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Broadband Adoption by Agriculture and Local Government Councils

Australia and the USA

A report for the Rural Industries Research and Development Corporation and the Australian Local Government Association by Wondu Business and Technology Services

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In submitting this report, the researcher has agreed to RIRDC publishing this material in its edited form.

Disclaimer
For the past decade there has been significant change in the development of new information and communication technologies and more recently in the adoption of them by users for business and consumer purposes. The report aims to present an accurate picture of the situation and outlook for the adoption of broadband, but in such a fast-changing industry it is important to recognise that data, especially on prices and use of broadband, can quickly become outdated. We also used a number of publications from other research to improve our understanding of particular developments and issues and while we took care to ensure the authenticity of the publications we are not responsible for their errors and omissions, if any.
The survey results were also affected by the sample size, and while proper survey and data-collection procedures were employed throughout, there are always some sampling and non-sampling errors. Non-response bias was a problem, more for the agricultural survey than the councils, and for this reason the agricultural survey results from Australia should be treated with caution.
We have aimed to interpret the findings for users in a balanced way and to draw conclusions that will be useful and effective for decision makers. Readers should, however, be aware of the limitations referred to above

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Foreword

The growing use of the Internet is providing rural, regional and remote areas with new opportunities to communicate, purchase goods and services and make use of applications that can reduce transaction costs, generate revenue and/or provide access to new forms of entertainment. The development of more data-intensive applications is stimulating demand for higher-speed access and technologies that do not occupy the voice lines. While there is collection of data at a general level on broadband adoption by the Organisation for Economic Co-operation and Development (OECD), the Australian Bureau of Statistics (ABS) and the Australian Competition and Consumer Commission (ACCC), there is less information at an industry and sector level and less information on what drives the adoption of broadband.

This publication provides insights into the adoption of broadband by agricultural producers and suppliers, and local councils. It analyses data from surveys undertaken of producers, suppliers and local government councils in Australia and suppliers in the USA. The main objective was to examine adoption levels and identify differences between Australia and the USA and sectors within Australia, as well as improve the overall level of information about broadband adoption at an industry level.

This project was funded from RIRDC Core Funds, which are provided by the Australian Government, for Sub-Program 4.3, Human Capital, Communications and Information Systems. The Australian Local Government Association funded the survey of Australian local government councils. A segment of the research culminating in the production of this report was funded under the Local Government Interoperability Framework (LGIF) project of the Australian Local Government Association. The LGIF program is supported by the Australian Government through the Networking the Nation Program of the Department of Communications, Information Technology and the Arts. The National Office of the Information Economy (now the Australian Government Information Management Office – AGIMO) also made a valuable financial contribution to the project.

This project fits within certain key strategies of the RIRDC Human Capital, Communications and Information Systems Sub-Program, including:

- Development of electronic communication systems with emphasis on responsiveness to farmers' needs.
- Investigation of rural social issues and issues relating to rural communities both in towns and on farms.
- Evaluation of existing and alternative policies and institutions affecting the development of a more innovative rural sector.

This report is an addition to RIRDC's diverse range of over 1000 research publications, and it forms part of our Human Capital, Communications and Information Systems R&D Sub-Program, which aims to enhance human capital and facilitate innovation in rural industries and communities.

Most of our publications are available for viewing, downloading or purchasing online through our website:

- downloads at http://www.rirdc.gov.au/reports/Index.htm
- purchases at http://www.rirdc.gov.au/eshop

Simon Hearn

Managing Director

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This study was undertaken with the assistance of Marketing and Research Associates in Sydney (especially Tracy Sheridan (Principal) and Samantha Parker (Analyst)), who carried out the significant survey task in Australia. The USA data-collection and analysis task was undertaken by the Center for the Study of Rural America at the Federal Reserve Bank of Kansas City (especially Mark Drabenstott and Jason Henderson, who also provided valuable information about a range of broadband developments in the USA, and papers on research undertaken by various USA analysts).

We also met with various Australian broadband groups and attended several workshops and meetings with Paul Budde Communications Pty Limited. Paul also provided reports and updates on the constantly changing broadband industry in Australia. In late June we attended a briefing on powerline communications organised by Savant Corporation and Big Air.

Tim Conway provided valuable insights into broadband developments in the EU and contacts with the UK Broadband Stakeholders Group (especially their CEO, Anthony Walker). We also met with the UK Department of Environment, Food and Rural Affairs (especially Nona Williamson and Tom Cunliffe, their e-business strategists) and the Oxford Internet Institute who provided details of recent research they had undertaken on Internet adoption in the UK.

Paul Bennett edited the report and provided valuable advice on formatting and the general layout of content.

The Commonwealth Grants Commission also agreed that we could include an extract from a recent publication of theirs on the speed requirements of different applications and the capacity of different technologies to meet these speed requirements (appendix 8). This data could be useful for people wanting to either use the ready reckoner developed as part of this study or to make general decisions about whether they need to adopt broadband.

Contents

Abbreviations and Glossary

All ‘DSL’ abbreviations	For clarification on entries that include the letters ‘DSL’, refer to the final entry in this Glossary: ‘xDSL’.
ADSL	Asymmetric digital subscriber line. ADSL enables high-speed transmission of data over fixed lines by installing compression technology at exchanges. ADSL can support transmission speeds of 1.5 – 9 Mbps (see entry ‘BPS’ in this glossary) when receiving data, and between 16 and 640 kbs when sending data.
ANSI	American National Standards Institute. Founded in 1918, ANSI is a voluntary organisation composed of over 1300 members (including all the large computer companies) that creates standards for the computer industry.
Backbone	Part of a network which joins LANs together, across country, city or building. LANS are connected to the backbone via routers or bridges.
Back Haul	Happens when a communication channel takes traffic beyond its destination and back again to take advantage of capacity available and low cost.
Bandwidth	A measure of the data-carrying capacity of a digital network, typically measured in bps (see below). For analogue transmission mediums the measurement is typically Hertz/second.
BPS	Bits per second, a measure of data transmission capacity. Hence kbps is thousands of bits/second, and Mbps is millions of bits/second.
BAG	Broadband Advisory Group
Broadband	Broadband is the term used to describe communication technologies that are capable of delivering data over multiple channels within a single communication medium. This is achieved typically through frequency or wave division multiplexing (Productivity Commission 2003). Broadband is distinguished by its high bandwidth and high-speed transmission of data and constant access or ‘always-on’ access to the Internet. That is, with ‘always-on’ there is never a ‘busy line’, there is no telephone connection. The minimum speed of transmission for the connection to be considered broadband has not yet been standardised, but the OECD benchmark is 256 kbps for downstream loads and 64 kbps for uploads.
BSEG	Broadband Services Expert Group. Expert government group in Australia to provide advice on broadband technologies and needs to enhance adoption. Author of the report ‘Networking Australia’s Future’ in 1994.
Convergence	Represents the trend towards common digital media across the electronic, telecommunication and computer industries and which is leading to more alliances and partnerships and less distinction between these as different industries.
CDMA	Code division multiple access. Digital mobile telephone technology.
Datacasting	Delivers digital content in the form of text, data, speech, music or visual images to people with suitable broadcasting reception equipment. Movies on demand (e.g. Moviebeam from Disney) and meetings on demand are being distributed.
Dialup	Standard dialup connection to the Internet through the conventional copper telephone wire. It is not ‘always-on’ and is often busy with traffic congestion.
DSL	Digital subscriber line. It combines separate voice and data channels over a single copper telephone line.
FDDI	Fibre distributed data interface, a set of ANSI protocols for sending digital data over fibre optic cable. FDDI networks are token-passing networks, and support data rates of up to 100 Mbps. FDDI networks are typically used as backbones for wide-area networks.
Fibre optic cable	Cable with a number of very thin strands of glass on which information is conveyed as light pulses.
GSM	Global system for mobile communications, the standard digital cellular phone service.
HFC	Hybrid fibre coax. Coaxial and fibre optic capable of transmitting video, voice and data.
Interoperability	Ability to connect hardware and software infrastructure from multiple sources and over time, using common protocols.
ISP	Internet service provider

ISDN	Integrated services digital network. ISDN networks are dedicated and capable of carrying voice, video and data traffic, over copper and other fixed lines. Data transfer rates are 64 kbps.
kbps	see ‘bps’
LAN	Local area network, connecting computers, printers servers and other devices, typically within a smaller defined area like a building.
Last Mile	Link between the telephone company centre and the end user — local, trunk or Internet. Used to highlight problems of reduced competition, poor technology and high price at the end delivery point.
Mbps	see ‘bps’
PLC	Power line carrier. Power line carriers use the existing AC power line to carry high frequency radio waves for the high-speed transmission of voice, data and video.
PSTN	Public switched telephone network. The basic telecommunication infrastructure of telephones, switches, exchanges and copper wire lines, carrying analogue voice data in contrast to the substitute telephone networks base on digital technologies such as ISDN and FDDI.
SME	Small-to-medium enterprise
ULL	Unconditional local loop. The copper wire between the end user’s network boundary and a local switch.
VDSL	Very high digital subscriber line. An advanced version of ADSL, transmitting data at between 13 and 55 Mbps over short distances through twisted pairs of copper cable (Broadband 2003).
VoIP	Voice over Internet protocol. Enables the transmission of voice calls over the same network that transmits data. The Internet protocol applies to the encoding technology that enables the voice call to be slotted in between data calls on a data network.
xDSL	Generic term for the family of DSLs that enable digital information to be delivered over existing copper wire pairs for limited distances from a central point. The ‘x’ in xDSL stands for any one of a number of letters denoting the different xDSL family members — asymmetric DSL (ADSL), high-bit-rate DSL (HDSL), ISDN DSL (IDSL), and single-pair symmetrical services DSL (SDSL). They offer a subscriber up to 8 million bps one-way downstream and somewhat fewer bps upstream to the phone company.
WAP	Wireless application protocol, a carrier-independent, transaction-oriented protocol for wireless data networks, designed for all types of networks, but initially implemented on GSM networks.

To expand on some of the explanations in this Glossary, see http://www.cisco.com/ and follow the prompts to the Glossary or consider Harry Newton’s Telecom Dictionary, which is available though the Technology Category on Wondu’s Bookstore (www.wondu.com).

Executive Summary

While growth in the adoption of the Internet is now reaching saturation in many countries in the Organisation for Economic Co-operation and Development (OECD), there remains variation in broadband adoption. This study was motivated by the idea of a 'digital divide' emerging between those who have and those who do not have access or are not adopting the Internet because of various constraints and motives. To the extent that production efficiency is affected by the adoption of new information and communication technologies, and broadband in particular, there is concern about the impact on economic growth and the distribution of wealth. Data was collected by surveys in Australia and the USA for the agricultural sector, and from the local government sector in Australia. The comparison between Australia and the USA added an international perspective to the study even though neither country is recognised in the leading group of OECD broadband adopters.

The main findings:

Internet use is high across the USA and Australian agricultural sectors, and across Australian local government councils (above 90 per cent for agriculture and 100 per cent for local councils).

There is a consistent migration pattern from dialup to broadband across sectors and between the USA and Australia with more than 75 per cent of broadband users being on dialup before adopting broadband.

There are significant differences in the level of adoption of broadband in agriculture (19 per cent adoption rate in Australia for suppliers of goods and services for agriculture, compared with 82 per cent in the USA). Some of the difference is due to the much larger size of USA agricultural supply firms and that large firms tend to have higher broadband adoption levels, but there are also unexplained issues because Australian suppliers generally have the same access to low-cost ADSL as USA suppliers and a high proportion of them have tertiary education, two factors normally associated with high levels of broadband adoption.

There are also differences within the Australian local government sector (68 per cent adoption of broadband on average), with urban-based councils (89 per cent broadband) more likely to be on broadband than those in rural areas (59 per cent).

At the farm production level in Australia the broadband adoption level (18 per cent) was similar to their agricultural input suppliers. The USA's adoption of broadband at the farm production level is estimated to be around 25 per cent.

The migration to broadband will continue, and 87.5 per cent of USA agricultural suppliers, 27 per cent of Australian suppliers and producers, and 85 per cent of councils are predicted to be on broadband by early 2005.

The main reason for adopting broadband is speed, which is needed for data-intensive applications. The main reason given for not adopting broadband in Australia is lack of access (for local government councils, 62 per cent of dialup users gave this as the main reason for non-adoption, and for agricultural suppliers and producers it was 53 per cent). In the USA it was 40 per cent for agricultural suppliers.

The second main reason for not adopting broadband was the belief by about half of dialup users that broadband is much more expensive. Over 50 per cent of Australian agriculture and 75 per cent of councils on broadband considered it to be about the same cost or even less expensive than dialup.

Australian agricultural production is a relatively intensive user of satellite broadband connection technology, with 56 per cent of broadband producer users on satellite compared to just 6 per cent for Australian suppliers and 4 per cent for USA suppliers. With local councils, satellite accounted for 23 per cent (14 per cent being two-way and 9 per cent one-way), with ADSL/DSL accounting for 53 per cent. In the USA there is a more diverse use of connection technologies through ADSL/DSL (35 per cent), cable (17 per cent) and wireless (14 per cent).

Australian broadband satellite prices for standard business packages are at least 60 per cent more expensive than equivalent packages in the USA and Canada, which usually also offer unlimited downloads for the same price or lower. Australian agricultural dialup users (71 per cent) indicated they would probably adopt broadband if the price were reduced to less than $30/month.

Australia, however, is a land of contrasts with some of the most expensive and also some of the least expensive broadband in the world. Where there is competition and higher population density the prices tend to be lower and competitive, though low broadband speed and download limits tend to limit competitiveness.

Broadband adoption is driven by the combination of price, speed, access and the benefits/utility gained from broadband. All four attributes need to be achieved to realise the full benefits of broadband. There are also unresolved questions about the management and organisation skills needed to exploit broadband. A number of survey respondents indicated that they needed more training in broadband to take advantage of it.

While the use of data-intensive applications is low, a higher level of awareness exists and a small group of councils and agriculturalists are increasingly using data-intensive broadband applications like videoconferencing and data-casting more frequently. Online buying and selling remains infrequent in both countries, although there is more use of online banking, finance and insurance transactions.

The use of broadband for research, education and online learning is a priority for users and new applications in this area, supported by interoperability, take on added importance because of this.

Broadband users tend to have higher income and education levels than dialup users, although Australian agricultural suppliers were an exception with relatively high education and low broadband adoption.

Does it matter that the broadband adoption rates are relatively low for councils and agriculturalists in rural and remote areas? The answer is generally yes if the objective is to improve efficiency and productivity, encourage research and online education, and facilitate access to data-intensive consumer applications like video on demand. But we are not sure whether broadband has a significantly greater impact on productivity than dialup Internet for all industries and all enterprises.

Can delayed adopters of broadband technology catch up with the early adopters? There is not a definitive answer to this because delays can sometimes, but not always, result in gaining access to better technology, lower risks, lower costs and higher levels of efficiency than with early adoption. Nevertheless, there is a lot to learn with broadband and those who adopt early can probably look forward to an early realisation of benefits.

The most important policy in stimulating increased use of broadband is to encourage technology providers to develop and make innovative broadband technology easy to obtain, and to help service providers develop robust business models that can be sustained in rural, regional and remote areas.

Other matters in brief

There is some evidence that the more data-intensive applications are not meeting the expectations of broadband users. Low speed is again the likely source of the problem.

Australia suffers the disadvantage of low overall population density, and one of the lowest rural populations as a percentage of total population in the OECD. There is also a relatively high proportion of land telecommunication lines in areas with relatively low population density. All of these factors tend to drive up average costs.

Ready reckoners on broadband adoption show that the cost of labour and the value of the benefits or the utility of broadband are seen as the reason for adopting it. Demonstrations of the benefits and value created by broadband, therefore, are as important or even more important than the nominal cost differences between dialup and broadband.

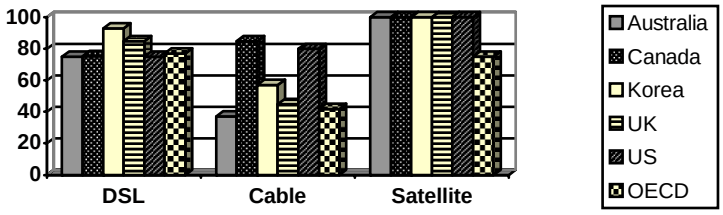
Consistent measurement and international comparison of the variables that affect broadband adoption — price, access, speed, and value creation — is required to monitor progress and adjust policies to overcome performance gaps at industry, regional, remote and local government levels.

A brief summary of the access and adoption f broadband is shown in the following charts.

Summary of broadband access and adoption: Australia, USA, and selected OECD countries

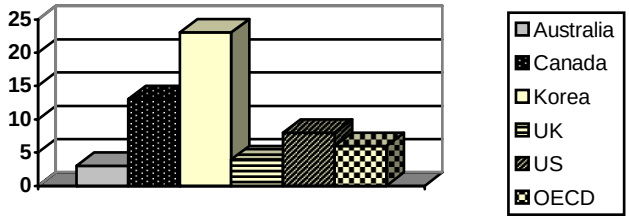
Whole-country access to broadband (2003)

S1: Broadband access [% of households/lines]



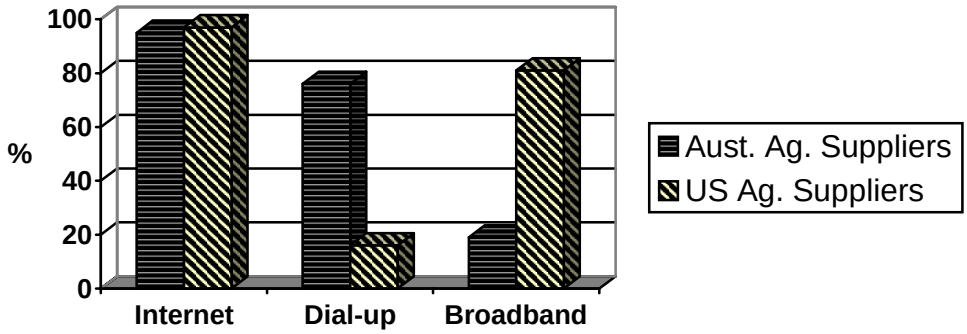
Whole-country adoption of broadband

S2: Adoption: number/capita: June 2003



Industry Adoption of Dial-up Internet & Broadband

S3: Agricultural sector adoption of Internet: broadband and dialup: Aust. & USA 2003–04



1. Introduction

Broadband technology and access to it has become increasingly important with the growing use of the Internet and realisation of its power in communication, buying, selling, and reduced transaction costs. Technologists responded to this emerging market with digital technology; network technology; and improved channel capacity, all of which have improved access to broadband in countries with competitive markets.

Very soon after the Internet became generally used, the standard copper wire telephone network, designed as it was for voice data only, started to become the limiting factor for any business or person wanting access to competitive communication channels, or to download or upload large datafiles. Moreover, the slow download and upload speeds meant the copper-wire line was often fully occupied and unavailable for traditional use. Installing a new copper-wire line solved some of the access problem, but was neither fast, reliable nor cost effective.

Economists and businesspeople have long recognised the opportunities of exploiting inefficient markets and they have seen the role that entry barriers play in holding those markets back. It is in this context that access to and adoption of broadband takes on added importance. Its contribution to market efficiency is profound.

There is also an equity or fairness issue. Broadband has the potential to provide access to better quality and lower-cost health and education services, as well as entertainment.

The efficiency and equity issues both take on added importance in remote areas where access to offline facilities and services has often been harder to get than in cities and regional centres.

It was against this background that this research project to investigate the level of adoption and access to broadband services was designed. The study value was enhanced further by a cooperative study arrangement with the Center for the Study of Rural America at the Federal Reserve Bank of Kansas City, and the Center for Food and agricultural Business at Purdue University, both in the USA. Both of these organisations collected broadly comparable data on the adoption of broadband by the agricultural sector in the USA.

1.1 Objectives of the study

The study examines the adoption of broadband by the agricultural sectors in the USA and Australia, and local government sectors in Australia.

Agriculture

For agriculture, the assumption or hypothesis being tested is that there is no significant difference in the adoption of broadband by agricultural enterprises whether they are in Australia or the USA. This was tested by collecting data from agricultural enterprises on their broadband connectivity for the year 2002–03.

Associated with this test, the study:

- examines current trends in broadband uptake by different countries
- identifies factors driving the uptake of broadband technology
- compares population densities and sectoral broadband policies of the participating countries
- examines the value of broadband technology for enterprises and identifies self-assessment methods for measuring the costs and returns of adopting broadband technology
- identifies emerging applications that operate best on broadband technology
- develops a data-collection framework for regular monitoring of broadband uptake.

Local government councils

For local government councils, there is a comparative analysis of the level and drivers of adoption of broadband by councils within Australia only.

1.2 Methods

The basic hypothesis being tested was that there is no significant difference in the adoption of broadband by agricultural enterprises whether they are in Australia or the USA. This was tested by examining differences in the proportions of respondents that are on broadband in both of the countries at the time of the survey. Data was collected in Australia by telephone survey from 352 agricultural producers and suppliers in Australia, with 250 classified as producers and 102 as suppliers of goods and services. In the USA, data was collected through an online survey of 165 agricultural suppliers.

Associated with this question was the identification of possible explanatory variables, which might include policy differences, industry structures, basic physical features, population densities, business structures (e.g. dependence on off-farm income) and enterprise income levels.

Policy and population density differences were gathered through general information searches.

Similar information was collected for the local government sector, in Australia only, from a sample size of 200 out of a population size of 691.

More general information about broadband adoption and policies was also gathered from meetings with industry and government representatives in the UK (including the UK Broadband Stakeholders Group, the Countryside Agency, DEFRA and the Oxford Internet Institute) and correspondence from similar organisations in other countries.

1.3 Scope

The study focus is on adoption of broadband by the agricultural sector and by local government councils. The reason for concentrating on these two sectors is that they both have inherent exposure to rural, regional and remote areas. A second reason for concentrating on sectoral adoption of broadband is that existing adoption level data used by the Australian Bureau of Statistics (ABS) is derived from Internet service providers (ISPs) who do not collect information on the industry or sector of their clients.

1.4 Broadband defined

‘Broadband’ is the term used to describe communication technologies that enable high bandwidth and high-speed transmission of data, and constant access, or ‘always-on’ access to the Internet. The ‘always-on’ access can be at home, at work or ‘on the move’. The transmission can be by high-speed fixed line (including cable, ADSL (asymmetric digital subscriber line) or other DSL), wireless, optic fibre or satellite technologies.

The minimum speed of transmission for the connection to be considered broadband has not yet been standardised, but 256 kbps for downstream loads and 64 kbps for uploads is often used as a demarcation line (OECD 2001). With development of new technologies, however, the 256 kbps threshold is starting to be recognised as the lower bound of broadband. For simplification, integrated services digital network (ISDN) is included as a broadband technology here within DSL even though it is narrowband, and its 128 kbs, is below the 256 kbs threshold. Moreover, because of ISDN’s historical marketing in Australia, and fast connection set-up, it is viewed as a close substitute to the ‘always-on’ function. ISDN-enabled exchanges can also be upgraded to provide a relatively slow (144 kbps) DSL service to subscribers at distances up to 15 kilometres from the exchange.

1.5 Outline of the report

The first section of the report examines existing evidence of the impact of information and communication technologies (ICT) and broadband technologies specifically on enterprise, economic activity and growth. We saw an understanding of this relationship, if any, to be important in improving our understanding of broadband policies. This section starts with an identification of the types of technologies and applications in use and emerging.

Section 2 reviews information and research on broadband and Internet adoption in rural, regional and remote areas and extends this to a 'ready reckoner' for enterprises faced with the decision of whether to stay on dialup or adopt broadband. Section 3 examines trends in the adoption of broadband across countries and across sectors for the Internet generally.

Section 4 provides a comparison of broadband policies and infrastructure that support broadband adoption across countries.

Sections 5 describes the results of the broadband surveys for agriculture, and section 6 describes it for local government councils. These results are taken up further in the discussion of section 7.

Appendixes A1 and A2 contain the detailed survey forms and statistical results.

Section 8 highlights the main lessons learned from the research. These are used for the formulation of conclusions and recommendations in section 9. A discussion on viable business models that have been used or could be used to improve adoption levels is included in section 8.

2. Economic Impact of Broadband Technologies on Enterprises and Economies: A Review

2.1 Emerging broadband technologies

Broadband technologies are supplied by two basic infrastructures: wired services, through the familiar public switched telephone network (PSTN) or through other cable mediums; and wireless services, based on satellite infrastructure, fixed wireless and mobile wireless infrastructures.

Wired services

xDSL ('x' meaning the wide variety of DSL technologies). Most of us are now familiar with Asymmetric digital subscriber line (ADSL) as the most prevalent form of broadband technology, mainly because it relies upon, and is supplied, over the twisted copper pair cable used by telephone companies as telephone lines. ADSL typically supports transmission speeds of 1.5 – 9.0 mbps. However, ADSL is but one variant of DSL technologies available. Because of the ubiquity of the twisted copper pair infrastructure (with notable exceptions), development of these DSL technologies offers perhaps the greatest potential for expansion of broadband.

Availability of DSL technology is currently limited by the distance between the subscriber and the nearest DSL-enabled exchange. In Australia, this distance has been limited to 3.5 kilometres for the ADSL product supplied by Telstra, but that is being extended.[1] However, in the UK, British Telecom (BT) and other DSL suppliers co-located in BT exchanges provide an ADSL product known as RADSL to subscribers up to 5.5 kilometres from the exchange. VDSL (Very High DSL) enables transmission speeds of 13.0 – 55 Mbps, but only over short distances of 300–1500 metres.

In the USA, there is a wider variety of xDSL technologies available, some of which offer services over twisted pairs of wire up to 15 kilometres from the exchange.[2]

The major barrier to the deployment of DSL, apart from distance, is the technology employed in exchanges and the local loop. In particular, ISDN-equipped exchanges usually comprise digital loop carrier (DLC) frames. These local concentrators, although digital, and fibre optic, were designed before DSL was really available, and do not support it. They do support ISDN, however. It is estimated that nationally around 20 per cent of USA telephone lines are served from a DLC. Comparable figures for Australia are not known.

A further, more serious barrier to DSL was the use of aluminium-based cable in the local loop. This was deployed as a cost-saving measure in the 1970s in the UK, and its use means that even parts of Central London cannot currently be served by DSL.

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[1] Telstra states: 'Currently, a user must be located within approximately 3.5 kms from their exchange in order to access ADSL. This distance is driven by technical standards, and is determined by the electrical attenuation of the telephone line, i.e. the effect that ADSL may have on the voice quality of the line' (http://www.telstra.com.au/demand/faq.htm)

[2] For example, USA carrier Rhythms offers an IDSL service (which, at 144kbps, may barely qualify as broadband) to subscribers located up to 50000 feet (that is, 15 km) from their exchange. IDSL is a hybrid DSL service, which 'uses ISDN transmission coding, bundling together both ISDN channels and voice all on one circuit. IDSL does not use any kind of dialup nor involve per-call fees. For those that live too far for regular DSL, IDSL may be the only DSL option. IDSL tends to be priced at a rather higher rate per bit of speed, than any regular DSL. IDSL can still be a very satisfactory solution for data transmission compared to the alternatives (modem), coping very well with online gaming, and medium quality streaming audio/video' (http://www.dslreports.com/information/kb/idsl)

The obvious remedy to both these technology limitations is replacement of the DLC and aluminium cable, the former being much easier than the latter. Where parts of the local loop need physical replacement, it makes much more sense to use fibre optic cable rather than twisted copper pairs because fibre can carry more information over much longer distances at lower costs. Furthermore, scientists keep on discovering new ways of sending more information down a single strand of fibre (Newton's Telecom Dictionary 2004).

Cable technologies relate to the use of cable TV lines to carry broadband services. Because these services do not rely on the exchange/local loop model of the traditional PSTN, they tend to be an 'easier' infrastructure to deploy. However, the physical environment for the infrastructure, and community concerns about, for example, above-the-ground cabling and the disturbance caused by earthworks to place cables underground, has proven to be a major limitation especially in the UK and Australia.

Power-line-communication technologies (PLC) are the other form of wire-based technologies that may become more prevalent because of their capacity to use existing infrastructure. These technologies use the electricity grid as the transmission medium. The technology is still in its infancy but USA trials have shown successful delivery of services between 256 kbps and 1.5 Mbps symmetrically to consumers, and Australian demonstrations are under way. A number of barriers seem to confront this technology, including the disinclination of power-grid owners to invest in a new business variation at this stage, and the largely ungrounded fears of regulators, installers and consumers about the safety, interference and quality of broadband services provided over electricity grids. Existing broadband technology suppliers may also be fuelling these fears.

Wireless services

Wireless broadband can be supplied through three main technologies. These are satellite, terrestrial fixed, and mobile wireless solutions. Satellite offers the choice of one-way and two-way satellite. One-way satellite, which needs another channel to upload data, does not satisfy the definition of broadband unless the other channel is a high-speed connection, and that is very unlikely, though technically possible. Two-way satellite uses the same dish to download and upload data and, providing the speed (256 kbs for download and 64 kbs for uploads) of the selected plan satisfies the definition described above, it would be considered as broadband. Satellite offers access to broadband for remote areas and this is where its benefits are most valued, a feature not lost on service providers who are quite astute at recognising a naturally segmented market that enables differential pricing.

The fixed and mobile wireless services remain undeveloped, but have great potential to penetrate the overall market. Paul Budde Communication estimated that wireless operators could gain 20 per cent of the broadband market in Australia. Wireless broadband remains limited by proprietary technologies, quality, and cost (Budde 2003). The report of the Estens Inquiry (2002) observed that '… no wireless broadband technology is able to handle the data rates of the best wire-line technologies, but there are many situations where the latter cannot be used or is simply unavailable … also there are situations where wireless technologies are cheaper or more flexible than wire-line solutions …' This background lead to the Federal Government's Higher Bandwidth Incentive Scheme (HiBIS), which is providing ISPs with a one-off incentive payment ($1540–$3300) for each regional customer who benefits from boosted bandwidth. Code division multiple access (CDMA) wireless technologies are eligible for the subsidy and this is providing a new and welcome source of competition for satellite technology in CDMA telephone areas.

2.2 Current and emerging broadband applications

One of the main limitations on research and public discussion about broadband is the frequent simple focus on the speed of data transmission and continuity of the connection. While continuity saves on dialup costs, the benefits of broadband are merely enabled by speed, capacity and continuity. The real gains in productivity for businesses and utility for consumers are linked to the applications and practices that have emerged from broadband. In this context broadband takes on a vastly different

level of significance. It can reconfigure the way people interact with each other (for example, regular, rapid communication of emails means a greater capacity to substitute data for voice), the quality and nature of services and the complexity of enabled applications. These developments, in turn, affect the relative buying and selling power of business supply chains and customers. Dutton (1999) set out a classification of the structure of broadband for different people and activities and how it loops back on to itself and on to access (table 2.1).

In this framework it is clear that broadband impacts not only on those who operate in information-intensive industries, but also those who interact with other people in any way, and those who depend on well-informed suppliers of high-quality goods and services.

Table 2.1: Use and non-use of broadband: reconfiguring access

Broadband provides access to:	Kind of broadband activities	Examples
People: Reconfigures how to interact and communicate with people.	Inter-creativity between individuals and within groups; other one-to-one, one-to-many, many-to-many communications.	Always-on messaging and emailing; collaborative online working; online education; videoconferencing and streaming; multimedia; online games; chat-rooms etc.
Services: Influences access and what can be done online; when it can be done; cost of services; offline substitutes; who pays and method of payment.	Electronic transactions and services from local, regional, national and international sources.	Fast, online delivery of multimedia products and services, to any location, involving large amounts of data, e.g. music and video; access by doctors to X-rays at remote locations; e-shopping; e-banking; and other e-business.
Information: Affects how and what to read, hear, see and know.	Retrieving, analysing and transmitting news, images, video, sounds, statistics etc. … again from local, regional, national and international sources.	Online news streaming; listening to or watching archived or live radio and TV; exchange of data-intensive research; web searches for diverse information.
Technologies: Shapes how and when to access the Internet and other ICTs.	Producing and using broadband know-how, equipment and techniques to shape access, use and consumption of Internet services.	Broadband telecommunication infrastructure; wireless; Internet infrastructure; new digital multimedia; network security; anti-virus, anti-spam and general security enhancement.

Within the general definition of broadband speeds (more than 256 kbs for downstream loads and 64 kbs for uploads, refer to section 1.4) there remains significant variation in the demand of different applications for download speed (figure 2.1). It is clear that the performance of the broadband user's access link can constrain their experience with broadband and, in turn, their preparedness to pay for the service. For this reason adoption of broadband is affected both by access to it and the quality of performance of the broadband service.

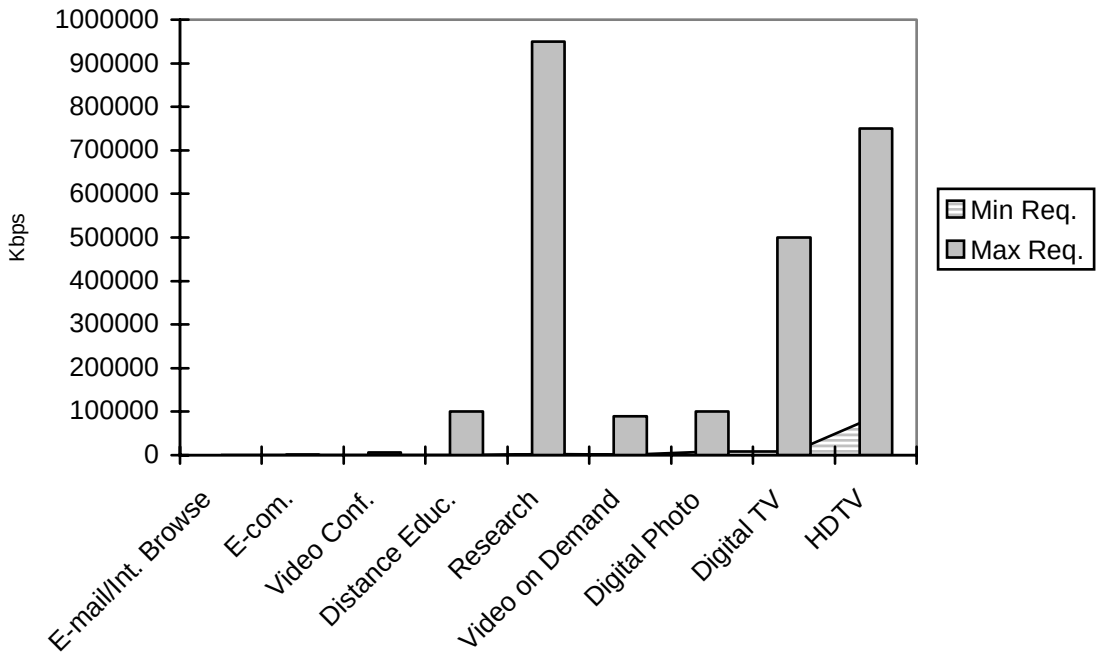
There is also a demand on users, either in their business or personal household practices that give them utility, to acquire skills that can make fuller use of broadband applications as they become available.

2.3 Economic linkages and impact of broadband

Many studies have found that ICT has made an important contribution to growth in productivity. The Commission of the European Communities (2001) concluded that ICT is increasing growth in productivity in the EU. In Australia, a 2003 study for the Australian Government Information Office (formerly NOIE) by Ovum found that ICT had contributed, on average, about one quarter of one percent of Australia's GDP growth between 1995 and 2000. This study concluded, however, that the impact at business enterprise and industry level depended on organisational efficiency and effective

managerial practices and strategies. Variation in management practice and performance means that there is significant variation in the impact of ICT on firm and industry productivity.

Figure 2.1: Bandwidth demand for different applications



Source: Commonwealth Grants Commission 2003

A USDA study of 1865 grain farms in 2002 (using year 2000 data) found that the adoption of ICT, and specifically use of the Internet, significantly moved farms towards higher production efficiency, as did the adoption of long-term business plans. (Hopkins and Morehart 2002). The Internet was used by farms mainly for price tracking (82 per cent of respondents), accessing agricultural information services (56 per cent), accessing USDA information (33 per cent), communicating with other farmers (31 per cent), obtaining crop advice (28 per cent) and online data management (31 per cent). E-commerce use at the time of this study appeared to be negligible. Goe and Kenney (2002) in a survey of 579 farmers in Iowa, Kansas, Nebraska and Oklahoma found that 36 per cent of farmers were using the Internet to buy goods and services for their farms. These purchases were motivated by price advantages and access to suppliers not available locally. They speculated on how farmers on the Internet could reconfigure the farm value chain and reduce transaction costs (figure 2.2). An important issue is whether there is any difference between dialup and broadband users in their ability to reduce transaction costs in the farm value chain.

In an examination of links between ICT activity and productivity performance the Productivity Commission found some evidence of mixed outcomes, referring to a study by Goldman Sachs, which found ICT had played a lesser role in Australia's productivity performance than it had in the USA. The conservative Australian Industry Group believe this is due to the relatively low level of ICT production in Australia and that the impact on productivity comes from production of ICT, not use. The Productivity Commission concluded, however, that

> … computers, telecommunication systems and the Internet have brought revolutionary changes to businesses, consumers, education, health, entertainment and many other aspects of life. A defining characteristic is that the costs of storing, accessing and exchanging information have been reduced. In so doing, ICTs have not only reduced the costs of coordination, communication and information processing, but they have also facilitated changes in what businesses do and how they do it …

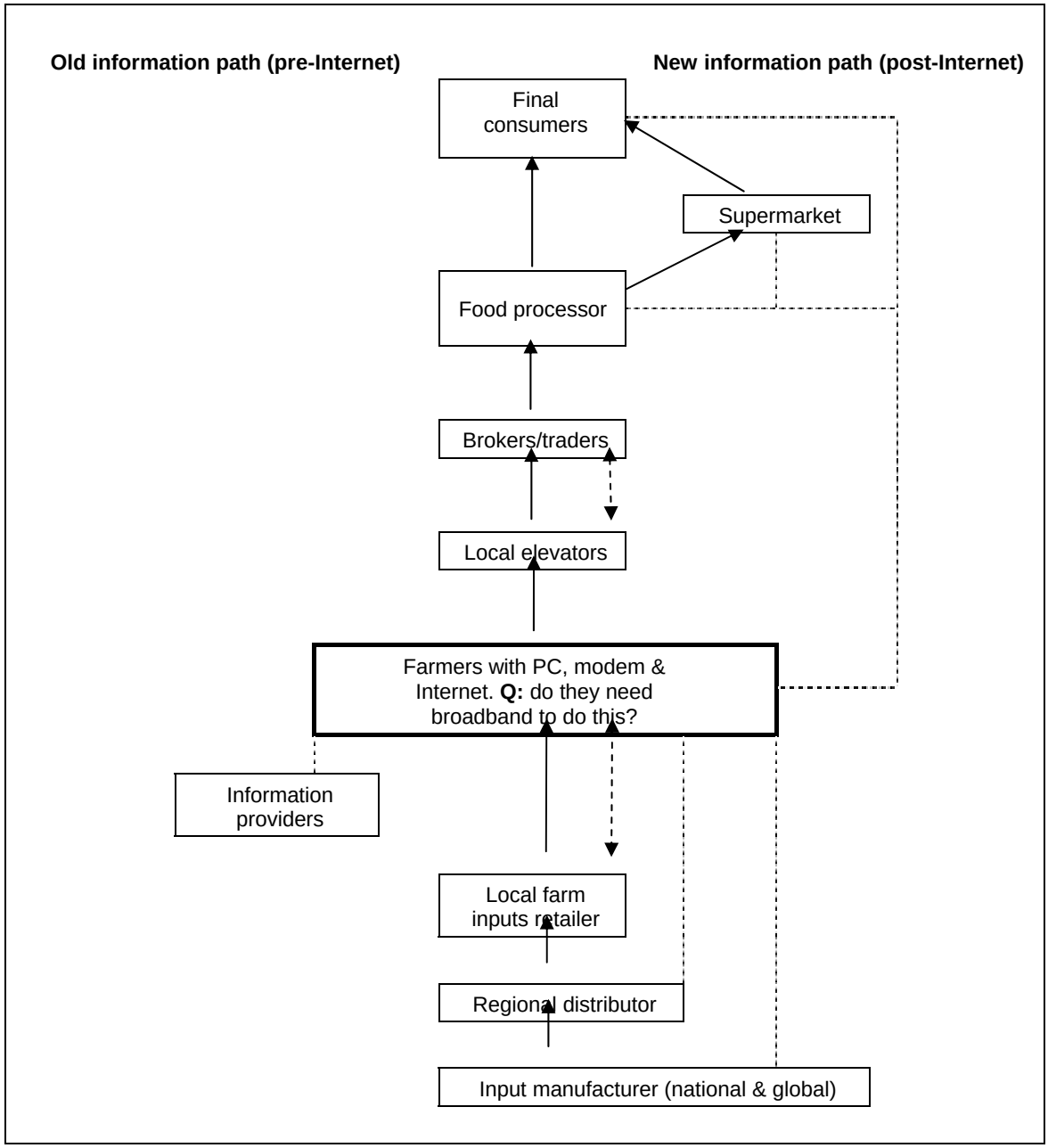
A review of the impact of ICT at the state and local government level by the Commonwealth Grants

Commission in Australia found conflicting arguments about the impact on state budgets. Several state governments claimed that greater use of ICT improved mainly the quality of services (especially in remote and rural areas), but did not reduce costs. Cost disadvantage was seen to be associated with the need to commit to high investment in ICT especially with small organisations. One state government (Victoria) argued, however, that ICT was enabling improved operational cost efficiency and better capacity to disperse information. The Commission concluded that the growing use of ICT had conflicting impacts at a state and regional government level including:

- a decline in relatively expensive voice communication, a benefit for both levels
- increased data communications, which could create value, but at extra cost
- reductions in interregional travel, a benefit especially for regional organisations
- increased freight, repair and support costs in information management.

Measuring the specific impact of broadband on productivity growth has been constrained by the limited time that broadband has been available to the general population, but several survey-based studies have found there are high expectations that the outcomes will be consistent with the general results on ICT. In the January 2004 Broadband Barometer report on the impact of broadband on small businesses in Australia, 85 per cent of respondents reported an increase in efficiency and productivity (Pacific Internet Australia 2004). In addition, many small businesses are indicating a significant impact on the range of supported applications and a reduction of operating costs. Pacific Internet's results, however, show a further widening of the adoption rates between city and non-metropolitan areas. This seems to be due mainly to lack of access to broadband in non-metropolitan regions, rather than differences in management practices. A research scientist at MIT Laboratory for Computer Science has predicted that broadband would eventually have the same impact as the wired dialup Internet.

Figure 2.2: Schematic representation of how Internet-enabled connections might reorganise the farm (adapted from Goe and Kenney)



The Net Impact Study (see http://www.netimpactstudy.com) predicted that the Internet would contribute 0.43 percentage points to USA's growth in productivity. Dutton et al. (2003) refer to the broadband studies by Crandall and Jackson (2001), Gartner Dataquest (2001) and the Mayor of London (2002), and the conclusions that broadband is making a positive contribution to growth in productivity. In February 2004, The OECD urged governments to do more to encourage the development of broadband, highlighting its importance to economic, social and cultural development (OECD 2004a). The OECD also considers that broadband can improve public administration and efficiency as well as extend the availability and reach of public sector services in areas such as health care and education. The OECD also warned that 'more needs to be done in expanding services to remote and rural areas and in promoting broadband in countries with relatively low penetration rates'.

Dutton et al. at the Oxford Internet Institute's Broadband Forum found there is a need for more

research to make the case for broadband gains in terms of both core productivity gains and wider social benefits. This includes studies at the firm level to demonstrate what factors combine to achieve the benefits, including organisational change, management practices and social policies. There is a belief that there is a danger in assuming that the benefits of broadband are self-evident to everyone exposed to it. Of course this concern applies to the adoption of all technology, management practices and reorganisations.

One feature that may make broadband different to other technologies is the possibility of a much faster rate of diffusion than, say, the dialup Internet. Wireless technologies in particular can be rolled out quickly and even wired technologies can be distributed quickly if the market and economics are viable. If there are significant productivity gains from broadband and diffusion is rapid, then those who do not adopt may soon find they are very uncompetitive or without access to social services used by those who do adopt early.

2.4 Measuring the costs and returns from adopting broadband

The methods used to make a decision about whether to adopt broadband and what type of broadband technology and download speed is required, range from the obvious and simple to high levels of complexity. Users that have a strong need for complex and data-intensive applications often face the easiest decision, because they just need a technology that delivers the speed to power the known application. For data-intensive applications such as an online graphical medical instruction or a detailed weather map or videoconferencing, this often means adopting a high-speed and reliable broadband link, regardless of cost. For many other users, however, broadband may not enable anything they need that is not currently provided by a standard dialup Internet connection. There is also the question of access to offline substitutes and whether online is a perfect substitute for, as an example, a movie in a high technology cinema centre with enhanced sound and image, or whether an online video-conference can capture all the benefits of offline interactions.[3]

A further complication with broadband decision making is the 'learning experience curve' after adoption. Users may find they discover a new range of applications and experiences they were unfamiliar with before. The potential for a steep learning curve would seem to be quite high for people, businesses and small organisations that have not previously been exposed to complex application possibilities. While some individuals and businesses prefer steep learning curves there are others who do not and their respective technology choices are affected by these attitudes.

Another complication with broadband decision making is its impact on time. It saves time in doing an equivalent task without it, and people and businesses facing severe time constraints can be expected to benefit more than those with more time available. The opportunity cost of time is an important factor in making the decision. In considering the time factor, however, it is also important to recognise that more time is now spent on the Internet simply by having access to it.

Against this background, a useful and simple starting point for making a decision would be to examine the functionality required of the connection by listing the applications required to run a business or household and then finding the cheapest way of satisfying these requirements. This list of application needs could be split into two or three categories including current, immediate-future and long-term requirements. The required speed to run these applications can be matched to them. Figure 2.1 above. shows a list of some common applications and their bandwidth requirements (derived from Commonwealth Grants Commission 2003).

[3] Hanover Fair Australia's 2004 CeBIT Forum and Information and Communication Technology trade display was still presented in a very offline format.

2.5 ‘Ready reckoner’ for adoption of broadband

Given the complexity of the broadband decision-making background, a framework recognising the circumstances of individuals and businesses will require simplification. We designed, as part of the study, a simplified ‘ready reckoner’ that helps businesses and individuals to evaluate their choice between dialup and different broadband technologies. The essence of the evaluation process is to estimate demand for bandwidth and match a low cost, but effective technology to it. The ready reckoner contains four basic blocks of information:

- details on the transmission speeds and efficiency losses of different technologies and conditions of particular service packages
- general usage requirements, including for emails, downloads of files and uploads of files
- set-up investment costs, amortised to a monthly value
- operating costs
- total costs.

The ready reckoner is essentially a partial budget. It considers only those costs and revenues that change in switching from one technology and service provider to another. Nevertheless, even partial budgets can be complex because changes can lead to additional revenue from, say, a new enterprise based on a particular broadband technology and cost changes for offline activities such as banking and postage and marketing.

The ready reckoner consists of a series of queries set out in an Excel spreadsheet, which users can modify further to suit their own situation (appendix 7 contains more details). Questions start with inputs for the connection speed and efficiency loss factors for the technology choices of interest. Efficiency loss can be very high for some technologies, such as a satellite, with upload speed often operating at less than 10 per cent of its rated capacity. Other technologies such as ADSL or cable may go down completely with an external disturbance caused by construction errors, lightening and other adverse weather conditions or cable distribution hub faults. Users may need to contact their ISP for this data, or gather it with experience or join a discussion group like Whirlpool Forums (http://forums.whirlpol.net.au). The structural and general usage section asks the respondent to input data about their use of the Internet for email, downloads, uploads and standard voice and fax mail. This data enables an estimate of demand for bandwidth to be made.

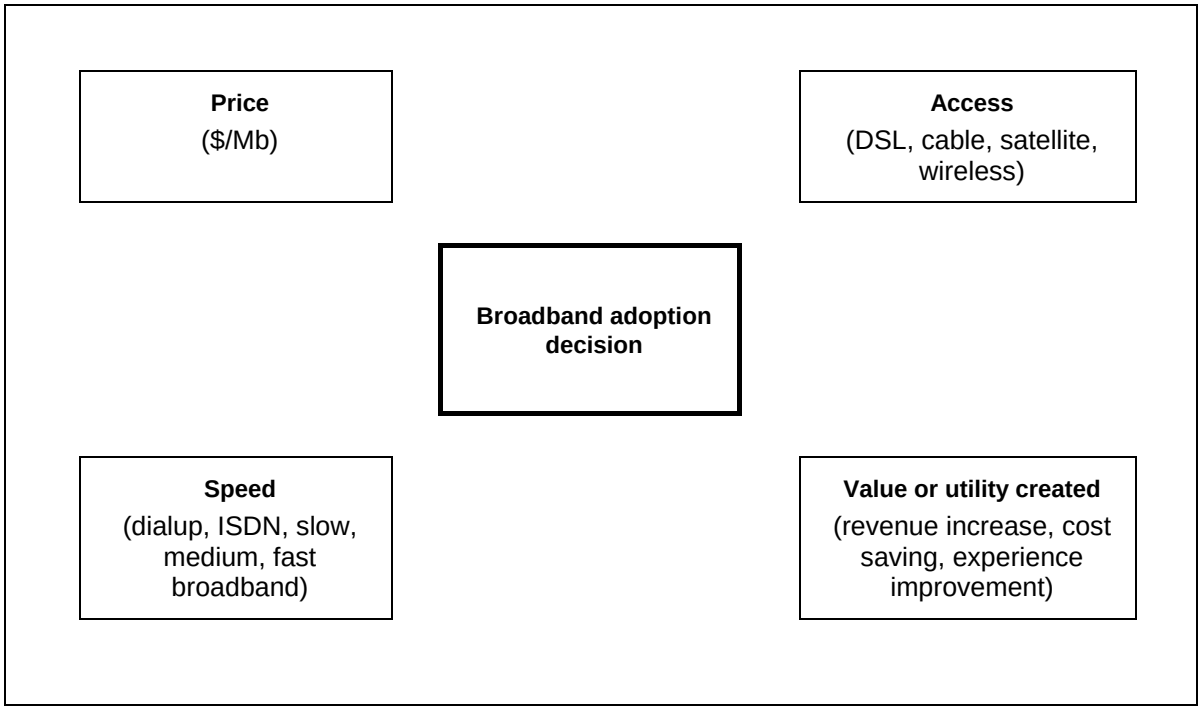
The choice between different broadband and dialup technologies is complicated further by the plans of the providers including their monthly limits, fixed costs and marginal costs of exceeding download limits. The ready reckoner incorporates these as fixed and marginal costs to the user, depending on their use. Substitutes for traditional telephone voice calls, such as VoIP technology, are also included in the options with broadband. VoIP can be enabled by broadband, and integrates data and voice traffic into a single network. There is a fixed investment cost, but a reduced cost for voice calls, which can be made over the Internet with broadband. The net value of VoIP depends on the savings generated by calls over the traditional wired line and these may be significant, especially in remote areas.

3. International Trends in the Adoption of Broadband

3.1 Broadband measurement indicators

With growing levels of broadband adoption a number of studies draw attention to the importance of access, price and speed of broadband, not simply the level of adoption, which is simply an outcome of these input variables. These three factors, along with the value creation benefits (section 2) are what this study believes are the main drivers of adoption.

Figure 3.1: Broadband decision framework



The Australian Government Information Office (formerly NOIE) has been examining ways of improving the measurement of key performance indicators for broadband, recognising OECD work in this area. The OECD framework incorporates three broad themes:

Readiness: measuring the technical, commercial and social infrastructure necessary to support an information economy. This relates mainly to technological diffusion (primarily the Internet) within the household, business and public sectors.

Intensity: the application of ICTs like the Internet to activities such as work, economic production, entertainment, education, banking, shopping, leisure, and cultural pursuits.

Impact: how the application of ICTs and the information economy is impacting the Australian economy and broader society.

These themes are generally aligned to the framework suggested above. ‘Access’ aligns with ‘readiness’; ‘value/utility creation’ with ‘impact’; and ‘speed’ is associated with intensity. The ABS is a contributor to the OECD process and implements indicators within these themes.

The components of the proposed NOIE (AGIMO) Index would contain:

- access to and availability of broadband networks
- cost of broadband, both in terms of initial establishment costs and ongoing costs relating to day-to-day usage of broadband
- adoption or take-up of broadband by households, businesses and public sector, and not-for-profit organisations
- applications of broadband.

We agree with NOIE that '… Statistical benchmarking is critical to monitoring progress towards Information Economy policy goals and to understanding Australia's standing in comparison to other OECD economies …' The proposed NOIE (AGIMO) Index, as a composite index, however, is relatively complex and ranks countries across 23 indicators relating to progress in the information economy in areas such as:

- take-up of enabling ICT such as the Internet
- price of Internet connectivity
- measures of the 'digital divide'
- intensity of use, for example the type and scope of online activities, including banking and government services
- measures relating to e-government and e-business preparedness.

As a general guideline we favour an index that is simple and readily understood, but which also captures the main content. One of the main limitations of composite indexes is that weights have to be applied to the sub-indicators and they can become too complex, posing problems for both data collection and general interpretation by stakeholders and decision makers. These problems are magnified further when data is to be collected from other countries with different capacities, statistical frameworks and priorities. There is also a time delay with more complex measures and this is an important problem with fast-moving markets like broadband.

There is a stronger case for simplicity for the measurement of industry and local government broadband competitiveness. Decision makers in these areas need to have quick access to data, be able to interpret the data, and make decisions on it. For these reasons we return to the measures of price, access, speed, and value creation. The first three indicators are easily measured and readily understood. It is only value creation that presents measurement problems in terms of finding a proxy indicator for it. Value is created when the extra revenue (both direct and indirect) from adopting broadband exceeds the costs (both direct and indirect). There can be complex effects here in terms of both volume and unit price effects. Most surveys seem to cut through these problems by measuring satisfaction. Questions on satisfaction should have more detail than those contained in the Pacific Internet *Broadband Barometer*, which simply asks respondents how satisfied they are with the reliability and cost of the service. There is more to value creation than reliability and cost of the service. There are, for example, revenue implications and indirect costs such as labour and investment in software and hardware, and the methodology should look more closely at satisfaction and dissatisfaction.[4]

---

[4] For measuring satisfaction we suggest a model based on quantitative and qualitative phases.

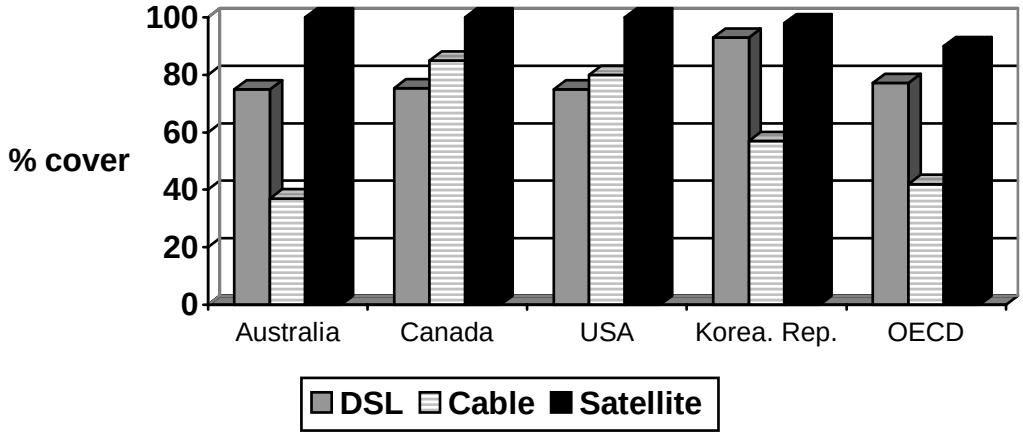
In a qualitative phase there would be a need to define expectations and service attributes for the 'ideal' broadband service model. A survey could then quantify against expectations the levels of service believed to be appropriate, and satisfaction with them. This measurement method is simple to use and makes sense to respondents as it is based around what they see as acceptable levels of service, and across the attributes they consider to be important. Overall scores could then be built and important service attributes identified by regression analysis.

In terms of broader explanatory indicators of broadband competitiveness it would be useful to add some measures of the level of competition, such as market shares by major providers for particular broadband technologies. These measures could be monitored across countries and tracked over time.

3.2 Country broadband access levels

The OECD (2004) estimated that broadband access in Australia in 2003 was below the OECD average for both DSL and cable availability (chart 3.1), but there is a rapid rollout of ADSL, and coverage for this is likely to reach more than 80 per cent in Australia by the middle of 2005. The Economist Intelligence Unit in 2003 ranked Australia in the top four countries of Asia for the Networked Readiness Index, which is a composite index with three components to represent the general attractiveness of the overall economic environment for using ICT; readiness of stakeholders to use ICT; and actual use of ICT (cited in Agrawala and Sehra 2004).

Chart 3.1: Broadband access: Australia, USA and selected OECD countries, 2003

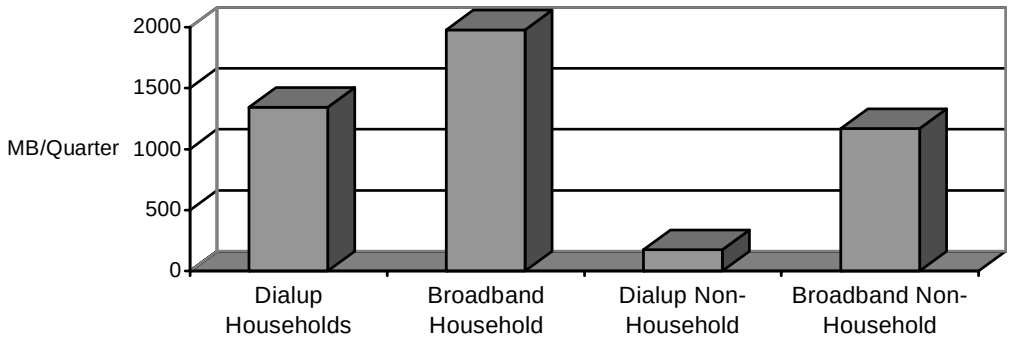


Source: OECD (2004). Australia and Canada based on population data, USA and UK based on lines.

3.3 Sectoral comparison

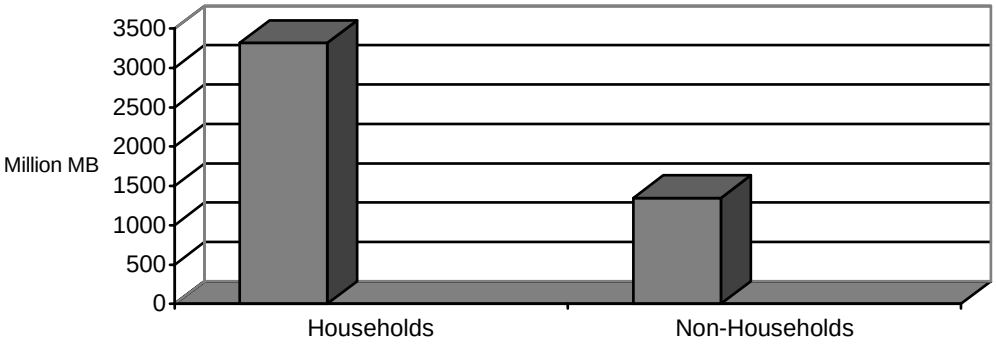
The household sector accounts for a large and growing share of the total volume of data downloaded in Australia, but it relies, as expected, on dialup technology to a much greater extent than business and government do. The average download size of households was 739 Mb/quarter compared to 1963 Mb with businesses (chart 3.2).

Chart 3.2: Data downloads: non-households and households: Australia: Sep. quarter 2003



Source: Australian Bureau of Statistics, 'Internet Activity', at. 8153.0

Chart 3.3: Total volume downloads: households and non-households: September quarter 2003



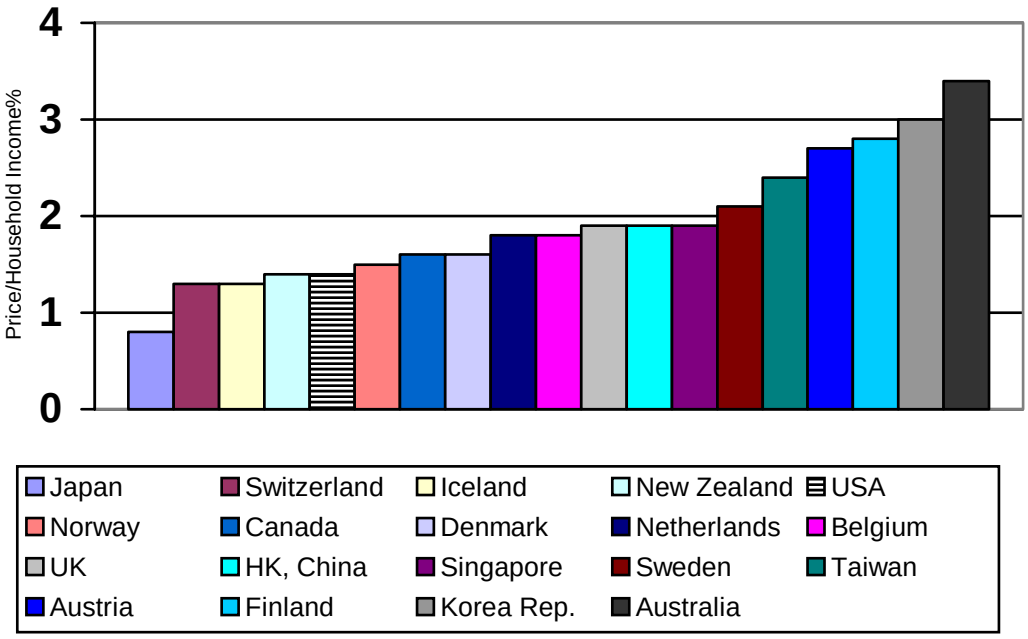
Source: Australian Bureau of Statistics, 'Internet Activity', Cat. 8153.0

The Pacific Internet *Broadband Barometer* (2004) also observed that small businesses's data downloads differ significantly depending on access technology, with 20 per cent of broadband small businesses downloading more than 3 gigabytes/month compared with just seven per cent of dialups downloading this volume of data.

3.4 Prices for broadband

Price comparisons are difficult to make even within one country because of volatility caused by new technology, and shifts in competitive prices set by leading market players. The OECD (2004) regional report on broadband indicates that Australia has some of the most competitive and some of the least competitive prices for broadband. It cites Alphalink's wireless plan 1500/256 (download speed of 1.5 Mbps and 256 kbps upload) with a price of $A77/month or $A847/year (http://wireless.alphalink.com.au). This is one of the lowest-cost broadband services in the OECD. However, a May 2003 'Workshop for Promoting Broadband in Japan' listed Australia as having the highest broadband prices relative to monthly household income out of 19 selected OECD countries (Ministry of Public Management, Home Affairs, Posts and Telecommunications 2003 (Japan)).

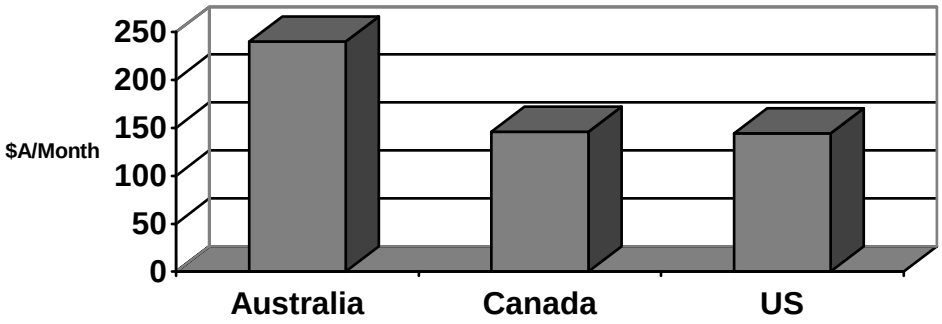
Chart 3.5: Broadband prices/month as % household Income: April 2003



Source: Ministry of Public Management, Home Affairs, Posts and Telecommunications 2003 (Japan)

Since early 2003 broadband prices in Australia have fallen generally, with the exception of broadband satellite. Between January 2004 and April 2004, Telstra Bigpond's ADSL prices were reduced by around 35 per cent at a time when other country's prices were relatively stable though still trending down (http://www.baskerville.telecoms.com/reports). In June 2004, however, two-way satellite broadband price for the Telstra Bigpond *2-Way Standard Business Plan* (512 kbps download) in Australia remained at $A240/month ($0.19/Mb marginal cost). In the USA at the same time the satellite Business Basic plan at Skycasters was $US99/month (http://www.skycasters.com/), equivalent to $A144; and in Canada the Package 2 Business Service at Broadband Ontario (http://www.canadianisp.com/) was $C145.99, equivalent to $A154/month. On average Telstra Business broadband prices using satellite connection were about 60 per cent more expensive than equivalent services in Canada and the USA in June 2004. Each of these packages has a download speed of around a peak of 512 kbps and upload peak of 128 kbps. While the Bigpond download limit is 1 Gb there are unlimited downloads and uploads on the Canadian and USA satellite services.

Chart 3.6: Business basic broadband satellite connection prices: Australia, Canada & USA:June 2004



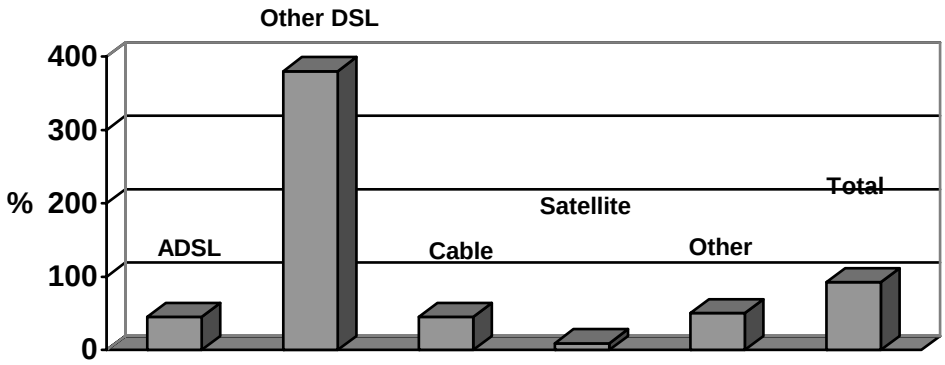
Source: Wondu Business & Technology Services, various websites

3.5 Broadband adoption situation and outlook

According to the 'Snapshot of broadband deployment' published by the Australian Competition and Consumer Commission (ACCC 2003(b)) broadband adoption in Australia grew by 92.2 per cent over the year ended December 2003, although the quarter ended 2003 was the lowest quarterly growth rate recorded over the 2.5 year history of their survey. There were around 840 000 households connected to broadband in Australia in April 2004. (Lowe 2004), giving access to an estimated 2.1 million people. Paul Budde Communications is predicting that broadband subscribers will increase to 1.5 million in 2004 and 2.5 million in 2005 (Budde 2003).

The fastest-growing broadband adoption sectors are in DSL and wireless, with satellite the slowest.

Chart 3.7: Growth in adoption of broadband technologies: Australia: year ended 2003



Source: ACCC's 'Snapshot of broadband deployment' (ACCC 2003(b))

The downward trend in broadband prices in Australia should encourage continued growth in the adoption rate. The exception is with satellite technology where prices remain high and uncompetitive with other connection technologies. Users that have the choice are likely to use other technologies such as DSL, cable and wireless. Those that do not have the choice to look to other ways of justifying broadband if they are to remain on it.

3.6 The search for competitive broadband business models in Australia

In 1998 Microsoft released a discussion paper on broadband business models in which they suggested that network operators offer reduced broadband prices, even if it involved cross-subsidies from other enterprise activities. The reduced prices would stimulate demand and broadband subscriptions, which in turn would stimulate demand for value-added services such as e-learning, business services and electronic commerce. Advertising revenue, multimedia communication revenue, systems management revenue and subscriptions would make up the basic components of a viable broadband business model. While Microsoft saw itself as the centre of the broadband business model, others thought differently — but the basic components and strategy remained the same; that cross-subsidies would be required for subscribers, and were in the interests of providers if they were to stimulate demand. The survey results indicate that users are sensitive to prices and that once on broadband there is reasonable expectation they will demand add-on services, which generate new revenue.

With revenue coming from different sources and from content providers outside the traditional telecommunications model, it was natural that partnerships, alliances and cooperative models would emerge. These partnerships became even more important at the regional and remote area. At a 2003 conference of the Australian Telecommunications Users Group (ATUG), Agile Communications outlined a cooperative business model being deployed in the CityLAN project in Adelaide, with viability at 14c/Mb. This business model is based around community and collaboration. (See the References section for details.)

Rural broadband wireless models are emerging in the USA (Sanders 2002) and Australia (ATUG 2003) to provide network operators with competition. The Australian Communications Authority (ACA) reported to a 2003 ATUG conference in Melbourne that 14 of the 20 carrier licences issued in 2002–03 were for WLAN operators, and most for outer-metropolitan and rural broadband service providers. (See www.aca.gov.au/consumer_info/fact_sheets/consumer_fact_sheets/fsc80.htm) The ACA also has a watching brief on wireless, VoIP and wireless IP through its Futures Panel at www.aca.gov.au/aca_home/about_aca/futures_panel/index.htm.

The wireless business model is now viewed as being viable against wired infrastructure (Gibson Quai), especially where capital expenditure constraints exist.

Leadership for the development of viable broadband business models in rural areas will be a key feature of further progress, especially when viability requires cooperation and partnerships to actually get resources mobilised.

4. Broadband Policies: A Brief Comparison

4.1 Background

4.1.1 OECD broadband policies

The OECD (2003) has reviewed extensively the broadband policy frameworks operating in its member countries. Their 2003 statement identified 10 principles for the development of broadband markets, promotion of efficient and innovative supply arrangements, and encouragement of effective use of broadband services.

These principles are:

> Effective competition and continued liberalisation in infrastructure, network services and applications in the face of convergence across different technological platforms that supply broadband services and maintain transparent, nondiscriminatory market policies.
>
> Policies that encourage investment in new technological infrastructure, content and applications to ensure wide take-up.
>
> Technologically neutral policy and regulation between competing and developing technologies to encourage interoperability, innovation and expand choice, taking into consideration that convergence of platforms and services requires the reassessment and consistency of regulatory frameworks.
>
> Recognition of the primary role of the private sector in the expansion of coverage and the use of broadband, with complementary government initiatives that take care not to distort the market.
>
> A culture of security to enhance trust in the use of ICT by business and consumers, effective enforcement of privacy and consumer protection, and, more generally, strengthened cross-border cooperation between all stakeholders to reach these goals.
>
> The need to address both: (1) supply-based approaches to encourage infrastructure, content, and service provision, and, (2) demand-based approaches, such as demand aggregation in sparsely populated areas, as an integrated package to promote take-up and effective use of broadband services.
>
> Access on fair terms and at competitive prices to all communities, irrespective of location, to realise the full benefits of broadband services.
>
> Assessment of the market-driven availability and diffusion of broadband services to determine whether government initiatives are appropriate and how they should be structured.
>
> Regulatory frameworks that balance the interests of suppliers and users, in areas such as the protection of intellectual property rights and digital rights management, without disadvantaging innovative e-business models.
>
> Encouragement of ICT research and development to encourage the development of broadband and enhancement of its economic, social and cultural effectiveness.

The OECD statement went on to identify the following priority areas for action.

Infrastructure development and readiness

The active engagement of the private sector in a competitive marketplace is the best way to facilitate ongoing and new investment in broadband, and to maximise the capacity to assess the potential risks and returns.

Liberalisation of telecommunications markets is fundamental but safeguards to improve competition

are also required where there is insufficient competition. Competition and the reduction of bottlenecks are important to stimulate take-up and extend the market.

The widespread availability and access to broadband on fair and reasonable terms remains an issue in some countries for remote areas and under-served groups. The broadening of geographic coverage, which may require the innovative use of spectrum, should deal with existing and new digital, social, and economic divides without creating new ones, while not increasing any dominant market position. Public financial assistance could complement private investment, where appropriate, provided it does not pre-empt private sector initiative or inhibit competition.

Competition among different operators and technological platforms and their capabilities to deliver content-rich services requires the interoperability of broadband networks, in the context of convergence.

Demand, application, use and skill development

Digital content and services are essential for increasing demand for broadband, and government and the private sector have key roles in facilitating content availability across all platforms.

As model users of broadband, government agencies can demonstrate the potential of broadband-based services and content, notably by using it to increase the efficiency of public service delivery, and encourage local development of new content, including content from public sources.

A high level of trust, security, privacy and consumer protection are needed to safeguard the integrity and reliability of networks, protect users through mechanisms such as encryption and authentication technologies, combat cyber-crime and spam, and protect intellectual property, and will only be achieved through the development of rules with cross-border application for the market place.

The private sector needs to take an active lead in developing standards and mechanisms that meet the demands of their customers and will also continue to build confidence in broadband services.

Government initiatives to expand coverage and use, such as aggregation of local demand, are best structured around public–private sector partnerships.

The private sector and government have a role in providing information about the benefits of the widespread adoption and use of broadband, especially those to small-to-medium enterprises (SMEs). The use of e-government in particular provides important demonstration effects and serves as a demand driver.

Education, health care, general government information and services, and provision of government services to businesses and citizens can all potentially benefit from the use of broadband and should be given priority in government strategies.

All stakeholders need to seek a consensus on the management of intellectual property rights to encourage new business models to be developed for the distribution of content.

In May 2004, the OECD expanded its policy position for the development of broadband access in rural and remote areas (OECD 2004(b)). In this paper the policy preference for open and competitive markets, regulatory safeguards where dominance exists, and technological neutrality were confirmed. If rural broadband is not keeping pace with developments, this should signal the need for a review of the competitiveness of market settings before considering subsidies that may actually further distort competitiveness. The OECD draws attention to the emergence of new private-sector services in rural areas with competitive prices and the expansion of DSL, cable, wireless and satellite services.

4.1.2 Australian policies for support of broadband in regional, rural and remote areas

The report of the 2003 Estens Inquiry examined the adequacy of telecommunication services for regional, rural and remote areas. This report, now accepted and being implemented, highlighted the continuing priority on expandable affordable mobile services, the need for improved speed of Internet services and measures to improve reliability of all services. On higher bandwidth Internet the Estens

Report stated: '… access to higher bandwidth services is becoming vital for the economic and social development of regional, rural and remote Australia …' It noted the major impediment to regional, rural and remote Australians having equitable access to higher broadband services is the higher prices that users in some areas pay. It noted the presence of discriminatory pricing by Telstra for ISDN services and delays in improving the reliability of ISDN services.

The Estens Report recommended establishing an incentive scheme for providing higher bandwidth services to regional, rural and remote areas and further support for aggregation of demand from different users, as well as support for small businesses to make effective use of higher bandwidth opportunities.

In response the government is implementing a program for demand aggregation and has also introduced the $108m Higher Bandwidth Incentive Scheme (HiBIS).[5] Through HiBIS, ISPs can receive a one-off incentive payment for providing eligible customers in regional Australia with a higher bandwidth service at a price comparable to that in metropolitan Australia. A 'metro-comparable' service is defined as having a peak download speed of at least 256 kbps and peak upload speed of at least 64 kbps, with a monthly allowance of at least 500 Mb and be offered at a price for a three-year package of up to:

- $2500 where the price is an ADSL service
- $3000 where the service is not an ADSL service.

HiBIS is basically a 'speed access' subsidy and with the 500 Mb threshold, not a download incentive, though, as seen in the survey results, it may initially match the needs (often under 300 Mb) of many smaller local government councils and agricultural enterprises in Australia. In regard to the 256 kbps threshold, however, Paul Budde at Budde Communications argues that 256 kbps – 2 Mbps is just 'fast narrowband', not really broadband (see http://www.budde.com.au).

HiBIS plans to offer two categories of incentive payments, a standard $1540, and a $3300 payment if installation involves higher costs, which are typical in remote areas. The aim of HiBIS is to improve the willingness of ISPs to invest in rural and remote areas where investments would not otherwise be viable. It is expected that ISPs will use the incentive payments to reduce the price of existing broadband services like satellite or to rollout new broadband infrastructure like ADSL or wireless local loops for small businesses, not-for-profit organisations and regional residents. (Further details on HiBIS are described at http://www.dcita.gov.au.)

4.1.3 USA policies for supporting broadband in regional, rural and remote areas

The Federal Rural Broadband Access Loan and Loan Guarantee Program is a major form of support in the USA, though there is a range of smaller measures operating at the state level. The Rural Utility Services in 2003 made available $US1.4 billion in loans and loan guarantees for the provision of broadband services in rural communities. These loans facilitate the implementation of new broadband technologies with two-way speeds of 200 kbps or more in communities with populations of up to 20 000. Before this the Broadband Pilot Program, also for the implementation of new broadband technologies, had been used at a cost of $US100m. There are also other Federal programs operating, more of a community nature, to enhance connectivity.

At the state level there are various tax concessions, grants and loans to enhance broadband adoption (refer for example to the report by Jon S. Beamer on State Broadband Initiatives, cited in OECD 2004, http://www.tiaonline.org/policy/states.cfm).

The USA has also been active in seeking improvements to communication regulations and policies with a view to enhancing the speed of rollout of new, higher-quality broadband services in rural areas and especially low-cost wireless broadband. These improvements include the elimination of unnecessary regulatory barriers and greater flexibility in remote areas by, for example, allowing providers in rural areas to operate at higher power levels to cover larger geographic areas with a given

[5] The Australian Government accepted all 39 recommendations of the Estens Inquiry.

infrastructure. Furthermore, new technology and devices using Wi-Fi technologies can now be used in frequency bands previously out of reach, providing they are servicing rural areas and not interfering with defence or other government services.

4.1.4 Canadian policies for supporting broadband in regional, rural and remote areas

The broadband policy goal of Canada is to have broadband access for all communities by 2005. The Broadband for Rural and Northern Development Pilot Program was introduced in 2003 with funding of $US76m and priority for northern, remote and rural communities in developing and implementing broadband business plans. Other support for broadband is available at the provincial and local government level.

Canada has stimulated wireless development, with the aim of increasing competition generally in telecommunications, by auctioning-off further licences in the 2300 MHz band and it now has more wireless ISPs than any country outside the USA. Broadband wireless prices are now often less than DSL and cable, which are already lower than most other OECD countries.

4.1.5 UK policies for supporting broadband in regional, rural and remote areas

In 2001 the UK government set the target of having the most extensive and competitive broadband market in the G7 by 2005. Programs include the Broadband Aggregation Unit (aggregation of public sector demand in rural and remote areas), $US1.5 billion on public sector demand connectivity, and establishment of nine regional aggregation bodies to aggregate public demand, $US47.4 billion for pilot projects, including the Remote Access Broadband Inclusion Trial (RABBIT), which has set up over 1800 pilots to demonstrate wireless and satellite alternatives for businesses in remote areas.

4.2 Comparison of broadband policy frameworks for rural areas

The OECD report on development of broadband access in rural and remote areas shows that each of Australia, the USA, the UK and Canada have policy priorities in developing broadband in these areas. Demand aggregation and stimulation of competition are key measures in all countries. While the emphasis may change in some areas the policy setting in each of these countries now conforms largely to the OECD principles of reliance on open and competitive markets, regulatory safeguards where market power exists, technological neutrality, and equal access for rural and remote areas. Paul Budde of Budde Communications, however, considers the level of competition in Australian telecommunications competition is among the worst in the western world, in part due to a legacy of extreme regulation that has had a perverse and lingering effect on the competitive culture of the whole industry. With convergence, this legacy is seen to be threatening the growth areas such as broadband.

Australia faces further and different challenges to the USA, Canada and the UK because of its combined very low population density and relatively low rural population. This means it is likely to continue to be more reliant on satellite and wireless than the other countries in servicing the rural, regional and remote areas. Regulatory changes and new technologies that can stimulate competition with and from satellite and wireless providers, therefore, take on added importance. The HiBIS and Demand Aggregation programs should have impact, but whether it is a sustainable impact and whether they have enough funds remains to be seen. The OECD (2004b) mentions that the UK does not favour broadband subsidies to providers because of the potential for adverse effects on competition, innovation and sustainable lower prices. Nevertheless, the UK does appear to have invested heavily in public sector connectivity for education and health in particular.

While HiBIS is a subsidy for ‘high-speed’ connections it may have a sustainable impact if users switch to a higher level when they connect to broadband. Paul Budde of Budde Communications believes that once broadband users adopt broadband they do not switch back, because of the improved experience, and they actually become more demanding in terms of information-rich content. The question here is whether the 256 kbps threshold to qualify for HiBIS will be a satisfying experience for users or fall short of expectations. The survey results indicate that the expectations of broadband users before

adoption are above the actual experience after adoption, especially with content-rich applications. Budde believes that within 10 years broadband users will be seeking nothing less than 50 MB/s to satisfy their growing demand for content-rich applications. While this outcome may be enabled by cable, DSL and wireless technologies at competitive costs, it will be a big challenge for satellite, which is used relatively extensively by Australians in remote areas.

4.3 Measures to raise awareness

Lack of availability of broadband or lack of awareness of availability is a common reason for broadband not being adopted. This is evident in this study's survey results for both the USA and Australia, as well as in the January 2004 small business survey results of Pacific Internet Australia. There is also an interactive effect with this comment as respondents may actually mean there is no access at this site because it is too expensive.

Even though there has been significant promotion of broadband by governments and providers it is apparent that further intensive promotion of broadband is likely to achieve a positive response. Governments that have become actively involved in the promotion of broadband have much higher adoption rates than countries without support (see http://www.budde.com.au).

4.5 Broadband infrastructure and network

While the principles of open and competitive markets and regulatory safeguards are and will remain laudable policy principles, the execution of policies that actually result in competition and competitive prices is likely to remain a significant challenge. This is especially so for countries like Australia, which has a legacy of intervention in the telecommunications market, a dominant supplier in every telecommunication market and is also a small market where entry barriers are very high. The ACCC, in a 2003 review of emerging structures in the Australian communications sector, stated that the regulation of telecommunications and related markets has presented some of the most significant challenges faced by it in its role as competition regulator, and expressed its concerns about competition and efficiency in the supply of broadband services:

> The economies of scale and scope associated with broadband networks mean the business case for deployment of these networks is typically reliant on multiple revenue streams from pay TV, broadband and telecommunication services. In the presence of economies of scale and scope, a lack of access to premium pay TV content is likely to have competition and efficiency implications in the supply of broadband and telecommunication services. Essentially, it acts as a barrier to entry and has the potential to significantly delay or foreclose investment totally.
>
> Any delay in the availability of broadband facilities to residential consumers, particularly in some metropolitan and regional areas of Australia could impose an economic cost in terms of the consumer benefit or access to those services. (ACCC 2003a)

Telstra remains the dominant supplier in key telecommunication markets in Australia. By way of comparison, the ACCC notes that British Telecom and the regional telecommunication companies in the USA do not have the same level of integration and, in the case of the USA, the national coverage that Telstra has in Australia.

The ACCC concludes that the telecommunications sector in Australia is at a crossroad with technological advances like high-speed broadband offering improved information and new experiences in entertainment. But for effective competition in a market dominated by one provider it believes there will be a continuing need for access regulation and conduct regulation.

4.4 Broadband education and training

Both dialup users and broadband users in the survey rated the Internet and broadband in particular as an important or very important vehicle for research, education and training. Distance learning for rural, regional and remote area users is one of the most important attributes that can be delivered to

people in these areas. It can reduce their costs of accessing educational services and expand significantly their demand for these services. In turn, this means a more educated and skilled population, which would be expected to contribute to growth in productivity and living standards generally.

Paul Budde's reports on the Australian broadband market provide an up-to-date overview of developments in tele-education in Australia, including trends in the vocational education and training markets (growing share for commercial education service providers), the Education Network Australia (EdNA), support for schools and universities online, the flexible learning framework, distance learning support, and global trends in the use of ICT in education.

A number of respondents to the Australian surveys of this study, especially smaller enterprises and local government councils, expressed a need for further training in how to make full use of broadband. This presents an opportunity for a cooperative offering by ISPs and educators.

5. Adoption of Broadband in Australia and the USA by the Agricultural Sector

International comparisons of the use of technology should always be treated with caution and especially the use of technology, which can be affected by different labour and capital costs, macro-economic conditions, market competition, the size of firms and the timing of the data collections at the different locations. The intensity of market competition can have a significant impact on the prices prevailing at a particular time, and sometimes these prices may be sustainable and, at other times, reflect just marginal costs and not truly reflect long-term costs. In addition, the sample numbers from the surveys of this study are relatively small and subject to sampling and non-sampling errors, including non-response bias. Of 1490 agricultural enterprises that refused to participate in the Australian survey, 43 per cent did not have an Internet connection, which indicates high potential for upward bias in the results reported here.

A more detailed description of the agricultural survey results is shown in appendix 2.

5.1 Australia and the USA: situation and outlook

The survey of 352 agricultural enterprises (237 producers and 115 suppliers) in Australia took place during November and December 2003. The 352 responses were achieved from a distribution to 5075 enterprises, a response rate of 7 per cent. The survey of 165 agricultural suppliers in the USA took place during February and March 2004. These responses were achieved from a distribution to 2388 firms, a response rate also of 7 per cent.

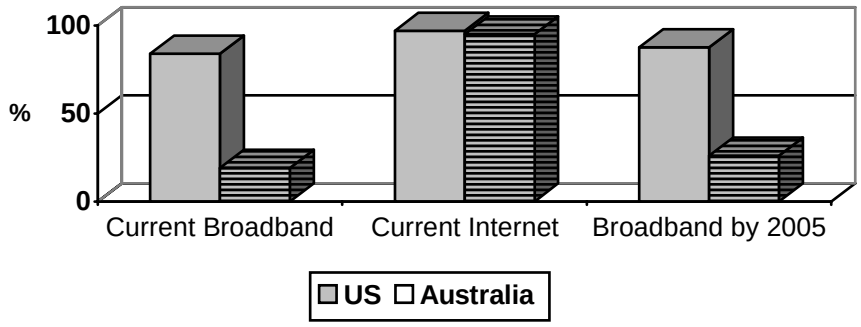
There was no significant difference in the overall level of Internet connections in the two countries, with 95 per cent connected in Australia and 97 per cent in the USA. While the proportion of suppliers connected to the Internet in Australia was relatively high (99 per cent), these same suppliers had a relatively low level of broadband adoption. Only 18 per cent of agricultural suppliers in Australia were connected to broadband, compared to 81 per cent in the USA. The adoption of broadband by Australian producers was similar to that of Australian suppliers at 18 per cent.

Within the dialup user group an estimated 31 per cent of Australian agricultural enterprises indicated an intention to switch to broadband, with over 60 per cent of this group switching within 12 months. In comparison, an estimated 50 per cent of USA suppliers now on dialup plan to adopt broadband, with 75 per cent of them switching within 12 months.

Based on the survey results there is expected to be an estimated 87.5 per cent of USA agricultural suppliers on broadband by early 2005 and 27 per cent of Australian agricultural enterprises (Chart 5.1).

The survey results suggest a lingering gap between Australian and USA adoption of broadband in the agricultural sector, unless some of the constraints (refer below) can be overcome.

Chart 5.1: Internet and broadband adoption: agricultural enterprises: 2004–05



5.2 Drivers of adoption of broadband by the agricultural sector

Previous experience with the Internet is an important stepping stone to the adoption of broadband, with 80 per cent of USA enterprises on broadband indicating prior experience with the Internet through dialup, compared to 82 per cent of Australian enterprises. The relatively high level of Internet connections in both countries suggests that growth in the adoption of broadband will continue in both countries.

High speed is a major driver of broadband adoption, with 63 per cent of Australians indicating that speed was a major reason for their adoption and 80 per cent of USA supplying enterprises agreeing that broadband reduced the time needed to place orders with their suppliers, and 60 per cent agreeing that broadband reduced the time needed for their customers to place orders.

In both the USA and Australia there was agreement among broadband users that broadband expands the ability to communicate with suppliers (86 per cent in Australia and 83 per cent in the USA) and with customers (82 per cent in Australia and 86 per cent in the USA). There was equally strong agreement about the value of broadband as a critical research tool and for e-learning.

Chart 5.2 shows the responses for what we identify as the main drivers of broadband in the two countries. There is broad agreement among respondents in the two countries about what motivates their adoption of broadband (ease of communication, research, time saving etc.).

Chart 5.2: Drivers of broadband adoption: agricultural enterprises: USA and Australia 2003–04

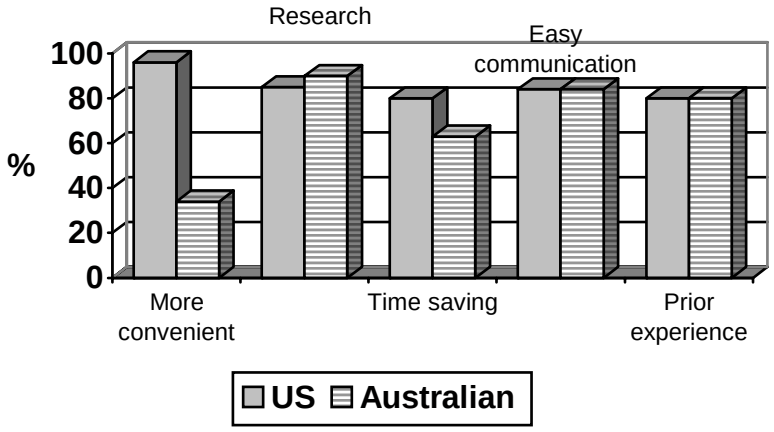


Chart 5.2 shows the percentage of broadband respondents who rate the attributes: ease of communication, research, and time saving as important reasons for adopting broadband.

While E-commerce does not appear to be a major driver of broadband adoption at this stage, with 60 per cent of agricultural producers in Australia and 20 per cent of suppliers not using their broadband to place any orders over the Internet, there is a significant difference in the e-commerce activity of dialup and broadband 'leaders'. Some 13 per cent of broadband users are using the Internet to place orders and make payments for over 25 per cent of their purchases, compared with 7 per cent of Dialup users. The real difference between dialup and broadband users in Australia is that the percentage of respondents reporting zero e-commerce activity is 50 per cent higher with dialup users than it is with broadband. That is, once broadband is adopted there is a much higher probability that there will be some e-commerce activity (chart 5.3).

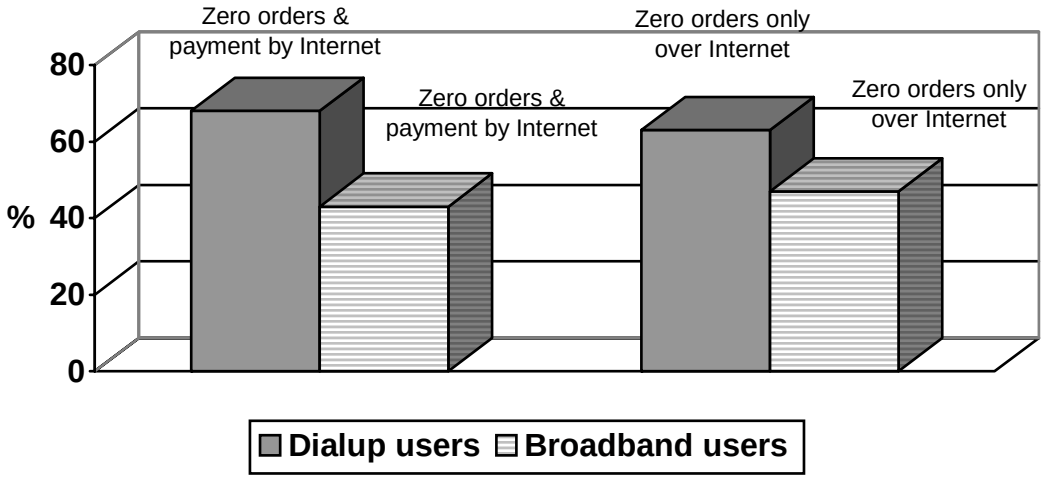
A similar low level of e-commerce use is reported for the USA. Less than one third of Internet-using USA firms reported that buying convenience would be a factor supporting e-commerce, but again there were major differences between broadband and dialup users, with 30 per cent of broadband users (compared with 17 per cent of dialup users) stating that buying convenience would be an important factor supporting the adoption of e-commerce.

Broadband users (54 per cent agreeing or strongly agreeing that the Internet facilitates expansion into additional markets) also rate the Internet more highly than dialup users (41 per cent) in facilitating expansion to new markets.

5.3 Constraints to adoption by the agricultural sector

Lack of access for dialup users takes on added importance in Australia because of the large percentage still on dialup (81 per cent (Australia) compared to 18 per cent (USA) — see above). Of those on dialup in Australia, 54 per cent indicated the reason they remained on dialup was that there was no broadband access at that location. These responses appear to be due to a lack of awareness about broadband satellite, which Telstra claims to be available to all Australians. For the USA there was also a significant 40 per cent indicating no access at that location. Again, there seems to be a lack of awareness about satellite coverage in that country.

Chart 5.3: E-commerce prevalence: dialup and broadband users: Australia



The cost of broadband appeared to be a more important driver in Australia than in the USA, with 23 per cent of Australians indicating it was the main reason they were on dialup compared to 16 per cent in the USA. The average cost of a broadband connection by respondents at the time of the Australian survey was $A48.45/month, with the average download less than 300 Mb/month. Of the dialup users 71 per cent agreed that if they could access broadband for $30/month or less they would probably join

up. USA suppliers, on average, are paying about $US100/month for broadband. While this is much higher than the expenditures for Australia the firms are much larger with 38 per cent of the USA respondents having sales above $US100m, whereas all Australian suppliers had turnover less than $US100m. More generally, large firms and farms have a higher proportion of broadband use and much greater downloads of data.

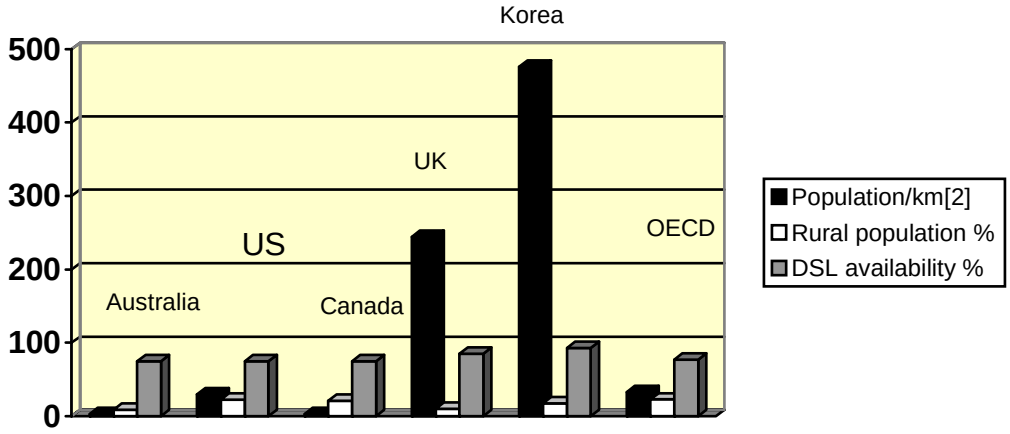
Perceptions about the value of broadband also constrain adoption. Dialup users in both countries tended to attribute fewer benefits to the Internet than broadband users did.

Both Dialup and Broadband users in Australia expressed agreement or strong agreement with the statement that there is too much unsolicited mail (84 per cent and 87 per cent respectively) and/or pornographic material (60 per cent and 59 per cent respectively) being distributed over the Internet. There is also joint concern about Internet security with 32 per cent of dialup users and 25 per cent of broadband users disagreeing with the statement that the Internet is quite secure for buying and selling products online.

5.3.1 Population density

Australia (3 persons/km^2 compared to 33 for the OECD and 30 for the USA) has one of the lowest population densities in OECD countries, and also one of the lowest rural population densities (8.9 per cent of the total population compared to 22.9 per cent for the OECD and 22.6 per cent for the USA (OECD 2004b). High population densities tend to favour low-cost development of DSL and cable communication technologies. Low population densities tend to favour satellite technologies, especially when the rural population density is also relatively low. In this context the availability of DSL technology in Australia appears to be relatively high and is close to the OECD average even though Australia has a very low population density and rural population percentage (chart 5.4).

Chart 5.4: Selected population and DSL data: Australia, USA & OECD: 2003 (Source OECD 2004)



The Federal Communications Commission (2003) (USA) found that broadband subscribers are present in 99 per cent of the most densely populated zip codes compared with only 69 per cent of those with the lowest population densities. In Australia, the Commonwealth Grants Commission (2003) recognised that '… the availability of communication infrastructure in most rural and outer regional areas is patchy …' They classified the country into six major regions according to the extent to which they had access to communication infrastructure that could support data-intensive applications. About half of these regions have limited capacity to support data-intensive applications. Map 5.1 shows the six regions with different communication infrastructure in Australia:

Region 1. (Dark-green shading on the map.) Locations that have dense and continuous population settlement patterns, wide- and high-capacity infrastructure options, are well connected and meshed, and can cost-effectively support a wide range of applications.

Region 2. (Mid-green.) Locations that have continuous population settlement patterns, good but limited infrastructure options, good interconnectedness but with patchiness in access in the surrounding areas, and can support a range of applications cost effectively.

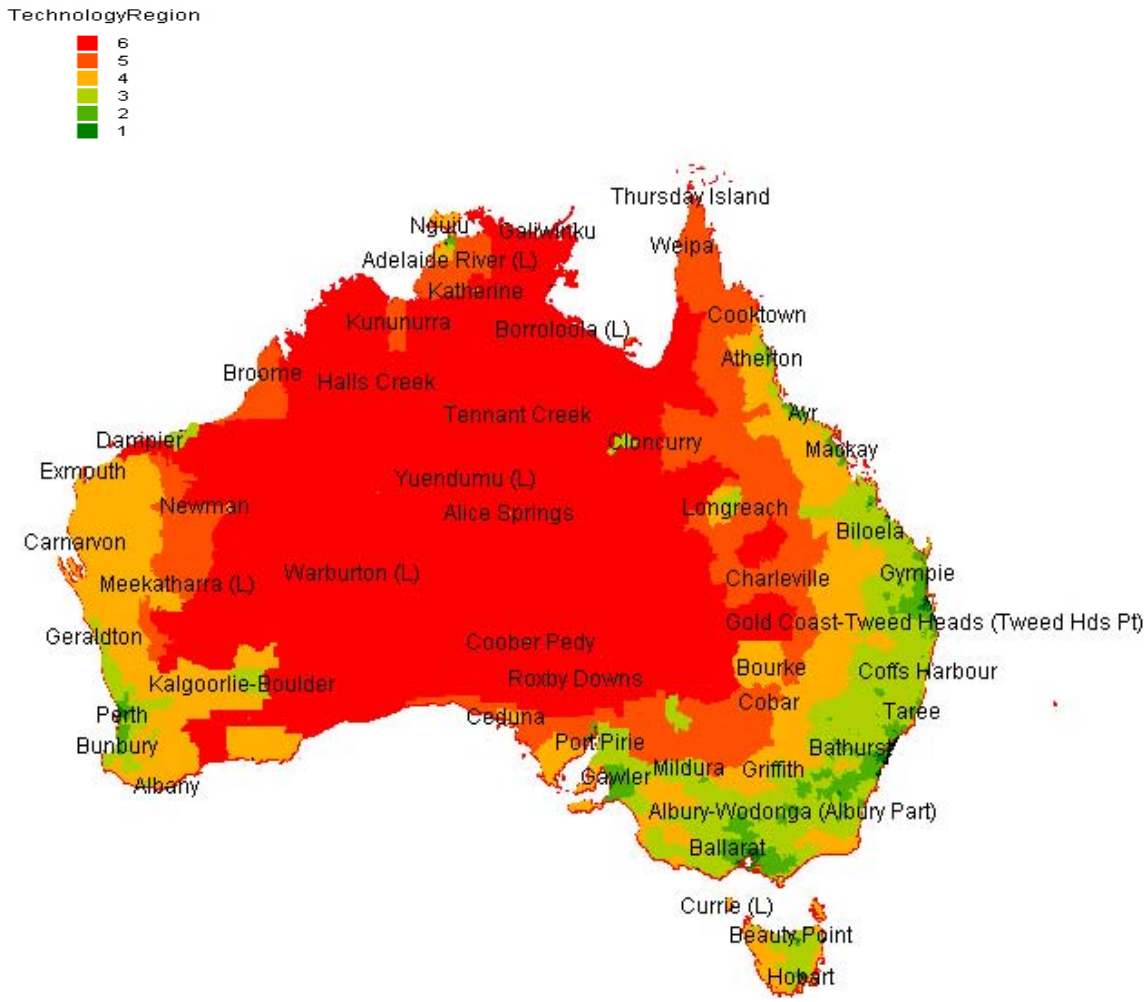
Region 3. (Light-green.)Locations that have identifiable but non-continuous population settlement patterns with major non-government economic activities, are connected through identifiable infrastructure corridors and can potentially support some applications cost effectively.

Region 4. (Orange.) Locations that are not directly covered by major infrastructure corridors but are within reasonable distance of service delivery points and thus have access to a range of services similar to those for region 3.

Region 5. (Light-red.) Locations that have no continuous population settlement patterns, patchy interconnectedness through low-end services that can support a limited range of lower-end applications but whose general cost effectiveness is doubtful.

Region 6. (Solid red.) Locations that are very remote with sparse and unconnected population settlements, with no or very poor access to services and which are not cost effective.

Map 5.1: Six regions with different communication infrastructure

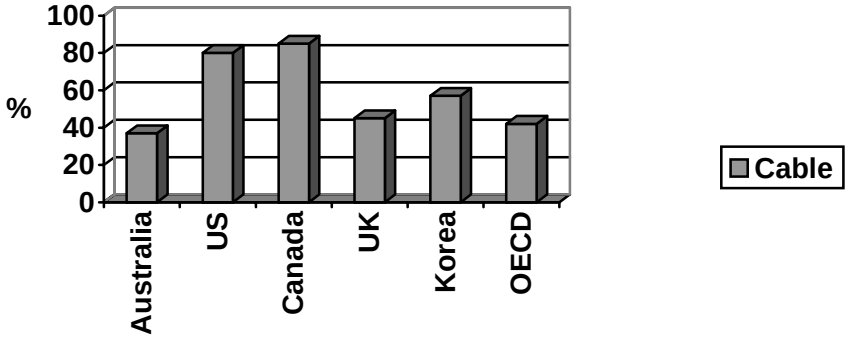


Even though the communications infrastructure is patchy in rural areas in Australia, a study by Berger, Cribbett and Smith (2001) at the Productivity Commission found that a relatively large proportion of lines are in less-populated regions, where costs can be 5–7 times higher than average costs. About 5 per cent of Australian lines are in very low population density areas compared with less than 1 per cent in many US states such as Ohio, Illinois and California, although Nevada at 4 per cent was closer to the Australian scene.

The Republic of Korea, which has the highest level of adoption of broadband among OECD countries, also has the highest population density of OECD countries (476 persons/km^2).

In terms of cable access Australia is well below the USA and Canada and slightly below the OECD (chart 5.5)

Chart 5.5: Households with nearby cable networks: 2003 (OECD 2004)



5.4 Opportunities for improving adoption by the agricultural sector

There are some common factors and some unique factors affecting broadband adoption in both the USA and Australia. The common factors include improving awareness that agricultural enterprises have access to broadband via satellite even if DSL and cable is unavailable. Further promotion of satellite availability could achieve a response, with existing dialup Internet users likely to be the most responsive.

The cost of broadband is a major constraint, especially in Australia, and actions that reduce costs can be expected to achieve positive results because users have indicated they would be very responsive to a reduction in broadband adoption costs.

6. Adoption of Broadband by Local Government Councils

The survey of Australian local government councils took place from 10 to 17 December 2003. The total number of councils in Australia is 693 and the number of responses was 200 (hit rate of 29 per cent) from a sample of 285, equivalent to a response rate of 78 per cent.

The Australian Local Government Association provided the list of Australian councils from which the sample was drawn. The sample was drawn from NSW (25 per cent), Victoria (11 per cent), QLD (20 per cent), WA (20 per cent), SA (10 per cent), Tasmania (4 per cent) and NT (10 per cent). The largest percentage of responses came from rural agricultural councils (35 per cent), followed by rural remote councils (19 per cent), with 46 per cent from urban localities.

The survey was conducted by telephone, and a 'primary approach letter' explaining the nature, importance and value of the survey was sent to respondents before the interviews.

Over 70 per cent of responding councils had budgets of less than $40m/year. Most responding councils had 40 full time employees. Fifty per cent of interviewees were either the CEO, the IT manager or the CIO. Nearly 60 per cent of interviewees had undergraduate or postgraduate tertiary qualifications. Most respondents were male (71 per cent), with females accounting for 29 per cent. Over 50 per cent of respondents were aged between 30 and 45 years.

Over 90 per cent of councils have their own website, used mainly for providing background information about the local area and council activities. Technical information, pricing information and a network directory were provided by just 9 per cent of councils. An estimated 15 per cent of councils had online ordering and payment facilities.

The survey included ISDN technology with ADSL/DSL, which together had the highest share of the technology market (56 per cent) with councils. While ISDN might be excluded on the basis of the OECD definition, to do so would prompt questions about satellite. Some people on both satellite and ISDN believe ISDN is much faster than any satellite option. Therefore ISDN was included in the broadband group.

A more detailed description of the survey and the detailed responses is shown in appendixes 1 and 2 respectively.

6.1 Main features of adoption of broadband by Australian local government councils

One hundred per cent of councils were connected to the Internet and of these 68 per cent were on broadband and 32 per cent on dialup. Of those not on broadband 62 per cent indicated that the reason they remained on dialup was that there was no broadband access at that location. (According to Testra, however, there is 100 per cent coverage of Australia by satellite, with the exception of some locations that might be shielded by mountainous or hilly terrain). A further 15 per cent indicated that they were remaining on dialup because it was cheaper and 11 per cent indicated that dialup better matched their needs.

Of the 32 per cent on dialup 57 per cent indicated that they expected to change to broadband, with 40 per cent indicating that change would happen in the next six months. Based on the planned adoption rates of respondents it is estimated that there will be 85 per cent of councils on the Internet by early 2005.

Nearly 40 per cent of the councils not on broadband indicated that they had no plans to adopt it, or did not know when they might adopt. This translates to about 10 per cent of total council numbers. This response is similar to the percentage of councils that indicate that dialup suits their needs.

There is a significant difference in the adoption rates of councils in remote and in urban areas with 89 per cent of urban councils on broadband compared to 59 per cent of those in rural areas.

6.2 Broadband technology

In terms of broadband technology links, 53 per cent of councils are on ADSL/DSL/ISDN[6] lines with 14 per cent on two-way and 9 per cent on one-way satellite, and 7 per cent on optic fibre. Only 3 per cent are on cable and 3 per cent on wireless, with 4 per cent unsure of what they were on. Some of these technologies have variable transmission speeds and one-way satellite barely qualifies for broadband status.

6.3 Drivers of broadband

The main reason councils are on broadband is to gain access to high transmission speed (nearly 60 per cent gave this as the main reason).

Cost reduction was rated by 22 per cent of councils as the main reason they adopted broadband, but for those who had dialup before going on to broadband nearly 50 per cent indicated that that their current connection was more expensive. The average cost of broadband for councils in the three months before the survey was $811/month. Large councils with more than 100 employees were more inclined to say that broadband is much more expensive than dialup. Less than 25 per cent consider broadband to be less expensive than dialup.

Nevertheless, nearly 80 per cent of councils on broadband agreed that broadband is *not too expensive to justify.*

Nearly 70 per cent of councils on broadband were on dialup before going on to broadband.

Most councils have broadband contracts that enabled unlimited downloads, although more than 30 per cent of councils had a limit of 5 Gb/month over the previous three months. These councils also seemed to be exceeding their limits and were therefore faced with extra costs.

6.4 Market share of the council broadband market

Telstra had a market share of 39 per cent of councils on broadband, and TPG and West Net each had 6 per cent. Other providers, which include directly owned or leased lines, accounted for 49 per cent of the market.

6.5 Internet value

Councils on both broadband and dialup rated the Internet highly as a tool for research and as a means for expanding the range of services they could offer their stakeholders. Over 50 per cent of councils agreed strongly that the Internet is a critical tool for research and 85 per cent agreed or agreed strongly that the Internet had enabled them to expand the range of services they offered. Also, most councils are finding the Internet very useful for education and training of staff.

Despite this, over 60 per cent of respondents, again both dialup and broadband users, also agreed strongly that there is too much unsolicited mail being sent over the Internet. Nevertheless, they tended to consider the Internet to be quite secure for buying and selling products and services online.

Most councils on broadband agreed that it is more reliable than dialup, is expanding their ability to communicate with stakeholders and suppliers, and reduces the time taken to place orders with suppliers. Over 80 per cent of broadband users rated it as more reliable than dialup.

Although over 70 per cent of dialup and 80 per cent of broadband-using councils are communicating

[6] ISDN connections were described as broadband, even though they do not meet the widely accepted speed specifications for broadband, which is 256 kbs or more for downloads and 64 kbs for uploads. ISDN is capable of 64 kbs over standard telephone and digital lines. A number of people with experience of both ISDN and satellite broadband indicated that ISDN is faster than most of the satellite options.

with ratepayers by email to some extent, the frequency of communication remains low among both groups with 50 per cent using emails for just 1–5 per cent of communications.

6.6 E-commerce

The level of e-commerce undertaken on the Internet remains low for both broadband and dialup users. Just 50 per cent of ratepayers are using the Internet to make payments to councils and even then it is for no more than 15 per cent of the transactions.

Although councils on broadband are using the Internet relatively more (75 per cent of broadband users compared to 50 per cent of dialup users) for payments to suppliers, the frequency of payments is very low with 50 per cent using e-payment methods for just 1–5 per cent of transactions. Nevertheless, nearly 70 per cent of broadband users indicated that broadband had enabled them to improve the efficiency of online banking, finance and insurance transactions.

6.7 Broadband applications

Over 30 per cent of councils on broadband indicated that they needed more training on how to make more use of it, although it is not a strongly held view, with over 40 per cent (mostly larger councils) disagreeing that they needed more training in the area.

Nearly 80 per cent of respondents who were on broadband indicated that broadband enables them to offer a wider range of services and to expand the range of their services beyond the traditional council boundaries. Forty per cent indicated that broadband was attracting new businesses to the region.

Nearly 40 per cent of broadband respondents agreed that broadband enables videoconferencing and webcasting of council meetings and that they were using it for this purpose, but over 50 per cent disagreed with the statement that broadband enables effective videoconferencing. Some respondents made the specific comment that videoconferencing is not working on broadband and features disjointed images. This could be due to the use of a slow-speed option, which is possible with satellite, although there are many other possibilities including low-quality DSL links.

Over 30 per cent of councils agreed that broadband enables e-learning and training and that they were using it for this purpose.

Over 20 per cent of broadband users indicated that broadband had enabled improved health services, but nearly 40 per cent indicated that there was no impact on health services.

6.8 Rating of broadband applications by dialup Internet users

The responses of dialup users about broadband provide some insight into their expectations of broadband. In some areas this group’s views on broadband are similar to the views of those already on broadband, but in two areas — use of broadband for videoconferencing and webcasting, and for e-learning — the expectations are well above the ratings of those already on broadband. For example, more than 50 per cent of those not on broadband agreed or agreed strongly with the statement that broadband enables videoconferencing and webcasting of council meetings and also that it enables e-learning and training. In contrast, only 12 per cent of those on broadband agreed with the videoconferencing statement and 28 per cent with the e-learning statement.

6.9 Summary

6.9.1 Adoption of broadband

The level of adoption of broadband by Australian local government councils is high and continues to grow, but there remains a significant 10 per cent without plans to adopt. Most of the non-adopters indicated that there is no broadband access at their location. This could be due to ignorance of what is available or there may actually be 'black-out' spots not covered by existing technologies. Broadband service providers could target this group with direct advertising to improve awareness. But first they need to check and, if required, improve the quality of communication channels.

6.9.2 Cost justification and demand aggregation

While councils rated broadband costs as more expensive or much more expensive, they tended to consider that the cost was justified in view of the benefits received. Nevertheless, there is a group accounting for nearly 30 per cent of councils that rate broadband too expensive to justify. There are risks that this group will disconnect from broadband. There is also evidence that the expectations of broadband by councils before they adopt it are above those with the experience of actually using it. There are risks that these unmet expectations could lead to revised assessments of the value of broadband. There is an opportunity to develop a demand aggregation scheme[7] to help councils not on broadband to adopt it and those that rate it too expensive or too unreliable to justify staying on.

6.9.3 The value of research, education and training from broadband

councils in Australia are generally aware of the benefits of broadband for research, education and training and in communicating with their stakeholders. This is a positive feature for the future development and progress of councils. Council leaders that have adopted broadband and integrated it effectively into their overall information management systems could be used as case studies to promote these attributes to other councils.[8]

A broadband training program to help smaller council operators make full use of broadband would be useful. This as a priority because it affects the value that is attached to the technology, and 35 per cent of broadband-using councils and 50 per cent of dialup-using councils indicated that they need more training to make full use of broadband.

6.9.3 E-commerce

Acceptance of the Internet as an effective vehicle for e-commerce still remains somewhat problematic, with a low frequency of online transactions by both dialup and broadband users. This should not be a big problem. Training to improve the capacity of operators, especially in smaller councils, to fully exploit e-commerce could be a solution.

6.9.4 Broadband for more intensive data movements

Use of broadband for videoconferencing and webcasting is not widely accepted as being practicable. Some of this is due to the selected or available speed of the specific broadband technology, but other respondents indicated that the broadband lines are unreliable and simply not capable of moving data-intensive applications. Again, council leadership case studies could be used to improve acceptance of this application. Infrastructure and service providers should be given as much information as possible about this problem.

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[7] The Australian Government, through NOIE, has introduced a program for 'community-based broadband demand aggregation'.

[8] There are several case studies of demand aggregation for broadband in remote areas. Refer, for example, to Budde 2003, referring to Coorong District Council in SA and DSLAM at Menindie.

7. Discussion of Results

7.1 The drivers of broadband adoption

Broadband adoption is driven by a combination of cost of access, physical access, speed and the value created by being on broadband. Value created is clearly a function, in part, of the cost of access and other costs, as well as the extra revenue or utility created from adoption. Previous experience with a dialup Internet connection is a common factor in the adoption of broadband across countries and sectors. Previous experience is likely to reduce risk and expose users to new production possibilities. For this reason access to the copper wire telephone network is and remains an important part of the network and an important vehicle in the switch to broadband.

7.2 Different adoption rates

The greatest difference in the adoption rates is between the agricultural supplying sector of the USA and the agricultural supplying sector of Australia. The relatively large size of USA suppliers accounts for some of the difference. Large firms within Australia, and larger councils, are more likely to be on broadband. Some of the difference may also be because of other differences in the sample characteristics. Nevertheless, there remain unexplained differences in the adoption rates of suppliers. Suppliers in both countries appear to have similar access to low-cost communication technologies like DSL and cable and wireless, and, therefore, the reason is not the technology or the cost of access. Agricultural suppliers tend to have higher educational qualifications than agricultural producers in Australia, although we were unable to compare their qualifications with USA suppliers.

The different adoption rates of agricultural suppliers needs more research including a larger survey sample size, closer matching of sample characteristics and use of identical surveys for both the USA and Australia.

7.3 The value of broadband

The value of broadband is seen as the combined impact of the cost of access and the benefits achieved. Broadband users tend to rate it high on some basic value-creating attributes like expanding into new markets, although this is not a universal finding because a number of dialup operators ranked broadband higher than those actually on it for videoconferencing and downloading of video. This suggests that expectations about broadband are not being met by some users on some attributes. Slow speed is the likely cause.

7.4 Applications for broadband

The use of broadband for e-commerce, videoconferencing and other data-intensive applications still remains low, although there is a general tendency to buy goods and services over the Internet, rather than sell online. This suggests that the capacity to develop effective and secure websites for selling goods and services by the respondents to this survey is less than those they are using to buy from. On the other hand, if this is true, we would have expected agricultural suppliers (who supply the goods and services for agricultural produces) to be indicating a stronger presence in online selling. Some of this gap is due to the organisation of agricultural marketing with many producers consigning grain and fibre to longstanding buyers or livestock auction saleyards. Many people worry about security in online transactions and this may impact more on selling than buying practices because it is essential for suppliers to establish a secure website and that can involve significant costs.

The development of broadband applications is only just emerging. New broadband applications include VoIP, enterprise resource planning software, online diagnostic tests for plants and other products, and a range of existing applications that may not be taken up because of speed constraints. There is, however, evidence of a small group of broadband users who are making extensive use of

advanced applications, with 12 per cent of councils and 12 per cent of agriculturalists in Australia using broadband for videoconferencing and/or webcasting of meetings; more than 25 per cent of councils and agriculturalists in Australia using broadband for e-learning and training; and more than 20 per cent agreed strongly that broadband was enabling them to do more online banking, finance and insurance transactions.

7.5 Policy measures

Authorities dealing with the information economy in both the USA and Australia have broadband policies containing programs dealing with the special circumstances of rural, regional and remote areas. The same situation applies to Canada and the UK. Australia features a more concentrated market than other countries and a less diverse spread of the main broadband technologies. It also has a relatively low rural population in the midst of a country with low overall population density. This has resulted in broadband prices being considerably higher in Australia than other countries and especially with satellite broadband. Nevertheless, there are several very low-cost ISPs emerging with new wireless technologies.

8. Lessons Learned

8.1 Internet users are moving up the experience curve

The presence of a relatively large proportion of Internet-connected respondents and evidence of a predictable pathway from dialup to broadband indicates that there is an underlying store of experience to build on. The dialup user gains experience with a range of less data-intensive applications like email communications, web searches and purchasing of goods and services. In many situations this experience may be all the user requires. In other situations the user may discover, as they make more intensive use of the Internet, the need for more data-intensive applications (e.g. videoconferencing, VoIP) and speed takes over as the limiting factor. Many of the new applications that are being most used are in the area of education, e-learning, training and research. Users will increasingly look to a broadband service that has fast speed, unlimited downloads, reliability, security and low cost.

8.2 Improved management of information systems and applications comes with the broadband experience

Respondents indicated that they are more likely to buy online than sell online. For suppliers, however, this should translate into more online sales, unless buyers are discovering new sources of supply. As users change to broadband, a new set of requirements emerges, not just for the user, but also the providers.

A number of users have indicated that they need more training to make better use of broadband and this seems to be an opportunity for ISPs, perhaps in conjunction with education institutions, to improve the capacity of users to fully exploit the power of broadband. This training should cover both the identification and use of existing applications as well as development of own applications. The growing demand of broadband users for data-intensive applications carries opportunities for ISPs, application developers and suppliers of goods and services. As online users become exposed to a globalised world of high-quality goods and services, available on demand, 24 hours/day, every day of the year, their expectations of suppliers increase. These demands will present significant challenges for suppliers and the level and sophistication of their management information systems. If Australian agricultural suppliers do not adopt broadband, they may fall behind their USA counterparts.

8.3 Broadband provider implications: price-elastic demand for broadband

The adoption of broadband is expanding significantly with reductions in the cost of joining, especially in wired lines. Users and potential users with access only to satellite would benefit from similar price reductions. With Australian satellite packages for business being at least 60 per cent more expensive than equivalent USA and Canadian packages there would be benefits in price reductions for satellite broadband services in Australia.

8.4 Policy implications: encourage new entrants and new technology, and a diverse range of broadband technologies

In view of the vast range of new broadband technologies emerging, the most important feature that policy makers can deliver is the stimulation of development of new technologies and access to it. With rapid technological change subsidies that are attached to particular technologies and delivery systems are exposed to the risk of being overtaken by new technology.

8.5 Access and equity to remain an ongoing challenge

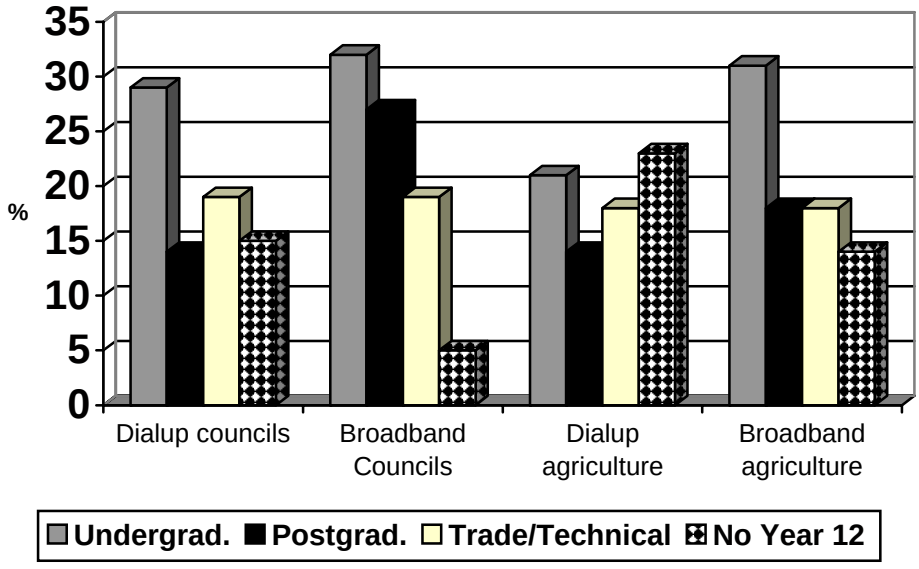
The relatively high price for satellite broadband, especially in Australia, poses questions about fairness and equity, especially when the market is highly concentrated and dominated by one supplier. Broadband has the potential to either accentuate or narrow the 'digital divide' (Agrawala and Sehra 2004). At one extreme, access, awareness and cost could favour those councils, businesses and individuals who already have an advantage, enabling them to quickly adopt the technology, gain experience with it, expand into new markets, lower transaction costs and grow rapidly. This would result in a growing cost disadvantage for non-adopters. Conversely, adoption of broadband could enable disadvantaged councils, businesses and individuals to take a large leap forward by having access to low-cost broadband and integrated voice, video and data networks that produce lower transaction costs and create value. This would result in a narrowing of the cost disadvantage for lagging adopters of broadband.

An important issue here is at what point is the market to be encouraged to work, allocate resources and sort out who and what businesses are to be on broadband? And at what point is the market failing and in need of intervention? The presence of economies of scale in broadband infrastructure is likely to continue to result in a digital divide. A continuation of government support for councils, businesses and individuals in regional, rural and remote areas is likely to remain important if a digital divide is to be avoided.

In fine-tuning assistance to ensure the best use of public funds for the adoption of broadband, there would be benefits in knowing more about the cultural characteristics of non-adopters. Bell, Reddy and Rainie (2004) in a study of Internet users in the USA found significant differences in the adoption rates of rural Caucasians (54 per cent online) and rural African-Americans (31 per cent online). This difference was found to be associated with differences in income.

This study showed some evidence that broadband users in Australia have higher educational qualifications than dialup users. A higher proportion of broadband users had undergraduate and postgraduate tertiary qualifications than dialup users (chart 8.1). This finding was consistent across both the agricultural and local government sectors. In addition, there is a large proportion of people without basic education to Year 12 in the dialup user group.

Chart 8.1: Adoption of broadband: by education and sector: Australia: 2004 (% of survey respondents)



9. Conclusions and Recommendations

This report describes the results of a study into the adoption of broadband by two sectors:

- agriculture (comparing Australia and the USA)
- local government (Australia).

While the level of Internet use is high across both countries and across sectors (above 90 per cent for agriculture and 100 per cent for local councils) there are significant differences in the level of adoption of broadband in agriculture (19 per cent adoption rate in Australia for suppliers of goods and services for agriculture, compared with 82 per cent in the USA).

Some of the difference is due to the much larger size of USA agricultural supply firms and that large firms tend to have higher broadband adoption levels, but there are also unexplained issues because Australian suppliers tend to have access to low-cost ADSL and have relatively high tertiary education levels, two factors associated with high levels of adoption of broadband. In addition, there are some signs that some Australian agricultural suppliers are losing their position in the farm supply chain with farmers now having direct access to large and efficient suppliers of farm inputs.

There was no difference between the adoption rates of Australian producers and suppliers, both 18–19 per cent. USA's adoption of broadband at the farm production level is estimated to be around 25 per cent, which is slightly higher than for Australia. Australian SMEs (665 000 in total) have a broadband adoption level of about 38 per cent, which is around double the Australian farm production level. Even with the very small segment of small businesses (0–4 employees) the adoption rate is over 30 per cent. In brief, the adoption of broadband by Australian agriculture, especially suppliers of inputs for agriculture, *is well behind both USA and comparable national levels.*

There are also differences within the Australian local government sector (68 per cent adoption on average), with *urban- based councils (89 per cent broadband) more likely to be on broadband than those in rural areas (59 per cent).*

The first main reason for adopting broadband is speed. High speed is needed for data-intensive applications. The main reason given for not adopting broadband is lack of access, especially in Australia and for both local government councils and agricultural suppliers and producers. Nevertheless, a 2003 study by the Economist Intelligence Unit ranked Australia in the top four countries of Asia in terms of 'networked readiness'. The OECD ranks Australia reasonably high for ADSL and satellite access.

The second main reason for non-adoption of broadband was the belief by dialup users that broadband is much more expensive, although this belief is not widely shared by broadband users. Australian agricultural production is a relatively intensive user of satellite broadband connection technology, with 56 per cent of broadband producer users on satellite compared to just 6 per cent for Australian suppliers and 4 per cent for USA suppliers. With local councils, satellite accounted for 23 per cent (14 per cent being two-way and 9 per cent one-way), with ADSL/DSL accounting for 53 per cent. In the USA there is a more diverse use of connection technologies through ADSL/DSL (35 per cent), cable (17 per cent) and wireless (14 per cent).

Broadband adoption is driven by the combination of price, speed, access and the benefits/utility gained from broadband. All four attributes need to be achieved to realise the full benefits of broadband. There are also unresolved questions about management and organisation skills needed to exploit broadband. A number of survey respondents indicated that they need more training in broadband to fully take advantage of it. Broadband users also tend to have higher education levels than dialup users.

Australia has some of the most expensive but also some of the cheapest broadband in the world. Alphalink Wireless, based in Melbourne, distributes a standard service of 2 Mbps for $US20/month, with a limit of 10 Gb download capacity/month. This is among the lowest cost broadband services in the world. Comparable business broadband packages based on satellite, however, are estimated to be at least 60 per cent more expensive in Australia (at June 2004) than in the USA and Canada (countries with somewhat similar population densities). The cost difference grows when download limits are

considered, with limits applying to Australia and not to the USA and Canadian packages. Over 50 per cent of agriculturalists in Australia downloaded less than 500 Mb/month and 50 per cent of councils less than 1500 Mb/month, compared to the average 2000 Mb/month download for all Australian non-households. The cost disadvantage is compounded when income-servicing ability is considered. A 2003 study rated Australia as having the most expensive broadband relative to income in the OECD. For users of satellite technology this situation has not changed.

Does it matter that the broadband adoption rates are relatively low for councils and agriculturalist in rural and remote areas? The answer is generally yes if the objective is to improve efficiency and productivity, encourage research and online education, and facilitate access to data-intensive consumer applications like video on demand. USA research shows that the adoption of new information and communication technologies (such as the Internet) moves farm producers closer to improved purchasing and sales results; numerous OECD studies show or rather suggest a positive link between productivity and broadband adoption; SMEs in Australia rate broadband highly for improving productivity; and this study shows that broadband users rate the Internet very highly for research, education, online learning and expanding markets. But we are not sure whether broadband has a significantly greater impact on productivity than dialup Internet for all industries.

Can delayed adopters of broadband technology catch up with the early adopters? There is not a definitive answer to this because delays can sometimes, not always, result in gaining access to better technology, lower risks, lower costs and higher levels of efficiency than with early adoption. The low level of downloads and lack of e-commerce transactions suggests that broadband users are not fully exploiting the power of broadband technology. Nevertheless, broadband has now been around for some time and users are gaining experience and being constantly exposed to new broadband technology and applications. Moreover, the firms and councils with larger market shares and on broadband seem to be making more use of it than the smaller users are.

Plans for the adoption of broadband by dialup users depend largely on access and price. Most Australian agricultural dialup users (71 per cent) indicated that they would probably adopt broadband if the price were reduced to less than $30/month**.** Price competition between ADSL providers, reflected in prices falling below $40/month, has resulted in a significant increase in adoption rates, but satellite connections are now more than three times as expensive as ADSL in Australia. The forthcoming HiBIS is expected to reduce costs for broadband in rural, regional and remote areas of Australia, but the 256 kbps threshold for the scheme is increasingly seen as a slow broadband or fast dialup. It may not be enough to provide the experience of genuine broadband (2 Mbps or more) and runs the risk of users returning to dialup after termination of the scheme in three years.

There are no major differences in the broadband policies of government information management agencies in Australia, the USA, the UK and Canada. They all tend to recognise the different circumstances of their own countries and their own rural and remote areas, and they all encourage new broadband technologies.

There is some difference of emphasis on particular instruments, with Canada, for example, providing more assistance in business planning to develop viable broadband business models; the USA encouraging deregulation of spectrum used in less populated areas; and Australia with a more diverse, but smaller set of programs. From a policy landscape perspective Australian broadband users typically face a more dominant market supplier than other countries.

Inefficiencies are ever-present in all highly concentrated markets. There is a gap in Australia between what is termed ‘network readiness’ and the actual adoption of broadband, with the country scoring highly on the readiness index, but at the same time continuing to decline in the ranking of adoptions.

The most important policy in stimulating an increased use of broadband is to encourage technology providers to make innovative broadband technology easy to obtain, and to help the service providers develop robust business models that can be sustained in rural, regional and remote areas. New satellite services or substitutes with higher speed and lower cost (perhaps achieved with more sharing and aggregation of demand) would increase adoption rates in rural, regional and remote areas of Australia. The extension of ADSL/DSL technologies to 80 per cent of Australia will improve access to low-cost

broadband, but there are risks that these price reductions may not reach remote areas with no other option but satellite.

Despite market imperfections the adoption of broadband in Australia and within both agriculture and the local government sectors is expected to grow. Most broadband adopters originate from dialup Internet and the migration from dialup is expected to continue. Based on the survey results of this study an estimated 87.5 per cent of USA agricultural suppliers and 27 per cent of Australian agricultural suppliers will be on broadband by early 2005. For local councils the broadband adoption rate is expected to grow to 85 per cent by early 2005. The adoption rate for people and enterprises in regional, rural and remote Australia would increase significantly if satellite broadband prices were reduced to the levels prevailing in Canada and the US.

Other matters in brief

In terms of applications the use of broadband in e-commerce remains very low in both countries and across sectors, even though there is recognition of the benefits. There is some evidence that expectations of broadband users are not being met with more data-intensive applications. Low speed is again the likely source of the problem. The use of broadband for research, education and online learning is a priority for users and therefore new applications, supported by interoperability, take on added importance.

Australia suffers the disadvantage of low overall population density and one of the lowest rural population percentages in the OECD, which tend to drive up costs.

Ready reckoners on broadband adoption show that the cost of labour and the value of the benefits or the utility of broadband drive the value added by it. Therefore, demonstrations of the benefits and value created by broadband are as important or even more important than nominal costs.

Government policies that encourage innovation and implementation of a diverse range of new and competitive broadband technologies offer the best prospect of reducing costs, increasing speed, removing download limits and improving adoption levels. Subsidies that fail to deliver on any of these measures are likely to have disappointing outcomes in terms of adoption rates and creation of value by users.

Consistent measurement and international comparison of the drivers of broadband adoption — price, access, speed, and value creation, is required for monitoring progress and adjusting policies to overcome performance gaps at industry, regional, remote and local government levels.

Recommendations

1. The survey of broadband adoption by agricultural producers and processors and local councils be repeated in January 2005, with comparable data collected from the USA for the purpose of monitoring international progress and policy development.

2. Surveys of broadband need to collect data on each of the four key variables that drive adoption: access, price, speed and value created by adoption, but to avoid complexity, which can cause measurement and interpretation problems and delays in the release of results.

3. A study (or studies) be undertaken into the efficiency of adopting broadband at the farm production, farm supply and local council level. The interrelationships between broadband and managerial and organisational skills should be examined in this study, especially at the farm supply level. In addition, the impact of specific broadband applications on efficiency should be examined. This research could also be undertaken in both the USA and Australia for comparative purposes.

4. Development of higher-speed and lower-cost broadband satellite services or services than can compete with satellite (e.g. PLC) should be a priority in the interest of improving efficiency and equity across urban, rural, regional and remote areas.

5. Voice over Internet protocol (VoIP) could emerge as an important broadband application in rural, regional and remote areas and help justify relatively high broadband costs through savings in voice

telephony costs, but interoperability standards of VoIP equipment need improvement without compromising the flow of new products operating on wider bandwidths and improved service levels.

6. A broadband training program be introduced for agricultural users to improve skills in exploiting the technology and its growing list of applications.

Appendices

Appendix 1: The survey questionnaire: Australian local government

Note: For publishing convenience, all questionnaires have been reproduced in smaller type

QUOTA n=200		
STATE QUOTAS		
QLD n= 38	WA n= 20	
NSW n= 68	SA n= 16	
VIC n= 50	TAS n= 4	NT n= 4

Good ..... My name is ..... and I'm calling from Marketing & Research Associates, a marketing research company. We are doing a national survey on behalf of the Australian Local Government Association and Wondu Business & Technology Services about the use of the Internet by local councils in Australia. This is not a sales call; we are only interested in your opinions. Can I please speak to the person responsible for the Internet?

Could you please spare 10 minutes or so over the phone to help us? If it is not convenient now, I can call back at a time that is convenient to you.

FIX APPOINTMENT OR CONTINUE

Question A

Can I just check whether you or any of your immediate family work for any of the following?

MULTIPLE MENTION POSSIBLE

READ OUT

	MMP	
1. Internet company	1	TERMINATE
2. IT company	2	
3. Any telecommunications company	3	
4. Advertising agency	4	
5. Market research company	5	
6. Marketing or Management Consultancy	6	
99. None of these (DO NOT READ)	7	CONTINUE

Question 1

What is your council's classification (Australian classification of Local Government Financial Assistance) Act(s)?

MULTIPLE MENTION POSSIBLE

DO NOT READ OUT

	MMP		MMP
Rural Agricultural		Urban Metropolitan	
Rural Agricultural Large (RAL)	1	Urban Metropolitan Large (UDL)	12
Rural Agricultural Medium (RAM)	2	Urban Metropolitan Medium (UDM)	13
Rural Agricultural Small (RAS)	3	Urban Metropolitan Small (UDS)	14
Rural Agricultural Very Large (RAV)	4	Urban Metropolitan Very Large (UDV)	15
Rural Remote		Urban Fringe	
Rural Remote Extra Small (RTX)	5	Urban Fringe Large (UFL)	16
Rural Remote Large (RTL)	6	Urban Fringe Medium (UFM)	17
Rural Remote Medium (RTM)	7	Urban Fringe Small (UFS)	18
Rural Remote Small (RTS)	8	Urban Fringe Very Large (UFV)	19
Rural Significant Growth (RSG)	9	Urban Regional	
Pending		Urban Regional Large (URL)	20
Pending (PEN)	10	Urban Regional Medium (URM)	21
Urban Capital City		Other SPECIFY	22
Urban Capital City	11	Refused	99

Question 2

Was your council connected to the Internet on the 31st of October 2003?

ONE MENTION ONLY

	OMO	
Yes	1	GO TO Q3a
No	2	SKIP TO Q3e

Question 3

IF CODE 1 AT Q2 ASK Q3a

a) What type of Internet connection does your council have?

READ OUT

ONE MENTION ONLY

	OMO	
Broadband (high speed/constant access)	1	SKIP TO Q4
Dialup	2	GO TO Q3b

IF CODE 2 AT Q3a ASK Q3b

b) Do you expect to change to a broadband service in the future?

ONE MENTION ONLY

	OMO	
Yes	1	GO TO Q3c
No	2	SKIP TO Q3d

IF CODE 1 AT Q3b

c) When are you expecting to join a broadband service?

ONE MENTION ONLY

DO NOT READ OUT

	OMO	
Next 6 months	1	GO TO Q3d
Next 12 months	2	
Next 18 months	3	
Don't know	4	

IF CODE 2 AT Q3a

d) Why have you chosen to use a dialup Internet service?

MULTIPLE MENTION POSSIBLE

DO NOT READ OUT

	MMP	
Cheaper	1	SKIP TO Q11a
We were on dialup before broadband existed	2	
We don't use the Internet much	3	
We didn't know that we could access broadband from our location	4	
There is no broadband access at this location	5	
There is only satellite access at this location	6	
Other SPECIFY	7	

IF CODE 2 AT Q2 ASK Q3e

e) How likely would you say it would be for your council to take up Internet services in the future? Would say … …

ONE MENTION ONLY

READ OUT

	OMO	
Very likely	1	GO TO Q3f
Quite likely	2	
Neither likely nor unlikely	3	SKIP TO Q11b
Not very likely	4	
Not at all likely	5	

IF CODES1/2 AT Q3e

f) Would that be dialup Internet or broadband Internet?

ONE MENTION ONLY

	OMO	
Broadband	1	SKIP TO Q11b
Dialup	2	

BROADBAND-ONLY QUESTIONS – Q3a(1) THEN ASK Q4-Q10

Question 4

What type of broadband connection does your council currently have?

ONE MENTION ONLY

DO NOT READ OUT

	OMO
Cable	1
1 way satellite	2
2 way satellite	3
ADSL/DSL (including ISDN)	4
Wireless	5
Optic fibre	6
Other SPECIFY	7
Don't know	98

Question 5

Why has your council selected a broadband Internet service?

DO NOT READ OUT

MULTIPLE MENTION POSSIBLE

	MMP
Speed	1
Reliability	2
Cost	3
Always online	4
Doesn't use the phone line	5
Useful for large data uploads and downloads	6
Something else SPECIFY	7

Question 6

Did your council have a dialup Internet service before you took up broadband?

ONE MENTION ONLY

	OMO
Yes	1
No	2

Question 7

a) What was the total cost of your council's broadband connection over the past 3 months?

USE LEADING ZEROS I.E. $5.00 SHOULD BE 05.00

RECORD 99999 FOR DON'T KNOW OR REFUSED

0	0	0	.	0	0

IF CODE 1 AT Q6

b) How do your broadband costs for the past 3 months compare to your previous dialup service? Was it …

READ OUT

	OMO
Much more expensive	1
A bit more expensive	2
About the same	3
A bit less expensive	4
Or much less expensive	5

Question 8

Was the average volume (MB/month) of data downloaded each month over the past 3 months:

READ OUT

ONE MENTION ONLY

	OMO
Less than 300 Megabytes (MB)	1
300-500 MB	2
500 MB -1GB	3
1-3 GB	4
3-5 GB	5
More than 5 GB	6
Don't know DO NOT READ	98

Question 9

And what was the data download limit per month (over the last 3 months) before you had to pay a higher fee or were cut off:

READ OUT

ONE MENTION ONLY

	OMO
Less than 300 Megabytes (MB)	1
300-500 MB	2
500 MB -1GB	3
1-3 GB	4
3-5 GB	5
More than 5 GB	6
Unlimited download (FOR THOSE WHO TAKE A PREPAID PACKAGE)	7
Don't know DO NOT READ	98

Question 10

Who currently supplies your broadband services?

DO NOT READ OUT

ONE MENTION ONLY

	OMO
Aaardvark Internet	1
AAPT	2
AOL	3
Chariot Internet	4
Comcen Internet Services	5
Connexus	6
Datafast/EfTel	7
Escape Online	8
FLOW	9
Hotkey Internet	10
iiNet	11
Internex	12
Internode	13
IPrimus	14
Netspace	15
OPTUS	16
OzEmail	17
OzForces	18
Pacific Home DSL	19
Spin Internet Services	20
Telstra BigPond	21
TPG	22
Internet Café	23
Other Shared Provider	24
Other SPECIFY	25
Don’t know	98

INTERNET USERS ONLY Q4 (1&2)

Question 11a

Thinking about the council's reasons for using the Internet, to what extent do you agree or disagree with each of the following statements.
READ 'IS THAT STRONGLY AGREE OR JUST AGREE' OR 'IS THAT STRONGLY DISAGREE OR JUST DISAGREE'
ROTATE STATEMENTS

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know
1. E-commerce improves our council's capacity to manage our own business transactions	5	4	3	2	1	98
2. Distribution constraints limit the extent of our council's transactions over the Internet	5	4	3	2	1	98
3. Buying council inputs over the Internet is more convenient than traditional channels.	5	4	3	2	1	98
4. Information about increasingly complex products is difficult and unreliable to provide over the Internet	5	4	3	2	1	98
5. The Internet allows our council to expand the range of services we can offer our stakeholders	5	4	3	2	1	98
6. The Internet is useful for education and training of council staff	5	4	3	2	1	98
7. The Internet is a critical tool for research in our council	5	4	3	2	1	98
8. Council uses the Internet for a number of recreational activities	5	4	3	2	1	98
9.The Internet is quite secure for buying and selling products and services online	5	4	3	2	1	98
10.There is too much unsolicited mail sent over the Internet	5	4	3	2	1	98

NON-INTERNET USERS Q3 (2)

Question 11b

Thinking about your council's attitudes towards using the Internet, to what extent do you agree or disagree with each of the following statements.

READ 'IS THAT STRONGLY AGREE OR JUST AGREE' OR 'IS THAT STRONGLY DISAGREE OR JUST DISAGREE'

ROTATE STATEMENTS

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know
1. E-commerce can improve council's capacity to manage business transactions	5	4	3	2	1	98
2. Distribution constraints limit the extent of council's transactions over the Internet	5	4	3	2	1	98
3. Buying council inputs over the Internet is more convenient than traditional channels.	5	4	3	2	1	98
4. Information about increasingly complex products is difficult and unreliable to provide over the Internet	5	4	3	2	1	98
5. The Internet allows councils to expand the range of services they offer to stakeholders	5	4	3	2	1	98
6. The Internet is useful for education and training of council staff	5	4	3	2	1	98
7. The Internet is a critical tool for research in councils	5	4	3	2	1	98
8. Councils use the Internet for a number of recreational activities	5	4	3	2	1	98
9.The Internet is quite secure for buying and selling products and services online	5	4	3	2	1	98
10.There is too much unsolicited mail sent over the Internet	5	4	3	2	1	98

ASK ALL

Question 12a

Thinking about broadband high-speed connection, to what extent do you agree or disagree with the following statements.

READ 'IS THAT STRONGLY AGREE OR JUST AGREE' OR 'IS THAT STRONGLY DISAGREE OR JUST DISAGREE'

ROTATE STATEMENTS

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know
1. Broadband reduces the time needed to place orders to suppliers	5	4	3	2	1	98
2. Broadband reduces the time needed for customers to place orders	5	4	3	2	1	98
3. Broadband expands the ability to communicate with our stakeholders	5	4	3	2	1	98
4. Broadband expands the ability to communicate with suppliers	5	4	3	2	1	98
5. Broadband is more reliable than Internet dialup	5	4	3	2	1	98
6. Broadband is too expensive to justify for our current council size	5	4	3	2	1	98
7. We need more training on how to make full use of broadband	5	4	3	2	1	98

INTERVIEWER NOTE FOR Q12a(5): If respondent asks what is meant by more reliable — it is the amount of downtime that they experience, anything more than 5% downtime is not considered reliable enough

BROADBAND ONLY Q3a(1)

Question 12b

Thinking about broadband applications, to what extent do you agree or disagree with the following statements.

READ 'IS THAT STRONGLY AGREE OR JUST AGREE' OR 'IS THAT STRONGLY DISAGREE OR JUST DISAGREE'

ROTATE STATEMENTS

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know
1. Broadband enables videoconferencing and webcasting of council meetings and we are using it for this purpose.	5	4	3	2	1	98
2. Broadband enables e-learning and training and we are using it for this purpose.	5	4	3	2	1	98
3. Broadband improves the quality of medicinal and health services offered in our council	5	4	3	2	1	98
4. Broadband has enabled our council to improve efficiency of our online banking, finance and insurance transactions	5	4	3	2	1	98
5. Broadband has improved the capacity of our council to shop online for products and services that we buy.	5	4	3	2	1	98
6. Broadband is enabling our council to offer a wider range of services and to expand our presence beyond the traditional council boundaries	5	4	3	2	1	98
7. Broadband is enabling us to attract new businesses to our council.	5	4	3	2	1	98

DIALUP INTERNET & NON-INTERNET USERS Q2a(2) & Q3a(2)

Question 12c

It doesn't matter if you have no direct experience with broadband, we are interested in your impressions only, to what extent do you agree or disagree that INSERT STATMENT

READ 'IS THAT STRONGLY AGREE OR JUST AGREE' OR 'IS THAT STRONGLY DISAGREE OR JUST DISAGREE'

ROTATE STATEMENTS

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know
1. Broadband enables videoconferencing and webcasting of council meetings	5	4	3	2	1	98
2. Broadband enables e-learning and training	5	4	3	2	1	98
3. Broadband improves the quality of medicinal and health services offered to councils	5	4	3	2	1	98
4. Broadband has enabled councils to improve efficiency of online banking, finance and insurance transactions	5	4	3	2	1	98
5. Broadband has improved the capacity of councils to shop online for products and services	5	4	3	2	1	98
6. Broadband enables councils to offer a wider range of services and to expand their presence beyond the traditional council boundaries	5	4	3	2	1	98
7. Broadband can enable councils to attract new businesses to their council.	5	4	3	2	1	98

IF Q2(2) SKIP TO Q14

Question 13

a) What percentage of your ratepayers (INSERT STATEMENT):

	None	1-5%	6-15%	16-25%	26-100%	Don't know	Refused
1. Communicate with your council by email	1	2	3	4	5	98	99
2. Make payment for council services over the Internet	1	2	3	4	5	98	99

b) And of all communication your council has with your ratepayers. (INSERT STATEMENT):

	None	1-5%	6-15%	16-25%	26-100%	Don't know	Refused
1. What percentage is by email	1	2	3	4	5	98	99

c) And of all the products councils order from suppliers. (INSERT STATEMENT):

	None	1-5%	6-15%	16-25%	26-100%	Don't know	Refused
1. What percentage of orders are placed via the Internet	1	2	3	4	5	98	99

DEMOGRAPHICS

ASK ALL

Question 14

Which of the following revenue brackets represents the gross budget of your council in the last financial year?

READ OUT

ONE MENTION ONLY

	OMO
Less than $2m	1
$2m to under $5m	2
$5m to under $10m	3
$20m to under $40	4
$40m to under $60m	5
$60 million plus	6
Refused DO NOT READ OUT	99

Question 15

How many full time employees work in your council?

ONE MENTION ONLY

	OMO
Less than 20	1
20-50	2
50-100	3
100-500	4
500-1000	5
1000 or more	6
Refused DO NOT READ OUT	99

Question 16

What is your position/area of responsibility within your council?

ONE MENTION ONLY

	OMO
CEO/Owner	1
Chief Information Officer	2
CFO/Controller/Treasurer/Finance	3
Production/Operations/Distribution/Logistics	4
Human Resource Manager	5
Research and Development	6
Other SPECIFY	7

Question 17

What is the highest level of education achieved by you?

ONE MENTION ONLY

	OMO
Not completed Year 12	1
Completed Year 12	2
Completed Undergraduate University studies	3
Completed Postgraduate studies	4
Completed further Trade/Technical education	5
Other SPECIFY	6
Don't know DO NOT READ OUT	98
Refused DO NOT READ OUT	99

DO NOT ASK IF CODE 2 AT Q2

Question 18

a) Does your council have a website?

ONE MENTION ONLY

	OMO	
Yes	1	CONTINUE
No	2	SKIP TO Q19

b) What features are on your website?

MULTIPLE MENTION POSSIBLE

DO NOT READ OUT

	MMP
Technical information about the services you sell	1
Pricing information for the services that you sell	2
Background information about your council	3
A network directory (of businesses in your council)	4
Links to industry trade associations in your council	5
Links to other data/information sources (e.g. universities, research institutes)	6
Online ordering (but traditional means of payment)	7
Online ordering with online payments	8
Online communities (i.e. chat rooms, bulletin rooms, message centres)	9
Areas with customised content to different audiences or individuals	10
A password protected area, only accessible to registered customers ratepayers or suppliers	11
Something else **SPECIFY**	12

Question 19

RECORD GENDER OF THE RESPONDENT (DO NOT ASK)

	OMO
Male	1
Female	2

Question 20

Can you tell me which one of these age brackets you fall into?

ONE MENTION ONLY

READ OUT

	OMO
18-25 years	1
26-30 years	2
31-35 years	3
36-40 years	4
41-45 years	5
46-50 years	6
51-55 years	7
56-60 years	8
61-65 years	9
65+ years	10
Refused **DO NOT READ OUT**	11

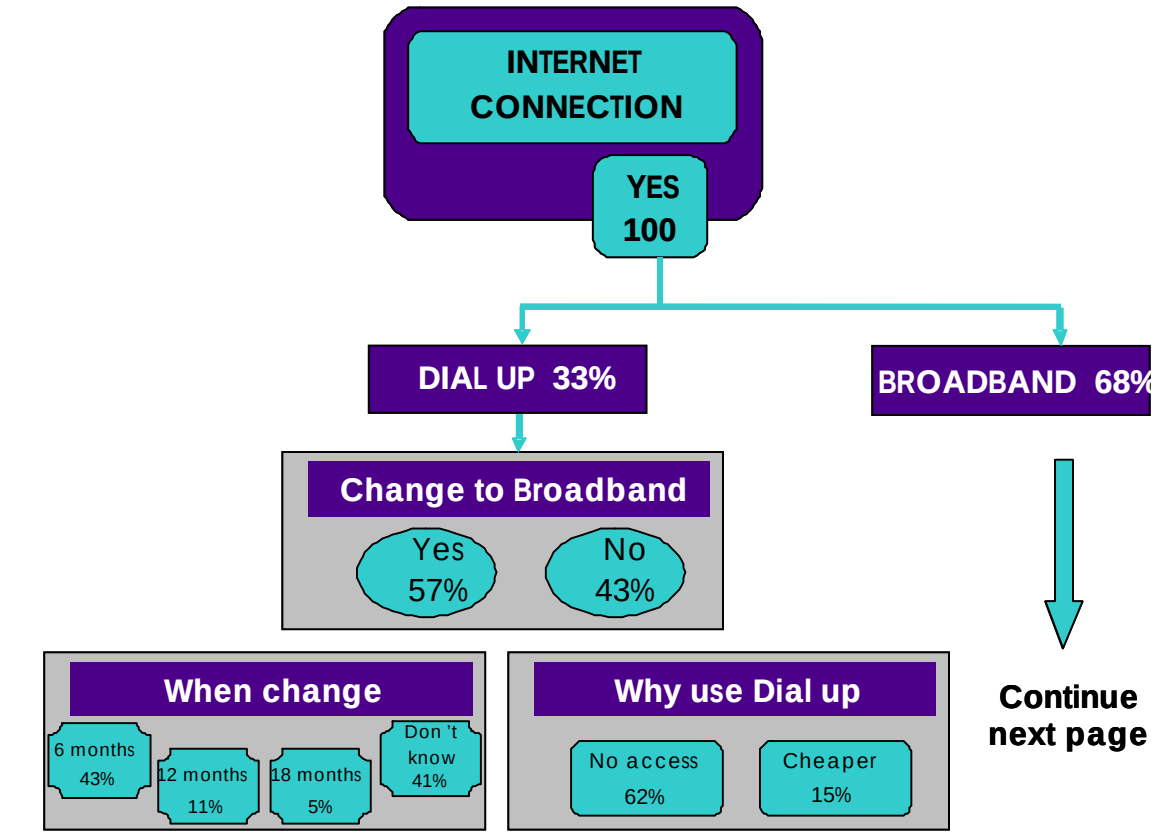
Appendix 2: The survey results: Australian local government

The key objective of the survey was to establish an initial level of broadband adoption among local councils in Australia to identify current levels of adoption and to monitor changes in adoption over time.

A2.1 Research approach

Total number of interviews:	n=200
Interview method:	CATI (computer assisted telephone interviewing)
Sampling method:	Probability Stratified quota sampling
Sample source:	List of all local councils in Australia supplied by Wondu P/L
Quotas:	Based on the sampling method, quotas were placed on following states: NSW 25% QLD 20% WA 21% VIC 11% SA 10% NT 10% TAS 4%

A2.2 Summary flowchart

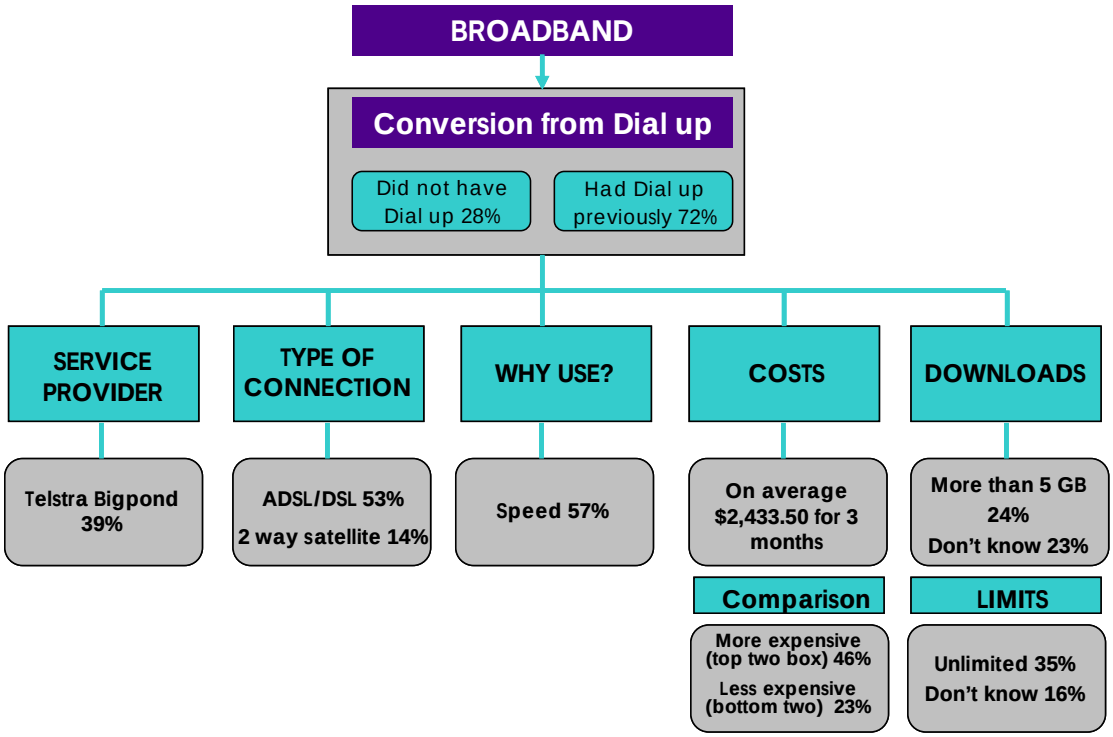


STATEMENTS

Using the Internet general	Broadband advantage	Broadband applications
The Internet is critical tool for research in our Council	Broadband expands the ability to communicate with suppliers	Broadband enables e - learning
The Internet is useful for education and training of Council staff	Broadband expands the ability to communicate with our stakeholders	Broadband has enabled Councils to improve the efficiency of on - line banking, finance and insurance transactions
The Internet allows our Council to expand the range of services we can offer our stakeholders	Broadband reduces the time needed to place orders to suppliers	

Business related use

Ratepayers communicate with your	Your Council communicates with ratepayers/
76% of ratepayers communicate with your Council email at least some of the time	71% of your Council communicates with via email at least some of the time
58% of ratepayers make payment for Council over the Internet at least some of the time	56% of your Council orders products from suppliers the Internet



STATEMENTS

Using the Internet in general	Broadband advantages	Broadband applications
The Internet allows our Council to expand the range of services we can offer our stakeholders	Broadband expands the ability to communicate with suppliers	Broadband is enabling our Council to offer a wider range of services and to expand our presence beyond the traditional Council boundaries
E-commerce improves our Councils capacity to manage our own business transactions	Broadband expands the ability to communicate with our stakeholders	Broadband has improved their capacity of our Councils to shop online for products and services that we buy
Internet is useful for education and training of Council staff	Broadband expands is more reliable than Dial up Internet	

Business related use

Ratepayers communicate with your Council	Your Council communicates with ratepayers/ suppliers
79% of ratepayers communicate with your Council via email at least some of the time	**73% of your Council communicates with ratepayers via email at least some of the time**
55% of ratepayers make payment for Council services over the Internet at least some of the time	**75% of your Council orders products from suppliers over the Internet**

A2.3 Main observations

A2.3.1 General Internet usage

Of the local councils who participated in the survey, all had an Internet connection.

The overall take-up of broadband among local councils was 68%, with large councils (100+ employees) and councils in NSW and Victoria more likely to be on broadband than small councils and councils in other states. For those respondents who had a dialup connection (32%), over 1 in 2 indicated that they would change to broadband in the future, although 2 in 5 of these local councils could not indicate when in the future this would be.

When respondents were asked why they had chosen a broadband Internet connection, almost 6 in 10 (57%) local councils reported their main reason as being 'speed' of the connection.

The map of Australia showing postcodes of broadband and dialup users indicates that a higher proportion of broadband users are located in populated areas. Of the broadband connection types, one in four were a satellite connection, and this roughly coincides with the number of broadband connections that appear in the remote areas of Australia. This further corresponds with the fact that this is often the only technology available in remote regions and that satellite broadband is seen as uncompetitive with other technologies in less remote regions.

A2.3.2 Dialup

Many current dialup users have the intention to switch to broadband in the near future, providing they have access. Those councils choosing to remain with their current dialup connection type are doing so because dialup is seen to cost less.

A2.3.3 Broadband

Many of those who currently have a broadband connection were dialup users previously and the dominant connection type used was an ADSL/DSL connection (53%), followed by two-way satellite (14%).

Among the main reasons for choosing a broadband connection were its improved speed, cost and reliability.

A2.3.4 Dialup versus broadband

The business-related uses of the Internet in terms of communication and transactions with ratepayers and suppliers is relatively similar across the two connection types.

Similarly, Internet usage in general is similar regardless of connection type in that both methods promote research, education and training, and enable the councils to expand their current service delivery options. Broadband was perceived by its users to be a more secure option to use to buy and sell products online when compared to how dialup users felt about the security of dialup.

Both dialup and broadband users acknowledge that broadband improves the communication and efficiency of local councils. As would be expected, dialup users were less familiar with the workings of broadband and felt they would require training to make the best use of this connection type.

Users of both broadband connection types agreed that broadband made it possible for councils to offer a wider range of services allowing for greater efficiency and accessibility to stakeholders. Many, but not all, broadband users felt, however, that this connection type did not promote videoconferencing/webcasting, e-learning and training, or improve the quality of medicinal and health services offered by the councils.

A2.4 Councils with dialup internet

A2.4.1 Conversion to broadband

Over half of those who had a dialup connection (57%) indicated that they would consider switching to

broadband in the future. This change in connection type would for many take place over the next six months (43%) with other councils indicating that they were unsure when the switch would occur (41%). The lack of clarity by some councils over when the switch to broadband would take place is likely to be because they believe it is currently unavailable to them.

A2.4.2 Reason for choosing a dialup Internet connection

Local councils chose a dialup Internet connection for the following reasons:

- broadband unavailable (net: 62%)
- dialup was the only service available
- did not have the access to broadband
- did not know that broadband was available
- the perception that dialup was cheaper than broadband (15%)
- that 'it suits their needs' or 'is best for them' (11%).

Those who intend to change to broadband were more inclined to say their reason for initially choosing a dialup connection was that broadband was not available to them (switchers 65% vs non-switchers 57%). This finding is correlated with the high percentage of switchers who did not know when they were likely to change to broadband.

The predominant reason for dialup users who did not intend to change to broadband was the perception that dialup was cheaper (non-switchers 25% vs switchers 8%).

A2.4.3 Business-related use of the Internet

Local councils indicated that the majority of ratepayers communicated with them via email (78%). While ratepayers are open to using this channel of communication it is in general only used a quarter of the time (1–5% of the time 54%; 6–25% of the time 22%). The same level of communication via email was noted for local councils with ratepayers (71%) and this too occurred a quarter of the time (61%).

More than half of ratepayers are said to make payments for council services over the Internet (58%). The frequency of payments by ratepayers occurs 1–25% of the time (48%).

Over 1 in 2 local councils reported ordering products from suppliers via the Internet and this occurred in general 1–5% of the time (39%).

A2.4.3 Statement assessment by dialup users

(a) Internet usage in general

Local councils were positively inclined to use the internet, as an important tool for research, education and training. The internet also gives councils the opportunity to expand their current service delivery options and allows them to manage their own business transactions.

Unsolicited mail sent over the internet is perceived to be the only major downside to internet usage. Using the Internet for recreational activities does not seem to be encouraged at least from a business perspective.

(b) Broadband associations

While it appears that local councils with dialup connections are unsure of whether broadband is more reliable than their current connection type or how to make full use of broadband, it is clear that broadband is seen to improve their ability to communicate with their suppliers and stakeholders.

(c) Broadband applications

There was strong consensus among dialup-connected local councils that broadband was indeed efficient and that it would make it possible for them to offer a wider range of services making them more accessible.

A2.5 Councils with broadband connection

A2.5.1 Usage before broadband connection

Of the local councils with a broadband connection (67%), the majority were previous dialup users (72%). This trend was particularly true of those councils with fewer than 100 employees.

A2.5.2 Type of connection

The dominant connection type used by local councils was an ADSL/DSL connection (53%). This finding was particularly true for councils located in NSW or in more populated areas. The next most mentioned connection type was a two-way satellite connection (14%). This type of connection was predominantly found in councils in the Northern Territory or those in more remote areas.

A2.5.3 Service provider

Overall, the dominant service provider for local councils was Telstra BigPond (39%).

A2.5.4 Why use broadband ?

Speed was reported as the greatest reason for having a broadband connection (57%) followed by cost (22%), reliability (12%) and uploads/downloads(11%).

A2.5.5 Costs of broadband

On average the total cost of a broadband connection for local councils was $2433.50/quarter or $811.17/month over the three months before the survey.

Just under a third (31%) of local councils were unable (did not know or refused) to state the cost of their broadband connection over the same period.

As would be expected those councils with more employees (>100) spend more on average per month than those councils with fewer employees (<100).

Almost half of the local councils who were previous dialup Internet users (46%) felt that their current connection was more expensive. This sense of broadband being more expensive came in particular from those councils with a higher number of employees (>100). Despite this there were some local councils who believed that their connection cost was about the same (30%).

A2.5.6 Downloads

Comparing usage to download limits reveals that just over a third of local councils have opted for unlimited downloads by means of a prepaid package.

A2.5.7 Business-related use of the Internet

Local councils with a broadband connection indicated that the majority of ratepayers communicated with them via email (79%). While ratepayers are open to using this channel of communication it is in general only used 1–5% of the time (50%). The same level of communication via email was noted for local councils with ratepayers (73%) and this too occurred 1–5% of the time (47%).

More than half of ratepayers are said to make payments for council services over the Internet (55%). The frequency of payments by ratepayers occurs 1–25% of the time (49%).

Three-quarters of local councils reported ordering products from suppliers via the Internet and this occurred in general 1–5% of the time (50%).

A2.5.8 General Internet usage

Local councils were positively inclined to use the Internet as an important tool for research, education and training. The Internet also permits councils to expand their current service delivery options and gives them the opportunity to manage their own business transactions. In addition to this the Internet is seen as a secure and convenient way to buy and sell products online.

Unsolicited mail sent over the Internet is perceived to be the only major downside to Internet usage and recreational internet activities is not seen to be encouraged.

A2.5.9 Broadband associations

Local councils who have a broadband connection agree that their current connection type improves their ability to communicate more efficiently with their suppliers and stakeholders. In addition to this broadband is perceived to be more reliable than dialup and not too expensive. These councils are aware of how broadband works and do not require further training.

A2.5.10 Broadband applications

There was a strong consensus among local councils that broadband was efficient and that it made it possible for them to offer a wider range of services making them more efficient and accessible to stakeholders.

These same councils did not, however, believe that broadband enabled videoconferencing or webcasting, or that it enabled e-learning and training, or that it could improve the quality of medicinal and health services offered by councils.

For all three sets of statement ratings various differences were noted between those councils with fewer than 100 employees and those with more than 100 employees.

Councils with more than 100 employees were more inclined to believe that the Internet expanded council's ability to service their stakeholders through the range of services they could offer via this medium and that it was able to support increasingly complex applications. These larger councils also indicated that the Internet was used for a number of recreational activities.

Larger councils were more at ease with navigating and using broadband and reported that it improved their efficiency and ability to communicate with their stakeholders thereby expanding their presence beyond the traditional council boundaries.

A2.6 Demographics

Over 3 in 10 respondents from local councils completed undergraduate university studies, while a further one in four completed postgraduate studies.

One in four local councils reported a gross annual turnover of $10 million – $40 million.

One in four local councils employed 20–50 fulltime employees, one in five employed 50–100 while almost a third employed 100–500 fulltime employees.

A2.7 Council classification

Of the local councils who participated in this study a higher proportion included a classification under 'Rural Agricultural' (35%), followed by 'Rural Remote' (19%).

A2.8 Postcodes

This map of Australia and the placement of dots representing either a dialup (red colour) or broadband (blue colour) connection are not to scale, neither are the placements of the dots accurate. They are, however, in the general area of the local council's postcode and provide a basic depiction of where in Australia the local councils are located and whether they have a broadband and/or dialup connection.

Broadband and dialup Internet connections appear to be spread fairly evenly over Australia, but there appears to more broadband in the populated areas as would be expected, due to access. The broadband connections appearing in more remote areas are attributed to the one in four satellite connections that are currently being used by local councils.

Appendix 3: The survey questionnaire: Australian agriculture

Introduction …

Question A

Can I just check whether you or any of your immediate family work for any of the following?

MULTIPLE MENTION POSSIBLE

READ OUT

	MMP	
1. Internet company	1	TERMINATE
2. IT company	2	
3. Any telecommunications company	3	
4. Advertising agency	4	
5. Market research company	5	
6. Marketing or management consultancy	6	
99. None of these (DO NOT READ)	7	CONTINUE

Question 1

What are your company's primary business interest(s)? -

MULTIPLE MENTION POSSIBLE

DO NOT READ OUT

Agricultural producers	MMP	Agricultural processors & suppliers	MMP
Crops		Advertising	15
Wheat	1	Animal Health	16
Vegetables	2	Industry Association	17
Fruit & Nuts	3	Agricultural and Veterinary Chemicals	18
Sugarcane	4	Agricultural Consulting	19
Other Crops SPECIFY	5	Crop Equipment	20
Livestock slaughtering and other disposals		Education	21
Cattle and Calves	6	Feed (sheep/cattle livestock grazing)	22
Sheep and Lambs	7	Fertiliser	23
Pigs	8	General Supply	24
Poultry	9	Government Agency	25
Other Livestock SPECIFY	10	Grain Merchandising/Processing	26
Livestock Products		Lending	27
Wool	11	Livestock Equipment	28
Milk	12	Seed	29
Eggs	13	Trade Publications	30
Other Livestock Products SPECIFY	14	Other Media	31
		Other SPECIFY	32
		Refused	99

Question 2

Is your business a single establishment or are you a branch operation of a larger company?

ONE MENTION ONLY

	OMO	
Single establishment	1	
Branch operation	2	

Question 3

IF CODE 1 AT Q2: Was your business connected to the Internet on the 30th of September 2003?

IF CODE 2 AT Q2: Was your business connected to the Internet on the 30th of September 2003 at this location?

ONE MENTION ONLY

	OMO	
Yes	1	GO TO Q4a
No	2	SKIP TO Q4e

Question 4

IF CODE 1 AT Q3 ASK Q4a

a) What type of Internet connection do you have?

READ OUT

ONE MENTION ONLY

	OMO	
Broadband (high-speed/constant access)	1	SKIP TO Q5
Dialup	2	GO TO Q4b

IF CODE 2 AT Q4a ASK Q4b

b) Do you expect to change to a broadband service in the future?

ONE MENTION ONLY

	OMO	
Yes	1	GO TO Q4c
No	2	SKIP TO Q4d

IF CODE 1 AT Q4b

c) When are you expecting to join a broadband service?

ONE MENTION ONLY

DO NOT READ OUT

	OMO	
Next 6 months	1	GO TO Q4d
Next 12 months	2	
Next 18 months	3	
Don't know	4	

IF CODE 2 AT Q4a

d) Why have you chosen to use a dialup Internet service?

MULTIPLE MENTION POSSIBLE

DO NOT READ OUT

	MMP	
Cheaper	1	SKIP TO Q12b
I was on dialup before broadband existed	2	
I don't use the Internet much	3	
Didn't know I could access broadband from my location	4	
There is no broadband access at this location	5	
There is only satellite access at this location	6	
Other SPECIFY	7	

IF CODE 2 AT Q3 ASK Q4e

e) How likely would you say you are to take up Internet services in the future? Would say …
ONE MENTION ONLY
READ OUT

	OMO	
Very likely	1	GO TO Q4f
Quite likely	2	
Neither likely nor unlikely	3	SKIP TO Q12b
Not very likely	4	
Not at all likely	5	

IF CODES1/2 Q4e
f) Would that be dialup Internet or broadband Internet?
ONE MENTION ONLY

	OMO	
Broadband	1	SKIP TO Q12b
Dialup	2	

BROADBAND-ONLY QUESTIONS - Q4a(1) THEN ASK Q5-Q11

Question 5
What type of broadband connection do you currently have?
ONE MENTION ONLY
DO NOT READ OUT

	OMO
Cable	1
1-way satellite	2
2-way satellite	3
ADSL/ DSL (including ISDN)	4
Wireless	5
Optic fibre	6
Other SPECIFY	7
Don’t know	98

Question 6
Why have you selected a broadband Internet service for your business?
DO NOT READ OUT
MULTIPLE MENTION POSSIBLE

	MMP
Speed	1
Reliability	2
Cost	3
Always online	4
Doesn’t use the phone line	5
Useful for large data uploads and downloads	6
Something else SPECIFY	7

Question 7
Did you have a dialup Internet service before you took up broadband?
ONE MENTION ONLY

	OMO
Yes	1
No	2

Question 8

a) What was the total cost of your broadband connection over the past 3 months?

USE LEADING ZEROS I.E. $5.00 SHOULD BE 05.00

RECORD 99999 FOR DON'T KNOW OR REFUSED

0	0	0	.	0	0

IF CODE 1 AT Q7

b) How do your broadband costs for the past 3 months compare to your previous dialup service? Was it …

READ OUT

	OMO
Much more expensive	1
A bit more expensive	2
About the same	3
A bit less expensive	4
Or much less expensive	5

Question 9

Was the average volume (MB/month) of data downloaded each month over the past 3 months:

READ OUT

ONE MENTION ONLY

	OMO
Less than 300 Megabytes (MB)	1
300-500 MB	2
500 MB -1GB	3
1-3 GB	4
3-5 GB	5
More than 5 GB	6
Don't know DO NOT READ	98

Question 10

And what was the data download limit per month (over the last 3 months) before you had to pay a higher fee or were cut off:

READ OUT

ONE MENTION ONLY

	OMO
Less than 300 Megabytes (MB)	1
300-500 MB	2
500 MB -1GB	3
1-3 GB	4
3-5 GB	5
More than 5 GB	6
Unlimited download (FOR THOSE WHO TAKE A PREPAID PACKAGE)	7
Don't know DO NOT READ	98

Question 11

Who currently supplies your broadband services?

DO NOT READ OUT

ONE MENTION ONLY

	OMO
Aaardvark Internet	1
AAPT	2
AOL	3
Chariot Internet	4
Comcen Internet Services	5
Connexus	6
Datafast/EfTel	7
Escape Online	8
FLOW	9
Hotkey Internet	10
iiNet	11
Internex	12
Internode	13
IPrimus	14
Netspace	15
OPTUS	16
OzEmail	17
OzForces	18
Pacific Home DSL	19
Spin Internet Services	20
Telstra BigPond	21
TPG	22
Internet Café	23
Other Shared Provider	24
Other SPECIFY	25
Don’t know	98

INTERNET USERS ONLY Q4 (1&2)

Question12 (a)

Thinking about your reasons for using the Internet, to what extent do you agree or disagree with each of the following statements.
READ 'IS THAT STRONGLY AGREE OR JUST AGREE' OR 'IS THAT STRONGLY DISAGREE OR JUST DISAGREE'
ROTATE STATEMENTS

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know
1. E-commerce improves my company's ability to manage inventory levels	5	4	3	2	1	98
2. Distribution issues limit sale of my industry's products over the Internet	5	4	3	2	1	98
3. Buying over the Internet is more convenient than traditional channels	5	4	3	2	1	98
4. Information about increasingly complex products is difficult and unreliable to provide over the Internet	5	4	3	2	1	98
5. The Internet allows my company to expand into additional markets	5	4	3	2	1	98
6. The Internet is useful for education and training	5	4	3	2	1	98
7. The Internet is a critical tool for research in my business	5	4	3	2	1	98
8.I use the Internet for a number of recreational activities	5	4	3	2	1	98
9.The Internet is quite secure for buying and selling products online	5	4	3	2	1	98
10.There is too much pornographic material on the Internet	5	4	3	2	1	98
13.There is too much unsolicited mail sent over the Internet	5	4	3	2	1	98

NON-INTERNET USERS Q3 (2)

Question 12b

Thinking about your attitude towards using the Internet, to what extent do you agree or disagree with each of the following statements.
READ 'IS THAT STRONGLY AGREE OR JUST AGREE' OR 'IS THAT STRONGLY DISAGREE OR JUST DISAGREE'
ROTATE STATEMENTS

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know
1. E-commerce can improve my company's ability to manage inventory levels	5	4	3	2	1	98
2. Distribution issues might limit sale of my industry's products over the Internet	5	4	3	2	1	98
3 Buying over the Internet can be more convenient than traditional channels.	5	4	3	2	1	98
4. Information about increasingly complex products can be difficult and unreliable to provide over the Internet	5	4	3	2	1	98
5. The Internet allows my company to expand into additional markets	5	4	3	2	1	98
6. The Internet is useful for education and training	5	4	3	2	1	98
7. The Internet can be a critical tool for research in my business	5	4	3	2	1	98
8.The internet can be used only for recreational activities	5	4	3	2	1	98
9.The Internet is quite secure for buying and selling products online	5	4	3	2	1	98
10.There is too much pornographic material on the Internet	5	4	3	2	1	98
13.There is too much unsolicited mail sent over the Internet	5	4	3	2	1	98

ASK ALL

Question 13 (a)

Thinking about broadband high-speed connection, to what extent do you agree or disagree with the following statements.

READ 'IS THAT STRONGLY AGREE OR JUST AGREE' OR 'IS THAT STRONGLY DISAGREE OR JUST DISAGREE'

ROTATE STATEMENTS

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know
1. Broadband reduces the time needed to place orders to suppliers	5	4	3	2	1	98
2. Broadband reduces the time needed for customers to place orders	5	4	3	2	1	98
3. Broadband expands the ability to communicate with customers	5	4	3	2	1	98
4. Broadband expands the ability to communicate with suppliers	5	4	3	2	1	98
5. Broadband is more reliable than Internet dialup	5	4	3	2	1	98
6. Broadband is too expensive to justify for my current business and recreational use	5	4	3	2	1	98
7. If I could access broadband for say $30/month or less then I would probably join up.	5	4	3	2	1	98
8. I need more training in how to make full use of broadband	5	4	3	2	1	98

INTERVIEWER NOTE FOR Q13a(5): If respondent asks what is meant by more reliable — it is the amount of downtime that they experience, anything more than 5% downtime is not considered reliable enough

BROADBAND ONLY Q4a(1)

Question 13 (b)

Thinking about broadband applications, to what extent do you agree or disagree with the following statements.

READ 'IS THAT STRONGLY AGREE OR JUST AGREE' OR 'IS THAT STRONGLY DISAGREE OR JUST DISAGREE'

ROTATE STATEMENTS

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know
1. Broadband enables videoconferencing and we are using it for this purpose	5	4	3	2	1	98
2. Broadband enables e-learning and training and we are using it for this purpose	5	4	3	2	1	98
3. Broadband improves access to medicinal and health services	5	4	3	2	1	98
4. Broadband has enabled us to do more online banking, finance and insurance transactions	5	4	3	2	1	98
5. Broadband has improved our capacity to shop online for products and services that we buy	5	4	3	2	1	98
6. Broadband is enabling us to develop new businesses and to expand our presence beyond the traditional scope	5	4	3	2	1	98
7. Broadband is enabling us to take advantage of new technology like global positioning satellite tracking	5	4	3	2	1	98
8. Broadband provides access to new entertainment and leisure services	5	4	3	2	1	98

DIALUP INTERNET & NON-INTERNET USERS Q3a(2) & Q4a(2)

Question 13 (c)

It doesn't matter if you have no direct experience with broadband, we are interested in your impressions only, to what extent do you agree or disagree that INSERT STATMENT

READ 'IS THAT STRONGLY AGREE OR JUST AGREE' OR 'IS THAT STRONGLY DISAGREE OR JUST DISAGREE'

ROTATE STATEMENTS

	Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree	Don't know
1. Broadband enables videoconferencing	5	4	3	2	1	98
2. Broadband enables e-learning and training	5	4	3	2	1	98
3. Broadband improves access to medicinal and health services	5	4	3	2	1	98
4. Broadband enables access to more online banking, finance and insurance transactions	5	4	3	2	1	98
5. Broadband improves capacity to shop online for products and services	5	4	3	2	1	98
6. Broadband enables development of new businesses and expansion of business presence beyond the traditional scope	5	4	3	2	1	98
7. Broadband enables businesses to take advantage of new technology like global positioning satellite tracking	5	4	3	2	1	98
8. Broadband provides access to new entertainment and leisure services	5	4	3	2	1	98

IF Q3(2) SKIP TO Q15

Question 14

a) What percentage of your customers (INSERT STATEMENT):

	None	1-5%	6-15%	16-25%	26-100%	Don't know	Refused
1. Communicate with your company by email	1	2	3	4	5	98	99
2. Place orders for products over the Internet (but still make payment by mail or traditional means)	1	2	3	4	5	98	99
3. Place orders and make payment for products over the Internet	1	2	3	4	5	98	99

b) And what percentage of your company (INSERT STATEMENT):

	None	1-5%	6-15%	16-25%	26-100%	Don't know	Refused
1. Communicates with your suppliers by email	1	2	3	4	5	98	99
2. Place orders for products over the Internet with your suppliers (but still make payment by mail or traditional means)	1	2	3	4	5	98	99
3. Place orders for products and make payment over the Internet with your suppliers	1	2	3	4	5	98	99

DEMOGRAPHICS

ASK ALL

Question 15

Which of the following revenue brackets represents the gross annual sales of your business?

READ OUT

ONE MENTION ONLY

	OMO
Less than $100,000	1
$100,000 to $500,000	2
$500,000 to 1 million	3
$2 million to $5 million	4
$6 million - $10 million	5
$11 million - $20 million	6
$20 million plus	7
Refused	99

Question 16

And what percentage of the sales at your location is accounted for by the agriculture sector?

READ OUT

ONE MENTION ONLY

	OMO
None	1
1 – 5%	2
6 – 15%	3
16 – 25%	4
26 – 100%	5
Don’t know	98
Refused	99

Question 17

How many full time employees work in your business?

READ OUT

ONE MENTION ONLY

	OMO
1-2	1
3-5	2
6-9	3
10-20	4
20+	5
Refused	99

Question 18

What is your position/area of responsibility within your company?

ONE MENTION ONLY

	OMO
CEO/Owner	1
General manager/Division president	2
CFO/Controller/Treasurer/Finance	3
Marketing (Manager, Director, Product)	4
Sales/Sales Management	5
Production/Operations/Distribution/Logistics	6
Human Resource Manager	7
Research and Development	8
Other SPECIFY	9

Question 19

What is the highest level of education achieved by you?

ONE MENTION ONLY

	OMO
Not completed Year 12	1
Completed Year 12	2
Completed undergraduate university studies	3
Completed postgraduate studies	4
Completed further trade/technical education	5
Other SPECIFY	6
Don’t know	98
Refused	99

DO NOT ASK IF CODE 2 AT Q3

Question 20

a) Does your firm have a website?

ONE MENTION ONLY

	OMO	
Yes	1	CONTINUE
No	2	SKIP TO Q21

b) What features are on your website?

MULTIPLE MENTION POSSIBLE

DO NOT READ OUT

	MMP
Technical information about the products you sell	1
Pricing information for the products that you sell	2
Background information about your company	3
A dealer directory (information on where your products are sold)	4
Links to industry trade associations	5
Links to other data/information sources (e.g. universities, unions)	6
Online ordering (but traditional means of payment)	7
Online ordering with secure credit card or direct debit payment	8
Online communities (i.e. chat rooms, bulletin rooms, message centres)	9
Areas with customised content to different audiences or individuals	10
A password protected area, only accessible to registered customers or suppliers	11
Something else SPECIFY	12

Question 21

RECORD GENDER OF THE RESPONDENT (DO NOT ASK)

	OMO
Male	1
Female	2

Question 22

Can you tell me which one of these age brackets you fall into?

ONE MENTION ONLY

READ OUT

	OMO
18-25 years	1
26-30 years	2
31-35 years	3
36-40 years	4
41-45 years	5
46-50 years	6
51-55 years	7
56-60 years	8
61-65 years	9
65+ years	10

Thank you, just to remind you, my names is ……calling from MRA, if you have any questions about this research please do not hesitate to contact our office on (02) 9966 4811

RECORD RESPONDENT'S DETAILS FROM LIST:

Mr/Mrs/Miss/Ms: _____

POSTCODE: _____ (INTERVIEWER: RECORD)

PHONE NO: _____

Thank you very much for your time. Just to remind you my name is (....) from MRA. If you have any questions about this research you can telephone our office on (02) 9966 4911.

_____

I DECLARE THAT THIS INTERVIEW HAS BEEN CARRIED OUT BY ME ACCORDING TO THE ICC/ESOMAR INTERNATIONAL CODE.

NAME DATE _____

SIGNED INTERVIEWER NO._____

Appendix 4: Detailed survey results: agricultural sector

This section describes in detail the results of the survey, which was undertaken by MRA.

A4.1 Background

A consortium of organisations sponsored a study with the aim of understanding the adoption levels of broadband among agricultural sectors in Australia and the USA. The consortium included:

The Rural Industries Research and Development Corp. (Aust.)

The National Office of the Information Economy (Aust.)

The Australian Local Government Association (Aust.)

The Center for the Study of Rural America (CSRA) at the Kansas City Reserve Bank, Kansas (USA).

The information is expected to be of use to:

- on-farm managers
- farm suppliers
- policy developers at all levels of government
- industry developers.

MRA, on behalf of Wondu Business and Technology Services (Sydney), was responsible for:

- localising the questionnaire instruments for Australia
- administration of fieldwork i.e. distributing the survey among a nationally representative sample of agricultural goods and services suppliers
- data analysis and reporting of the Australia findings.

The detailed findings of the initial benchmarking survey are contained within this document.

A4.2 Survey objective

The key objective of the survey was to establish an initial level of broadband adoption in the agricultural sector in Australia in order to measure future changes.

A4.3 Research approach

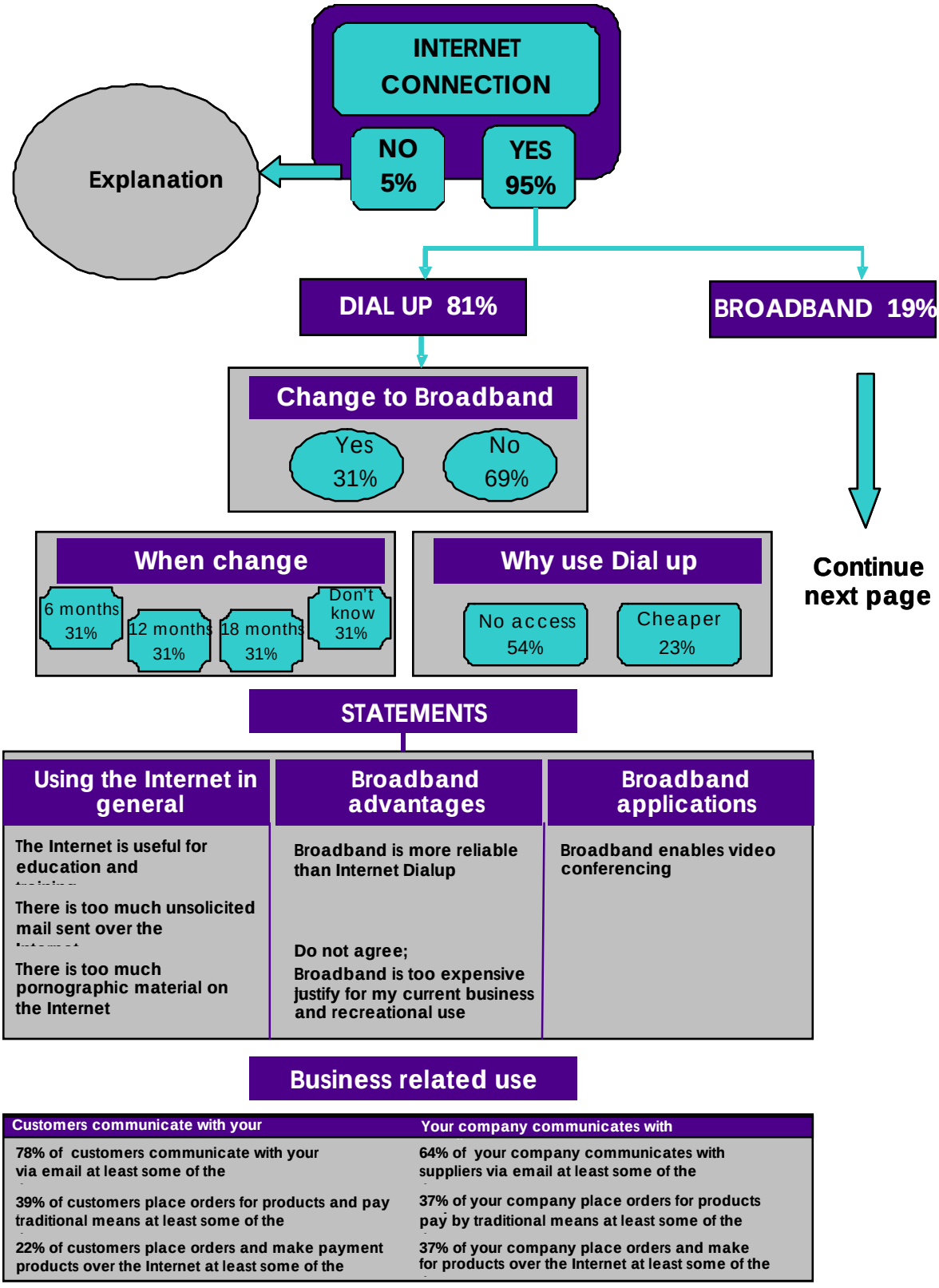
Total number of Interviews:	352	250 agricultural producers 102 agricultural suppliers and producers
Interview method:	CATI (computer assisted telephone interviewing)	
Sampling method:	Non-probability non-proportional Quota sampling	
Sample source:	Oz on Disc: agricultural producers List Bank: agricultural suppliers and producers	
Quotas:	Based on the sampling method, quotas were placed on the following: Agricultural suppliers and producers vs agricultural producers (28%:72%) State quotas were split according to the distribution of agricultural enterprises across Australia. NSW 30% VIC 25% QLD 21% SA 11% WA 9.5% TAS/NT/ACT 3.5%	

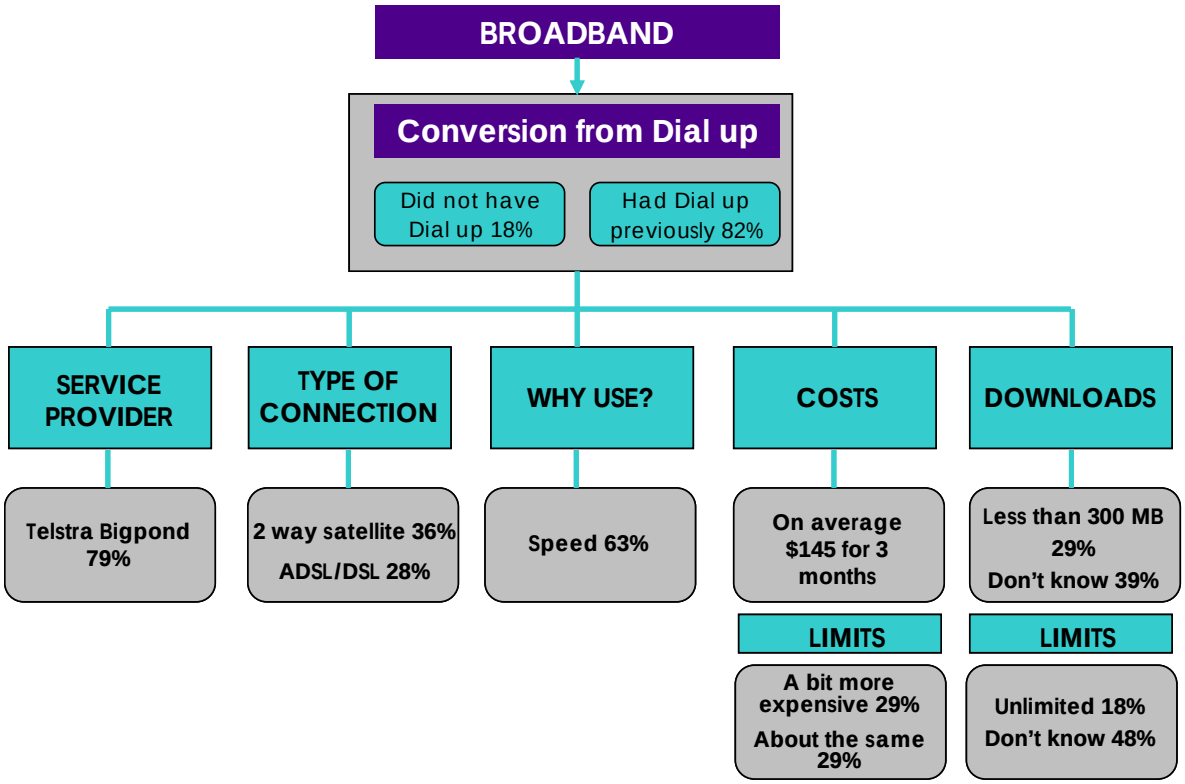
The number of interviews achieved by state did not match the above distribution. To correct the distribution, weights were applied to the data to ensure correct state representation across agricultural enterprises.

Questionnaire length: 10 minutes

Fieldwork period: November 23 to January 4

A4.4 Summary flow chart: all respondents





STATEMENTS

Using the Internet in general	Broadband advantages	Broadband applications
The Internet is useful for education and training	High percentages of 'don't know' indicating the need for education	High percentages of 'don't know' indicating the need for education
There is too much unsolicited mail sent over the Internet	Broadband is too expensive to justify for my current business and recreational use	Broadband enables video conferencing
There is too much pornographic material on the Internet		

Business related use

Customers communicate with your company	Your company communicates with suppliers
83% of customers communicate with your company via email at least some of the time	93% of your company communicates with your suppliers via email at least some of the time
37% of customers place orders for products and pay by traditional means at least some of the time	58% of your company place orders for products and pay by traditional means at least some of the time
42% of customers place orders and make payment for products over the Internet at least some of the time	62% of your company place orders and make payment for products over the Internet at least some of the time

A

4.5 Survey summary

A4.5.1 General Internet usage

The overall take-up of broadband among the Agricultural enterprises interviewed was 19 per cent. There was no difference found in the take-up of broadband within the agricultural sector between the supplier/processor subsector (18 per cent) and producer subsector (19 per cent).

For respondents with dialup connections (81 per cent), almost a third indicated that they would change to broadband in the future. Of these more were from the supplier/processor subsector than from the producer sector (39 per cent vs 26 per cent).

When respondents were asked why they had chosen a broadband Internet connection, 3 in 5 respondents (63 per cent) reported their reason as being ‘speed’ of the connection.

The map of Australia with postcodes of broadband and dialup users indicates that a higher proportion of broadband users are located in remote regions. This complements the finding that more broadband users were inclined to have a two-way satellite (36 per cent) as this is the only technology available in remote regions.

A4.5.2 Responses of dialup users

Of the agricultural enterprises with a dialup connection, 3 in 10 expect to change to Broadband in the future. Those from the supplier/processor subsector were more likely to change than those from the producer subsector (39 per cent vs 26 per cent).

The key reason agricultural enterprises had a dialup connection was the perception that broadband was not available to them.

The predominant reason for Internet use across the agricultural sector is communication, with around 8 in 10 agricultural enterprises communicating with their customers via email and 6 in 10 using email to communicate with their suppliers.

The statement assessment by dialup users demonstrated awareness of the advantages of the Internet for education and training purposes, as well as being critical for research in their business. However, it is evident that dialup users are unaware of the benefits that a broadband connection could bring to their company, with the perception that broadband is too expensive to justify for their business needs. Education and training aimed at these Internet users would be very useful for the uptake of a broadband connection.

A4.5.3 Responses of broadband users

Of those enterprises with a broadband connection, 8 in 10 had a dialup connection previously. No relationship could be found with the size or type of agricultural enterprises and previous dialup experience.

The dominant service provider for enterprises with broadband was Telstra BigPond. With the main type of Internet connection by agricultural enterprises being a satellite connection, this coincides with Telstra being the main provider of satellite broadband in Australia.

The average cost of a broadband connection was $48.45 per month.

As with agricultural enterprises using dialup, the measurement of Internet use revealed ‘communication’ as the main reason for Internet use among broadband users. In this instance the measurement of business transaction use proved to be higher among broadband users compared to dialup users.

Broadband users as compared to dialup users have a greater awareness of the advantages of Internet use. For them, cost of connection was not an issue. Further to this, more than half of broadband users indicated that they did not require further training in how to make full use of broadband. From the divided levels of agreements, however, it is apparent that it would still be useful for agricultural enterprises to receive further training on how to make optimal use of broadband.

A. 4.6 Main findings

A4.6.1 Internet connectivity

Of those who participated in the survey, 95 per cent had Internet connectivity and 5 per cent did not. This indicates a high percentage of Internet penetration among agricultural enterprises.

One of the aims of the project was to provide some insight into the enterprises that did not have access to the Internet. Unfortunately, only 17 respondents fell into that category, so further analysis was not possible without compromising the level of significance. It is interesting to note, however, that of the enterprises that refused to participate (1490), 43 per cent did not have an Internet connection.

A4.6.2 Internet connection type

The majority of agricultural enterprises interviewed in this study had a dialup Internet connection (81 per cent).

There were no differences found within the subsectors: agricultural supplier/processor compared to agricultural producer. However it was found that agricultural enterprises with three or more employees were more likely to have a broadband Internet connection. This would seem to imply that the size of the business influences the take-up of broadband Internet by agricultural enterprises.

A4.7 Detailed views of dialup Internet users

A4.7.1 Conversion to broadband

Three in ten agricultural enterprises with dialup Internet indicated that they would change to a broadband. Those who said they would change were more likely to have three or more full-time employees and be from the supplier/processors subsector.

As can be seen in the following chart, a high proportion (48 per cent) of agricultural dialup users do not know when they expect to change to broadband. No differences were found in company size or sector, suggesting that the reasons for staying with a dialup connection i.e. ‘cost and access’ are also impacting on the conversion from dialup to broadband.

A4.7.2 Reason for choosing and staying with a dialup Internet connection

One in two agricultural enterprises with dialup Internet reported that they chose dialup as there was no access to broadband or that broadband was unavailable to them. Dialup users also believe dialup Internet connectivity is cheaper.

Looking at dialup users who were considering switching to broadband, the reasons remained much the same as those not switching, except that cost is less of a concern. Dialup users who do not intend to change to broadband indicated that the reason was more to do with cost (28 per cent (no change) vs 11 per cent (planning to change)). Furthermore, those who did not intend to change to broadband claimed that they did not use the Internet much (14 per cent (no change) vs 4 per cent (planning to change)).

A4.7.3 Business-related use of the Internet by dialup users

The main use of the Internet by agricultural enterprises with dialup is for communication. This was found to be more prevalent for communication with customers than with suppliers (78 per cent vs 64 per cent). It was also found that agricultural enterprises in the supplier/processor subsector used the Internet for communication more than those in the producer sector (88 per cent vs 73 per cent) did.

The use of the Internet for E-commerce, such as placing orders for products over the Internet by customers of agricultural enterprises, is relatively low, with around one in four doing so. E-commerce activity with suppliers was higher, with 2 in 5 dialup users in this activity.

A4.7.4 Statement agreement assessment

a) Internet usage in general

Agricultural enterprises with dialup appear to be evenly divided in their level of agreement with several statements presented to them in the survey. There was, however, a high proportion of

agreement with the statement ‘the Internet is useful for education and training’ (93 per cent) and further it was agreed that ‘the Internet is a critical tool for research in their businesses’ (65 per cent). There were no further significant differences found based on company size or agricultural subsector.

Even though these results appear to be divided, it should be kept in mind that we cannot be certain whether the respondents are disagreeing with the statement because they actually disagree, or because they do not use the Internet for these purposes. Education about how businesses can use the Internet to enhance competencies should be kept in mind.

b) Opinions by dialup users on broadband Associations

With more broadband specific statements, it was clear that a high proportion of agricultural enterprises with dialup could not say whether they agreed or did not agree with some statements about the attributes of broadband.

This implies a ignorance of the benefits of broadband connectivity among dialup users, suggesting a need for education about the benefits i.e. reliability, speed and communication, in turn further encouraging the take-up of broadband connections among agricultural enterprises. This was highlighted by agreement with the statement ‘I need more training in how to make full use of broadband’ (59 per cent).

To further emphasise the barrier of cost for dialup users, there was general agreement that ‘if I could access broadband for say $30 per month or less then I would probably join up’ (71 per cent) and disagreement with ‘broadband is *not* too expensive to justify for my current business and recreational use’ (57 per cent).

There was a high level of agreement among dialup users with the statements listed below, although this was found more among agricultural enterprises with three or more full-time employees and those from the supplier/processor subsector. This seems to point to a higher level of awareness of the benefits of broadband within larger companies:

‘Broadband enables e-learning’ (60 per cent).

‘Broadband improves capacity to shop online for products and services’ (54 per cent).

‘Broadband enables videoconferencing’ (53 per cent).

‘Broadband enables businesses to take advantage of new technology like global positioning satellite tracking’ (52 per cent).

‘Broadband provides access to new entertainment and leisure services’ (50 per cent).

A4.8 Detailed features of broadband users

A4.8.1 Usage before broadband connection

Of the respondents with a broadband connection, four in five had converted from dialup.

A4.8.2 Internet service providers for broadband users

For broadband users, the overwhelmingly dominant service provider was Telstra BigPond, with four in five respondents using it. One possible reason for such a large proportion of broadband users having Telstra BigPond as their supplier is that one in three have a two-way satellite connection, and Telstra is the main provider of satellite broadband in Australia.

A4.8.3 Broadband technology used by broadband users

The two main types of connections used by respondents were two-way satellite (36 per cent) and ADSL/DSL (28 per cent), with these two technologies accounting for two in three broadband connections.

Agricultural enterprises from the producer subsector were more likely than suppliers to have a two-way satellite connection (50 per cent vs 6 per cent), with geographical location possibly a driving factor in connection type. Producers are likely to be located in more remote areas than suppliers, often

limiting their broadband connection options to satellite rather than cable or ADSL.

In contrast suppliers are more likely to be located in less remote areas than producers, thus a higher proportion of suppliers compared to producers have access to ADSL/DSL (56 per cent vs 15 per cent).

A4.8.4 Why broadband users adopted broadband

Overall, three in five respondents with broadband reported their main reason for using broadband as 'speed/dialup was slow' (63 per cent). This reason was mentioned more often than any other.

Producers were more likely than suppliers to state their reason for having a broadband connection as being the only option available (24 per cent vs 0 per cent). The reason for this is that producers are generally located in more rural/remote areas than suppliers, and are, therefore, limited in their ability to take up a dialup connection.

A4.8.5 Broadband users' view on costs

On average, the total cost of broadband for agricultural enterprises over the three months before the survey was $145.30, or $48.45 per month.

Just over one in four agricultural enterprises were unable to state the cost of their broadband connection over the three months.

For respondents who had dialup before their broadband connection (82 per cent), 47 per cent indicated that the cost for this type of connection was more expensive (29 per cent 'a bit more', and 18 per cent 'much more'). Almost 3 in 10 felt that the cost was about the same as they paid previously for dialup.

A4.8.6 Broadband users and downloads

Three in ten broadband users indicated that their average download for the month was less than 300 Mb, while two in ten respondents reported their average download to be 300–500 Mb. Four in ten respondents did not know their monthly download.

Almost one in two respondents did not know what their download limit was. Of those who did know, around one in five indicated that they were on an unlimited download package.

On the whole, suppliers reported a slightly higher level of data download each month compared to producers.

A4.8.7 Business-related use of the internet by broadband users

As with dialup users, the main use of the Internet by broadband users is for communication, with 8 in 10 respondents using it for this reason. All those who said that they did not communicate with their customers at all were from the producer sector. Producers clearly are not using the Internet to communicate with their customers as actively as those in the supplier/processor sector.

The use of the Internet for business transactions such as placing orders for products was higher for those with broadband. Again, respondents who mentioned that they did not place orders over the Internet were more likely to be from the producer sector than the supplier/processor sector.

A4.8.8 Broadband users' agreement with statements

a) General Internet usage

As with dialup users, those who have broadband have a high level of agreement that 'the Internet is useful for education and training' (94 per cent) and that 'the Internet is a critical tool for research in their business' (77 per cent). There appears to be room for more education on the benefits that the Internet can have on business.

Again these results should be interpreted with care, keeping in mind that we cannot be certain whether the respondents are disagreeing with the statement because they actually disagree or because they do not use the Internet for these purposes.

b) Broadband users' views on broadband associations

In terms of statements relating specifically to broadband, existing broadband users had, not

surprisingly, much less trouble rating these statements than those with dialup. This would imply that agricultural enterprises with broadband have a better understanding of broadband's benefits than do those without.

In contrast to dialup users, broadband users do not feel that it is too expensive to justify for their needs; this was noted more among the supplier/processor subsector than the producer subsector.

c) Broadband users' views on broadband applications

Direct comparisons of the quoted statements between dialup users and broadband users were not possible. Even though the statements were basically the same, broadband users were asked more specifically about their level of agreement with statements such as: 'Broadband enables videoconferencing *and we are using it for this purpose*' while dialup users were asked about their level of agreement more generally, as 'Broadband enables videoconferencing'.

This being said, it is interesting to note that the only obvious difference between the two user groups can be seen by a higher response of 'don't know' for dialup users and a higher response of 'disagree' among broadband users. This ties in with the possibility that the disagreement is because the respondent does not use the broadband connection for these applications, as noted previously in this report.

Overall it can be seen that there is a good level of agreement that broadband enables improved access to services on the Internet. This was more so for those in the agricultural supplier/processor sector than in the producer sector.

A4.9 Demographics of all respondents: broadband and dialup

- One in two (48 per cent) of agricultural enterprise respondents interviewed reported that they were the CEO/Owner of the company.
- Education levels were fairly evenly distributed. Around one in five participants had not completed Year 12, with similar proportions having completed Year 12 and undergraduate university studies.
- Two in five (43 per cent) agricultural enterprises reported a gross annual turnover of $100 000 to $500 000.
- Nine in ten agricultural enterprises reported that 26–100 per cent of their sales were in the agricultural sector.
- Three in five (63 per cent) of agricultural enterprises employed 1–2 full time employees.

A4.10 Respondents' primary business interest

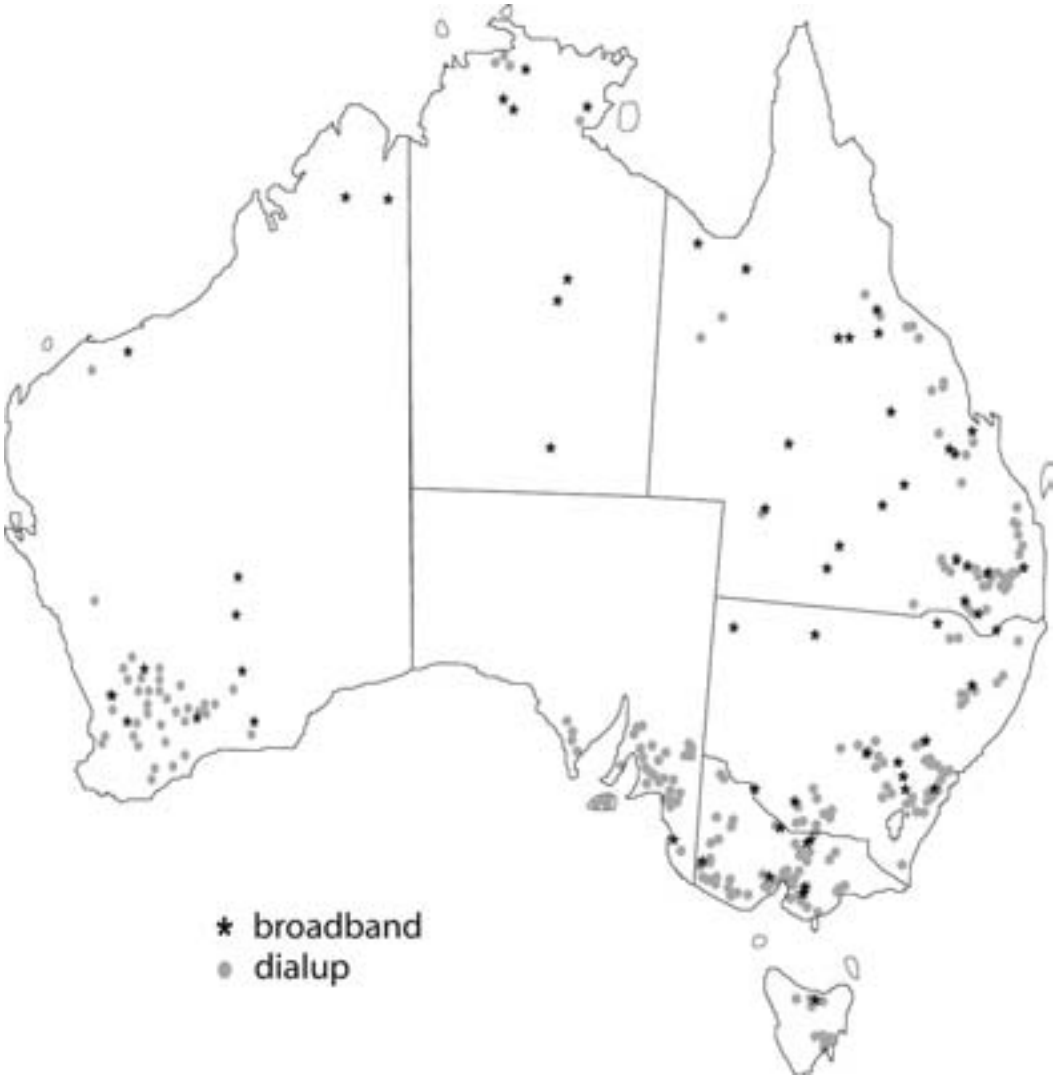
The top three primary business interests for agricultural producers were that of 'cattle and calves', 'sheep and lambs' and 'wheat'. The main primary business interest for agricultural suppliers is 'agricultural consulting'.

A4.11. Respondents' geographic locations

The following map of Australia and the placement of dots representing either a dialup (red colour) or broadband (blue colour) connection are not to scale, nor are the placements of the dots accurate. They are, however, in the general area of the respondent's postcode and provide a basic depiction of where in Australia the respondents are and whether they have a broadband and or dialup connection.

These results are interesting when looking at the main reasons for respondents to chose a dialup connection. These were 'no broadband access' (53 per cent) and 'cheaper' (23 per cent). The use of broadband appears to be more common in the more densely populated areas, while dialup seems to be grouping in the less populated areas. These results further explain the dominant technology of two-way satellite use (36 per cent), which is the only option available to remote areas.

A general impression of where the questionnaire's respondents are



Appendix 5: Broadband adoption by US agricultural input firms

This part of the report is a verbatim reproduction of the paper delivered by Jason Henderson at the Center for the Study of Rural America. The views expressed in this appendix are those of the author and do not necessarily reflect the views of the Federal Reserve Bank of Kansas City or the Federal Reserve System. All dollar amounts in this appendix are in US dollars.

A survey of broadband adoption by USA agricultural input firms took place during February and March 2003. Questionnaires were successfully sent by fax or email, when available, to 2388 agricultural input firms.[9] A total of 199 questionnaires were returned. However, 34 respondents failed to fully complete the survey and were dropped from the final response list leaving 165 observations for a 7 per cent response rate.[10]

Respondents held a variety of positions in their companies. Twenty per cent of the respondents were a president, CEO, or owner of their firm. Another 20 per cent were a vice president/general manager, or division president in their company. An additional 20 per cent were in sales or sales management. Marketing personnel accounted for 19 per cent of the respondents. Additional respondents were responsible for research, human resources, finance, production, operations, or logistics.

A majority of the respondents indicated doing business in the crop sector. Almost 80 per cent indicated involvement in the crop industry (crop equipment, seed, chemicals, fertiliser, grain merchandising and processing). Over a fourth of the respondents indicated involvement in the livestock industry (animal health, feed, livestock equipment).

Respondents represented a broad cross-section of the agribusiness distribution channel. Almost a third of the respondents were employed in agribusiness manufacturing firms and a quarter were dealers. Distributors accounted for 10 per cent of the respondents. More than 16 per cent of the respondents indicated servicing multiple roles in the distribution channel (manufacturer, distributor, and dealer).

Over half of the respondents were employed in private firms. A quarter of the respondents were employed in cooperatives. Twenty per cent of the respondents were employed in publicly held firms.

Over half of the respondents (52 per cent) worked in branch locations. The other 48 per cent worked in single establishment firms. The distribution of responses from branch locations and single establishment firms appears to have contributed to a bi-model distribution of firms according to sales. Roughly 29 per cent of the respondents reported firm sales less than $10 million with another 16.4 per cent with firm sales between $10 and $49 million. Most of these respondents, (71 per cent) were single establishment firms. At the other extreme, 20 per cent of the respondents reported firm sales over $1 billion dollars with another 18.2 per cent with firm sales between $100 and $999 million. Most of these firms (70 per cent) were branch establishments.

The respondents reported a broad scope for the establishment's distribution of products or services. Over a third of the respondents indicated that the establishment operated in international markets. Another 37 per cent indicated the establishment operated in a national or multi-state market. A quarter of the respondents indicated that the establishment operated in state or local markets.

Almost 90 per cent of the respondents reported their firm having a website. Most of the respondents used the website to provide background information about their business. Technical information was provided by 73 per cent of the respondents. Only a fourth of the respondents provided pricing information on their websites.

A5.1 Adoption of broadband

Agricultural input firms in the USA have extensive access to the Internet and mainly through

[9] 477 surveys faxed or emailed did not arrive successfully.

[10] Contact information was drawn from an agricultural firm database compiled by the Center for Food and Agricultural Business at Purdue University.

broadband connections. Almost all of the respondents (97 per cent) reported having an Internet connection. Some 84 per cent of them used a broadband connection to connect to the Internet, with 16 per cent using a dialup connection.

Dialup users indicate that lack of broadband access is a primary reason for dialup use. Forty per cent of dialup users indicated that lack of broadband access at their location was the reason for using dialup. Another 28 per cent reported using dialup because they subscribed to dialup service before broadband was available. Only sixteen per cent stated that the cheaper cost of dialup service motivated the company to use a dialup Internet connection. Roughly half of the dialup users indicated that they were likely to switch to broadband service, with 75 per cent of them likely to switch in the next year.

A5.2 Broadband technology in the USA

A diverse set of broadband technology is being used by USA agricultural inputs firms. More than a third of the broadband users use DSL/ADSL technology to connect to the Internet. Another 17 per cent use cable technology and 14 per cent use wireless technology. Fewer agricultural input firms use optic fibre (6.5 per cent) and satellite (4.0) technology to connect to the Internet.

The cost of broadband service is somewhat more expensive relative to dialup connections. More than 80 per cent of broadband users had Internet service before switching to broadband. Almost half (46 per cent) of the broadband users indicated that broadband service was a bit more expensive than their previous service. Another 37 per cent indicated that broadband service was much more expensive than their previous service.

Half of the respondents reported that the average monthly cost of broadband was less than $50 per month. More than 17 per cent spent between $50 and $100 per month on broadband connections. Thirteen per cent spent between $100 and $200 per month, while 17 per cent spent more than $200 dollars per month.

A5.3 Use of Internet and e-commerce

Most Internet users indicated that they communicate with their customers and suppliers by email, with 93 per cent of Internet users communicating with some of their customers and 97 per cent communicating with some of their suppliers by email. However, the intensity of communications is more limited. Only a quarter of the respondents reported communicating with more than 25 per cent of their customers by email. Roughly half of the respondents communicate with more than 25 per cent of their suppliers by email.

Few agricultural input firms use the Internet to either receive orders or place orders. Respondents indicated they were more likely to place orders to suppliers than to receive order from customers over the Internet. While 85 per cent of Internet-using firms reported placing orders to suppliers over the Internet, only 17 per cent reported placing orders over the Internet to more than 25 per cent of their suppliers. Roughly half (53 per cent) of Internet-using firms reported receiving orders from customers over the Internet. Yet only 5.5 per cent of these firms reported receiving orders from more than 25 per cent of their customers.

A5.4 Drivers of broadband adoption

Over 80 per cent of broadband users had previous Internet service. Almost all of the broadband users (96 per cent) indicated that broadband was more convenient than Internet dialup. In contrast, only 53 per cent of dialup users thought that broadband was more convenient than Internet dialup.

An overwhelming majority indicated that broadband reduced the time needed to place orders and expanded the ability to communicate with suppliers and customers. Eighty per cent agreed with the statement that broadband reduced the time needed to place orders to suppliers. Sixty per cent agreed with the statement that broadband reduced the time needed for customers to place orders. Over 80 per cent of the broadband users agreed that broadband expands the ability to communicate with suppliers (83 per cent) and customers (86 per cent).

A5.5 Comparison between broadband and dialup users

USA respondents reported overwhelming agreement that the Internet is critical for education and training. Over 95 per cent of Internet users agreed that the Internet is useful for education and training. Some differences appear to exist between broadband and dialup users. Roughly 97 per cent of broadband users agreed with the usefulness of the Internet for education and training compared to 83 per cent of dialup users.

The Internet was also found to be a critical research tool for agricultural input firms, although it appears to be more critical to broadband users than dialup users. An overwhelming majority (85 per cent) of broadband users agreed that the Internet was a critical research tool. Only 64 per cent of dialup users agreed that the Internet was a critical research tool.

Broadband users indicated that e-commerce improved the company's ability to manage inventory levels. Over half (55 per cent) of broadband users agreed with the statement that e-commerce would improve inventory management in the next three years. In contrast, only a third of the dialup users agreed that e-commerce would improve inventory management.

Internet users indicated that the Internet allows the company to expand into additional markets. A slight majority (58 per cent) of broadband users agreed that the Internet allows expansion into additional markets. However, only a third of dialup users agreed that the Internet allows the expansion into additional markets.

There is general agreement that business relationships are difficult to develop over the Internet. Roughly 75 per cent of broadband users and 70 per cent of dialup users agreed that relationships were difficult to develop over the Internet.

A5.6 Reasons for farmers' adoption of e-commerce

USA agricultural input firms do not think that Internet access will be a barrier to farmers' adoption of e-commerce. Over half of broadband (54 per cent) and dialup users (52 per cent) indicated that a lack of access would not be a barrier to farmers' e-commerce adoption.

Respondents also indicated that the limited ability to promote after-sales service would be a barrier to farmers' adoption of e-commerce. Roughly 70 per cent of dialup users indicated the lack of after sales service would be a barrier to farmers' e-commerce adoption compared to broadband users (60 per cent).

Perceptions regarding information access over the Internet differ significantly between broadband and dialup users. Roughly 65 per cent of broadband users indicated that the ability to obtain information easily over the Internet would be a major factor in farmers' e-commerce adoption. In contrast, only 30 per cent of dialup users indicated that the ease of information access would be a factor in farmers' adoption.

Less than a third of Internet-using firms reported that buying convenience would be a factor supporting farmers' e-commerce adoption. However, responses varied dramatically between broadband and dialup users. Broadband users felt that buying convenience would be a more important factor for farmers' adoption than dialup users. Roughly 30 per cent of broadband user stated that buying convenience would be a factor compared to 17 per cent of dialup users. Moreover, only 30 per cent of broadband users stated that buying convenience would not be an important factor compared with 56 per cent of dialup users.

USA agricultural input firms indicated that cost savings associated with e-commerce would be a factor in Internet adoption by farmers. Roughly 60 per cent of Internet users reported that lower prices for products sold over the Internet would be a factor in farmers' e-commerce adoption.

Only a small majority of Internet-using agricultural input firms (51 per cent) reported that security and privacy issues would be a barrier to farmers' e-commerce adoption.

A majority of Internet-using respondents (58 per cent) reported that lower product prices over the Internet would be a factor supporting farmers' e-commerce adoption.

A5.7 Summary of broadband adoption by USA agricultural input firms

The Internet is widely used by USA agricultural input firms, although the percentage of firms engaging in frequent and intensive use is limited.

A vast majority of agricultural input firms use broadband technology to connect to the Internet. The lack of broadband access is the most important reason agricultural input firms continue to use dialup technology.

Broadband users were more likely to use land-based technology (DSL, ADSL, cable, optic fibre) than other technology (satellite and wireless).

The Internet remains more of a business-to-business (B2B) tool than a business-to-customer (B2C) tool. Agricultural input firms use the Internet to communicate and engage in more business transactions with suppliers than with customers.

Security and privacy are not expected to be major barriers to e-commerce adoption.

Internet access problems are not expected to limit farmers' e-commerce adoption.

The Internet is viewed as a critical tool for education and research. Compared to broadband users, dialup users felt that the Internet provided fewer benefits in the ability to disseminate information. Moreover, dialup users felt that information issues were not as important in farmers' e-commerce adoption decisions.

Broadband users were more likely to engage in e-commerce activity with suppliers and to report the perceived benefits of improved inventory management associated with e-commerce.

Broadband users felt that broadband is more convenient than dialup and that buying convenience is more important to the adoption of e-commerce by farmer customers.

Appendix 6: Comparison of the Australian and USA agricultural surveys and results

A6.1 Research approach

Australia (undertaken by MRA)

Total number of Interviews:	352	250 agricultural producers 102 agricultural suppliers and producers
Interview method:	CATI (computer assisted telephone interviewing)	
Sampling method:	Non probability non proportional Quota sampling	
Sample source:	Oz on Disc: agricultural producers List Bank: agricultural suppliers and producers	
Quotas:	Based on the sampling method, quotas were placed on the following: agricultural suppliers and producers vs agricultural producers (28%:72%) state quotas were split according to the distribution of agricultural enterprises across Australia. NSW 30% VIC 25% QLD 1% SA 11% WA 9.5% TAS/NT/ACT 3.5%	

The number of interviews achieved by state did not match the above distribution. To correct the distribution, weights were applied to the data to ensure correct state representation across agricultural enterprises.

Questionnaire length: 10 minutes

Fieldwork period: December 2003 to January 2004

USA (undertaken by the Center for the Study of Rural America)

A survey of broadband adoption by USA agricultural input firms took place during February and March 2004. Questionnaires were sent out by fax and email to 2388 agricultural input firms from a database compiled by the Center for Food and Agricultural Business at Purdue University

Total number of interviews:	199
Interview method:	Self-completed questionnaire sent by fax or email
Sampling method:	N/A
Sample source:	Drawn from an agricultural firm database compiled by the Center for Food and Agricultural Business at Purdue University

Questionnaire length: Approximately 10–15 minutes

Fieldwork period: February and March 2003

A6.2 Comparison of data collected

As with the methods used, the USA and the Australian questionnaires differ slightly. The Australian questionnaire is shown in appendix A3. The USA questionnaire is available on request from the Center for the Study of Rural America.

Comparisons of the data have been made only where questions are phrased exactly the same.

The USA sample consisted entirely of agricultural enterprises in the supplier/processor sector. In this report, therefore, only the Australian agricultural enterprises in the same sector are compared against one another.

Demographics

Respondents from the USA appeared to have a fairly even distribution in the variety of positions they held. For example, 20 per cent were the CEO or owner of the agricultural firm, 20 per cent were in sales or sales management, and 19 per cent were in marketing personnel.

While in Australia a higher percentage of respondents were the CEO or owner of the firm (45 per cent), and a similar percentage to the USA were in marketing (18 per cent), the remainder of positions held by respondents could not be compared.

USA respondents indicated that the most of their business was in the crop sector (80 per cent) while in Australia 33 per cent said their business was in consulting.

Whereas 52 per cent of USA respondents worked in a branch location, only 11 per cent of Australian respondent did the same.

The business size of the USA respondents to the survey was much larger than the Australian group. While almost 40 per cent of USA respondents had sales above $US100m/year and 29 per cent had sales less than $US10m, almost 90 per cent of Australian respondents had sales less than $US10m.

Whereas almost 90 per cent of USA respondents reported their firm as having a website, only 25 per cent of Australians reported the same. USA respondents reported that 73 per cent of the information provided on their website was technical information with similar proportions found in Australia (60 per cent).

Adoption of broadband

Agricultural firms in the USA and in Australia have extensive access to the Internet, 97 per cent and 95 per cent respectively, but whereas respondents in the USA reported roughly 84 per cent of broadband connections, Australia reported only 20 per cent

Broadband technology

While the USA results showed a more diverse set of broadband technology used by agricultural firms, the Australian results showed that a larger percentage used DSL. Over a third of USA respondents used this technology compared to 6 in 10 Australian respondents. Roughly similar percentages were found in the use of cable technology by both countries (17 per cent USA, 15 per cent Australia) and there was a similar result for satellite.

The expenditures on broadband cannot be compared because of differences in download limits and other package conditions.

Use of Internet and e-commerce

A high proportion of Internet users indicated that they communicate with their customers and suppliers by email. Roughly 93 per cent of USA and 89 per cent of Australian respondents reported communicating with some of their suppliers by email. However, in both countries, the intensity of the communication was limited. Only a quarter of USA respondents and a higher percentage of Australian respondents (42 per cent) reported communicating with more than 25 per cent of their customers by email. Roughly half of USA respondents and 32 per cent of Australian respondents communicate with more than 25 per cent of their suppliers by email.

Few agricultural input firms use the Internet to either receive orders or place orders. Respondents indicated that they were more likely to place orders to suppliers than to receive orders from customers over the Internet. While 85 per cent of USA Internet-using firms reported placing orders to suppliers over the Internet, only 48 per cent of Australian respondents reported the same. Seventeen per cent of USA respondents reported placing orders over the Internet to more than 25 per cent of their suppliers, and Australian respondents reported the same. Roughly half (53 per cent) of USA and 35 per cent of

Australian Internet-using firms reported receiving orders from customers over the Internet. Yet only 5.5 per cent of USA firms and 13 per cent of Australian firms reported receiving orders from more than 25 per cent of their customers.

Principal reasons for broadband adoption

Ninety per cent of Australian respondents and over 80 per cent of USA respondents had an Internet connection before they adopted broadband.

While 80 per cent of USA respondents agreed with the statement that broadband reduced the time needed to place orders to suppliers, only 46 per cent of Australian respondents did the same (65 per cent vs 40 per cent broadband vs dialup). Sixty per cent of USA and 39 per cent of Australian respondents agreed with the statement that broadband reduces the time needed for customers to place orders. Over 80 per cent of the US broadband users agreed that broadband expands the ability to communicate with suppliers (83 per cent), compared with 56 per cent Australian, though broadband users in Australia tended to be closer to their USA counterparts (75 per cent (broadband) vs 51 per cent dialup). Similarly, the USA suppliers agreed more with the statement that broadband expands the ability to communicate with customers (86 per cent), compared to 56 per cent Australian (75 per cent broadband vs 51 per cent dialup).

Comparison between broadband and dialup users

USA and Australian respondents reported overwhelming agreement that the Internet is critical for education and training. Over 95 per cent of USA and 91 per cent of Australian Internet users agreed that the Internet is useful for education and training. Some differences appear to exist between USA broadband and dialup users with roughly 97 per cent of broadband users agreeing with the usefulness of the Internet for education and training compared to 83 per cent of dialup users. The type of connection used by Australian respondents showed no differences in their responses to the question.

The Internet was also found to be a critical research tool for agricultural input firms in the USA and in Australia, although it appears to be more critical to broadband users than to dialup users. An overwhelming majority (85 per cent each) of USA and Australian broadband users agreed that the Internet was a critical research tool, while only 64 per cent of USA and 69 per cent of Australian respondents agreed with the same statement.

Internet users indicated that the Internet allows the company to expand into additional markets. Fifty-eight per cent of USA and 55 per cent of Australian respondents with broadband agreed that the Internet allows expansion into additional markets. However, only a third of USA and 35 per cent of Australian dialup users agreed that the Internet allows expansion into additional markets.

There is general agreement by USA respondents that business relationships are difficult to develop over the Internet. Roughly 75 per cent of broadband users and 70 per cent of dialup users agreed that business relationships were difficult to develop over the Internet. However this was much lower for Australian respondents with 25 per cent of those with broadband agreeing and 42 per cent of those with a dialup connection agreeing.

Appendix 7: Broadband ready reckoner

This is a facsimile of the ready reckoner, reproduced for publishing convenience. To see the actual ready reckoner, go to www.wondu.com/ReadyReckoner

Wondu Ready Reckoner

Factors Affecting Incremental Direct Costs
1. NOTE: This is a Partial Budget 'Reckoner". It aims to consider only those costs and revenues that change in switching from one technology to another. This sheet [Cost Questions] collects data to estimate the additional direct costs of different dial-up and broadband technologies. The next sheet [Benefits Questions] considers the additional revenue and costs of sales associated with the technologies.
2. Please fill in data where [Enter Here] is indicated for all the appropriate technology types you are considering. You may need to contact your ISP provider to get the full details of the specification of a particular technology. For dial-up and Satellite we have entered some typical data, but you can change these numbers to suit your own situation.
3. Where the cell indicates 'Value' there is a calculation from other cells and it is locked.
4. Note: To be strictly comparable, demand loads for different technologies should be identical to obtain a fair and accurate cost comparison. Alternatively you need to recognize you can do different things with different technologies. For example, it's not easy to download graphics with dial-up and large file movements often just 'give up'.
5. Note: If you save this template as a workbook, note the workbook's filename and location. To edit the workbook next time, you must open it using Excel. Every time you open this template from Business Planner, a new workbook is created.

Year ended: 2004

				DIAL-UPS	BROADBAND			
				COLUMN F	COLUMN G	COLUMN H	COLUMN I	COLUMN J
				Dial-up	ADSL	Wireless	Cable	Satellite
Broadband Dial-up Structural and Usage Questions		QUANTITIES	MEASURES					[2-way Bus. Std]
A. Connection Information								
The efficiency loss factor adjusts the theoretical transmission speeds for losses caused by interference or poor lines.	Connection speed for downloads		kbps	56.00	[Enter Data]	[Enter Data]	[Enter Data]	256.00
	Efficiency loss factor		%	30.00	[Enter Data]	[Enter Data]	[Enter Data]	20.00
	Connection speed for uploads		kbps	56.00	[Enter Data]	[Enter Data]	[Enter Data]	128.00
	Efficiency loss factor		%	35.00	[Enter Data]	[Enter Data]	[Enter Data]	25.00
	Net download speed after loss		kbps	39.20	*#VALUE!*	*#VALUE!*	*#VALUE!*	*204.80*
	Net upload speed after loss		*kbps*	*36.40*	*#VALUE!*	*#VALUE!*	*#VALUE!*	96.00
B. Usage Information								
	How many people and connections at this address?							
Applied to email. In our example we assume the broadband technology takes only 45 seconds to read one-mail viz dial-up which takes 60 sec. What is your own situation?	Planned connection sessions/month/person @ this address		Number	60.00	[Enter Data]	[Enter Data]	[Enter Data]	60.00
	Disconnection faults/month/person total		%	20.00	[Enter Data]	[Enter Data]	[Enter Data]	1.00
	Total connections/month/person		*Number/Mo.*	*72.00*	*#VALUE!*	*#VALUE!*	*#VALUE!*	*61*
	Number of persons using this address		Number	2.00	[Enter Data]	[Enter Data]	[Enter Data]	2
	Number of connections/month at this address		*Number/Mo.*	*144.00*	*#VALUE!*	*#VALUE!*	*#VALUE!*	*121*
	How many emails at this address?							
	Emails sent/received by each person/day		Number/Day	25.00	[Enter Data]	[Enter Data]	[Enter Data]	25.00
	Average size of emails (text & attachment)		Mb/email	.03	[Enter Data]	[Enter Data]	[Enter Data]	0.03
	Duration (on average) of each email transaction [includes view time]		Seconds	45.00	[Enter Data]	[Enter Data]	[Enter Data]	33.75
	Bandwidth used by emails/person/day		Mb/email/pers	.63	*#VALUE!*	*#VALUE!*	*#VALUE!*	0.63
	Total bandwidth used/month(30 days) by household/bus on emails		*Mb/Month*	*37.50*	*#VALUE!*	*#VALUE!*	*#VALUE!*	*37.5*
	Total time spent on Sending & Receiving emails at this Site		*Hours/Month*	*25.00*	*#VALUE!*	*#VALUE!*	*#VALUE!*	*14.06*
	How much web surfing takes place @ this address?							
Applied to web surfing. In our example we assume the broadband technology takes only 45 sec. to read 1-mail viz. dial-up, which is 60 sec. What is your own situation?	Web page used by each person/day		Number	25.00	[Enter Data]	[Enter Data]	[Enter Data]	25.00
	Average size of web page viewed		Mb	0.03	[Enter Data]	[Enter Data]	[Enter Data]	0.03
	Duration (on average) of web pages viewed (includes view time)		Seconds	45.00	[Enter Data]	[Enter Data]	[Enter Data]	33.75
	Bandwidth used in web surfing/person/day		*Mb/day*	*0.63*	*#VALUE!*	*#VALUE!*	*#VALUE!*	*0.63*
	Total bandwidth used/month (30 days) by household/bus on surfing		*Mb/month*	*37.5*	*#VALUE!*	*#VALUE!*	*#VALUE!*	*37.5*
	Time spent/month on web surfing and emailing @ this address		*Hours*	*18.75*	*#VALUE!*	*#VALUE!*	*#VALUE!*	*14.06*
	How much downloading of files takes place @ this address?							
The size & number of file downloads varies significantly. Except for VoIP (not available for dial-up) we recommend you enter data in the 1st column only for an apples-with-apples cost comparison. The other columns will then take the same value.	1. MP3 files downloads/month (music)		Number/mo.	4.00	4.00	4.00	4.00	4.00
	Average downloaded MP3 file size		Mb	4.00	4.00	4.00	4.00	4.00
	2. Movie downloads/month		Number/mo.	2.00	2.00	2.00	2.00	2.00
	Average downloaded movie file size		Mb	25.00	25.00	25.00	25.00	25.00
	3. Application updates downloaded - anti-virus Windows & other update		Number/mo.	4.00	4.00	4.00	4.00	4.00
	Average downloaded application update size		Mb	1.00	1.00	1.00	1.00	1.00
	4. New applications downloaded		Number/mo.	2.00	2.00	2.00	2.00	2.00
	New downloaded applications file size		Mb	8.00	8.00	8.00	8.00	8.00
	5. VoIP downloads		Number/mo.	0.00	[Enter Data]	[Enter Data]	[Enter Data]	864.00
	Average VoIP file download size		Mb	0.00	[Enter Data]	[Enter Data]	[Enter Data]	0.10
	Total number of downloads/month		Number	12.00	*#VALUE!*	*#VALUE!*	*#VALUE!*	876.00
	Duration on average in dealing with each download		Seconds	20.00	[Enter Data]	[Enter Data]	[Enter Data]	10.00
	Total bandwidth used/month on downloads @ this site		*Mb/month*	*86.00*	*#VALUE!*	*#VALUE!*	*#VALUE!*	*172.40*
	Time spent/month on downloading		*Hours/month*	*0.07*	*#VALUE!*	*#VALUE!*	*#VALUE!*	*2.43*

Wondu Ready Reckoner

Factors Affecting Incremental Direct Costs
1. NOTE: This is a Partial Budget 'Reckoner". It aims to consider only those costs and revenues that change in switching from one technology to another. This sheet [Cost Questions] collects data to estimate the additional direct costs of different dial-up and broadband technologies. The next sheet [Benefits Questions] considers the additional revenue and costs of sales associated with the technologies.
2. Please fill in data where [Enter Here] is indicated for all the appropriate technology types you are considering. You may need to contact your ISP provider to get the full details of the specification of a particular technology. For dial-up and Satellite we have entered some typical data, but you can change these numbers to suit your own situation.
3. Where the cell indicates 'Value' there is a calculation from other cells and it is locked.
4. Note: To be strictly comparable, demand loads for different technologies should be identical to obtain a fair and accurate cost comparison. Alternatively you need to recognize you can do different things with different technologies. For example, it's not easy to download graphics with dial-up and large file movements often just 'give up'.
5. Note: If you save this template as a workbook, note the workbook's filename and location. To edit the workbook next time, you must open it using Excel. Every time you open this template from Business Planner, a new workbook is created.

Year ended: 2004

				DIAL-UPS	BROADBAND			
				COLUMN F	COLUMN G	COLUMN H	COLUMN I	COLUMN J
				Dial-up	ADSL	Wireless	Cable	Satellite
	How much uploading of files takes place @ this address?							
For many respondents, uploading may be limited. For those with web sites, uploading could be a significant source of demand for bandwidth	1. MP3 files uploads/month (music)		Number/mo.	1.00	1.00	1.00	1.00	1.00
	Average uploaded MP3 file size		Mb	4.00	4.00	4.00	4.00	4.00
	2. Movie uploads/month		Number/mo.	0.00	0.00	0.00	0.00	0.00
	Average uploaded movie file size		Mb	25.00	25.00	25.00	25.00	25.00
	3. Application updates uploaded - anti-virus Windows & other update		Number/mo.	0.00	0.00	0.00	0.00	0.00
	Average uploaded application update size		Mb	1.00	1.00	1.00	1.00	1.00
	4. New applications uploaded		Number/mo.	0.00	0.00	0.00	0.00	0.00
	New uploaded applications file size		Mb	8.00	8.00	8.00	8.00	8.00
	5. VoIP uploads		Number/mo.	0.00	[Enter Data]	[Enter Data]	[Enter Data]	864
	Average VoIP file upload size		Mb	0.00	[Enter Data]	[Enter Data]	[Enter Data]	0.10
	Total number of uploads/month		Number	1.00	*#VALUE!*	*#VALUE!*	*#VALUE!*	865
	Duration on average in dealing with each upload		Seconds	20.00	[Enter Data]	[Enter Data]	[Enter Data]	20
	Total bandwidth used/month on uploads @ this site		*Mb/month*	*4.00*	*#VALUE!*	*#VALUE!*	*#VALUE!*	90.40
	Time spent/month on uploading		*Hours/month*	*0.01*	*#VALUE!*	*#VALUE!*	*#VALUE!*	*4.81*
	How many voice & fax calls?							
The purpose of this query is to compute a comparable cost of voice, data and Internet calls for the different technologies.	Voice calls		Number/mo.	576.00	[Enter Data]	[Enter Data]	[Enter Data]	484.80
	Fax transmissions		Number/mo.	144.00	[Enter Data]	[Enter Data]	[Enter Data]	121.20
	Connections to Internet		Number/mo.	144.00	[Enter Data]	[Enter Data]	[Enter Data]	121.20
	Duration on average in dealing with each connected call		Seconds	20.00	[Enter Data]	[Enter Data]	[Enter Data]	20.00
	Total time in dealing with these calls		Hours	4.80	[Enter Data]	[Enter Data]	[Enter Data]	4.04
	Total voice, data etc. calls		Number/mo.	864.00	#VALUE!	#VALUE!	#VALUE!	727.20
	Monthly Summary							
This is the summary of your bandwidth needs and time on the web. If the bandwidth used exceeds the ISP allowance there will be a cost for the extra bandwidth.	Total bandwidth used/month		Mb	165.00				337.80
	Total time on web/month		Hours	43.82				40.05
	Total wired connections		Number	864.00				727.20
	Monthly bandwidth use allowance [The limit set by your ISP]		Mb/month	100.00				1,000.00
	Extra bandwidth required		Mb/month	-65.00				662.20
	Cost Summary							
	C. Set-up Investment Costs			Dial-up	ADSL		Cable	Satellite
These set-up costs are treated as amortised over a period of 48 months at an annual discount rate of 9%. Change the formula if necessary to reflect different duration & discount rates.	Internet connection fee			125.00	[Enter Data]	[Enter Data]	[Enter Data]	250.00
	Telephone connection fee			0.00	[Enter Data]	[Enter Data]	[Enter Data]	0.00
	Communications hardware - dish			0.00	[Enter Data]	[Enter Data]	[Enter Data]	699.00
	Installation charge			0.00	[Enter Data]	[Enter Data]	[Enter Data]	350.00
	Cancellation fee (for termination)			0.00	[Enter Data]	[Enter Data]	[Enter Data]	699.00
	Web development fee (if relevant)			5,000.00	[Enter Data]	[Enter Data]	[Enter Data]	5,000.00
	Research (if relevant)			1,000.00	[Enter Data]	[Enter Data]	[Enter Data]	1,000.00
	Staff education & training			1,000.00	[Enter Data]	[Enter Data]	[Enter Data]	2,000.00
	New dedicated phone and ISDN line			200.00	[Enter Data]	[Enter Data]	[Enter Data]	0.00
	Domain name registration			125.00	[Enter Data]	[Enter Data]	[Enter Data]	125.00
	Software - VoIP			0.00	[Enter Data]	[Enter Data]	[Enter Data]	250.00
	Hardware - VoIP			0.00	[Enter Data]	[Enter Data]	[Enter Data]	1,200.00
	Total set-up costs (fixed?)			7,450.00	0.00	0.00	0.00	11,573.00
	Amortised monthly costs of set-up costs			184.01	0.00	0.00	0.00	285.85
	D. Operating Costs (per month)							
	Average voice cost per call		$/call	0.15	[Enter Data]	[Enter Data]	[Enter Data]	0.05
	Total voice call costs		$/month	129.60	#VALUE!	#VALUE!	#VALUE!	36.36
	Monthly Internet Access fee		$	20.00	[Enter Data]	[Enter Data]	[Enter Data]	240.00
	Monthly Internet excess rate		$/mb	0.18	[Enter Data]	[Enter Data]	[Enter Data]	0.19
	Total excess use cost		$/month	11.70	#VALUE!	#VALUE!	#VALUE!	0.00
	Staff or own time spent on web		Hours	43.82	#VALUE!	#VALUE!	#VALUE!	40.05
	Cost of time on Internet		$/hour	16.00				16.00
	Total cost of time on Internet		$/month	701.16	#VALUE!	#VALUE!	#VALUE!	640.82
	Other		$/month	15.00	15.00	15.00	15.00	15.00
	Total Monthly operating costs			877.46	#VALUE!	#VALUE!	#VALUE!	932.18
Total broadband dial-up costs				693.44	#VALUE!	#VALUE!	#VALUE!	646.33

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Factors Affecting Benefits

1. Note: The different channel technologies also have potential to affect revenue and qualitative benefits and off-line costs. These benefits can be incorporated here, but this is only a broad structure and details would need to be included to suit individual situations.
2. Note: The costs and benefits here are indirect. Take care to avoid double counting. Cost included in Sheet 1 should not be included here.

Year ended 2004

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A. REVENUE TABLES

Incremental revenue	DIALUP	BROADBAND			
	Dialup	ADSL	Wireless	Cable	Satellite
Revenue Directly Attributable to Ecommerce Associated with this Technology	[enter data]	[enter data]	[enter data]	[enter data]	[enter data]
Revenue Indirectly Attributable to Ecommerce (eg. Phone contact via web introduction)	[enter data]	[enter data]	[enter data]	[enter data]	[enter data]
Other Incremental Revenue Attributed to Ecommerce Associated with this Technology					
Less incremental costs					
Costs of Sales or Goods Sold Attributable to Ecommerce Associated with this Technology	[enter data]	[enter data]	[enter data]	[enter data]	[enter data]
Cost of Postage or Fulfilment Attributable to Ecommerce Associated with this Technology	[enter data]	[enter data]	[enter data]	[enter data]	[enter data]
Gross Benefit of Increase in Revenue per annum	0	0	0	0	0

B. OFF-LINE COST SAVINGS*	MEASURE	QUANTITIES PER ANNUM	MEASURE	AVERAGE COST PER ITEM	TOTAL OFF-LINE COST SAVINGS	TOTAL OFF-LINE COST SAVINGS	TOTAL OFF-LINE COST SAVINGS	TOTAL OFF-LINE COST SAVINGS	TOTAL OFF-LINE COST SAVINGS
Postage (emailing rather than mailing letters, documents and other marketing material)	Items	[enter data]	Av. cost per unit	[enter data]	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Brochures	Items	[enter data]	Av. cost per unit	[enter data]	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Banking	Hours	[enter data]	Hourly rate	[enter data]	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Banking	Cheques	[enter data]	Cheques	[enter data]	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Marketing	Hours	[enter data]	Hours	[enter data]	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Travelling/meetings	Hours	[enter data]	Hours	[enter data]	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Transport	Deliveries	[enter data]	Deliveries	[enter data]	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
Off-line Cost Savings/Annum					#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!

* If the per unit costs are not known, just override the totals and enter total costs per annum for these factors in the right hand column.

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Solution: Annual data

The following charts summarise the costs and benefits of the technology choices.

Year ended: 2004

		Dialups	Broadband			
		Column F	Column G	Column H	Column I	Column J
		Dialup	ADSL	Wireless	Cable	Satellite
Gross benefit of increase in revenue per annum		$0	$0	$0	$0	$0
+	Off-line cost savings	#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!
–	Direct operating costs	$10,529	#VALUE!	#VALUE!	#VALUE!	$11,186
–	Direct establishment set-up costs	$2,208	$0	$0	$0	$3430
Annual benefit		#VALUE!	#VALUE!	#VALUE!	#VALUE!	#VALUE!

Further factors for consideration in your selection

There are several other unquantifiable factors which could be taken into account in your selection. Enter details below to review these qualitatively.

		Dialup	ADSL	Wireless	Cable	Satellite
Email address	Enter number	[Enter data]	[Enter data]	[Enter data]	[Enter data]	[Enter data]
Email storage	Mb	[Enter data]	[Enter data]	[Enter data]	[Enter data]	[Enter data]
Web space	Mb	[Enter data]	[Enter data]	[Enter data]	[Enter data]	[Enter data]
Anti-virus	Yes/No	[Enter selection]	[Enter selection]	[Enter selection]	[Enter selection]	[Enter selection]
Spam filtering	Yes/No	[Enter selection]	[Enter selection]	[Enter selection]	[Enter selection]	[Enter selection]
Reliability critical?	Yes/No	[Enter selection]	[Enter selection]	[Enter selection]	[Enter selection]	[Enter selection]
Firewall	Yes/No	[Enter selection]	[Enter selection]	[Enter selection]	[Enter selection]	[Enter selection]

Appendix 8: Comparison of technology platforms

This appendix is from the Commonwealth Grants Commission Discussion Paper on the Impact of Technology on Assessments. It is reproduced here verbatim as a valuable supporting document for the 'ready reckoner' and guideline for speed requirements and download of different files.

Comparison of technology platforms

Table A8.1: Types of technology infrastructure

Technology type	Physical medium	Use
Wired	PSTN copper	Access and backbone
	ISDN	Access
	Conditioned PSTN copper (DSL)	Access
	Optic fibre	Access and backbone
	HFC(hybrid coaxial cable)	Access
Wireless	Cellular mobile	Access
	Microwave	Backbone
	Broadband wireless (LMDS and MMDS)	Access
	Satellite	Access and backbone

Table A8.2: Comparison of technology infrastructure

Access	Short email	Average webpage	4-minute MP3 music file	4 Minute video clip	Standard 90-minute movie	HDTV 90-minute movie
Bandwidth	**1 KB**	**50KB**	**4MB**	**11.5 MB**	**260 MB**	**520 MB**
28.8 kbps Dial modem						
			Approx.	Approx.	Approx.	Approx.
Time taken	< 1 sec.	15 sec.	18 mins	1 hour	20 hours	40 hours
Advantages	Mature technology.					
	Ubiquitous — covers 99% of the Australian population.					
	Cost for optimisation and improvement relatively low.					
Disadvantages	Low speed..					
	Not readily suitable for high-speed data and multimedia applications					
56 kbps Dial modem						
Time taken	< 1 sec.	9 sec.	Approx.	Approx.	Approx.	Approx.
			9 mins	27 mins	10 hours	20 hours
Advantages			Same as above			
Disadvantages			Same as above			
128 kps ISDN						
Time taken	< 1 sec.	3 sec.	Approx.	Approx.	Approx.	Approx.
			4 mins.	12 mins	4.5 hours	9 hours
Advantages	Mature — widely available, covers 96% of Australia population.					
	Global interoperability.					
	Supports a multiple of services.					
	Unlike DSL, not distance-sensitive technology.					
Disadvantages	Distance-sensitive costs and prices.					
	High equipment cost with expensive customer premises equipment.					

Access	Short email	Average webpage	4-minute MP3 music file	4 Minute video clip	Standard 90-minute movie	HDTV 90-minute movie
Bandwidth	**1 KB**	**50KB**	**4MB**	**11.5 MB**	**260 MB**	**520 MB**
ADSL 512 kbps						
	< 1 sec.	< 1 sec.	63 sec.	Approx. 3 mins	Approx. 1 hour	Approx. 2 hours
ADSL1.5Mbps						
	< 1 sec.	< 1 sec.	22 sec.	Approx. 1 min	Approx. 24 mins	Approx. 48 mins
Advantages of ADSL	High bandwidth up to 1.5 Mbps, able to support high-speed Internet and video services No new wiring as it works on existing copper/fibre lines Multiplexer and modem are installed at the supplier and user sites Unlike cable architecture, DSL user has a dedicated copper connection and receives only the information they request Scalability and cost effective — unlike HFC, MMDS, and optic fibre, which must be installed on an area-wide basis, DSL installation requirse a modest investment to equip serving centres with multiplexers.					
Disadvantages of ADSL	Requires access to the tail ends or exchanges of incumbent operators that involves time, interconnection and cost Performances of some DSLs (ADSL and VDSL) are distance-sensitive. Limited range (2 km to 5 km from the exchanges) Sharing the copper medium, which restricts technology and speeds, and issues relating to interference					
VDSL 6Mbps						
	< 1 sec.	< 1 sec.	6 sec.	15 sec.	Approx. 6 mins	Approx. 12 mins

Access	Short email	Average webpage	4-minute MP3 music file	4 Minute video clip	Standard 90-minute movie	HDTV 90-minute movie
Bandwidth	**1 KB**	**50KB**	**4MB**	**11.5 MB**	**260 MB**	**520 MB**

HFC (Cable Modem)	
Advantages	768 kbps to 30 Mbps bandwidth
	‘Always-on’ service using cable TV lines
	Cost effective — a single pipe for the delivery of all services (voice, data and TV video)
	Unlike wireless technology, there is little susceptibility to weather condition and minimal interference because it is buried underground
	Able to support network speeds comparable to those of DSL
	Being a broadcasting technology, the network speed upstream to Internet will be slower than downstream to the home or office
Disadvantages	Unlike some DSL services with dedicated local bandwidth, cable modems share local bandwidth. Hence performance will depend on the number of users in a particular local area
	High deployment cost — digging trenches and laying cable required
	Costs of building the network are sunk before any users are connected
	Slow deployment — applying for access duct, council permit and work involved in laying cable are time consuming. Hence, a slower return on investment.

Access	Short email	Average webpage	4-minute MP3 music file	4 Minute video clip	Standard 90-minute movie	HDTV 90-minute movie
Bandwidth	**1 KB**	**50KB**	**4MB**	**11.5 MB**	**260 MB**	**520 MB**
FTTC 30 Mbps	< 1 sec.	1 sec.	1 sec.	3 sec.	90 sec.	Approx. 3 mins
FTTB 155 Mbps	< 1 sec.	< 1 sec.	< 1 sec.	< 1 sec.	17 sec.	34 sec.

Advantages	With 10 Gbps to 100 Gbps bandwidth, it is a long-term solution for the superhighway society, unmatched by other technology.
	Scalability and capacity — with enabling technologies like SDH and DWDM, capacity can be increased without laying new fibres.
	Unlike wireless technology, there is little susceptibility to weather conditions and minimal interference in cable technology as it is buried underground.
Disadvantages	High deployment cost — digging trenches and laying cable involve high costs in terms of material and labour.
	Costs of building the network are sunk before any users are connected.
	Slow deployment — applying for access duct, council permit and work involved in laying cable are time consuming. Hence, a slower return on investment.
Cellular	
Advantages	Wireless, 9.6 kbps bandwidth, provides communications on a mobile basis.
	Cellular technology can provide a large capacity service in an area (30 km) compared to other wireless technology.
Disadvantages	Low data capacity rate (9.6 kbps).
	Cellular is designed mainly for voice with limited capability for high-speed data and video application.
	High deployment cost, as it must be installed on an area-wide basis to provide service coverage.

Access	Short email	Average webpage	4-minute MP3 music file	4 Minute video clip	Standard 90-minute movie	HDTV 90-minute movie
Bandwidth	**1 KB**	**50KB**	**4MB**	**11.5 MB**	**260 MB**	**520 MB**

Microwave	
Advantages	Wireless, 35 kbps bandwidth.
	Mature technology
	Greater scalability — unlike wired technology where capital costs of building the network are sunk before any users are connected, cost only incurred until the user is connected in a wireless network.
	Lower cost of deployment than wired technology in terms of materials and labour.
	Speedy deployment — faster network deployment than wired technology without the need to duct trenches and lay cable. Hence, a rapid return on investment.
	Flexibility — equipment can be redeployed if customers change their services.
Disadvantages	The need of line of sight means coverage is dependent on geography, weather and the density of building.
	Poor weather condition (rain and snow) could affect performance.
	Performance is distance-dependant, to increase network reliability; stronger transmitters need to be located closely..
	Customer misconception that the performance of wireless technology is inferior to fixed technology.
	Compare to fibre (10 Gpbs), it has a low bandwidth of about 35 Mbps to 155 Mbps.

Access	Short email	Average webpage	4-minute MP3 music file	4 Minute video clip	Standard 90-minute movie	HDTV 90-minute movie
Bandwidth	**1 KB**	**50KB**	**4MB**	**11.5 MB**	**260 MB**	**520 MB**

Broadband wireless (LMDS and MMDS)	
Advantages	High bandwidth which is able to provide up to 100 Mbps
	Lower cost of deployment than wired technology in terms of materials and labour.
	Speedy deployment — faster network deployment than wired technology without the need to dig trenches and lay cable. Hence, a rapid return on investment. A new user site can be connected within 10 days.
	Ease of deployment — unlike wired network, it requires minimal infrastructure, consists of an antenna and NIU which are installed on the user's rooftop. It requires no rewiring and has minimal impact on user sites.
	Greater scalability — unlike wired technology where capital costs of building the network are sunk before any users are connected, cost only incurred until the user is connected in a wireless network.
	Flexibility — equipment can be redeployed if customers change their services.
Disadvantages	Line of sight means coverage depends on geography, weather and the density of building.
	Antennas require professional installation, significantly increasing cost.
	Customer misconception that the performance of broadband wireless is naturally inferior to wired technologies.
	Cost involved in spectrum license acquisition could be high.
	Being a new technology, the equipment costs could be high due to lack of mass production.
	Poor weather conditions (rain and snow) could affect performance.
	Limited range (about 5 km) and the distance is dependant on geographical and climatic condition.
	New and unproven technology which lack test-bed result, international standard and reliability.

Access	Short email	Average webpage	4-minute MP3 music file	4 Minute video clip	Standard 90-minute movie	HDTV 90-minute movie
Bandwidth	**1 KB**	**50KB**	**4MB**	**11.5 MB**	**260 MB**	**520 MB**

Satellites	
Advantages	Wireless, 0.6 Gbps bandwidth
	Greater coverage with the potential of covering 100% of Australian population.
	Unlike DSL and LMDS, its performance is not distance-dependant and it's suitable for rural or remote areas.
	Dedicated connection — unlike cable architecture, user has a dedicated connection and speed won't drop when others use it at the same time.
	Greater scalability — unlike wired technology where capital costs of building the network are sunk before any users are connected, cost only incurred until the user is connected to the satellites network.
Disadvantages	High deployment cost.
	Low bandwidth — 0.6 Gpbs, compared to fibre (10 Gbps).
	As a broadcast technology, it is not designed for 2-ways communications. Satellite access generally requires an extra line and modem for ongoing traffic.
	It is suitable to provide access services to users 20 km beyond local exchanges.
	Satellite is more expensive to deploy in metro areas than other technologies.

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