomas et al., 2020; Thomas et al., 2019)

ADII Sub-Index: Affordability		2016	2017	2018	2019	2020
Relative Expenditure	Rural	44.7	43.2	47.2	47.1	45.3
	Capitals	49.6	48.1	56.8	56.7	57.9
	Gap	4.9	4.9	9.6	9.6	12.6
Value of Expenditure	Rural	48.2	49.8	53.5	58.3	62
	Capitals	57.9	61.7	63.3	65.5	68.7
	Gap	9.7	11.9	9.8	7.2	6.7
Average	Rural	46.5	46.5	50.4	52.7	53.6
	Capitals	53.7	54.9	60	61.1	63.3
	Gap	7.2	8.4	9.6	8.4	9.7
	National	51.2	52.7	57.6	59.2	60.9

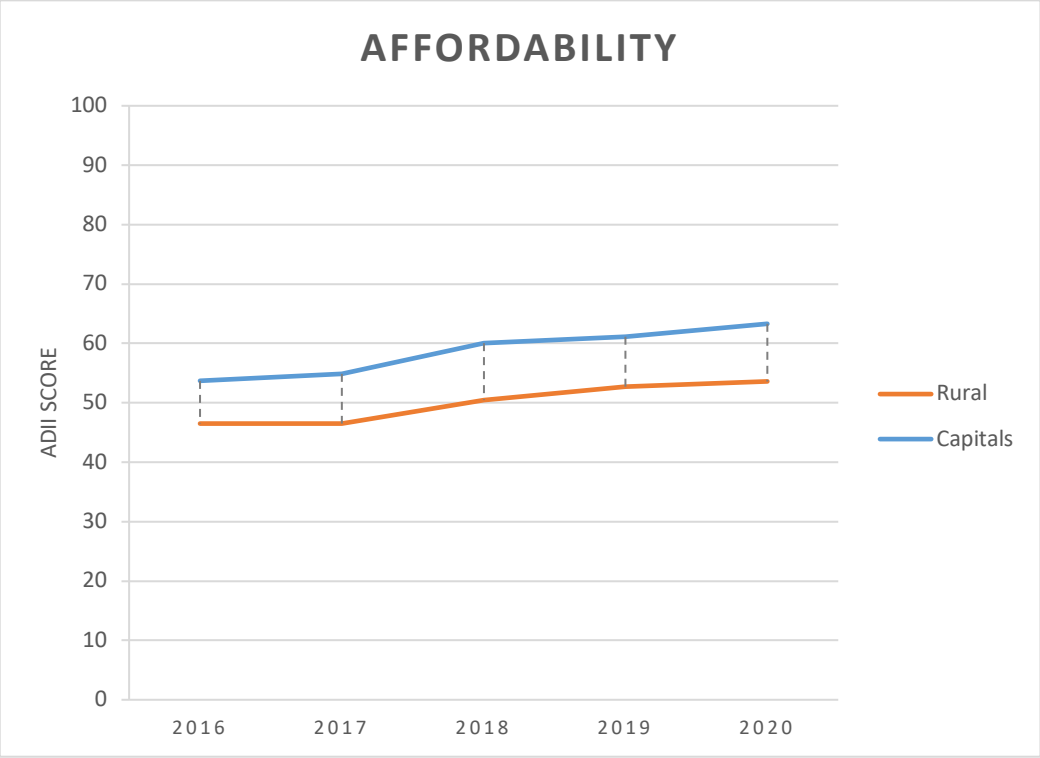

Figure 4.4 Comparison of Rural and Capital ADII Affordability Scores

Comparing the results for rural areas with capital cities from 2016 to 2020, the digital inclusion gaps for Affordability are depicted in Figure 4.5. The overall Affordability gap

has increased by 2.5 points, due to the significant increase (7.7 points) in the Relative Expenditure gap.

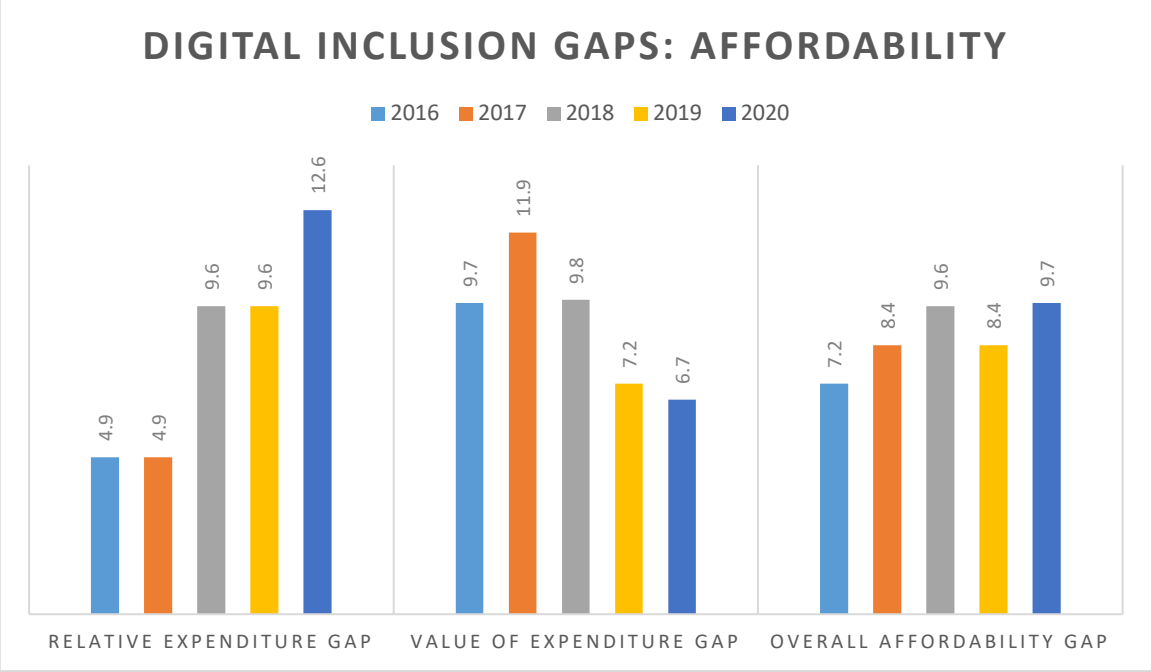

Figure 4.5: Comparison of 2016 and 2020 ADII Affordability Sub-Index, Identifying Digital Inclusion Gaps

4.2.3.3 Digital Ability

The ADII "Digital Ability" sub-index has three components: attitudes, basic skills and activities. Score for basic skills and activities improved incrementally from 2016 to 2020 for rural areas, as depicted in the chart below. However, the attitudes component does not have a steady trajectory. A chart of the average for the Access sub-index is shown in Figure 4.6, comparing rural areas and capitals.

Table 4.4 ADII Digital Ability Scores, 2016-2020 (Thomas et al., 2016; Thomas et al., 2018; Thomas et al., 2017; Thomas et al., 2020; Thomas et al., 2019)

ADII Sub-Index: Digital Ability		2016	2017	2018	2019	2020
Attitudes	Rural	45	44.7	45.3	44.2	45.9
	Capitals	51.2	52.2	53.1	53.3	52.3
	Gap	6.2	7.5	7.8	9.1	6.4
Basic Skills	Rural	47.3	46.9	49.6	50.1	52.8
	Capitals	54	55.5	59.3	60.9	61.7
	Gap	6.7	8.6	9.7	10.8	8.9
Activities	Rural	32.7	33	33.6	35.1	39.4
	Capitals	39.8	40.3	43.8	45.7	48.5
	Gap	7.1	7.3	10.2	10.6	9.1
Average	Rural	41.6	41.5	42.9	43.1	46
	Capitals	48.3	49.3	52.1	53.3	54.2
	Gap	6.7	7.8	9.2	10.2	8.2
	National	46	47.3	49.5	50.8	52

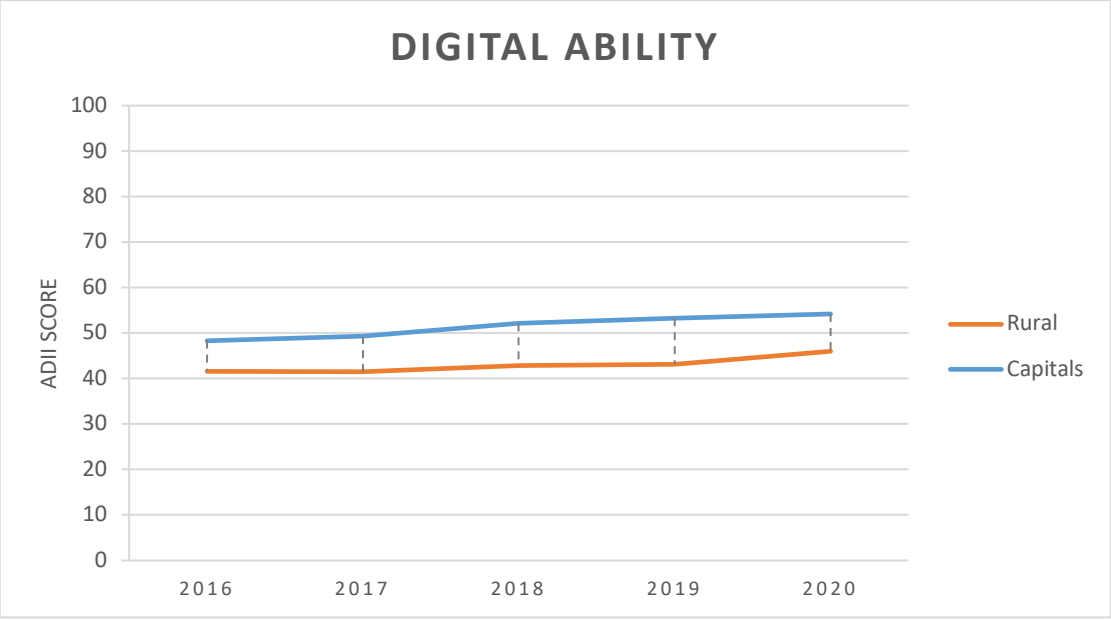

Figure 4.6 Comparison of Rural and Capital ADII Digital Ability Scores

Comparing the results for rural areas with capital cities from 2016 to 2020, the digital inclusion gaps for Digital Ability are depicted in Figure 4.7. The overall Digital Ability gap

increased from 2016 to 2019, with significant gap increases in all three components: Attitudes, Basic Skills and Activities. However, the data shows a decline in the gap across all three components from 2019 to 2020.

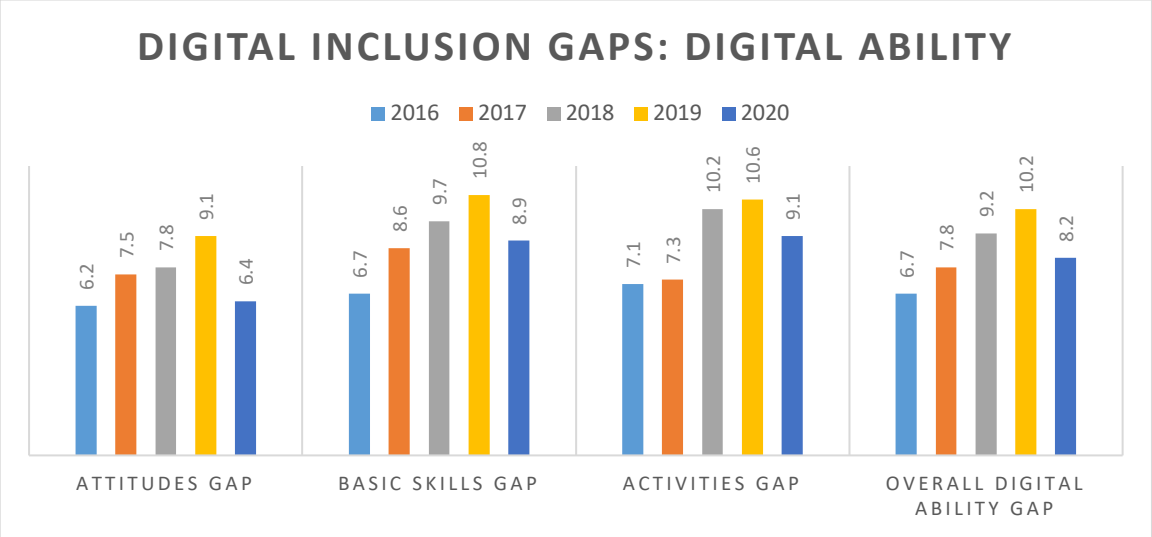

Figure 4.7: Comparison of 2016 and 2019 ADII Digital Ability Sub-Index, Identifying Digital Inclusion Gaps

Out of the eight components that form the three ADII sub-indices, all improved in rural areas from 2016 to 2019 except one – the Attitudes component, which declined by 0.8 points over the same time period, as shown in Figure 4.8. The 2019 data was the latest available at the beginning of the present research project and informed the research direction. However, the Attitudes component did increase in rural areas between 2019 and 2020. The analysis in this section indicates that Digital Ability, and in particular its attitudes component, is an important area for future research, in order to better understand digital inclusion in RRR areas.

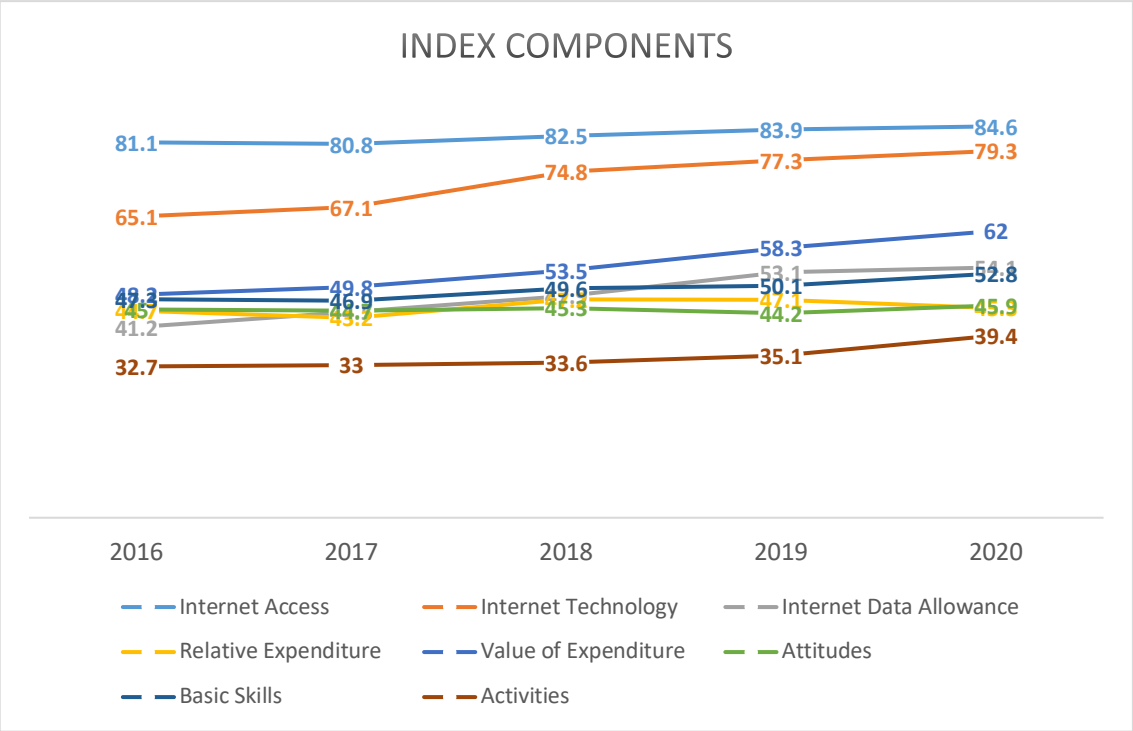

Figure 4.8 ADII Component Scores in Rural Australia from 2016 to 2020

4.2.3.4 2021 ADII Update

In 2021, the ADII was revised and updated. Whilst the index retains the original three key aspects of digital inclusion (Access, Affordability and Digital Ability), the components within those sub-indexes have been updated to accommodate changes in digital technologies, digital skills, and the telecommunications marketplace (Thomas et al., 2021). Substantial revisions have been made to the Digital Ability components, including the removal of the attitudes component which provided useful data for exploring the rural-urban digital divide (see Section 4.2.3.3 Digital Ability). The authors state that the new ADII results are not directly comparable to measures reported in previous Index reports (Thomas et al., 2021) – as such, the previous section included an analysis of the 2016-2020 data, and not the 2021 data.

Figure 4.9 shows a summary of the gaps identified between Regional and Metro areas in 2021. The highest gaps were in Digital Ability: Operational advanced (8.7 points), Access: Speed and data allowance (8.5 points), and Digital Ability: Information navigation (7.7 points). The Affordability gap is remarkably small. The Affordability component was revised in 2021, to “measure the percentage of household income

required to purchase an 'internet bundle' that reflects quality and reliable connectivity." (Thomas et al., 2021). This is a marked difference to data from the previous Affordability measure, which found a significant gap between rural and capital areas. More analysis and comparison with other sources are needed to understand this change and whether it accurately portrays the difference between rural and urban areas.

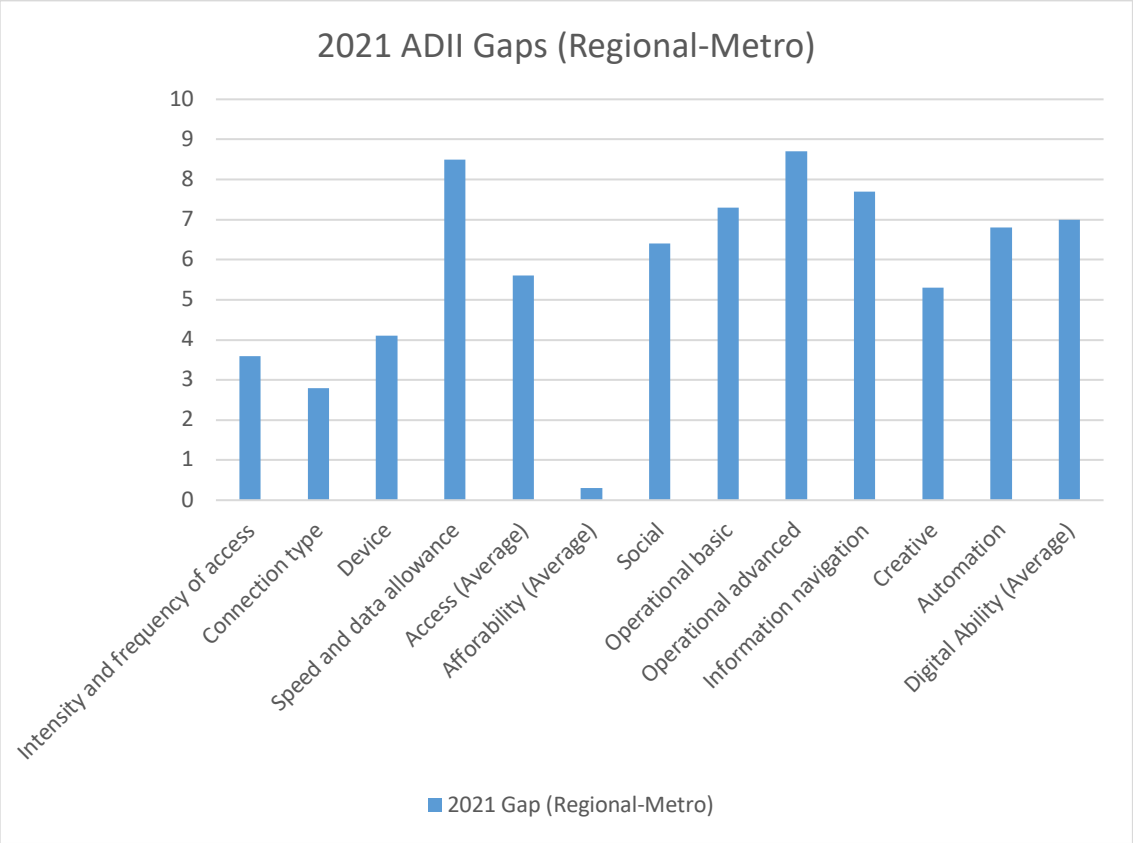

Figure 4.9 2021 ADII Gaps between Regional and Metro Areas (Thomas et al., 2021)

4.2.4 Access does not equal adoption

The ADII figures show that although a portion of the RRR population still do not have adequate access, access in RRR areas is improving. It is becoming more evident that digital connectivity access does not automatically lead to adoption (Freeman & Park, 2015; Park, 2017). Therefore, it is important to look forwards to understand other drivers of digital inclusion and exclusion. Borg and Smith note that there is an important

distinction between having access and being able to make effective use of technologies in daily life (Borg & Smith, 2018).

4.2.5 Understanding lack of adoption and usage

There has been a tendency to focus exclusively on demographic factors to explain usage of digital connectivity (Borg & Smith, 2018), including age, income, gender and education level. Research by Park et al. (2019) suggests that digital exclusion in Australian rural areas cannot be explained by demographics or infrastructures alone (Park et al., 2019). Greenhalgh, Alexander et al (2019) propose that beliefs, decisions, and actions can lead to "pinch points" where farmers are forced to make decisions regarding the adoption of new technologies. Recently, attention has turned to the role that digital literacy skills play in the lack of adoption. A more holistic and human-centered concept of digital inclusion is emerging, that recognises the role that digital ability and attitudes play in helping or hindering digital participation, along with other factors (Thomas et al., 2019). In the 2019 ADII report, the authors note that there are significant attitudinal barriers to effective usage, and propose that addressing Digital Ability issues should not just simply focus on skill building, but also consider anxieties about digital technology usage and building an appreciation of the value of being online (Thomas et al., 2019). This presents an opportunity to build on previous research.

4.2.6 Research gap

While it is evident that the digital divide persists between urban and rural Australia, the factors that influence the adoption of connectivity technologies have not been studied in RRR SMEs. More research is needed to understand the selection of internet plans, providers and equipment in this population, and the factors that influence such decisions, as well as the reasons that people do not adopt these technologies.

4.3 Data collection

As noted in Section 2.5 Instruments, data was collected via an online survey and online focus groups. This study draws from selected questions in the survey (see Section 2.5.1) and relevant discussion points from the focus groups. Refer to Chapter 2 Research

Methods for a detailed description of the instruments, recruitment, data analysis techniques, and sampling strategy.

4.4 Results

4.4.1 Technology adoption categories

The survey asked respondents to self-classify their technology adoption category, with the question: “When it comes to technology adoption, I would describe myself as a” with the following answers:

- Tech Enthusiast (enjoy trying new things, prepared to take risks) (Rogers, 2003)
- Visionary (selective about new technology, like to stay ahead of the curve) (Rogers, 2003)
- Pragmatist (will adopt once I understand the productivity and practical benefits) (Rogers, 2003)
- Conservative (will adopt when necessary, and good support is available) (Rogers, 2003)
- Sceptic (avoid adopting new technology) (Rogers, 2003)

The results in Table 4.5 show that 42.5% of respondents who answered this question classify themselves as pragmatists, followed by 26% tech enthusiasts, 19.2% visionaries, 11% conservatives, and 1 person identified as a sceptic. It is unusual to ask respondents directly what technology adoption category they belong to, and some people may not have answered this accurately as they may not typically compare themselves to others in terms technology adoption. As a result, validity may be affected. However, the responses do represent how participants view themselves.

Table 4.5: Frequency Analysis: Technology Adoption Type

When it comes to technology adoption, I would describe myself as a:	n	%	Valid %
Tech Enthusiast	19	20.9	26.0
Visionary	14	15.4	19.2
Pragmatist	31	34.1	42.5
Conservative	8	8.8	11.0
Sceptic	1	1.1	1.4
Total	73	80.2	100
Missing	18	19.8	
Total	91	100	

4.4.2 Connectivity technologies and providers

Respondents were asked what type of internet connection their business uses most of the time. Results are displayed in Table 4.6. The data shows that mobile broadband and nbn Satellite are the most used technologies, each accounting for 32% of the sample.

Table 4.6: Frequency Analysis of Primary Internet Connection Type

Type of internet connection	n	%
nbn Satellite	24	32.0
Mobile Broadband (3G, 4G or 5G - broadband that uses a mobile tower, via a modem or hotspotting off your phone)	24	32.0
nbn Fixed Line (Fibre or Cable)	12	16.0
nbn Fixed Wireless	8	10.7
ADSL	4	5.3
Non-nbn Fixed Wireless (WISPs - Wireless Internet Service Providers)	2	2.7
Other Satellite (e.g., Starlink)	1	1.3
Total	75	100

The respondents were also asked if they have any other internet connections for their business, see

Table 4.7. Interestingly, 38.1% of businesses surveys do not have any secondary internet connections, thus no redundancy in the event of an outage or degradation of service and hence no back up communication in the event of an emergency. Unreliable connectivity is one of the greatest challenges for RRR residents, as network outages, network congestion, and periods of slow speeds occur, and can take considerable time to be rectified. To maintain internet connectivity when their primary connection is not functioning, a secondary internet connection is required. The findings indicate that more education and support is needed in this area.

Mobile broadband is the most used secondary internet connection type, accounting for 44% of secondary connections in use. Just over eight percent (8.3%) identified nbn Satellite as a secondary internet connection type.

Table 4.7: Frequency Analysis of Secondary Internet Connection Type

Secondary internet connection type	n	%
Mobile Broadband (3G, 4G or 5G)	37	44.0
No other internet connections	32	38.1
nbn Satellite	7	8.3
nbn Fixed Wireless	2	2.4
Non-nbn Fixed Wireless (WISPs - Wireless Internet Service Providers)	2	2.4
ADSL	1	1.2
Other Satellite (e.g., Starlink)	1	1.2
LPWAN Technologies (including LTE-M, NB-IoT) for IoT (Internet of Things) devices	1	1.2
Other (please specify)	1	1.2
Total	84	100

Note: Some businesses have multiple additional internet connections in place, so the total number of connections in this analysis is greater than that of the primary internet connection types.

Cross tabulation analysis was used to investigate the 38.1% of businesses that do not have secondary internet connections.

Table 4.8 shows the secondary internet connection types in use for each primary internet connection type. The results indicate that those with no secondary internet connection include 25% of nbn Satellite users, 50% of nbn fixed wireless users, 25% of nbn fixed line users, 70.8% of mobile broadband users, 50% of non-nbn fixed wireless users, and 100% (n=1) of other satellite users. The most widely used secondary connection type is mobile broadband, which is used by 66.7% of nbn satellite users, 50% of nbn fixed wireless users, and 75% of nbn fixed line users.

Table 4.8: Cross Tabulation Analysis: Primary and Secondary Internet Connection Types

	Secondary Connection/s								
	Percent								
	nbn Satellite	nbn Fixed Wireless	nbn Fixed Line	Mobile Broadband	Non-nbn Fixed Wireless	ADSL	LPWAN Tech	Other	None
Primary Connection									
nbn Satellite (n = 24)	8.3	0.0	0.0	66.7	4.2	0.0	4.2	0.0	25.0
nbn Fixed Wireless (n = 8)	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0
nbn Fixed Line (n = 12)	0.0	0.0	0.0	75.0	0.0	8.3	0.0	0.0	25.0
Mobile Broadband (n = 24)	16.7	8.3	0.0	8.3	0.0	0.0	0.0	4.2	70.8
Non-nbn Fixed Wireless (n = 8)	0.0	0.0	0.0	50.0	0.0	0.0	0.0	0.0	50.0
ADSL (n = 4)	25.0	0.0	0.0	100.0	25.0	0.0	0.0	0.0	0.0
Other Satellite (n = 1)	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
Other (n = 1)	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0

Technology Types:

LPWAN Technologies include LTE-M, NB-IoT

nbn Satellite (Sky Muster™ and Sky Muster™ Plus)

nbn Fixed Wireless

nbn Fixed Line (Fibre or Cable)

Mobile Broadband (3G, 4G or 5G - broadband that uses a mobile tower, via a modem or hot spotting off your phone)

Non-nbn Fixed Wireless (WISPs - Wireless Internet Service Providers)

ADSL

Other (please specify)

Other Satellite (e.g., Starlink)

We investigated the data further to understand why a business would not have a secondary service to ensure they stayed connected in the case of an outage, initially looking at the mobile network. The data in Table 4.9 reveals that 50% of the businesses with no backup internet connections do have mobile service inside the building, and a further 18.8% have mobile service directly outside the building. Taken together, the data shows that 68.8% of businesses without internet redundancy do have the ability to set up a mobile broadband connection as a backup but have not.

Table 4.9: Cross Tabulation Analysis of Businesses with No Secondary Internet Connection, and Mobile Service Availability

Mobile Service	n	%
Yes - Inside the building.	16	50.0
On my property - within 5 kms of the building.	7	21.9
Yes - Directly outside the building.	6	18.8
On my property - more than 5 kms from the building.	2	6.3
No	1	3.1
Total	32	100

Respondents were asked what Internet Service Provider (ISP) they use for their primary internet connection. The top 4 ISPs in use were identified as Telstra, SkyMesh, Optus, and Activ8me.

Table 4.10: Frequency Analysis of Internet Service Provider (ISP) for Primary Internet Connection

Internet Service Provider (ISP)	n	%
Telstra	27	36.0
SkyMesh	10	13.3
Optus	9	12.0
Activ8me	8	10.7
Ant Communications	4	5.3
iiNet	4	5.3
HarbourISP	3	4.0
Aussie Broadband	2	2.7
Bordernet	1	1.3
IPSTAR	1	1.3
Westnet	1	1.3
Ciphertel	1	1.3
Just ISP	1	1.3
MATE	1	1.3
Starlink	1	1.3
Via our IT firm, who buy from Telstra	1	1.3
Total	75	100

Respondents who use nbn Satellite were also asked what kind of plan they are on. Of those who answered this question, 62.1% stated that they are on a Sky Muster™ Plus plan and the remainder are on Sky Muster™, see Table 4.11.

Table 4.11: Frequency Analysis for nbn Satellite Plan Type

Plan	n	%
Sky Muster™ Plus	18	62.1
Sky Muster™	11	37.9
Total	29	100

Interestingly, 37.9% of respondents using nbn Satellite are still on a Sky Muster™ plan and have not yet upgraded to Sky Muster™ Plus. Sky Muster™ Plus plans are more advanced than the original Sky Muster™ plans and resolve some of the issues that many RRR users face. For example, Sky Muster™ Plus plans offer unmetered data for everything except VPN & video streaming, reducing the need to monitor and restrict data usage for most of the activities that businesses typically conduct online as shown in Figure 3.4: Analysis of Business Needs and Prioritisations.

To explore this situation further, a means analysis was conducted to compare nbn Satellite plan type with the question: “How much do you agree or disagree? My internet connection has met all of my business needs over the last six months.”, which had a 5-point Likert scale to measure agreeance. The data in Table 4.12 shows a difference between Sky Muster™ (M=2.4; SD=1.27) and Sky Muster™ Plus (M=3.29; SD=1.57) users, indicating that Sky Muster™ may not be meeting business needs as well as Sky Muster™ Plus. A Mann-Whitney U Test revealed no significant difference in agreeance or not of the nbn Satellite plans meeting the needs of the participants, Sky Muster™ (Md=2.00, n=10) and Sky Muster™ Plus (Md=4.00, n=17), U=114.5, z=.123, p=.141, r=.02. While Sky Muster™ Plus mean scores show a higher agreeance factor for meeting business needs, the Mann-Whitney U Test results suggest that the type of plan may not have an effect on meeting the business needs of the participant - further confirming that participants may not realise the advanced benefits of Sky Muster™ Plus plans.

Table 4.12: Means Analysis for "How much do you agree or disagree? My internet connection has met all of my business needs over the last six months." For nbn Satellite Users.

	Mean	n	SD
nbn Satellite Plan			
Sky Muster™	2.4	10	1.27
Sky Muster™ Plus	3.3	17	1.57

Likert Scale: 1 Strongly disagree to 5 Strongly agree

At the time the survey was conducted (September 2021), some providers, including iinet, Westnet and Bordernet, did not offer Sky Muster™ Plans (Better Internet for Rural Regional and Remote Australia (BIRRR), 2021c). To investigate if ISPs are a possible factor in preventing users from upgrading, a cross tabulation analysis was conducted, see Table 4.13. Out of the 11 respondents still on Sky Muster™, one is with iiNet, and one is with Bordernet, and four are unknown as they selected Telstra as their primary ISP, which does not sell Sky Muster plans (refer to note in Table 4.13). Regardless of this, at least five of the 11 respondents are with ISPs that do offer Sky Muster™ Plus plans.

The process to switch plans while staying with the same provider is relatively simple with minimal to no downtime, and the cost is comparable, so further research is required to determine what is holding people back from upgrading their plan. It is possible that such upgrade behaviours can be explained by the Technology Upgrade Model (TUM) (Wang et al., 2018). Users may persist with using their current system instead of upgrading due to *inertia*, which can weaken the *behavioural intention* to upgrade*,* even when there is a *perceived need* to upgrade. This was explored further in the online focus groups, see Section 4.4.6 - Thematic analysis of focus group data. The findings in this study show that whilst respondents had adopted various connectivity technologies, there were relatively low levels of interest in adopting new technologies, highlighting inertia as a barrier to technology adoption.

Table 4.13: Cross Tabulation Analysis of Primary ISP and nbn Satellite Plan

	Primary Internet Service Provider (n)								
	Activ8me	Ant Comms	Bordernet	HarbourISP	IPSTAR	iiNet	SkyMesh	Telstra	Total
nbn Satellite Plan									
Sky Muster™	2	0	1	2	0	1	1	4	11
Sky Muster™ Plus	4	2	0	1	1	0	9	1	18
Total	6	2	1	3	1	1	10	5	29

Note: five users indicated that Telstra is their primary ISP, however Telstra does not offer nbn Satellite services. It is possible that these users utilise Telstra as their primary ISP for mobile broadband and have nbn Satellite as their secondary connection (the survey did not ask the ISP for secondary connections).

Respondents were asked if they ever receive any form of mobile service at their business location - even enough to receive a text message. The data in

Table 4.14 shows that just over half (53.9%) do receive mobile service inside the building where their business is located. A further 13.2% receive mobile service directly outside the building. However, the remaining 32.8% do not receive mobile service at the building, including 3.9% that don't receive mobile service on their property at all, and 10.5% that receive mobile service more than 5km from the building. A lack of mobile service would make doing business more difficult, particularly for farmers who are outside much of the time and unable to use Wi-Fi. This theme was explored further in the online focus groups, see Section 4.4.6.

Table 4.14: Frequency Analysis of Mobile Service at Business Location

Mobile service at business location	n	%
Yes - Inside the building	41	53.9
On my property - within 5 kms of the building	14	18.4
Yes - Directly outside the building	10	13.2
On my property - more than 5 kms from the building	8	10.5
No	3	3.9
Total	76	100

4.4.3 Plan selection

The survey asked respondents: "What is important in an internet connection, for your business?". The data in Figure 4.10 shows that most respondents consider all six factors to be either important or very important. We combined the totals for important and very important, to identify the most important element of an internet connection to business owners are data allowance (100%), reliability (100%), speed (98.6%), cost (90.4%), customer service (82.2%), and latency (76.7%).

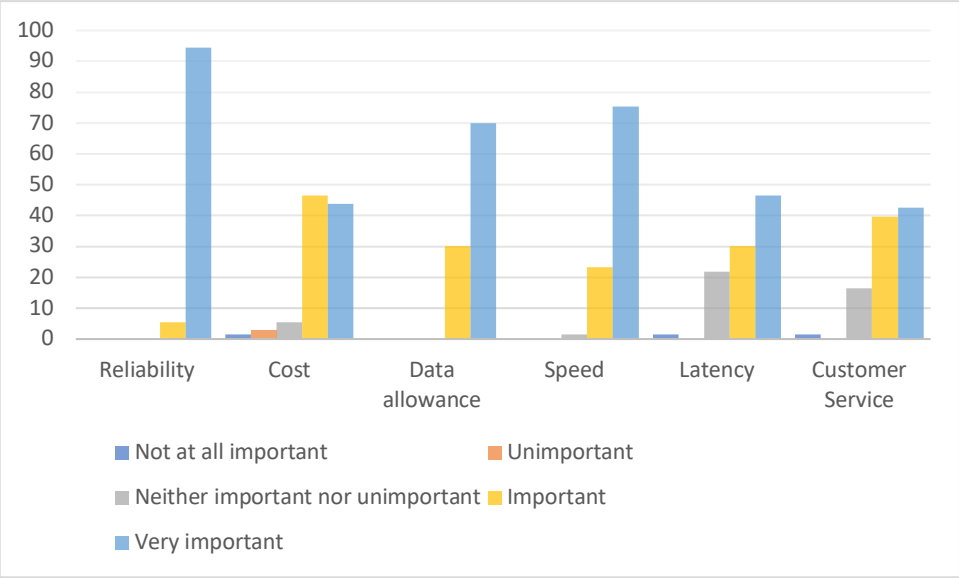

Figure 4.10: Importance of internet connection factors

Respondents were asked how they chose their internet connection (type, plan and provider). Figure 4.11 shows that a range of factors influenced connectivity choices. The primary influences identified were “I have used them for a long time”, along with data allowance, value for money, and recommendations in online groups (e.g., BIRRR or Regional Tech Hub).

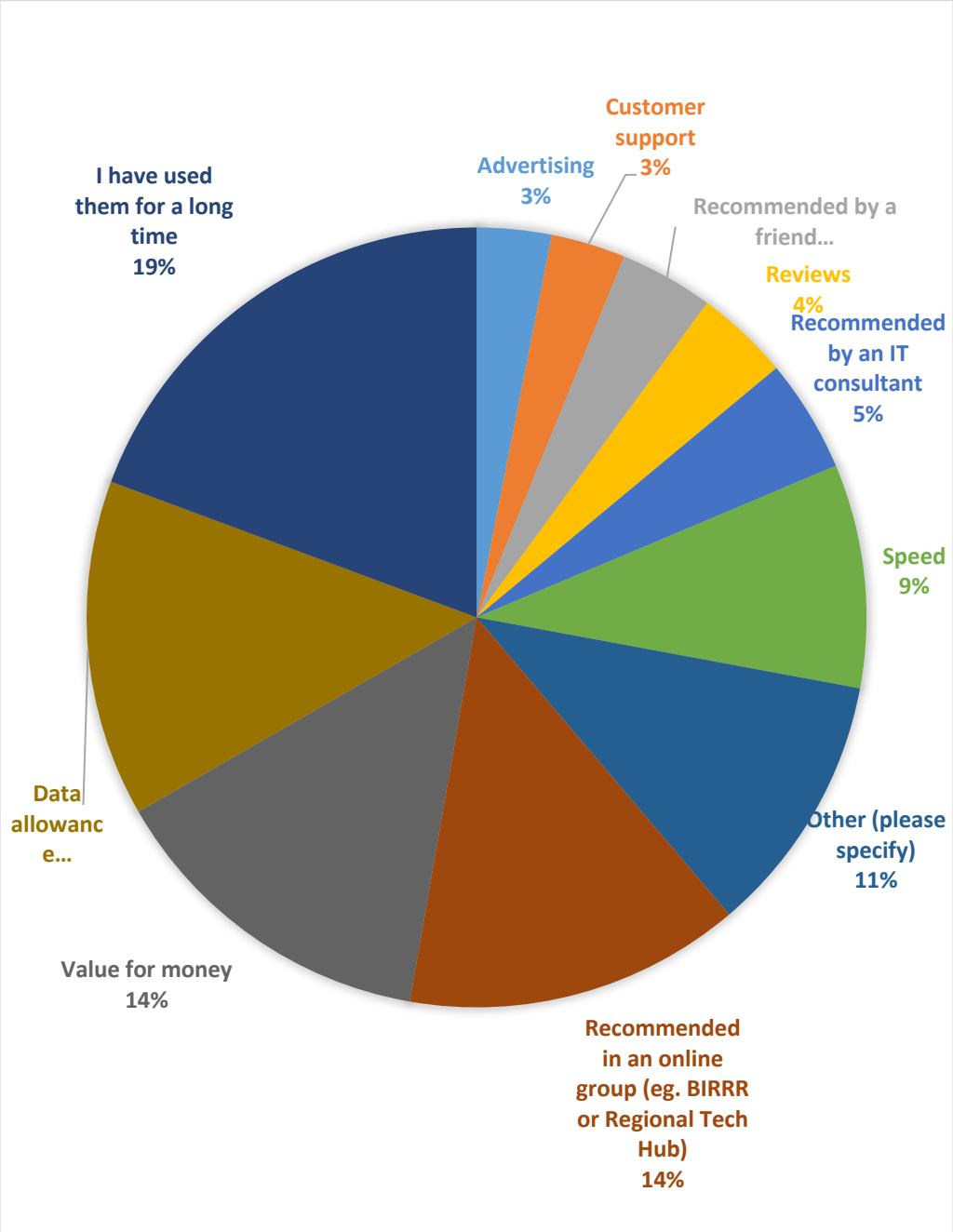

Figure 4.11: Frequency Analysis of the Factors that Influenced Connectivity Choices

Nearly 11% (n=14) of the respondents selected “Other” in this multiple-choice question and opted to provide more details about how they chose their internet connection (type, plan and provider). Out of this group, 9 respondents stated that it was the only option available at the time, see Table 4.15.

Table 4.15: Other Factors that Influenced Connectivity Choice

Reason	n
Only option available at the time	9
Came to our town and talked to the businesses and community	1
Same provider for mobile and nbn, on a single bill	1
Speed	
Was here went we bought the property	1

It is noteworthy that nine respondents indicated that they had no other option available at the time, as this accounts for 7% of the total factors that influence connectivity choices, and it is possible that their assumptions may be incorrect. To further understand this matter, a cross tabulation analysis was conducted to compare primary internet connection type with “How did you choose your internet connection (type, plan and provider)?”. The analysis was limited to cases who answered, “only option available at the time”, see

Table 4.16. It would be interesting to find out more about the three respondents who are on mobile broadband and stated that this was the only option available at the time, as it is possible that they do have nbn services available at their location but have not accessed them. The remainder of the data in this analysis did not reveal any significant insights.

Table 4.16: Cross Tabulation Analysis - Primary Internet Connection Type and Choice Determined by Availability

	How did you choose your internet connection (type, plan and provider)?	
	Only option available at the time	
	n	%
Primary Internet Connection Type		
nbn Fixed Wireless	3	33.3
Mobile Broadband	3	33.3
nbn Satellite	1	11.1
nbn Fixed Line	1	11.1
ADSL	1	11.1
Non-nbn Fixed Wireless	0	0.0
Other	0	0.0
Other Satellite (e.g., Starlink)	0	0.0
Total	9	100

In a further attempt to understand the respondents that indicated they have no other option available, and whether digital literacy is a factor, a cross tabulation analysis was conducted to compare primary internet connection type with self-classified technology adoption categories. The analysis was limited to cases who answered, “only option available at the time”, see

Table 4.17. The data revealed a relatively even distribution of cases, with more than 50% falling into the Visionary or Tech Enthusiast categories (Rogers, 2003) , who are more likely to have higher digital literacy. Consequently, there is no strong evidence to indicate that digital literacy is a factor in these cases.

Table 4.17: Cross Tabulation Analysis- Primary Internet Connection Type and Technology Adoption Type

	How did you choose your internet connection (type, plan and provider)?	
	Only option available at the time	
	n	%
Technology Adoption Type		
Pragmatist	4	44.4
Tech Enthusiast	3	33.3
Visionary	2	22.2
Conservative	2	22.2
Sceptic	0	0.0
Total	9	100

4.4.4 Connectivity equipment

The survey asked respondents what types of equipment they use to improve mobile reception, see

Table 4.18. Just over half (52.7%) of business owners are using equipment to boost mobile reception. Out of that group, 29% use aerials and antennas, which are generally used to strengthen the connection with the nearest mobile tower and can be used in conjunction with a repeater. A further 22% use mobile repeaters (3G/4G/5G), which are generally used to amplify the mobile signal on a site.

Table 4.18: Frequency Analysis: What Equipment Do You Use to Improve Your Mobile Reception?

Equipment	n	%
Nothing	40	43
Aerials and antennas	27	29
Mobile repeaters (3G/4G/5G)	22	23.7
Other (please specify)	4	4.3
Total	93	100

Other: Celfi booster; In the past I used Telstra mobile data dongles for better data coverage and speed away from my home office; we are in a black spot - nothing works to boost consistent signal; we to remote

To better understand the adoption of equipment to improve mobile reception, a cross tabulation analysis was conducted, comparing the equipment used to improve mobile reception, and technology adoption type, see

Table 4.19. The data for the cases that answered “nothing” to the question: “What equipment do you use to improve your mobile reception?” was separated from other answers. The data shows that over two nearly two thirds (64.7%) of visionaries have adopted specialist equipment to boost mobile reception, followed by pragmatists (57.9%), then tech enthusiasts (50%), and finally sceptics (50%) and conservatives (44.4%). Interestingly, 11 of the 22 tech enthusiasts (50%) did nothing to improve their mobile reception, in comparison to 16 of the 38 pragmatists (42.1%). This does not follow the theory that tech enthusiasts are more likely to embrace new technology, or in this case to enhance its functionality, so perhaps this is related to the way that people respond to location-specific needs – the need for equipment to enhance mobile reception is heightened when there is lower service at that location.

Table 4.19: Cross Tabulation Analysis of Equipment Used to Improve Mobile Reception and Technology Adoption Type

	Technology Adoption Type (N=73)									
	Tech Enthusiast		Visionary		Pragmatist		Conservative		Sceptic	
	n	%	n	%	n	%	n	%	n	%
What equipment do you use to improve your mobile reception?										
Nothing	11	50.0	6	35.3	16	42.1	5	55.6	1	50.0
Aerials and antennas	6	27.3	5	29.4	11	29.0	3	33.3	0	0.0
Mobile repeaters	4	18.2	5	29.4	10	26.3	1	11.1	0	0.0
Other (please specify)	1	4.5	1	5.9	1	2.6	0	0.00	1	50.0
Total (special equipment)	11	50.0	11	64.7	22	57.9	4	44.4	1	50.0
Total	22	100	17	100	38	100	9	100	2	100

Next, respondents were asked what equipment they use to improve their internet connections (i.e., within the property), see Table 4.20. Nearly 68% of respondents are using some type of equipment to improve their internet connections, whilst the remaining 32.4% do not use anything. Some respondents use multiple types of equipment to improve their internet connections. Just under half of respondents (47.3%) use regular Wi-Fi routers, which are generally used with nbn connections to give Wi-Fi access. Approx. 21% of respondents make use of Wi-Fi extenders, which are generally used to extend Wi-Fi from one location to another, e.g., from the house to a shed or cattle yards. Eleven percent of respondents use Mesh Wi-Fi systems, whereby two or more routers are used to extend Wi-Fi signal. Finally, 7.1% of respondents use Point-to-Point Wireless Connections, also known as wireless access point (WAP), Wi-Fi bridge, or wireless bridge, which are generally used to get a connection from one location to another. In summary, looking at all equipment used to improve the internet connection within the property and eliminating regular wi-fi routers which are commonplace, 39.7% of respondents are using some form of specialised equipment to improve their connection.

Table 4.20: Equipment used to improve internet connection

Equipment	n	%	% of Cases
Regular Wi-Fi routers	35	35.7	47.3
Nothing	24	24.5	32.4
Wi-Fi extenders	21	21.4	28.4
Mesh Wi-Fi systems	11	11.2	14.9
Point-to-Point Wireless Connections	7	7.1	9.5
Total	98	100	132.4

Other:

we to remote (excluded as it is unclear what this means)

Yagi antenna (excluded as this is used to improve mobile reception, rather than connectivity within the property)

Considering that nearly 40% of respondents are using specialised equipment to improve their connection, further analysis was undertaken to understand more about the adoption of this additional equipment. A cross tabulation analysis was conducted, comparing the equipment used to improve internet connection within the property, and technology adoption type, see

Table 4.21. Putting aside the cases that answered nothing or regular Wi-Fi routers, which are commonplace, reveals the number of respondents using specialised equipment. The data shows that equipment to improve internet connections have been adopted by 49.9% of tech enthusiasts, 44.5% of visionaries, 36.6% of pragmatists, 22.2% of conservatives, and none of the sceptics. This aligns with expectations according to the Diffusion of Innovations theory.

Table 4.21: Cross Tabulation Analysis of Equipment Used to Improve Connection and Technology Adoption Type

	Technology Adoption Type (N=73)									
	Tech Enthusiast		Visionary		Pragmatist		Conservative		Sceptic	
	n	%	n	%	n	%	n	%	n	%
What equipment do you use to improve your internet connections?										
Nothing	5	19.2	4	22.2	9	21.9	4	44.4	1	100
Regular Wi-Fi routers	8	30.8	6	33.3	17	41.5	3	33.3	0	0.0
Mesh Wi-Fi systems	5	19.2	3	16.7	2	4.9	0	0.0	0	0.0
Wi-Fi extenders	5	19.2	4	22.2	11	26.8	1	11.1	0	0.0
Point-to-Point Wireless Connections	3	11.5	1	5.6	2	4.9	1	11.1	0	0.0
Total (special equipment)	13	49.9	8	44.5	15	36.6	2	22.2	0	0
Total	26	100	18	100	41	100	9	100	1	100

To understand how the target group makes decisions when purchasing equipment, the survey asked respondents how they chose their internet equipment (router, antenna, etc), see

Table 4.22. Nearly half (47.2%) of respondents use equipment supplied by their ISP. Other factors that influence choice include recommendations by IT consultants (19.4% of cases), recommendations by ISP (13.9% of cases), and recommendations within online groups such as BIRRR and RTH (12.5% of cases). Interestingly, only 2.8% of respondents said that they chose equipment based on value for money, or features. These findings indicate a propensity amongst RRR users to seek assistance when getting connected and that assistance is valued much more than price when seeking connectivity assistance.

Table 4.22: Frequency Analysis of Factors that Influence Internet Equipment Selection.

Factors that influence equipment selection	n	%	% of Cases
Supplied by ISP (internet service provider)	34	39.1	47.2
Recommended by an IT consultant	14	16.1	19.4
Recommended by ISP (internet service provider)	10	11.5	13.9
Recommended in an online group (e.g., BIRRR or Regional Tech Hub)	9	10.3	12.5
Other (please specify)	7	8	9.7
Recommended by a friend	6	6.9	8.3
Online reviews	3	3.4	4.2
Value for money	2	2.3	2.8
Features	2	2.3	2.8
Total	87	100	120.8

4.4.5 Connectivity management

To understand how proactive the respondents are and what motivates them to take action or not when managing connectivity, the survey included several questions about when business owners last changed various aspects of their connection. Respondents were asked when they last changed their internet plan. Table 4.23 identifies that over three-quarters (77%) of respondents changed their plan in the last 3 years.

Table 4.23: Frequency Analysis of Last Plan Change Timeframe

Last internet plan change	n	%
0-1 year ago	34	45.9
1-3 years ago	23	31.1
3-5 years ago	10	13.5
6 or more years ago	3	4.1
Never	4	5.4
Total	74	100

Respondents were then asked specific questions depending on their answer to the previous question. Those that haven't changed their plans were asked "If you haven't changed your internet plan - why not?", see Table 4.24. Three of the respondents said that their current plan already meets their needs, two said that it is too hard to change plans, and one said that they are worried about losing connectivity during a changeover.

Table 4.24: Frequency Analysis of Reasons for Not Changing Plan

Reasons for not changing plan	n	%	% of Cases
Current plan meets my business needs	3	50.0	75.0
It's too hard to change plans	2	33.3	50.0
I am worried to lose days with a change over, can't afford to be offline	1	16.7	25.0
Total	6	100	150

The top three responses to the question 'what prompted participants to change their plan' included that they found a better plan, they had concerns about data, and they had concerns about speed, ping or latency, see

Table 4.25.

Table 4.25: Frequency Analysis of Reasons for Changing Plan

Reasons for changing internet plan	n	%	% of Cases
I found out about a better plan	24	22.6	34.3
Concerns about data allowance	19	17.9	27.1
Concerns about speed / ping / latency	14	13.2	20
Concerns about connection reliability	9	8.5	12.9
Upgrade was needed to run new software or equipment for business	8	7.5	11.4
Moved premises	8	7.5	11.4
Concerns about cost	7	6.6	10
My knowledge improved	6	5.7	8.6
Other (please specify)	11	10.4	15.7
Total	106	100	151.4

Other: nbn became available (n=6); Moved to our IT consultants so we didn't have to deal with Telstra anymore; Needed faster speed and more data and reloadable for home-schooling during lockdowns; Phase out period ADSL; Wanted more data and less cost.

The survey included several statements with an agree-disagree Likert scale. Two of these statements related to plans and knowledge of connectivity options, see Figure 4.12 and Figure 4.13. The data shows that 75.4% of respondents agree or strongly agree that they would change their plan within the next two months if they found out that they could get better internet at a similar price. Thirty percent of respondents disagree or strongly disagree that they are confident they know all the internet connectivity options available to their business, and a further 22.9% were neutral.

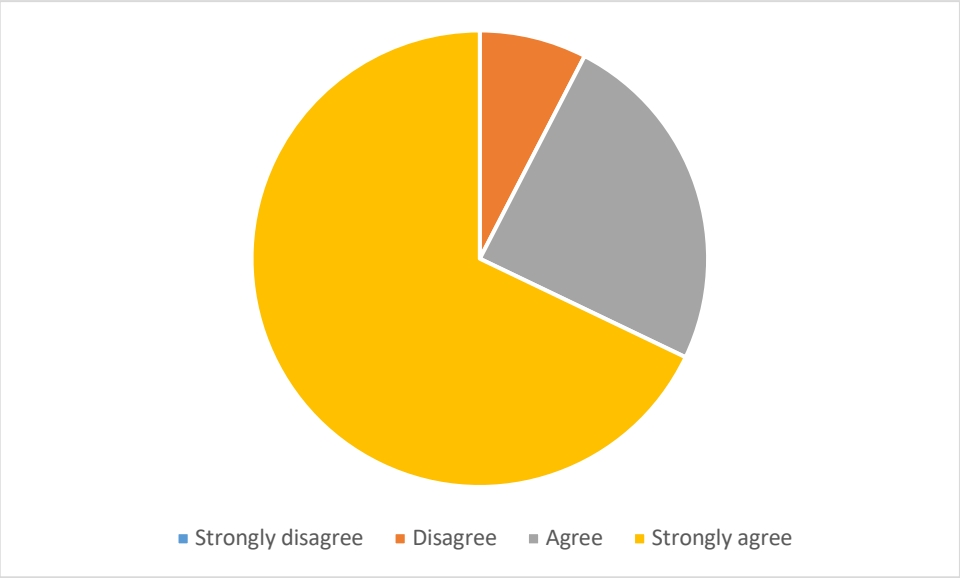

Figure 4.12: Frequency Analysis for "If I found out that my business could get better internet at a similar price, I would change our plan within the next two months."

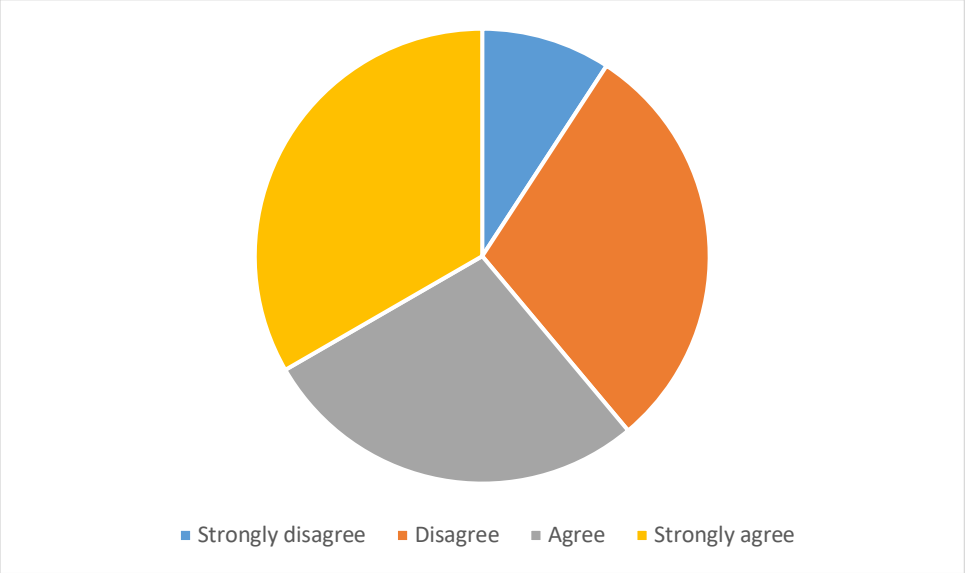

Figure 4.13: Frequency Analysis for "I'm confident that I know all the internet connectivity options available to my business."

The four respondents who indicated that they would not change their plan were asked a follow-up question to determine if cost is a factor in the decision-making process: "You indicated that you wouldn't change your plan, even if you knew you could get better internet at a similar price. Why not?".

Table 4.26 shows the four responses to this question.

Table 4.26: Frequency Analysis of Reasons for Not Changing Plan “Even If You Knew You Could Get Better Internet at a Similar Price”

Reason	n	%
Locked in.	1	1.1
Normally causes greater issues	1	1.1
Not worth the effort	1	1.1
Reliability and customer service matter more than price. "Cheap" internet around here comes at a cost that we can't bear.	1	1.1

The survey asked, “When did you last change your internet service provider?”, see Table 4.27. The data showed that most respondents fell into one of two extremes: 39.2% have never changed their ISP, and 24.3% changed within the last 12 months.

Table 4.27: Frequency Analysis of Last ISP Change Timeframe

Last ISP change	n	%
0-1 year ago	18	24.3
1-3 years ago	6	8.1
3-5 years ago	12	16.2
6 or more years ago	9	12.2
Never	29	39.2
Total	74	100

Those that have never changed their ISP were asked why. The reasons are displayed in Table 4.28. Approx. 41% of respondents said that their current provider meets their needs and 31% of respondents said it was too hard to change providers. The text responses gave an example of a procedural switching cost that causes some people to consider it too hard to change providers – the process of changing to a new email address is difficult when it is linked to an existing provider.

Table 4.28: Frequency Analysis of Reasons for Not Changing ISP

Reasons for not changing ISP	n	%	% of Cases
Current provider meets my business needs	12	36.4	41.4
It's too hard to change providers	9	27.3	31.0
I don't know how to compare providers	4	12.1	13.8
Provider choice confuses me	1	3	3.4
I don't know where to go to get advice	1	3	3.4
Other (please specify)	6	18.2	20.7
Total	33	100	113.8

Other: Email address too hard to change (n=2); Other providers don't cover our area (n=2); Been with them for a long time; No other provider compares to offerings of current provider even though current provider does not meet delivery needs all of the time; United service options Telstra provide better coverage and easy to keep all things together; Worried we will lose days changing over.

Respondents who changed their ISP were asked what prompted them to change, see

Table 4.29. The top 3 reasons for changing ISP were that they needed better coverage, they found out about a better provider and because of technical issues.

Table 4.29: Frequency Analysis of Reasons for Changing ISP

Reasons for changing ISP	n	%	% of Cases
Needed better coverage	14	17.7	31.1
I found out about a better provider	12	15.2	26.7
Technical issues	10	12.7	22.2
Poor customer support	8	10.1	17.8
Moved premises	8	10.1	17.8
My knowledge improved	7	8.9	15.6
Concerns about cost	6	7.6	13.3
I needed to because I changed my connection type	4	5.1	8.9
Other (please specify)	10	12.7	22.2
Total	79	100	175.6

Other: Changed connectivity technology type; Dealing with Telstra was going to lead to a terrible nervous breakdown!!; More data; Provider no longer supported their hardware. Basically broken.; To split the services for reliability; Wanted to move to a single supplier and bill.

Next, respondents were asked “When did you last change your internet equipment (router, etc)?”. The data in

Table 4.30 shows that the majority (83.8%) of business owners changed their internet equipment within the last 3 years.

Table 4.30: Frequency Analysis of Last Equipment Change Timeframe

Last equipment change	n	%
0-1 year ago	37	50.0
1-3 years ago	25	33.8
3-5 years ago	7	9.5
6 or more years ago	2	2.7

Never	3	4.1
Total	74	100

Those who selected “Never” were then asked, “If you haven't changed your internet equipment, why not?”. Of the three cases, two said that their current equipment meets their business needs, and one said that they do not require equipment as they run internet off their mobile phone, see Table 4.31.

Table 4.31: Frequency Analysis of Reasons for Not Changing Internet Equipment

Reasons	n	%	% of Cases
Current equipment meets my business needs	2	66.7	66.7
No equipment e.g., routers - run off mobile phone	1	33.3	33.3
Total	3	100	100

The remainder of participants, who have changed their internet equipment at some point in the last 6 years, were asked what prompted them to change it. The data in Table 4.32 shows that 25.7% of respondents got new equipment that was supplied by their ISP, which is likely to coincide with a change in plan. As discussed earlier, the data in Table 4.23 shows that over three-quarters (77% n=57) of respondents changed their plan in the last 3 years. A further 25.7% of respondents changed because they found out about better equipment, and 20% said they changed because their knowledge improved. Other reasons included replacing faulty equipment and improving signal strength to premises.

Table 4.32: Frequency Analysis of Reasons for Changing Internet Equipment

Reason	n	%	% of Cases
I found out about better equipment	18	18.8	25.7
Supplied by internet service provider	18	18.8	25.7

My knowledge improved	14	14.6	20.0
Concerns about reliability	13	13.5	18.6
Upgrade was needed to run new software or equipment for business	11	11.5	15.7
Moved premises	11	11.5	15.7
I needed to because I changed my connection type	7	7.3	10.0
Other (please specify)	4	4.2	5.7
Total	96	100	137.1

Other: Faulty modem; My router was not doing the job, so after much troubleshooting we invested in a new one; Replace faulty provider supplied equipment; Signal strength across household.

4.4.6 Thematic analysis of focus group data

A thematic analysis was conducted on comments made in the focus groups. Comments were themed according to the 5 key determinants of adoption in Diffusion of Innovations (DOI) theory (Rogers, 2003):

1. Relative advantage: the degree to which the individual perceives the technology to be better than what it is replacing. It is influenced by perceptions of economic, convenience and status factors.
2. Compatibility: the degree to which the technology fits with the individual's existing values, practices, and needs. It is influenced by norms, cultural aspects and religious beliefs.
3. Complexity: the degree to which the individual perceives the technology to be difficult to understand or use.
4. Trialability: the degree to which the technology may be trialled before commitment to use.
5. Observability: the degree to which the results of the technology are visible by others.

According to DOI theory (Rogers, 2003), the rate of adoption is influenced by individuals' perception of these 5 attributes. A summary of relevant comments from the

focus groups is provided in the following section, see Table 4.33, Table 4.34, Table 4.35, Table 4.36, and Table 4.37.

Table 4.33: Focus Group Comments Associated with Relative Advantage

"We do have SkyMuster now. I have heard there are better connections now, but we have not changed because we are not sure if it will be any better."
"Our data is limited and we are already on the highest plan. I'm thinking about going to SkyMuster Plus but am worried if we cannot use it on rainy / windy / smoky / dusty days."
"Our other options include nbn Satellite, but it is too expensive. We have a 3G mobile as a back up and the iPad with 3G data SIM."
"A mobile setup would be good if it was cost effective and had a reasonable plan. It would allow me to travel more, and therefore do more business on the road."
"You don't go looking (at new technology) because it has taken so long to get what I have got going and stable. So the cost benefit of getting new things is not positive, but you know that you have to, otherwise you get left behind."
"It's about the cost benefit, so while the Yagi antenna is good, there is no benefit in the paddock."
"New technology is not always better. Can we just have the stuff we have but better?"
"There is not much focus on the new technology and trying to integrate, it's more about getting the technology that we have now to work properly. So it's about making the current tech work better before we go to emerging tech."
"New stuff comes out and you're keen, but the cost is expensive to start with, but I guess it comes down over time."
"To get 4 bars of 4G, we had to pay $1500 (Yagi antenna) and it is not enhancing our business really, just our personal use."
"The plans we are on are very expensive. We looked at others that will be approximately $3k to get what we need. So we are paying $350/month for home internet, plus mobile plans for each of us, then the landline as well is $70/month - that we cannot get rid of. The cost is huge compared to city folk."

"I pay about $300 per month for 2 mobiles and data allowance etc. but I must look into that to see if I am paying too much."
"We have to have more than one service. We have satellite as well as mobile and landline, so we are paying for three things to have connectivity."
"My husband uses a tractor with GPS - there is a lot of that sort of technology that he is not using. E.g. field mapping, fertilizer, chemical efficiency and productivity. It means that we are using more inputs than we need to."
"I finally bit the bullet to get a Yagi antenna when kids were at home (during Covid-19 restrictions), as they couldn't access their school work."
"At our place we have to stick with Telstra, because our internal boosters mean that we are stuck, unless I change everything. I do not know what else is out there now."
"I will only adopt a new technology if I was 150% sure it was going to have a positive effect on my business."

Table 4.34: Focus Group Comments Associated with Compatibility

"They (the government) are not asking us what we want or need, they are just telling us what we are getting. We got a new satellite system that we just threw away. It would have been better to choose what we wanted (Yagi antenna)."
"There is guilt there about not progressing. My son wants to farm but has an interest in communication and IT. He also has guilt of not contributing to the technical solutions, but we just don't have the options.
"Telstra is refusing to go to our area, as it is identified as not having enough mobile devices."

Table 4.35: Focus Group Comments Associated with Complexity

"To be honest, I have gotten to a point where I don't look anymore (at new technology), because it takes up data to look. I am not thinking about new stuff. I was thinking about writing online content, but I am going to hit brick wall and I am not

ready to hit brick walls mentally."
"It's too hard to get your head around things. They were invented by tech people as a great solution, but are too hard to use. In my experience it is never as easy as it has been portrayed. Zoom has been a necessity, but I may not have adopted if it wasn't necessary."
"Sometimes it literally depends on who you talk to about the service they provide. Once you get someone who can help then it's good. [Regarding ISP phone support]"
"We are looking at farming devices like irrigation controllers and GPS tractors, but the reliability is not there. Who is going to service it? We have lost the ability to do that ourselves. Connectivity is the biggest barrier and you are often not there to see it if something goes wrong, because it might be two km away."
"In a small business you are responsible for all roles, as well as looking after your customers, so it is hard to find the headspace to look for new technology. New technology is not at the top of the list, so getting my head around the old technology is more of a priority."
"Sometimes you stick with what you have rather than finding something new. My son has a bar of 4g that he uses to research, but he is finding that mentally challenging as well, so it's easier to keep it simple."
"I don't think about how I am going to look at new technology, because I am over subscribed at the moment. I put the energy into fixing spot fires in my current system, rather than looking at new options."
"It is a mental strain because I'm always trying to think of ways to do things outside of having the internet."
"It can be mentally hard to think about how we fit all those things together."

Table 4.36: Focus Group Comments Associated with Trialability

"If I sign up on a plan and don't get what we signed up for, then we should get a refund or have an option to have fall back."

Table 4.37: Focus Group Comments Associated with Observability

"I have looked at Starlink, but am not wanting to move to other plans until we have a better idea of what is going on."
"I am waiting for Starlink, its in the north now, but I am waiting for it to come to the south."
"I am researching Starlink all the time, its twice the price of what we have now and the reviews are still quite negative, so not ready to commit yet."
"I am watching Starlink too, but am concern about the cost of having multiple connections"

4.5 Findings

The aims of Study 2, Connectivity Choice and Adoption were to determine the factors that influence connectivity adoption and usage by RRR SMEs. The primary research question for this study was: *RQ3: What factors influence the choice of internet connectivity tools, providers, and solutions by RRR SMEs?* Key themes from Study 2 are presented in Figure 4.14 and are discussed in the following sections.

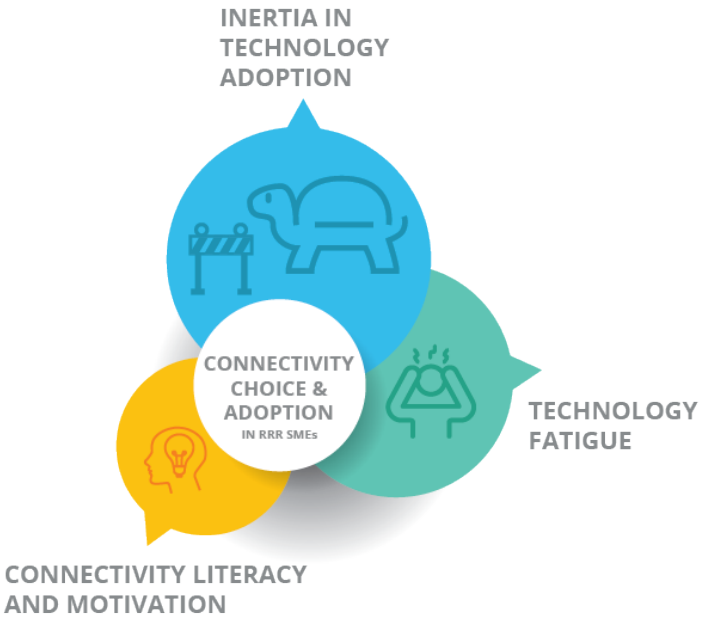

Figure 4.14: Key Themes from Study 2 - Connectivity Choice and Adoption

4.5.1 Inertia in technology adoption

Study 2 revealed a theme of inertia in technology adoption in RRR SMEs. Significantly, nearly 40% of Sky Muster™ users have not yet upgraded to Sky Muster™ Plus, which would likely solve some of the problems they reported, such as insufficient data. One of the main influences on choice of connection type, plan and provider was: "I have used them for a long time", indicating that they prefer to stay with the status quo. Focus group discussions revealed a resistance to exploring new connectivity options due to uncertainty about whether they would be any better. Additionally, broader focus group discussions about emerging technologies revealed mixed levels of interest in adopting new technology. Many are interested in new technology, but they're not actively exploring their options as they would like to get their current technology working smoothly first.

These findings show that whilst respondents had adopted various connectivity technologies, there were relatively low levels of interest in adopting new technologies, highlighting inertia as a significant barrier to technology adoption. The Technology Upgrade Model (TUM) (Wang et al., 2018) can be applied to understand inertia in connectivity technology upgrades such as changing a plan from Sky Muster™ to Sky Muster™ Plus. For example, whilst a user may have a *perceived need* to upgrade, the *behavioural intention* to upgrade can be significantly weakened by *inertia,* causing them to persist with using their current system.

Factors that influence *Inertia* were observed in some of the focus group comments about resistance to changing plans, providers, or equipment. Apprehensions about Procedural Switching Costs (the time and effort involved in finding and adapting to a new provider or plan) were evident in the focus group data, particularly in comments relating to the mental load of managing technology and uncertainty about the benefits of newer alternatives. For example: "…we have not changed because we are not sure if it will be any better" (Focus Group 1 Participant); "I don't think about how I am going to look at new technology, because I am oversubscribed at the moment. I put the energy

into fixing spot fires in my current system, rather than looking at new options." (Focus Group 1 Participant). Similarly, survey data revealed that respondents cited concerns related to Procedural Switching Costs as reasons for not changing their current plan or ISP. For example, they consider it too hard to change plans or providers, they are worried about time offline during a changeover, they believe that changing normally causes greater issues, and they feel it is not worth the effort. This reluctance to change due to perceived risk could extend beyond technology adoption and supports findings in other areas. For example, perceived transaction costs were identified as a barrier to landholders' engagement in grants and tenders for land management change (Coggan et al., 2021). On the other hand, Incumbent System Habits (subconscious predisposition to continue using a current system in an automatic and unthinking manner) were more difficult to observe in the data but there was a hint at this underlying influence. For example, one focus group stated: "New technology is not always better. Can we just have the stuff we have but better?" (Focus Group 1 participant). Overall, the survey data and focus group data corroborate to identify that *inertia* is a barrier to technology upgrades, thus demonstrating validity in the finding.

More research is required to better understand how to overcome the factors that influence inertia, particularly Procedural Switching Costs. Some of the influences identified stem from insufficient connectivity literacy and preconceived ideas due to misinformation and disinformation. For example, one of the key findings from the 2021 Regional Telecommunications Review is that there is significant misinformation about the availability of telecommunications services, spread by inaccurate or misleading information – for example, some individuals were told that nbn is not available at their location, despite the ubiquity of Sky Muster (Australian Government: Regional Telecommunications Review, 2021). However, as the Regional Telecommunications Review observes, when an individual has insufficient connectivity literacy, they may not challenge inaccurate information or seek further support. However, it may prove challenging to convince RRR SMEs to invest the time and effort required to improve their connectivity literacy, as many are time poor and already feel pressured by a large mental load. In addition, many fall into the Diffusion of Innovations (DOI) adopter category of Pragmatists, who typically want innovations to be easy and well supported

before adopting and are influenced by fellow Pragmatists in their zone of reference (Rogers, 2003). Initiatives to foster connectivity literacy would do well to be sensitive to these pressures and influences. In addition, a concerted effort to clear up misinformation about connectivity in RRR Australia could prove beneficial in reducing inertia. For example, the Australian Government: Regional Telecommunications Review (2021) has recommended that regional businesses need access to independent advice and improved connectivity literacy to make more informed choices, and that trusted providers should do more to promote the availability of Sky Muster™ Plus to reduce misinformation around the service. RRR SMEs would benefit from access to more reliable information around the availability of other broadband services too, such as Starlink and private ISPs.

4.5.2 Technology fatigue

A strong theme in the focus group data was the view that technology management and digital literacy are viewed as a mental burden that takes time away from the business. The general sentiment from participants was that they want their existing technology to work better. They find it difficult and time consuming to look at new technology and think that understanding current technology is more of a priority. However, few respondents indicated that were dedicating time or effort to understand their current technology, demonstrating a lack of interest. This feeds into a broader discussion about hidden costs, the perceived value of time, and how people choose to spend their time. According to DOI theory (Moore, 2002), Early Adopters are willing to sacrifice time, money and energy to adopt new technology. However, the Early/Late Majority are more cynical and practical about the use of their time and want to know what the benefits will be. Further research on psychological theory and motivation may help understand this theme of technological fatigue in more detail.

4.5.3 Connectivity literacy and motivation

In order to effectively improve an internet connection on a RRR property, often there is a need for good connectivity literacy (Australian Government: Regional Telecommunications Review, 2021). The survey data showed that just over half of respondents are not confident that they know all the internet connectivity options

available to their business, and that most respondents do not find it easy to solve their own connectivity issues. This finding is directly related to insufficient connectivity literacy and was corroborated in the focus group data. For example, one respondent remarked: “You don’t know what you don’t know, so it’s hard to know what you need” (Focus Group 1 participant). This corresponds with “Awareness-Knowledge in the Diffusion of Innovations (DOI) Theory (Rogers, 2003), which represents the knowledge of an innovation’s existence - this can motivate an individual to learn more, leading to adoption.

When looking at the factors that influence connectivity technology adoption, the survey data shows that a significant number of respondents changed their plan, provider, or equipment because they found out about a better plan, provider or equipment, or their knowledge improved. This demonstrates that improved knowledge is positively correlated to connectivity technology adoption.

Overall, there is a clear need to empower business owners with the knowledge and skills (connectivity literacy) required to establish and maintain a reliable internet connection. Three-quarters of survey respondents expressed a desire to improve their technology skills. However, there appears to be an intention-action gap, whereby many RRR SME owners would like to improve their technology skills but are not taking the action needed. The motivation to act can be driven by “pinch points” (Greenhalgh et al., 2019) where individuals are forced to make “go/no-go” decisions regarding the uptake of a new technology. For example, the farm business owner (Focus Group 1 participant) who “finally bit the bullet” to get a Yagi antenna because her children were at home during Covid-19 restrictions and needed to do schoolwork online.

The study did not conduct further analysis of respondents’ remoteness and demographics in relation to connectivity literacy, as the initial data analysis did not indicate a link between these factors and on-the-ground work by BIRRR has found that the problem of connectivity literacy exists across demographics and remoteness areas. However, this may be worth investigating further in future studies.

The underlying motivations and barriers to taking the action necessary to develop connectivity literacy need to be better understood from a psychological perspective. The concept of motivation is more complex than whether an individual wants to change or not, as what they say they want to do can differ to their actual behaviour (Trotter, 2015). Focus group data revealed that some participants perceive technology as risky and uncertain, and that there are attitudinal barriers related to mental burden, transaction costs, and scarcity of time. This is associated with Effort Expectancy, a construct within the Unified Theory of Acceptance and Use of Technology (UTAUT) (Venkatesh et al., 2003) which represents the "the degree of ease associated with the use of the system" (Venkatesh et al., 2003). This construct has stronger moderators for behaviour intention in women, older workers, and those with limited experience (Venkatesh et al., 2003), which includes a significant proportion of the study participants. However, in considering the gap in connectivity literacy, it is evident that the motivation to learn needs to be explored in future research, in addition to the motivation to adopt.

4.6 Chapter summary

Chapter 4 presented Study 2 and explored the theme of Connectivity Choice and Adoption for RRR SMEs. It provided an analysis of the factors that influence the choice of digital connectivity tools, providers, and solutions for the target population of RRR SMEs. Findings were congruent with themes in the literature. Key connectivity issues are shifting from inequalities of availability and access, to inequalities of digital skills and usage, confirming the findings of van Deursen and van Dijk (2014). However, it is likely that misinformation and lack of connectivity literacy causes some consumers to believe that availability and access are more problematic than they really are. The findings indicate that misinformation about connectivity may stem from consumers poor knowledge and lack of connectivity literacy (Australian Government: Regional Telecommunications Review, 2021).

It is evident that connectivity access does not automatically lead to adoption, as highlighted in the literature (Freeman & Park, 2015; Park, 2017). The study confirmed that usage, skills and relevance are important elements of Digital Inclusion (Freeman &

Park, 2015), in addition to access and affordability (Thomas et al., 2019). Furthermore, the study showed that beliefs, decisions, and actions can lead to “pinch points” where farmers are forced to make decisions to adopt new technologies (Greenhalgh et al., 2019). For example, the business owner who said she “finally bit the bullet” to get a Yagi antenna when her children needed to do schoolwork from home during Covid-19 restrictions.

The study showed that connectivity is a more complex matter than having access or not, due to variations in quality and multiple services available, confirming the work of Park et al. (2019). Addressing the challenges of connectivity adoption in RRR SMEs is a complex matter that will be discussed in depth in Chapter 5.

Chapter 5 Addressing the Challenges of Technology Adoption: How SMEs Seek Connectivity Support (Study 3)

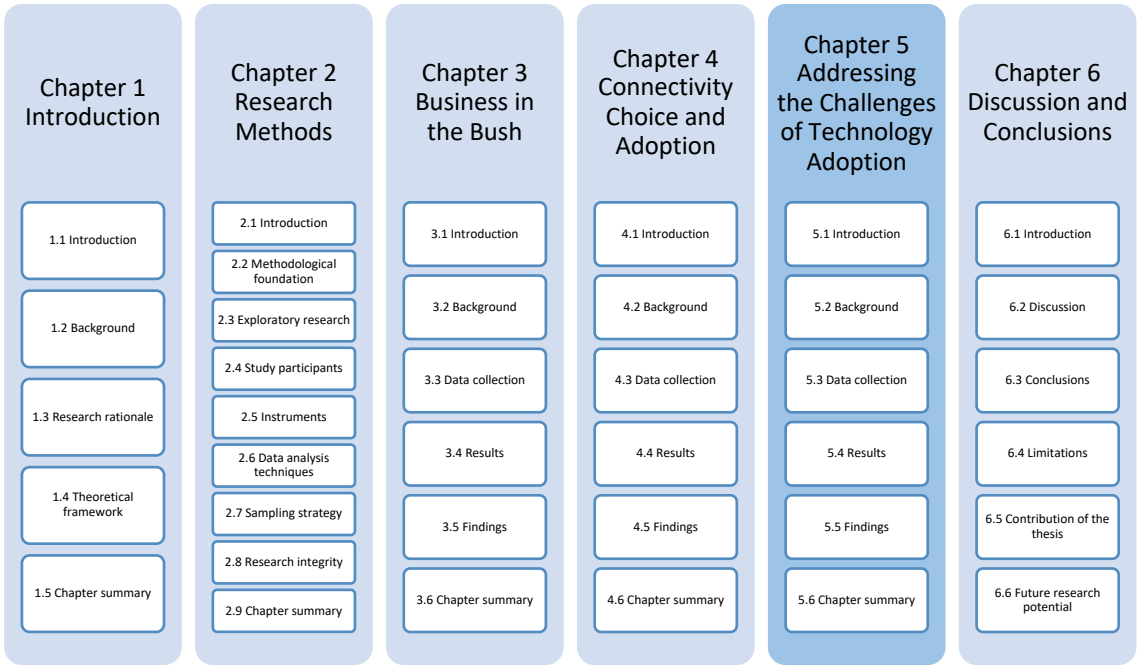

Figure 5.1: Outline of the thesis – Addressing the Challenges of Technology Adoption

5.1 Introduction

Chapter 5 presents Study 3 for this project and will explore the theme of Addressing the Challenges of Technology Adoption and How SMEs Seek Connectivity Support. It seeks to uncover where RRR SMEs go to find information and support on internet connectivity and explores motivations and barriers to solving problems. The primary research question for this study is detailed in .

Table 5.1.

Table 5.1: Study 3 Research Question and Theme

Study	Research Questions	Theme	Research Objective
Study 3: Addressing the Challenges of Technology Adoption: How SMEs seek connectivity support (Chapter 5)	RQ4: Where do RRR SMEs go to find information and support on internet connectivity?	Staying online	To explore the motivations and barriers that impact the effective use of internet connectivity in RRR SMEs.

5.2 Background

5.2.1 Complexity of digital connectivity in RRR Australia

The complexity of establishing and maintaining a reliable internet connection in RRR Australia is problematic. RRR residents face a number of challenges that are not typically faced by metropolitan people, including unreliable connections, limited to no mobile service, slow speeds, data limitations, high latency, cost of services, and delays in installations and repairs, as documented in the Better Internet for Rural, Regional and Remote Australia (BIRRR) Landline and Connectivity Survey 2018 (Hay, 2018). Additionally, mobile and fixed wireless networks are susceptible to network congestion issues, caused by increased demand for data (Australian Government: Regional Telecommunications Review, 2021). Sky Muster™ users report difficulties with insufficient data allowances, high latency and reliability issues, although Sky Muster™ Plus has improved access to data (Australian Government: Regional Telecommunications Review, 2021). Furthermore, the Australian Government: Regional Telecommunications Review (2021) found that there is significant misinformation about the availability of telecommunications services, and recommended that regional

businesses need access to independent advice and improved connectivity literacy to make more informed choices. For example, coverage maps do not align with on-the-ground experiences (Australian Government: Regional Telecommunications Review, 2021), making it difficult for consumers to determine what options are available on their property. Research by Freeman et al. (2016) found that rural residents are not so much concerned about the form of connectivity – what matters more is access to digital opportunities, which they feel should be ensured to all as an essential service.

The Australian Government: Regional Telecommunications Review (2021) found that RRR residents and businesses experience difficulties in resolving their telecommunications issues, and that their providers are "not adequately addressing the complex needs of regional users". This situation is not conducive to optimising economic opportunities for SMEs (Australian Government: Regional Telecommunications Review, 2018). According to Park, Freeman et al (2019), the broadband quality gap is deepening as services offered online are becoming more data heavy. Data needs are growing exponentially, which can result in network congestion.

Mobile connectivity is important in RRR Australia, especially to those living and working on farms. Producers are increasingly looking to use their mobile phones out in the paddock to make the most of their time – they want to be connected into their business while working outside, rather than just from the farm office (Lamb, 2017). However, access to mobile internet can incur significant additional costs for RRR residents. Although the pricing for mobile plans is the same nationwide, for those in areas of marginal mobile coverage, additional equipment is required to improve signal strength (Szeles, 2018). The 2016 BIRRR Regional Internet Access Survey found that 50% of respondents paid between $501 and $2,000 for this extra equipment (Hay, 2016).

Unreliable connectivity is one of the greatest challenges for RRR residents. Network outages, network congestion, periods of slow speeds, and interruptions to power occur, and can take considerable time to be rectified. Diminishing speeds are being experienced by some, due to dynamic contention ratios as more users access the same local network (Lamb, 2018). In order to maintain an internet connection, many

consumers 'layer-up' on several internet services, so that they can switch between them when needed (Marshall & Dale, 2019). While 'layering-up' is a good approach to redundancy, it brings about the added complexity of dealing with multiple internet providers and additional costs and understanding the intricacies of multiple connections. However, many RRR residents do not have a convenient backup internet option. The 2017 BIRRR nbn Sky Muster Survey found that 43% of nbn Sky Muster™ users do not have a backup internet option available (typically mobile coverage with Telstra, Optus or Vodafone), whilst others travel away from home in order to access backup services – which is for some a 20 minute drive, but for others it could take hours, as the closest mobile tower may be 200km or more away (Hay, 2017). Besides business continuity, there are other serious reasons to maintain a continued internet connection in RRR areas, including tracking weather events, flood and fire information and warnings, accident and emergency contact, as well as people's well-being (maintaining connectedness when living in isolated areas) (Hay, 2016).

5.2.2 New types of knowledge and skills

Due to the complexity of using digital connectivity technologies in RRR areas, residents are having to develop new types of knowledge and skills that those in major cities do not have to acquire (Park et al., 2019). This includes knowledge of the numerous technologies available, including infrastructure and devices (booster antennas, towers, and repeaters), as well as service plans (Park et al., 2019). However, it is often more difficult for regional Australians to obtain this knowledge (Szeles, 2018), as there is a limited amount of 'on the ground' understanding and independent advice about telecommunications infrastructure that can be used on RRR properties. Lamb (2017) cites a telephone survey of Australian producers conducted by CSIRO Data61 in 2017 where respondents were asked about their "the options available to connect devices on their farm" (such as radio links, Wi-Fi and local area networks) - one third of respondents reported that they had no knowledge, half said they had little-to-moderate knowledge, and only 5% believed they knew a lot about these options. In addition, managing data limitations has resulted in some RRR residents adjusting their daily life to use the internet during off-peak times, and restricting what they do online. Park et al. (2019) found that this practice contributed to participants viewing the internet as a

source of burden and fear, rather than a tool of convenience. According to the Australian Government: Regional Telecommunications Review (2021), connectivity literacy is affected by many factors, including misinformation and disinformation, inconsistent and complex terminology, and a lack of transparency and support from providers.

5.2.3 Connectivity Literacy

The concept of Digital Literacy is well documented in the literature. However, a new conceptual framework, *Connectivity Literacy*, reveals a unique set of skills and knowledge required by a consumer to get connected and stay connected to telecommunications services, as identified by the Australian Government: Regional Telecommunications Review (2021). These skills are different to the skills usually taught in digital literacy programs, which focus on the use of digital technologies. Connectivity Literacy skills include the need to understand connectivity terminology, and navigate the choice of providers, technologies, plans, and equipment related to connectivity (Australian Government: Regional Telecommunications Review, 2021). Metropolitan users do not typically need to acquire this set of skills and knowledge. However, it is becoming increasingly critical for RRR people to gain this understanding in order to establish and maintain their internet connections.

5.2.4 Research gap

It has recently been established that residents in RRR areas are required to acquire new types of knowledge and skills, *Connectivity Literacy*, to successfully establish and maintain reliable internet connections. However, more research is needed to understand the motivations and barriers that impact on how RRR SMEs address connectivity challenges and make effective use of their connections. It will be difficult to future-proof digital connectivity for this sector without a clear understanding of human factors and their influence on SMEs pathway to adoption.

5.3 Data collection

As noted in Section 2.5 Instruments, data was collected via an online survey and online focus groups. This study draws from selected questions in the survey and relevant

discussion points from the focus groups. Refer to Chapter 2 Research Methods for a detailed description of the instruments, recruitment, data analysis techniques, and sampling strategy.

5.4 Results

This section analyses the data collected from the online survey and online focus groups.

5.4.1 Connectivity issues and support

To understand the extent of respondents' experience with troubleshooting their internet connections, the survey asked, "Have you ever done the following to improve your connection?", see

Table 5.2. Most respondents (87.7%) have conducted a speed test. More than half of respondents have conducted troubleshooting with their provider (64.4%) and connected equipment using ethernet cables rather than Wi-Fi (54.8%). Just under half of respondents have upgraded to a higher-powered, better quality router (47.9%) or updated router firmware (47.9%). Thirty eight percent of respondents have enlisted an expert to help improve their connection.

Table 5.2: Connectivity troubleshooting experience

Have you ever done the following to improve your connection?	n	%	% of Cases
Conducted a speed test	64	18	87.7
Conducted troubleshooting with your provider	47	13.2	64.4
Connected equipment using ethernet cables rather than Wi-Fi	40	11.3	54.8
Updated router firmware	35	9.9	47.9
Upgraded to a higher-powered, better-quality router	35	9.9	47.9
Relocated router	33	9.3	45.2
Tested different cables	29	8.2	39.7
Enlisted an expert to help improve your connection	28	7.9	38.4
Shifted router antennae around	22	6.2	30.1
Changed Wi-Fi frequencies on your router	19	5.4	26
Other (please specify)	3	0.8	4.1
Total	355	100	486.3

Other: 4G antennas; Asking for assistance from the Better Internet for Rural, Regional and Remote Australia; Conduct and record results of Nielsen Speed Test.

To better understand the kinds of issues that RRR businesses are facing, the survey asked, “What kinds of issues have you experienced with your connections in the last six months?”, see

Table 5.3. The top 5 issues faced recently include slow speeds, dropouts, variable performance, no service (outages) and certain platforms not performing well (e.g., Video conference buffering).

Table 5.3: What Kinds of Issues Have You Experienced with Your Connections in the Last Six Months?

Issues in last 6 months	n	%	% of Cases
Slow speeds	62	17.2	84.9
Dropouts	60	16.6	82.2
Variable performance	56	15.5	76.7
No service (outages)	55	15.2	75.3
Certain platforms not performing well (e.g., video conferencing buffering)	35	9.7	47.9
Certain webpages not loading	27	7.5	37.0
Long wait for customer support	26	7.2	35.6
Degradation of service	23	6.4	31.5
Equipment issues	14	3.9	19.2
Other (please specify)	3	0.8	4.1
Total	361	100	494.5

5.4.2 Business impacts

The survey asked participants “In the last six months, have you had concerns about your connection reliability having a negative impact on your business? What aspects of your business were you concerned about?”. The data in

Table 5.4 shows that business owners have a variety of concerns in this area. The main concerns are about negative impacts on business operations, productivity, customer service, and business opportunities. Only 12.3% of respondents said they had no concerns about their connection reliability having a negative impact on their business.

Table 5.4: Concerns About Negative Impact of Connection on Business

Concern	n	%	% of Cases
Business operations	51	21.7	69.9
Productivity	42	17.9	57.5
Customer service	27	11.5	37.0
Business opportunities	26	11.1	35.6
Business image	22	9.4	30.1
Responsiveness to disasters / emergencies	21	8.9	28.8
Customer satisfaction	13	5.5	17.8
Employee morale	12	5.1	16.4
Health and safety	11	4.7	15.1
No concerns	9	3.8	12.3
Other (please specify)	1	0.4	1.4
Total	235	100	321.9

Other: Mainly email issues, not receiving or sending. This was rectified. Also not reliable emails with larger attachments

The survey asked respondents how much they agree or disagree to two statements relating to their business needs, see Figure 5.2. When asked if they agreed to the statement: “My internet connection has met all of my business needs over the last six months.”. The results were mixed, 43.8% agreed or strongly agreed, 12.3% were neutral, and 43.9% disagreed or strongly disagreed that their internet connection met all of their needs. The final statement was: “The limitations of my internet connection are preventing me from adopting new technologies to improve my business.” Results leaned mostly towards agreement, with 63.4% of participants agreeing or strongly agreeing, 21.1% remaining neutral, and 15.5% disagreeing or strongly disagreeing.

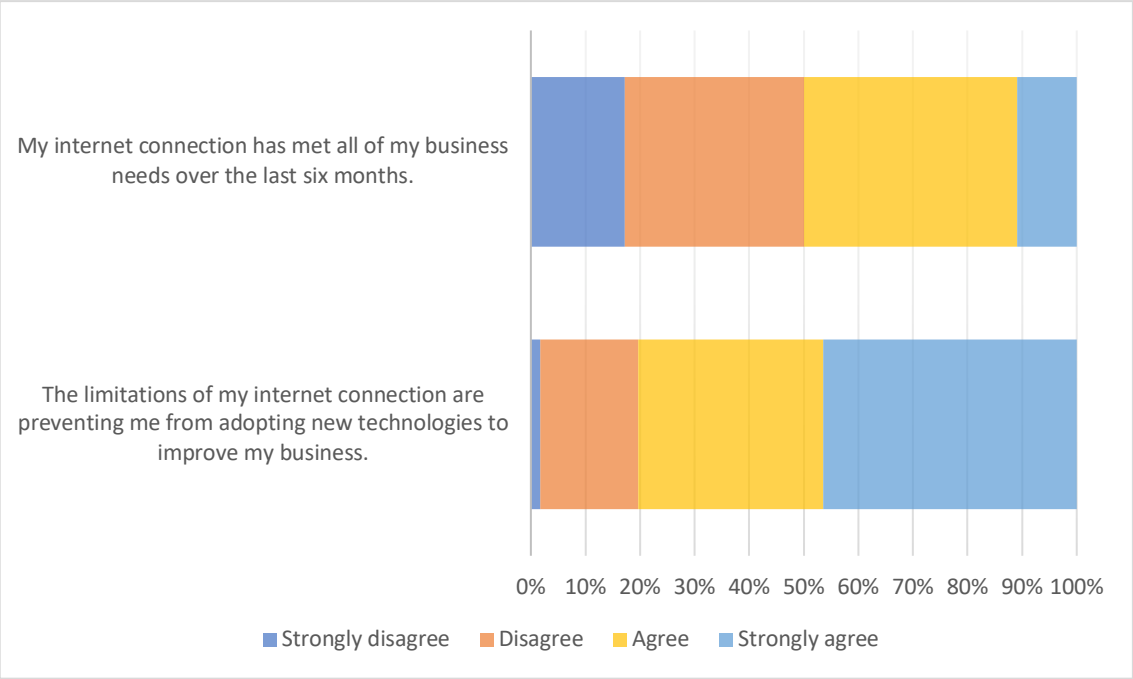

Figure 5.2: Connectivity Relevance to Business Needs

Respondents who indicated that the limitations of their internet connection are preventing them from adopting new technologies to improve their business were asked what kinds of new technologies they would like to adopt. The data in

Table 5.5 shows there are many technologies that RRR business owners would like to adopt. The technologies that ranked highest were camera surveillance (e.g., CCTV), on-farm communications, videoconferencing equipment, imagery and mapping, and animal and herd management.

Table 5.5: New Technologies Business Owners Would Like to Adopt

Technology	n	%	% of Cases
Camera surveillance (e.g., CCTV)	25	10.8	55.6
Videoconferencing equipment	17	7.4	37.8
On-farm communications	17	7.4	37.8
Animal and herd management	16	6.9	35.6
Imagery & mapping	16	6.9	35.6
Wi-Fi for staff & guests	14	6.1	31.1
Farm sensors	14	6.1	31.1
Weather monitoring & forecasting	14	6.1	31.1
Farm management software	13	5.6	28.9
Smart irrigation & water	12	5.2	26.7
Online sales and e-commerce (e.g., Shopify, WooCommerce, eBay store)	11	4.8	24.4
Point of sale (POS) terminals (e.g., EFTPOS, Square)	9	3.9	20.0
Soil, pasture & plant monitoring	9	3.9	20.0
Workforce & safety	8	3.5	17.8
Pest, weed and disease management	7	3	15.6
Online bookings (e.g., appointments, tourism, and accommodation)	6	2.6	13.3
Asset tracking	6	2.6	13.3
Crop forecasting & prediction	5	2.2	11.1
Traceability & provenance	4	1.7	8.9
Planting and harvesting solutions	4	1.7	8.9
Other (please specify)	4	1.7	8.9
Total	231	100	513.3

Other: Cloud-based software applications; Interconnecting remote workers from other sites; Particularly on farm - we used to be able to back up with mobile data on our phones but the past few months we have barely any 3G or 4G and it's become virtually impossible to utilise any on-farm technologies. Within the office, day to day I can cope - I have Optus plug in Wi-Fi modem with 500gig. Optus said it wouldn't work but 95% of the time it does. We cut off NBN Satellite as it wasn't worth the $170 a month for barely any data - it barely worked. We have Yagi antennas, Cel-fi boosters etc. I can't really make Mobile calls - I have to use Wi-Fi but the lag makes it really difficult; Speed limits some options with workflow.

5.4.3 Source of information

The survey asked respondents "If you needed help with your internet connection, where would you go for information.". The data in Table 5.6 shows that respondents seek information in a variety of places. The top sources are: BIRRR Facebook Group, Internet Service Provider (ISP), Local IT Consultant, Google, BIRRR Website, and Regional Tech Hub Facebook Group. The results are subject to a limitation, in that they reflect the membership groups used to recruit survey respondents and may have been biased accordingly (see Section 6.4 for further discussion on limitations of the study).

Table 5.6: Where Do RRR Business Owners Go for Information

Source	n	%	% of Cases
BIRRR Facebook Group	33	15.9	45.2
Internet Service Provider (ISP)	31	14.9	42.5
Local IT Consultant	24	11.5	32.9
BIRRR Website	23	11.1	31.5
Google	23	11.1	31.5
Regional Tech Hub Facebook Group	22	10.6	30.1
Phone a friend	20	9.6	27.4
Regional Tech Hub Website	12	5.8	16.4
Ask on social media	9	4.3	12.3
Phone the Regional Tech Hub Hotline	6	2.9	8.2
Other (please specify)	4	1.9	5.5
Whirlpool or other forums (please specify)	1	0.5	1.4
Total	208	100	284.9

Other forums: ICPA

Other: Contact one of my professional colleagues I worked with on Communications and IT Support, Standards and Education; I have good knowledge myself and strong connections to good industry people.; I run my own IT business; My network of developers.

To further interpret these results, a thematic analysis was conducted of all answers, see Table 5.7. The data shows that there is a preference to seek information from peers via social media groups, forums, or phone calls (approximately 41% of responses). Approximately 30% of information seeking occurs by contacting professionals such as ISPs, consultants and the RTH hotline. The remaining 28.85% of information seeking takes place independently, using resources such as the BIRRR Website, Google, RTH Website, and existing knowledge.

Table 5.7: Thematic Analysis: Where Do RRR business Owners Go for Information

Theme	Sources	n	%
Peer support	BIRRR Facebook Group, Regional Tech Hub Facebook Group, Phone a friend, Ask on social media, ICPA forum	85	40.86
Professional support	Internet Service Provider (ISP), Local IT Consultant, Phone the Regional Tech Hub (RTH) Hotline, Contact professional colleague, Industry connections	63	30.29
Independent information seeking	BIRRR Website, Google, Regional Tech Hub (RTH) Website, Existing knowledge	60	28.85
Total		208	100

5.4.4 Troubleshooting

Respondents were asked: “How easy or difficult is it for you to solve your own connectivity issues when they arise?”. The data in Figure 5.3 shows that 11% of respondents find it very difficult, and 28.8% find it difficult to solve their IT issues. On the other hand, 12.3% find it easy and 6.8% find it very easy. A remaining 41.4%, a significant portion of the sample, say they find it neither difficult nor easy to solve their IT problems.

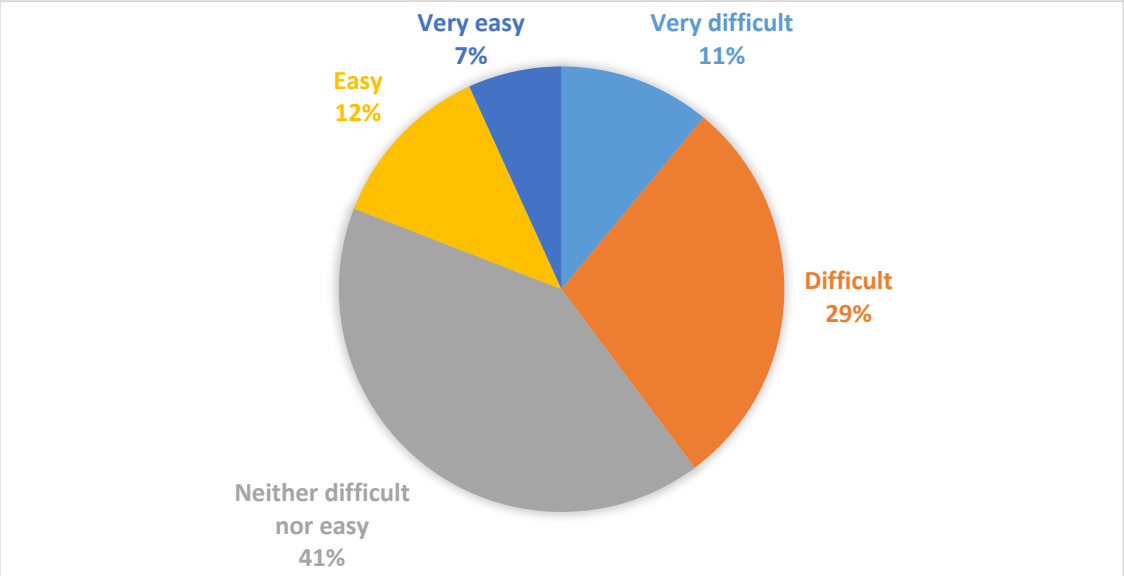

Figure 5.3: How Easy or Difficult Is It for You to Solve Your Own Connectivity Issues When They Arise

Based on their responses to the previous question, participants were asked follow-up questions. Those that answered easy or very easy were asked: “It sounds like you are good at solving connectivity issues... Why is that? Tell us your secrets. What are your favourite tools?”. A total of 13 answers were received, see Table 5.8 for a cross-section of responses.

Table 5.8: Reasons for Solving Connectivity Issues

Reason
"I have been involved in the tech industry for a long time and have good knowledge about networking, routing, connectivity, etc. It is a significant help when issues occur. I use tools as simple as Speedtest, but also use core networking tools such as ping, traceroute, WireShark."
"Many friends in IT, a few friends at BRRR and at NBN co, ready research and ask questions of neighbours and comms friends."
"Was interested in computers and technology in school and have continued that passion."
"We have had 4g internet for many years and a range of issues. After many years of trouble shooting with technicians, I usually can fix the problem myself. Although mostly it is a tower issue now, rather than something I can address at home."

Respondents who answered neither difficult nor easy, difficult, or very difficult to the question "How easy or difficult is it for you to solve your own connectivity issues when they arise?" were asked: "It sounds like you have some trouble solving connectivity issues. What is your biggest challenge? What do you do next if you cannot solve a problem?". A total of 25 responses were received, and a thematic analysis was conducted on the answers, see Table 5.9.

Table 5.9: Thematic Analysis: Challenges Faced and Responses to Solving Connectivity Issues

Challenges faced and responses to solving issues	n
Unreliable service	8
Lack of connectivity literacy	6
Delegate to someone else	3
Support issues	3
Time consuming	3
Attempt basic troubleshooting	1
ISP Infrastructure issues	1
Problems with finding a provider and plan	1
Total	26

Out of the 25 responses, eight respondents cited problems with unreliable service being the core problem that they cannot solve. A further six respondents' answers were around the theme of lack of connectivity literacy (Australian Government: Regional Telecommunications Review, 2021). Specifically, the issues they face include not knowing where to start, finding it confusing, lack of knowledge, lack of understanding, and finding it difficult to apply information to their unique situation. See Table 5.10 for a selection of answers provided.

Table 5.10: Thematic Analysis - What Is Your biggest challenge? What Do You Do Next If You Cannot Solve a Problem?

Survey answers: challenges faced and responses to solving connectivity issues
"Finding a provider who can offer large enough data package with suitable speed and reliability. My belief is that the government provided technology is not good enough for rural areas to access what they need so expectations of being able to solve these problems are not high. Can't do much else if this is the case."
"Our challenge has been that until recently NBN was not available and our mobile tower is insufficient to meet demand, leading to many days where internet can't be used at all due to the influx of visitors swamping the mobile network."
"We have a farmers group where I live (there are about 35 people on it) and we have tried everything. We've lobbied our Federal Member, we've had Telstra come to some of the properties. The biggest challenge is the lack of reliability - mobile particularly. Bad weather means no service. And even on the brightest day it can just disappear. When we can't connect I drive to town sit at the waterhole where there's a toilet and table and chairs and do my work, make my calls. I do not want to have to rent an office - it's an added cost and the driving - I have a beautiful big office here and I've spent literally thousands on connectivity over the past couple of years. It's embarrassing running a business when you're talking to clients and it drops out or you're running around trying to find a bar of service. The Wi-Fi calls are really not ideal at our speeds for business calls - they barely scrape by for personal calls. The lag is difficult. On a personal level, I have lost connection with family and friends as they don't call me anymore - and I rarely try to call them. If I want to have a decent chat I will make the time to drive to town and make a call there."
"Taking the time away from work duties to troubleshoot connectivity issues. Since time is money, this is an issue. I phone the IT expert in town or phone the ISP."
"Very slow during peak times. Use very early or late. Drop out during stormy weather; overhead flights in and out of our regional airport. Solution = patience!!"

Finally, the survey participants were asked how much they agree with the statement: "I would like to improve my skills in technology". The data (see Figure 5.4) shows that 74% of respondents agreed or strongly agreed that they would like to improve their technology skills.

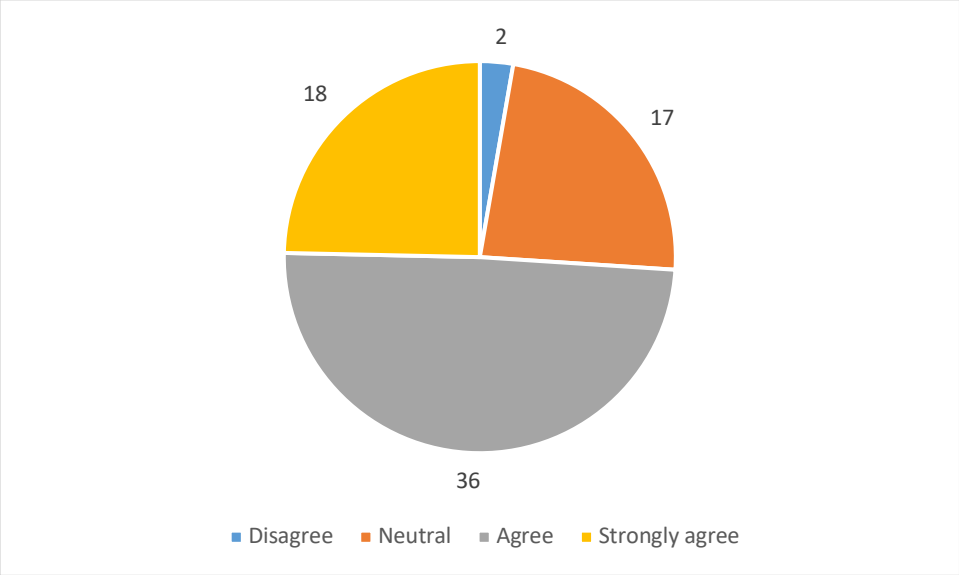

Figure 5.4: Descriptive Analysis on "I would like to improve my skills in technology"

5.4.5 Thematic analysis of focus group data

Focus group participants were asked who is responsible for the technology troubleshooting in their business – 100% of participants said they were personally responsible.

A thematic analysis was conducted on comments made in the focus groups. Five emerging themes were identified, see

Table 5.11. A summary of relevant comments from the focus groups is provided in the following section, see Table 5.12,

Table **5.13**,

Table **5.14**,

Table 5.15, and Table 5.16.

Table 5.11: Focus Group Themes- Addressing Challenges and Seeking Support

Focus Group Themes
Negative impacts on business due to poor connectivity
Connectivity challenges faced by RRR businesses
Sources of information and support for establishing and maintaining connectivity
Sources of information on emerging technology relevant to RRR SMEs
Digital literacy challenges experienced by RRR SME owners

Table 5.12: Focus Group Comments Related to Negative Impacts on Business Due to Poor Connectivity

"Not having a reliable connection increases the cost, I now travel for research work, it increases the cost to our business."
"I can pretty much do anything (on the internet) but not all at once."
"The negative impacts make it look like I am unreliable, so it puts people (customers) off."
"Our customers cannot use our portal, so they need to phone in and book which increases administration time."
"If we had cattle on the farm at the moment, we would have lost a lot of profit because we cannot get online, same for machinery etc. We can't be part of the electronic catalogue, so we can't be part of the opportunities."
"It has gotten better over the past 12 months but we have spent a lot of time on the phone to Telstra over the past year. It's better but not much."
(If solved) "It would free up time to run the business more smoothly. Not having to come back to the house to do things, not having to wait around for hours for customers to come in. I could be where I needed to be on the farm while waiting for calls."
(If solved) "We could take much more advantage of online sales, so less trucking etc. Approx. 5 hours would be saved if we could do it from home, plus less stress on the livestock."
"We had to get a Yagi antenna. Now there is better mobile connection at house but doesn't help in the paddocks (where husband is most of the time)."
"There is a lack of internet at shed, so we can't participate in online cattle sales."

Table 5.13: Focus Group Comments Related to Connectivity Challenges Faced by RRR Businesses

"At my previous place I was only getting 10mb, and there was no reason that it should have been slow. The ISP tried to tell me that was good, but I knew it wasn't - mum was getting 50mb. So I switched providers. They explained that they have a quota and once over that it gets congested."
"When the connection is not good, you might have to run into town to watch a YouTube video on how to do something."
"We used to have good reception at the house. I've tried calling the comms companies, but they have no idea."
"Our website hosted through Wix. Updating in peak times is a nightmare. We see variation in our speed."
"We lose EFTPOS 2 to 3 times per week. It can be a simple reset to fix it, or sometimes we have to do manual bookings for the day and try again tomorrow."
"The satellite we had before was tragic for business. It is better now, but sometimes transactions do not go through and people think you are not paying on purpose."
"My closest town has great internet but it gets congested, so then my internet slows and then I cannot engage with my customers."
"My remote contractors/staff have connectivity issues. This impacts on customer service. The staff are very responsive but we have some delays in providing customer support due to connectivity issues."
"We go to workshops that have fantastic ideas, but the internet and phone connectivity stops us from getting the businesses up and running." (talking about diversifying with additional businesses)

Table 5.14: Focus Group Comments Related to Sources of Information and Support for Establishing and Maintaining Connectivity

"I learnt from my neighbours. They had it sorted so they could help me. BIRRR, without them I would never have been connected to mobile. They directed me to the right advisor… so having a group that understood was good. There is only one supplier here so we have to use them. The providers have no idea what we are talking about (i.e., zero reception), so that is very frustrating, so the irony is going online to get someone to help you connect. I need a mobile phone to work and live. Information was not easy to find and not easy to implement."
"I am the person that everyone comes to for connectivity, but I cannot tell you why that is."
"I ask my 11 year old son. I manage all of the technology, but then ask friends and family for help. You don't know what you don't know, so it's hard to know what you need."
"I go to our provider for help, they are not the most helpful. I look at the BIRRR Facebook page for other people's experiences and answers, or I google and research. I wouldn't say it is the easiest, a lot of the time it comes from chat rooms, there is not a lot of reliable material, so it's hard."
"I have recently brought it up with my local members and the ombudsman, and it does not get very far. I don't like confrontation, I just wanted to tell my local member that the whole district has problems. They say it can be solved, and then go round in circles until they have found the same things that I have. It's frustrating, so we are not finding the help. It's not moving from what we can see in any way shape or form."
"Even though you can access the basics, they are not always reliable, and people think we have not done enough to fix it, or don't believe you on some level."

Table 5.15: Focus Group Comments Related to Sources of Information on Emerging Technology Relevant to RRR SMEs

"We learn about things on Landline that would be fantastic, but we have barriers that they take for granted, for example they do trials in high internet areas. So we get information but we dismiss it very quickly because we know the barriers exist. We don't explore it further."
"Field days, demonstrations from machinery companies, friends, colleagues in industry, industry and research organisations. We are not on social media."
"LinkedIn professional social media, email newsletter. I also learn from clients about the things that they are using e.g., teams v zoom. I learn a lot from clients."
"Publications in post, email from industry groups, a bit from social media industry groups, links to other things, then off the internet. I have become a chronic keeper of links to other things for when I get good internet."
"Google and YouTube, and industry bodies."

Table 5.16: Focus Group Comments Related to Digital Literacy Challenges Experiences by RRR SME Owners

"I'm learning how to use technology. I am an early adopter, but some things are hard to pick up so it's not easy. So I throw myself at the internet to learn and then its trial and error, so it takes time. Small businesses don't have time to set aside for learning."
"Some of these interfaces are designed by computer nerds, so they are not intuitive. They need to be designed for people with no experience and have better security."

5.5 Findings

The aims of Study 3, Addressing the Challenges of Technology Adoption: How SMEs seek connectivity support, were to determine the types of challenges faced by RRR SMEs, the resulting business impacts, and barriers to solving issues. The primary research question for this study was: *RQ4: Where do RRR SMEs go to find information*

and support on internet connectivity? Key themes from Study 3 are presented in Figure 4.14 and are discussed in the following sections.

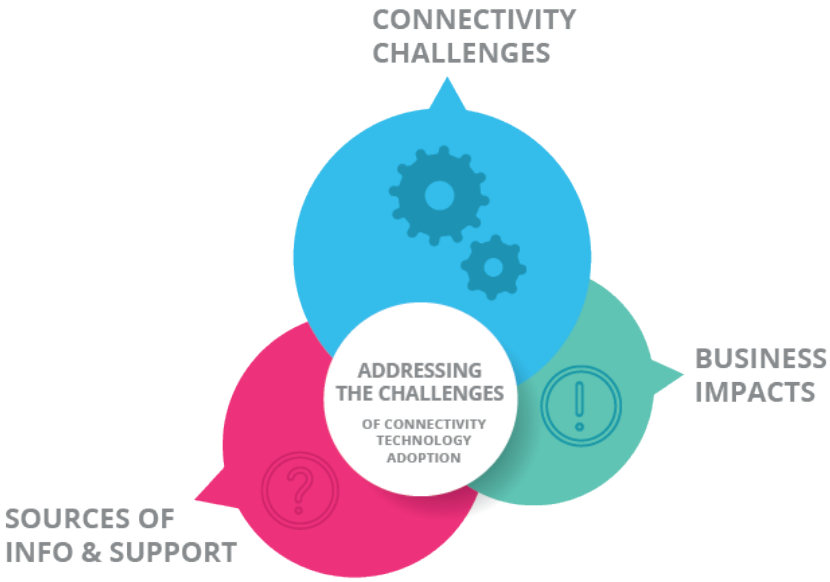

Figure 5.5: Key Themes from Study 3 - Addressing the Challenges of Connectivity Technology Adoption: How SMEs seek connectivity support

5.5.1 Connectivity challenges and connectivity literacy

A considerable proportion (40%) of respondents encounter difficulties in solving their own connectivity issues. This is partially due to unreliable service. Most respondents have experienced slow speeds, variable performance, dropouts, and outages in the last six months. Ideally, redundancy is required to provide alternative service during outages. It is concerning that nearly 40% of participants have not established a secondary connection to use in the event of an outage or degradation of their primary service. Whilst some simply do not have access to a secondary service such as a mobile broadband, the majority do have access to but have not established a secondary service for redundancy.

Some of the difficulties that respondents encounter in solving their own connectivity issues are related to connectivity literacy. Specifically, the difficulties experienced include not knowing where to start, finding it confusing, lack of knowledge, lack of understanding, and finding it difficult to apply information to their unique situation. This was explored in more depth in the online focus groups, where the main barriers identified were complexity and time costs. This relates to the Connectivity Literacy and Motivation finding from study 2 (see Section 4.5) and confirms that the complexity of establishing and maintaining a connection in RRR Australia requires specific types of knowledge that urban residents do not usually require. This places an added burden onto those RRR SME owners who do not have strong technical skills yet are responsible for managing the technology in their business. These findings indicate that more education and support is needed to improve connectivity literacy.

5.5.2 Sources of information and support

Participants seek connectivity information and support through a variety of channels, including social media groups, their provider, IT consultants, search engines, websites, friends, and neighbours. Many of these are online resources, which makes troubleshooting a poor connection difficult for those that do not have a secondary internet service. For example, one focus group participant explained that when the connection is unreliable, they “might have to run into town to watch a YouTube video on how to do something”. Given that many RRR SMEs are more than 15km from the nearest town, this approach to troubleshooting has considerable financial and time costs which may outweigh the cost of maintaining a secondary internet connection in some cases. Access to more resources that can be utilised offline would be beneficial - for example, downloadable and printable guides.

Misinformation can make it more difficult for RRR SMEs to find the information and support they need. Several participants expressed frustration about the customer service they receive from their providers, in particular the lack of understanding of the unique connectivity challenges that RRR residents encounter. This makes peer support more necessary. Some participants seek information and support from neighbours, friends and family who understand RRR connectivity and direct them to the appropriate

resources. However, the appropriate resources are limited or underserved, therefore, more resources (human, financial, trusted information) need to be provided to trusted information providers.

5.5.3 Business impacts of poor connectivity

Most participants are concerned about the negative impact that poor connectivity has on their businesses, particularly on business operations, productivity, and customer service. A considerable proportion of participants indicated that not all of their business needs are being met by their current connection. However, this cannot be solely attributed to inadequacies of the internet service being provisioned, as other factors are involved including failure to upgrade plans and equipment, and difficulties experienced in solving connectivity issues.

Most respondents indicated that the limitations of their internet connection are preventing them from adopting new technologies to improve their business. On farms, the lack of internet access beyond the vicinity of the homestead is a significant concern. Focus group data showed that this is preventing farmers from adopting new technology to improve productivity. For example, one participant explained that they could save approximately 5 hours each time they sell cattle if they could participate in online sales, however a lack of internet access at their shed is preventing this. Technologies that participants would like to adopt include on-farm communications, and a variety of agricultural technologies such as imagery, mapping, and animal and herd management. Importantly, this shows that issues related to poor connectivity are delaying the implementation of agricultural technologies that could potentially improve efficiency, profitability and/or sustainability on farms.

5.6 Chapter summary

Chapter 5 presented Study 3 for this project and explored the theme of Addressing the Challenges of Technology Adoption: How SMEs seek connectivity support. It provided an analysis of the challenges that the target population faces when adopting connectivity technologies, and where they seek information and support. The results show that unreliable connectivity is a continued source of frustration for RRR SMEs.

Findings were congruent with themes in the literature. Notably, RRR residents are having to develop connectivity literacy (Australian Government: Regional Telecommunications Review, 2021), a new framework of knowledge and skills that those in major cities do not have to acquire. This includes knowledge of the numerous technologies, devices, providers, and service plans, in addition to basic troubleshooting skills, and knowing where to seek information and support.

Chapter 6 Discussion and Conclusions

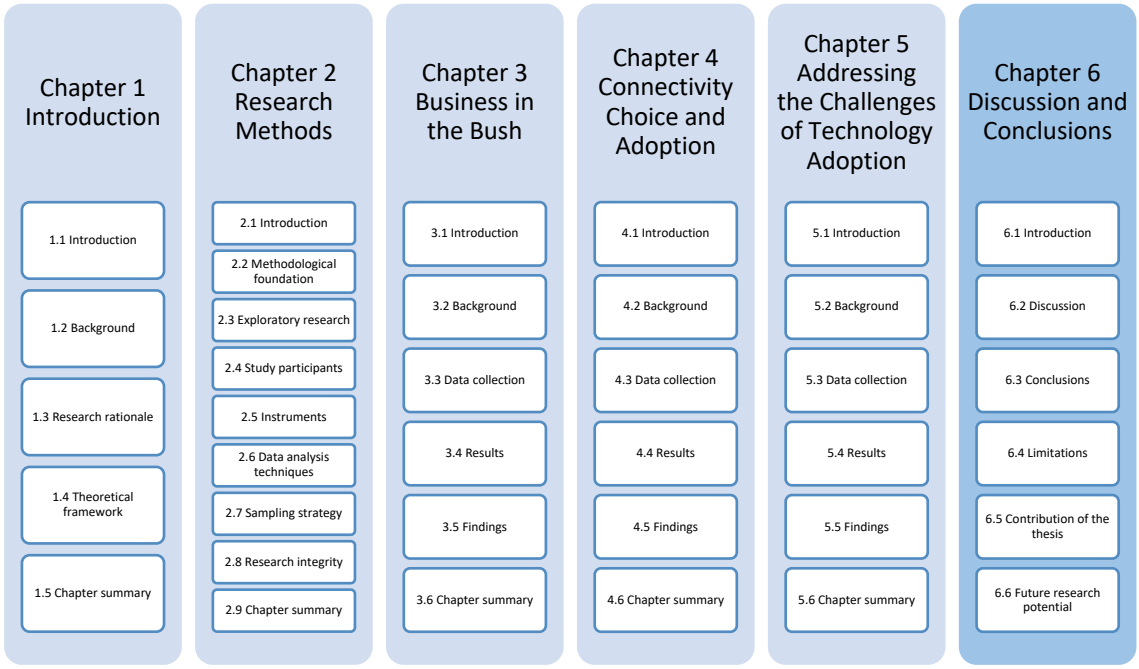

Figure 6.1: Outline of the Thesis - Discussion and Conclusions

6.1 Introduction

Chapter 6 presents the final discussion and conclusions for this research project. First, it will bring the thesis together with a discussion of the findings from the three studies, along with some new information and ideas linking to next steps. Second, it will present the conclusions. Third, it will discuss the limitations of the project. Finally, it will discuss the overall contribution of the thesis, and highlight areas of potential for future research potential.

6.2 Discussion

Based on the findings presented in this thesis, integrated with insights from the literature and emerging trends, several key ideas are drawn. The thesis highlights that there is general agreement amongst RRR SMEs, industry and government that technology has the potential to improve economic development in rural, regional, and remote Australia. Emerging technologies such as the Internet of Things, Artificial Intelligence, Virtual Reality, and Web3 are beginning to change the business landscape. In agriculture, data is becoming a strategic asset and enabling farmers to make more informed decisions. Furthermore, the years 2020 to 2022 have been a period of

unprecedented change amidst the Covid-19 pandemic. The study found that some RRR SMEs accelerated their uptake of new connectivity technology due to changing needs related to the pandemic (e.g., working from home and children doing schoolwork from home). Other changes that occurred during the pandemic include population increases in regional areas (Borsellino et al., 2022). Initially it was thought that this was due to increased internal migration from urban areas, however, evidence of this "regional renaissance" (Borsellino et al., 2022) is largely anecdotal, and the net population gains in regional areas may be due to fewer departures rather than an increase in arrivals from urban areas (Borsellino et al., 2022). In either case, the population in regional areas has grown, adding to the RRR business landscape. Increased opportunities for remote working could see more people stay in regional areas in the years ahead to work and do business. Whilst we cannot be certain about what will happen in the future, these patterns indicate that reliable internet connectivity is an increasingly important requirement for RRR residents and SMEs.

As discussed throughout this thesis, connectivity technology is often complex to establish and maintain in RRR areas and requires a unique set of skills and knowledge – known as connectivity literacy (Australian Government: Regional Telecommunications Review, 2021). A lack of these capabilities can be a burden for RRR SME owners who are often managing their business' technology themselves, albeit somewhat reluctantly. Many participants in the study find it difficult to dedicate the time and effort required to develop the connectivity literacy required to find the right plans, providers, and equipment, and troubleshoot issues whilst running their business. In turn, this increases stressors when something goes wrong with their connection, or when their connectivity requirements suddenly increase, as they may not be equipped to solve these types of problems.

The study found evidence of inertia in technology upgrade behaviour. For many participants, a request to their provider to upgrade from the Australian product SkyMuster™ to SkyMuster Plus™ could resolve the common complaint of insufficient data allowance. However, a significant number of respondents have not yet done this. In this situation, the Procedural Switching Costs (Wang et al., 2018) are perceived to be

higher than they actually are. The participants considered changing plans to be too hard, but in reality, the evaluation cost is minimal as there are a small number of plans to choose from, and there are usually no learning, setup, or equipment costs involved in the plan upgrade. Additionally, the ongoing economic cost is comparable or better. The inertia in this situation is also impacted by Incumbent System Habits (Wang et al., 2018), the concept that people continue to use a current system in an automatic and unthinking manner. This relates to the interplay between motivation and connectivity literacy – those that are more motivated to acquire the skills and knowledge required to evaluate connectivity technology upgrades are more likely to have an accurate perception of the procedural switching costs involved. This theme of inertia could be part of a deeper problem for RRR SMEs that applies to other matters beyond connectivity and technology adoption, such as the attitude of being "too busy" to undertake training (Mitchell, 2007).

The perception that improving or changing a connection is too much of a hassle is worsened by misinformation. Some RRR SMEs find it difficult to find trusted sources of information and to make sense of the information when they find it. This study supports Finding 13 in the 2021 Regional Telecommunications Review by the Australian Government: Regional Telecommunications Review (2021) that states: "There is significant misinformation about the availability of telecommunications services. Regional consumers, businesses and local governments need access to independent advice and improved connectivity literacy to support them in making informed connectivity choices".

RRR SMEs are entering an increasingly digital future. Many of the RRR business owners that participated in the study self-identified in the technology adopter category of Pragmatists (Diffusion of Innovations), who prefer to wait for products and services to be easy and well supported before they adopt new innovations (Rogers, 2003). As digital technologies improve, RRR SMEs are likely to increase usage of their internet connection. Over time this will lead to increased pressure on telecommunications infrastructure and networks. This could result in network congestion issues, making it more important for RRR SME owners to be aware of all the options available to them.

More needs to be done to support RRR SME owners to improve their connectivity knowledge and skills, in a method that is not too demanding in terms of time or mental effort, and is non-blaming, supportive and empowering. The Working With Involuntary Clients model (Trotter, 2015) provides four key principles that could achieve effective outcomes: role clarification, pro-social modelling, and reinforcement, problem-solving, and relationship. These principles should be reflected in outputs that attempt to support SME owners to improve their connectivity knowledge and skills.

This study has found that unreliable connectivity is negatively impacting on the participants' businesses, particularly in operations, productivity, customer service and missed business opportunities. Participants were interested in adopting new technology and acknowledge that this would be beneficial for their business, but many were not actively exploring their options as they would prefer to get their current technology working smoothly first. However, as discussed throughout this section, they face multiple barriers to improving or upgrading their existing internet connection.

Better support is needed to help RRR SME owners establish and maintain reliable internet connections. This adds an extra layer to the key challenge of rural telecommunications observed by Townsend et al. (2013), in that reliable connectivity has potential to benefit rural communities socially and economically, yet a lack of access and adoption are one of the key social and economic problems faced by these communities – thus rural isolation is amplified. Better support and capabilities are needed to overcome these significant issues for RRR SME owners, who encounter geographical narcissism and want to feel better acknowledged, appreciated, understood, and supported, particularly by their urban counterparts.

6.3 Conclusions

The thesis was an exploration of connectivity technology adoption by RRR SMEs, and its findings have important implications for the RRR community. Businesses in RRR Australia are increasingly realising the value of the internet. However, this study found that unreliable connectivity has a significant negative impact on business and is inhibiting the adoption of new technology. For RRR SMEs to realise the untapped

economic potential of digital technologies, such as digital agriculture, more reliable internet connections are needed. In the past, deficits in telecommunications infrastructure and high costs were a major barrier for people in the regions. More recently, this has been improving, which is evident in increased scores for both access and affordability in the Australian Digital Inclusion Index (ADII). Nevertheless, ADII data also shows that the digital divide between urban and rural Australia persists. This thesis highlights the importance of exploring human factors in interaction with technology adoption to gain a deeper understanding of the factors that influence the uptake of connectivity technologies. Critically, this work emphasises that establishing and maintaining internet connectivity is far more complex for RRR SMEs than it is for their metropolitan counterparts. A unique set of skills and knowledge, Connectivity Literacy, is required to successfully navigate this complex landscape. However, acquiring Connectivity Literacy can be a burden for business owners who often take on many roles, including managing the business' technology, and have limited access to professional help due to their remoteness. As a result, RRR SMEs are confronted with multiple barriers to establishing, maintaining, improving, and upgrading their existing internet connections. Importantly, the thesis found that insufficient Connectivity Literacy caused participants to have misconceptions about the procedural switching costs of improving their connections, resulting in a failure to upgrade (or a delay). This inertia is exacerbated by pervasive misinformation and misperception about connectivity in RRR Australia. Better support is needed to empower business owners with relevant knowledge and skills, and to simplify the complex connectivity landscape. This will be critical for realising the benefits of emerging technology in the coming years.

6.4 Limitations

While the methodology and methods for this project were confirmed as suitable for the research project, they did present some limitations and challenges. The study was designed to investigate SMEs in rural, regional, and remote areas. However, by combining these three remoteness areas together, any differences between each of the areas was not investigated. The focus group responses highlighted that each

remoteness area may have its own unique challenges, and this is a valid consideration for future studies.

This study recruited participants from three online membership groups, with additional snowball recruitment. Some people might have been missed from the study, resulting in a limitation of views from the kinds of business owners who did not participate. For example, those that are perfectly happy with their connections may have been less inclined to participate in the study. As a result, the study may have overstated the problem. Focus group discussions indicated that the respondents knew plenty of other people facing similar issues in their local communities. However, this may be due to confirmation bias, as people tend to seek others who agree with them. Other people that may have been missed include those that are digitally disinclined and those that do not use email or social media. Therefore, the study may have underrepresented the challenges that these kinds of people face and may have been skewed towards certain technology adoption categories. The practical challenges of reaching those that are not online was not possible within the scope of this project and therefore we have no understanding of why they are not online. It is important that we gain an understanding of those who are not connected, therefore offline duplication of this study is recommended.

Some RRR SME owners may have been too busy to participate. To help counteract this, a prize draw was used as an incentive and the survey was kept to a reasonable length. However, an absence of data from the busiest RRR SME owners may have resulted in an understatement of the challenges that they face in dedicating time and effort to establishing and maintaining their connection. Similarly, while the survey was open to both small and medium sized enterprises, there were limited response from medium sized business owners. As a result, any unique issues that medium sized SMEs face may have been underrepresented.

The online survey and online focus groups were open to male and female participants, however fewer men responded, thus there was a limitation of perspectives from men who did not participate. This could be explored in future studies by encouraging more

men to participate in the recruitment communications and extending data collection to include face-to-face interviews at events attended by members of the target population. Alternatively, the results may highlight that RRR SMEs have a higher proportion of female owners than male owners - supporting previous research that RRR women are taking a larger role in management of SMEs in Australia (Hay & Pearce, 2014; Houghton & Strong, 2004).

To ensure high completion rates, the number of questions in the online survey were limited. As a result, some topics could not be explored in detail. However, the online focus groups did allow further exploration of key topics identified from an initial analysis of the survey data. Nevertheless, it was not possible to correlate this back to the survey data for individual participants, as the survey data was anonymous.

Practical constraints meant that collaboration with stakeholders was largely limited to the initial research design and online survey design. Ideally, participatory research would involve multiple cycles of collaboration to discuss findings and draw a more thorough set recommendations from the findings. Further efforts will be made in this area in future projects that flow on from this research.

The number of survey responses cleared for analysis (n=91) limited the ability to undertake more descriptive analysis of the data. While triangulation was used to gain a greater understanding of the results from the online survey and online focus groups, the focus group results may have been subject to bias as the survey was used to inform the focus group recruitment.

Finally, the study was conducted from 2020 to 2022, a time of significant disruption due to Covid-19. Focus group results revealed that impacts of the pandemic motivated some participants to improve their internet connections. Without Covid-19, participants may have been less likely to upgrade their connectivity, therefore, the results may have differed.

Overall, while the findings may not be widely generalisable across the entire target population of RRR SME decision makers, they offer rare in-depth insights from these business owners' perspectives.

6.5 Contribution of the thesis

The thesis contributes to existing knowledge about connectivity technology adoption by SMEs in rural, regional, and remote Australia. The findings have practical implications that are of interest to policy makers, researchers, and training providers who seek to improve connectivity adoption and usage in rural, regional, and remote areas, as well as RRR SME owners.

The work informs key stakeholders involved in shaping the connectivity environment about the key factors that influence technology adoption by RRR SMEs. It highlights the complexity of connectivity literacy, the problem of inertia in connectivity technology adoption, and key barriers to adoption. In addition, it reveals examples of circumstances that have motivated RRR SME owners to improve their connectivity literacy which in turn led to adopting newer technologies.

The thesis provides useful insights for planning and intervention, which contribute to the digital inclusion environment. It identifies gaps in connectivity literacy support for RRR SMEs and considerations for delivering this support. The research also has potential to benefit the wider community by aiding the sustainable development of business in RRR Australia in the digital era. These contributions are summarised in Table 6.1.

Table 6.1: Contribution of the Thesis

Practical Problem	Research Gap	Research Question/s	Key Findings Contribution	Theoretical Contribution	Practical Contribution
Study 1: Business in the Bush	The characteristics of RRR SME decision makers in Australia have not been widely studied within the context of technology adoption.	What types of SMEs are operating in RRR Australia? What are the characteristics of SMEs (and their owners) in RRR Australia?	Knowledge of the characteristics of RRR SME business owners, which provides a contextual foundation for further research in technology adoption and usage. Confirmation of the importance of connectivity for RRR SMEs.	Findings contribute to the literature on RRR SMEs in Australia, and the factors that influence their decision-making.	Identification of considerations for delivering connectivity literacy support to RRR SMEs.
Study 2: Connectivity Choice and Adoption	The factors that influence connectivity technology adoption and usage by RRR SMEs have not been widely studied.	What factors influence the choice of internet connectivity tools, providers and solutions by RRR SMEs?	There is a significant level of inertia in connectivity technology adoption by RRR SMEs. Attitudinal barriers to digital literacy have a negative impact on connectivity technology adoption.	No single theoretical model offers a complete explanation of factors that influence technology adoption in this population, particularly in relation to post-adoption behaviour and successive versions of innovations. Findings advance literature on connectivity literacy and connectivity technology adoption amongst this population.	Identification of gaps in connectivity literacy support for RRR SMEs. Identification of motivations and barriers to connectivity technology adoption by RRR SMEs in Australia.
Study 3: Addressing the Challenges of Connectivity Technology Adoption: How SMEs seek connectivity support	The challenges associated with connectivity technology adoption and maintenance by RRR SMEs have not been widely studied.	Where do RRR SMEs go to find information and support on internet connectivity?	Knowledge of the complexity of connectivity technologies, and confirmation that unique skills and knowledge (connectivity literacy) are required by RRR SMEs. Knowledge of the sources of information and support for addressing challenges associated with connectivity technology adoption.	Findings contribute to the literature on the complexity of connectivity technologies in RRR Australia, and the associated information, knowledge, skills and support required.	Identification of the challenges that RRR SME owners face in establishing and maintaining reliable internet connections.

6.6 Future research potential

This study revealed several potential topics for further exploration. Considering the need for better connectivity literacy it is evident that the motivation to learn needs to be explored in future research, in addition to the motivation to adopt. There is a dearth of literature about technology upgrade behaviour and the effect of inertia. However, the findings from this study indicate that this is a concept worth exploring in more depth.

More research is needed to explore how RRR SMEs might face the digital frontier and function in a better-connected future. Emerging technologies such as the ubiquitous computing, the Internet of Things, Artificial Intelligence, Virtual Reality, and Web3 have the potential to significantly the business landscape. The Australian Government is ambitious about Australia's digital future and developed a Digital Economy Strategy 2030 (Australian Government, 2021), which acknowledges that many SMEs continue to face ongoing challenges when considering digital adoption, and aims to lift digital capability and adoption in SMEs. More research in this area will help uncover what support is needed for RRR SMEs, to develop digital inclusion strategies.

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Appendix

Appendix 1: Focus Group Guidelines

Welcome Zoom Tips
Informed Consent Obtain consent for participation and recording
Introduction Research overview (aim, objectives, outcomes), purpose of focus groups
Icebreaker In 30 seconds, tell us a little about yourself.
Group discussion Q1 Thinking about connectivity in your business - what are the unmet needs? • Is your connection meeting all of your business needs? • What do you want/need to do online, but can't? • What negative impacts does your connection have on your business? • How much of a factor did connectivity play when deciding to start your business?
Group discussion Q2 How has your internet connection prevented you from adopting new technology? • What kinds of new technologies would you like to adopt? • What are the barriers to adopting new technology? • What are your thoughts on emerging technology and how you might use it in your business?
Group discussion Q3 Would the potential to adopt new technology motivate you to learn more about connectivity? • Thinking about the potential benefits of new technology - does this make you to want to learn more about connectivity? • Who is responsible for managing the technology in your business? • How do you learn about connectivity? • How easy is it to find information on connectivity vs how easy is it to implement the information?
Group discussion Q4 (optional) Are there any other barriers to the adoption of new technology?
Open discussion Is there anything you want to say that we haven't covered?
End

Appendix 2: Online Survey / Questionnaire (Qualtrics)

Standard: Information Sheet and Consent (2 Questions)
Block: Confirm Survey Suitability (3 Questions)

Branch: New Branch
If
If For this research, I am interested in SMEs (Small and Medium Enterprises) businesses that employ... No Is Selected
Or What is your age? Under 18 Is Selected
Or All areas of Australia outside of Major Cities are considered to be 'Rural, Regional and Remote'... No Is Selected

EndSurvey: Advanced

Standard: Additional Demographics (1 Question)
Standard: Location (6 Questions)
Standard: SME Type (3 Questions)
Standard: SME Type - Business 1 (6 Questions)

Branch: New Branch
If
If For this research, I am interested in SME (Small and Medium Enterprise) businesses that employ le... 2 Is Selected

Block: SME Type - Business 2 (6 Questions)

Branch: New Branch
If
If For this research, I am interested in SME (Small and Medium Enterprise) businesses that employ le... 3 Is Selected
Or For this research, I am interested in SME (Small and Medium Enterprise) businesses that employ le... More than 3 Is Selected

Block: SME Type - Business 3 (6 Questions)

Standard: ADII (4 Questions)
Block: Factors that influence choice (19 Questions)
Standard: Troubleshooting (17 Questions)
Standard: Where do they go for info and support (4 Questions)
Standard: Business Characteristics (2 Questions)
Standard: Focus Group (2 Questions)

Branch: New Branch
If
If Would you like to participate in an online focus group to help with this research? Yes Is Selected

EndSurvey: Advanced

Start of Block: Information Sheet and Consent

Information Sheet **Understanding the motivations and barriers to adoption and effective use of connectivity technologies by SMEs in RRR Australia**

You are invited to take part in a research project about the human factors that influence the adoption

and implementation of internet connectivity technologies by small and medium businesses in rural, regional and remote Australia. The study is being conducted by Carrie-Ann Wilson and will contribute to the Master of Philosophy (Management and Commerce) at James Cook University.

This survey is completely voluntary and your responses and contact details will be strictly anonymous. It will take approximately 15 minutes to complete, so you might want to get yourself a cup of tea or coffee before you start.

If you have any questions about the study, please click here to access contact details in the information sheet.

Consent
By clicking on the next arrow, you agree to participate in this study

End of Block: Information Sheet and Consent

Start of Block: Confirm Survey Suitability

Q1 *For this research, I am interested in SMEs (Small and Medium Enterprises) businesses that employ less than 200 people. This includes any entity that is operating for purpose or profit, including freelancers, side hustles, home-based businesses, small and medium businesses, community groups and not-for-profit organisations.*

Are you an SME business owner, or do you make technology decisions within a SME business?

Yes (1)

No (2)

Skip To: End of Block If Q1 = No

Q2 What is your age?

▼ Under 18 (1) ... 85 and over (16)

Skip To: End of Block If Q2 = Under 18

Q3 *All areas of Australia outside of Major Cities are considered to be 'Rural, Regional and Remote' (RRR) for the purpose of this research.*

Do you have a business located in a Rural, Regional or Remote (RRR) area, in Australia?

Yes (1)

No (2)

Skip To: End of Block If Q3 = No

End of Block: Confirm Survey Suitability

Start of Block: Additional Demographics

Q38 What is your gender?

Female (1)

Male (3)

Prefer not to say (4)

End of Block: Additional Demographics

Start of Block: Location

Thinking about where your business is located, answer the following questions.

Q4 What best describes the type of property?

Urban residential (1)

Rural residential with agriculture (2)

Rural residential without agriculture (3)

Commercial (4)

Industrial (5)

Agricultural (6)

Q5 How far is it from the nearest town?

In town (1)

Less than 5km (2)

5 to 15 km (3)

15 to 30 km (4)

30 to 60 km (5)

More than 60 km (6)

Q6 Is this location also where you live?

Yes (1)

No (2)

Q7 What is the postcode?*

Q8 What is the suburb/town/locality?

End of Block: Location

Start of Block: SME Type

Q9 *For this research, I am interested in SME (Small and Medium Enterprise) businesses that employ less than 200 people. This includes any entity that is operating for purpose or profit, including freelancers, side*

hustles, home-based businesses, small and medium businesses, community groups and not-for-profit organisations.

How many SME businesses do you run from this location?

1 (1)

2 (2)

3 (3)

More than 3 (4)

Display This Question:

If Q9 = More than 3

Thinking about the top THREE BUSINESSES that you run from this location, answer the following questions.

Q10 What sort of business do you run?

Describe as fully as possible, using two words or more. For example: beef cattle grazing, livestock transport, information technology services, make and sell clothes online, community group.

Business 1 (1)

Business 2 (2)

Business 3 (3)

End of Block: SME Type

Start of Block: SME Type - Business 1

Thinking about your [BUSINESS-DESCRIPTION-1] business, answer the following questions.

Q11-1 Which best describes the industry of your business?

▼ Agriculture, Forestry and Fishing (1) ... Other (please specify) (22)

Q12-1 Including yourself, family and workers, how many people work in the business?
Number of family members who work in the business : (1)
Number of other workers : (2)
Total : [calculation]

Q13-1 How many hours per week do you usually work in this business?

0-4 hours (1)

5-19 hours (4)

20-34 hours (5)

35 hours or more (6)

Q40-1 What best describes your job in this business?

This is my main job (paid work) (1)

I do this in addition to my main job (paid work) (2)

This is unpaid work (3)

This is volunteer work (4)

Q96-1 How many years has this business been running?*

End of Block: SME Type - Business 1

[Repeat SME Type Block for Business 2 and 3 if applicable]

Display This Question:

If Q89 = More than 6 months ago

Or Q89 = Never

Q88 What are the reasons why you do not use the internet?

I have no need to use the internet (1)

I am not confident using the internet (2)

The internet is too expensive for me (3)

I am concerned about privacy or scams (4)

The internet is not a priority for me (5)

I do not have access to the internet (6)

I have a disability that prevents me from using the internet (7)

Other (8)

Display This Question:

If Q89 = In the last week

Or Q89 = In the last month

Or Q89 = In the last 3 months

Or Q89 = In the last 6 months

Q86 What are the reasons you do not use the internet more often?

I do not need to use the internet more often (1)

I am not confident using the internet (8)

The internet is too expensive for me (4)

I am concerned about privacy or scams (5)

The internet is not a priority for me (6)

I have a disability that restricts me from using the internet (7)

I do not have convenient access to the internet (9)

Other (10)

Display This Question:

If Q89 = In the last week

Or Q89 = In the last month

Or Q89 = In the last 3 months

Or Q89 = In the last 6 months

Q87 How concerned are you that the amount of time you spend online adversely affects your health and wellbeing (e.g. relationships with family and friends, work, sleep patterns)?

Extremely concerned (1)

Moderately concerned (4)

Slightly concerned (5)

Not at all concerned (6)

Not applicable (7)

End of Block: ADII

Start of Block: Factors that influence choice

Thinking about internet usage at your business, answer the following questions.

Q14-A The following needs have been identified as potential priorities for business internet usage. Please rate the significance of each for your business.
[Five-point Likert scale: Not at all important, Unimportant, Neither important nor unimportant, Important, Very important]

Basic activities (eg. email, social media, messenger, banking, government services, etc) (Q14-A_28)
Video and audio streaming (eg. YouTube, Spotify) (Q14-A_5)
Education, training and workshops (Q14-A_7)
Ordering goods and services (Q14-A_8)
HR tools (eg. timesheets) (Q14-A_49)
Software updates (Q14-A_9)
Personal use (Q14-A_26)

Q14-A CCC The following needs have been identified as potential priorities for business internet usage. Please rate the significance of each for your business.
[Five-point Likert scale: Not at all important, Unimportant, Neither important nor unimportant, Important, Very important]

Team communication and collaboration (eg. WhatsApp, Trello) (29)

Phone calls (eg. Wi-Fi calling and VoIP (Voice Over Internet Protocol)) (6)

Video calls and meetings (eg. Zoom, Teams) (4)

Cloud based software (eg. Canva, Google Docs, Trello, Xero, accounting programs, etc) (21)

Cloud storage and backups (eg. Dropbox, One Drive, Google Drive) (22)

Q14-A SM The following needs have been identified as potential priorities for business internet usage. Please rate the significance of each for your business.
[Five-point Likert scale: Not at all important, Unimportant, Neither important nor unimportant, Important, Very important]

Point of sale (POS) terminals (eg. EFTPOS, Square) (14)
Marketing and online promotion of business (10)
Managing websites (30)
Online bookings (eg. appointments, tourism and accommodation) (15)
Online sales and e-commerce (eg. Shopify, WooCommerce, eBay store) (16)
Customer Relationship Management (CRM) (47)

Q14-A F The following needs have been identified as potential priorities for business internet usage. Please rate the significance of each for your business.
[Five-point Likert scale: Not at all important, Unimportant, Neither important nor unimportant, Important, Very important]

Camera surveillance (eg. CCTV) (25)
Providing Wi-Fi for staff (19)
Providing Wi-Fi for guests (17)
Providing Wi-Fi for guests at LARGE EVENTS (18)

Q14-A S The following needs have been identified as potential priorities for business internet usage. Please rate the significance of each for your business.
[Five-point Likert scale: Not at all important, Unimportant, Neither important nor unimportant, Important, Very important]

Internet of Things (IoT) technologies (eg. water sensors & monitoring, walk-over-weigh systems, controlling gates, sensors, etc) (12)
GPS technologies (eg. ear tags) (13)
Weather stations (11)

Q74 What other priorities are there for internet usage in your business? (optional)

Display This Question:

If If What other priorities are there for internet usage in your business? (optional) Text Response Is Not Empty

Q75 Please rate the significance of these other priorities.
[Five-point Likert scale: Not at all important, Unimportant, Neither important nor unimportant, Important, Very important, Not applicable]

Q77 Were you aware that many of the activities just mentioned don't require **mobile connectivity**?

For example: Wi-Fi calling allows you to make phone calls using an internet connection, even in areas where there is no mobile signal.

Yes (1)

No (2)

Q78 Were you aware that some of the activities just mentioned don't require **constant internet connectivity**?

For example: Some cloud based software has an offline mode, so you can work without an internet connection and it will sync when you reconnect.

Yes (1)

No (2)

Q15 What type of internet connection do you use most of the time?

nbn Satellite (1)

nbn Fixed Wireless (4)

nbn Fixed Line (Fibre or Cable) (5)

Mobile Broadband (3G, 4G or 5G - broadband that uses a mobile tower, via a modem or hotspotting off your phone) (6)

Non-nbn Fixed Wireless (WISPs - Wireless Internet Service Providers) (7)

ADSL (8)

Other Satellite (eg. Starlink) (11)

Unsure (9)

Other (please specify) (10)

Q76 Who is your internet service provider (ISP)?

Activ8me (1)

Ant Communications (2)

Bordernet (3)

Clear Broadband (4)

HarbourISP (5)

IPSTAR (6)

iiNet (7)

Optus (13)

reachnet (8)

SkyMesh (9)

Southern Phone (14)

Telstra (11)

Vodafone (12)

Westnet (10)

Other (please specify) (15)

Q16 Do you have other internet connections? (select all that apply)

No other internet connections (1)

nbn Satellite (13)

nbn Fixed Wireless (4)

nbn Fixed Line (Fibre or Cable) (5)

Mobile Broadband (3G, 4G or 5G) (6)

Non-nbn Fixed Wireless (WISPs - Wireless Internet Service Providers) (7)

ADSL (8)

Other Satellite (eg. Starlink) (14)

LPWAN Technologies (including LTE-M, NB-IoT) for IoT (Internet of Things) devices (10)

Unsure (11)

Other (please specify) (12)

Display This Question:

If Q15 = nbn Satellite

Or Q16 = nbn Satellite

Q17 You said that you use nbn Satellite. What kind of plan are you on?

Sky Muster™ (1)

Sky Muster™ Plus (Plus plans offer unmetered data for everything except VPN & video streaming, they are not offered by iinet, Westnet or Bordernet) (4)

Business Satellite Service (5)

Unsure (6)

Q18 How did you choose your internet connection (type, plan and provider)? (Select all that apply)

Advertising (1)

Letter in the post (4)

Recommended by a friend (5)

Recommended by an IT consultant (6)

Recommended in an online group (eg. BIRRR or Regional Tech Hub) (7)

Reviews (8)

Value for money (9)

Data allowance (10)

Speed (11)

Customer support (12)

I have used them for a long time (13)

Bonus offer (eg. free router) (14)

Other (please specify) (15)

Q82 Do you ever receive any form of **mobile service** at your business location - even enough to receive a text message?

Yes - Inside the building. (3)

Yes - Directly outside the building. (4)

On my property - within 5 kms of the building. (1)

On my property - more than 5 kms from the building. (2)

No (5)

Q81 What equipment do you use to improve your **mobile reception**? (Select all that apply)

Nothing (1)

Aerials and antennas (generally used to improve mobile reception and signal to a location, can be used in conjunction with a repeater) (4)

Mobile repeaters (3G/4G/5G) (generally used to boost mobile reception and signal to a location) (5)

Other (please specify) (9)

Q19 What equipment do you use to improve your **internet connections**? (Select all that apply)

Nothing (1)

Regular Wi-Fi routers (generally used with nbn connections to give Wi-Fi access) (10)

Mesh Wi-Fi systems (two or more routers used to extend your Wi-Fi) (8)

Wi-Fi extenders (generally used to extend Wi-Fi from one location to another, e.g. from the house to a shed or cattle yards) (7)

Point-to-Point Wireless Connections (also known as wireless access point (WAP), Wi-Fi bridge, or wireless bridge) (generally used to get a connection from one location to another) (6)

Other (please specify) (9)

Q20 How did you choose your internet equipment (router, antenna, etc)? (Select all that apply)

Supplied by ISP (internet service provider) (1)

Recommended by ISP (internet service provider) (13)

Recommended by a friend (4)

Recommended by an IT consultant (5)

Recommended in an online group (eg. BIRRR or Regional Tech Hub) (6)

Value for money (7)

Features (8)

Online reviews (9)

Other (please specify) (11)

End of Block: Factors that influence choice

Start of Block: Troubleshooting

Q21 Have you ever done the following to improve your connection? (Select all that apply)

Conducted a speed test (1)

Connected equipment using ethernet cables rather than Wi-Fi (4)

Updated router firmware (5)

Upgraded to a higher-powered, better quality router (6)

Relocated router (7)

Shifted router antennae around (8)

Changed Wi-Fi frequencies on your router (9)

Tested different cables (10)

Conducted troubleshooting with your provider (11)

Enlisted an expert to help improve your connection (12)

Other (please specify) (13)

Q22 What kinds of issues have you experienced with your connections in the last six months? (Select all that apply)

Dropouts (1)

Variable performance (4)

Slow speeds (5)

No service (outages) (6)

Degradation of service (7)

Long wait for customer support (8)

Equipment issues (9)

Certain webpages not loading (10)

Certain platforms not performing well (eg. video conferencing buffering) (11)

Other (please specify) (13)

Q95 **Thinking about the main internet connection at your business, answer the following questions**

Q23 When did you last change your **internet plan?**

Within the last 6 months (1)

6 months to 1 year ago (4)

1-3 years ago (5)

3-5 years ago (6)

6 or more years ago (7)

Never (8)

Display This Question:

If Q23 = Never

Q24 If you haven't changed your **internet plan** - why not? (Select all that apply)

Current plan meets my business needs (1)

Plan choice confuses me (4)

It's too hard to change plans (5)

I don't know how to compare plans (6)

I don't know where to go to get advice (7)

Budget (8)

Other (please specify) (9)

Display This Question:

If Q23 != Never

Q25 What prompted you to change your **internet plan**? (Select all that apply)

My knowledge improved (1)

I found out about a better plan (4)

Concerns about cost (6)

Concerns about data allowance (7)

Concerns about speed / ping / latency (8)

Concerns about connection reliability (9)

Upgrade was needed to run new software or equipment for business (11)

Moved premises (12)

Other (please specify) (13)

Q23-2 When did you last change your **internet service provider**?

Within the last 6 months (1)

6 months to 1 year ago (4)

1-3 years ago (5)

3-5 years ago (6)

6 or more years ago (7)

Never (8)

Display This Question:

If Q23-2 = Never

Q24-2 If you haven't changed your **internet service provider**, why not?

Current provider meets my business needs (1)

Provider choice confuses me (4)

It's too hard to change providers (5)

I don't know how to compare providers (6)

I don't know where to go to get advice (7)

Other (please specify) (9)

Display This Question:

If Q23-2 != Never

Q25-2 What prompted you to change your **internet service provider**? (Select all that apply)

My knowledge improved (1)

I found out about a better provider (14)

Concerns about cost (15)

Poor customer support (16)

Needed better coverage (22)

Technical issues (17)

Moved premises (18)

I needed to because I changed my connection type (23)

Other (please specify) (19)

Q23-3 When did you last change your **internet equipment** (router, etc)?

Within the last 6 months (1)

6 months to 1 year ago (4)

1-3 years ago (5)

3-5 years ago (6)

6 or more years ago (7)

Never (8)

Display This Question:

If Q23-3 = Never

Q24-3 If you haven't changed your **internet equipment**, why not?

Current equipment meets my business needs (9)

Equipment choice confuses me (10)

It's too hard to change equipment (11)

I don't know how to compare equipment (12)

I don't know where to go to get advice (13)

Other (please specify) (14)

Display This Question:

If Q23-3 != Never

Q25-3 What prompted you to change your **internet equipment**? (Select all that apply)

My knowledge improved (18)

I found out about better equipment (20)

Concerns about reliability (21)

Upgrade was needed to run new software or equipment for business (23)

Moved premises (24)

Supplied by internet service provider (26)

I needed to because I changed my connection type (28)

Other (please specify) (19)

Q26 In the last six months, have you had concerns about your connection reliability having a negative impact on your business? What aspects of your business were you concerned about? (Select all that apply)

No concerns (1)

Productivity (13)

Customer service (4)

Customer satisfaction (5)

Business operations (6)

Employee morale (7)

Health and safety (8)

Responsiveness to disasters / emergencies (9)

Business image (10)

Business opportunities (11)

Other (please specify) (12)

Q27 What is important in an internet connection, for your business?
[Five-point Likert scale: Not at all important, Unimportant, Neither important nor unimportant, Important, Very important]

Reliability (1)
Cost (2)
Data allowance (3)
Speed (4)
Latency (5)
Customer Service (6)

Q28 How much do you agree or disagree with the following statements?
[Five-point Likert scale: Strongly disagree, Disagree, Neutral, Agree, Strongly agree, Not applicable]

My internet connection has met all of my business needs over the last six months. (1)
I'm confident that I know all the internet connectivity options available to my business. (2)
The limitations of my internet connection are preventing me from adopting new technologies to improve my business. (3)
The internet is essential to my business (7)
My internet connection is as important to my business as other utilities (electricity, water, etc). (4)
If I found out that my business could get better internet at a similar price, I would change our plan within the next two months. (5)

Display This Question:

If Q28 = If I found out that my business could get better internet at a similar price, I would change our plan within the next two months. [Disagree]

Or Q28 = If I found out that my business could get better internet at a similar price, I would change our plan within the next two months. [Strongly disagree]

Q29 You indicated that you wouldn't change your plan, even if you knew you could get better internet at a similar price. Why not?

Display This Question:

If Q28 = The limitations of my internet connection are preventing me from adopting new technologies to improve my business. [Agree]

Or Q28 = The limitations of my internet connection are preventing me from adopting new technologies to improve my business. [Strongly agree]

Q28-2 You indicated that the limitations of your internet connection are preventing you from adopting new technologies to improve your business. What kinds of new technologies would you like to adopt?

Point of sale (POS) terminals (eg. EFTPOS, Square) (24)

Camera surveillance (eg. CCTV) (25)

Wi-Fi for staff & guests (26)

Online bookings (eg. appointments, tourism and accommodation) (30)

Online sales and e-commerce (eg. Shopify, WooCommerce, eBay store) (29)

Videoconferencing equipment (28)

Workforce & safety (17)

Animal and herd management (27)

Asset tracking (5)

Farm sensors (7)

Imagery & mapping (8)

On-farm communications (9)

Smart irrigation & water (12)

Soil, pasture & plant monitoring (13)

Traceability & provenance (14)

Weather monitoring & forecasting (16)

Planting and harvesting solutions (18)

Pest, weed and disease management (19)

Crop forecasting & prediction (21)

Farm management software (22)

Other (please specify) (6)

End of Block: Troubleshooting

Start of Block: Where do they go for info and support

Q30 If you needed help with your internet connection, where would you go for information? (Select all that apply)

BIRRR = Better Internet For Rural, Regional And Remote Australia

Phone a friend (1)

Local IT Consultant (4)

Internet Service Provider (ISP) (5)

BIRRR Facebook Group (6)

Regional Tech Hub Facebook Group (7)

Phone the Regional Tech Hub Hotline (8)

BIRRR Website (9)

Regional Tech Hub Website (10)

Ask on social media (11)

Google (12)

Whirlpool or other forums (please specify) (14)

Other (please specify) (13)

Q31 How easy or difficult is it for you to solve your own connectivity issues when they arise?
[Five-point Likert scale: Very difficult, Difficult, Neither difficult nor easy, Easy, Very easy]

Display This Question:

If Q31 = Easy

Or Q31 = Very easy

Q32 It sounds like you are good at solving connectivity issues... Why is that? Tell us your secrets. What are your favourite tools?

Display This Question:

If Q31 = Very difficult

Or Q31 = Difficult

Q33 It sounds like you have some trouble solving connectivity issues. What is your biggest challenge? What do you do next if you cannot solve a problem?

End of Block: Where do they go for info and support

Start of Block: Business Characteristics

Q35 How much do you agree or disagree with the following statements?
[Five-point Likert scale: Strongly disagree, Disagree, Neutral, Agree, Strongly agree, Not applicable]

I am following a strategic plan for my business (1)
I am growing my business (4)
I am skilled in technology (6)
I would like to improve my skills in technology (7)

Q37 When it comes to technology adoption, I would describe myself as a:

Tech Enthusiast (enjoy trying new things, prepared to take risks) (1)

Visionary (selective about new technology, like to stay ahead of the curve) (2)

Pragmatist (will adopt once I understand the productivity and practical benefits) (3)

Conservative (will adopt when necessary, and good support is available) (4)

Skeptic (avoid adopting new technology) (5)

End of Block: Business Characteristics

Start of Block: Focus Group

Q39 Would you like to participate in an online focus group to help with this research?

Yes (1)

No (2)

Display This Question:

If Q39 = Yes

Q39-Response Thank you for your interest in the online focus groups! At the end of this survey you will be taken to a separate form to provide your contact details - this is to ensure that your survey responses remain anonymous.

End of Block: Focus Group