DIGITAL DATA INQUIRY

PUBLIC INQUIRY UNDER SECTION 486(1) OF THE TELECOMMUNICATIONS ACT 1997

REPORT TO THE MINISTER FOR COMMUNICATIONS, THE INFORMATION ECONOMY AND THE ARTS

15 AUGUST 1998

Executive Summary

On 30 April 1998, in accordance with the requirements of section 141 of the *Telecommunications Act 1997* (the Act), the Minister for Communications, the Information Economy and the Arts, Senator the Hon. Richard Alston, directed the Australian Communications Authority (ACA), under section 486(1) of the Act, to hold a public inquiry to review whether a carriage service that provides digital data capability broadly equivalent to 64 kilobits per second (kbit/s), comparable to the capability provided by a basic rate Integrated Services Digital Network (ISDN) service, should be incorporated into the Universal Service Obligation (USO).

The ACA was also required to investigate the costs, benefits and risks of such a decision and have regard to a number of matters in the conduct of the inquiry.

The ACA was required to consult with carriers, carriage service providers, representatives of end-users, business consumers, residential consumers and rural consumers in the conduct of the inquiry. As part of the consultation process, the ACA issued a discussion paper, invited written submissions from interested organisations and individuals, and conducted five public hearings. The 89 written submissions and evidence at the hearings were a valuable source of information for the ACA in its consideration of issues relevant to the inquiry.

The inquiry has revealed that access to a data capability is becoming increasingly important in Australian society as evidenced by increasing Internet and e-mail usage statistics. Additionally, there are encouraging signs that the data services market will deliver outcomes to address this increasing demand. Despite these developments, disparity exists in terms of data service capability and access charges between metropolitan and rural consumers.

In addressing this disparity the ACA does not favour specifying a digital data carriage service as part of the USO. This is not supported on cost/benefit assessments. Furthermore, use of the USO provisions would have unfavourable impacts on competition. It is arguable that the USO provisions themselves may be a denial of competitive opportunity and a disincentive for other carriers who may wish to take advantage of new developments, such as wireless local loop and satellite systems, to provide Australians with enhanced data services.

A more favoured approach is to target the impediments which inhibit market growth for data services in rural and remote areas. Two particular barriers are the slower data rates for customer access and timed call charges for ISP access.

The ACA presents the following information and conclusions in accordance with the Terms of Reference for the inquiry.

Chapter 1 sets out the legislative basis, the scope and the conduct for the inquiry and explains themes central to the Minister's directions to the ACA.

Chapter 2 outlines the public and regulatory context surrounding the market provision of data services in Australia. The process and chronology of the deregulation of the Australian telecommunications market is described. Common data applications including facsimile, e-mail, Internet access and online business information are

examined and an assessment is made of data rates appropriate for particular applications.

An explanation of data rate functionality is provided and the barriers to achieving higher data rates are broadly considered. These include the quality and structure of the telecommunications network, the customer equipment connected to the customer access network, the data capacity of the Internet Service Provider (ISP) and the Internet itself. Data capability through the public switched telephone network (PSTN) was seen to be a function of the length and grade of the copper line between the customer and the exchange. Information provided showed subscribers to the digital radio concentrator system are typically limited to 2.4kbit/s but the current upgrade program may improve this data rate to 19.2kbit/s.

The chapter also provides a synopsis of submissions to the inquiry which focus on the access and affordability of data services in rural and remote Australia. Having regard to this analysis the following conclusion is drawn:

- rural and remote customers are at a disadvantage, compared with urban customers, in terms of the data rate capability available over the PSTN.

Chapter 3 provides the legislative framework, purpose and scope of the USO and examines other legislative obligations and policy initiatives related to the inquiry. The historical basis for the USO is presented and the current USO provisions in the Act are described. Targeted and broad options for adjusting the USO to include a data capability are examined and obligations, including price cap regulations on the universal service provider, are discussed.

The funding arrangements for the USO are presented and the legislative provisions which allow for multiple universal service providers to be declared for the purpose of provision of services contained within in the USO are discussed.

The chapter concludes with an examination of other legislative obligations and policy initiatives which are relevant to enhancing the provision of data capability throughout Australia. The impact of Telstra's existing carrier licence condition to provide ISDN on demand to 96 per cent of the Australia population, the *Networking the Nation* program and the ACCC investigation into competition in data markets are examined.

Chapter 4 summarises the central themes expressed in submissions to the inquiry. The data applications identified as being required for participation in society were fast and reliable access to the Internet, e-mail and facsimile. The benefits that accrue from access to these applications were broadly categorised as effective and efficient provision of government services and alleviating the isolation inherent in living and working in rural and remote Australia. Many submissions identified inequity in terms of data capability rates and affordability in rural areas as the major barrier to the benefits of the full range of information services.

Submissions from individuals and representative organisations argued for the inclusion of a data capacity within the USO whilst carriers and technology organisations considered that recent market development, carrier licence conditions and proposed satellite delivery of data services would ensure the market would satisfy demand for data services.

Chapter 5 contains an overview and analysis of the current telecommunications infrastructure in Australia and its capability to provide data services at various data rates. An assessment of data service capabilities through the PSTN in metropolitan areas compared with that available in rural and remote areas was undertaken to determine the extent of deficiencies in the provision of data services. This analysis identified that the Telstra PSTN is currently capable of providing data services at a data rate of 9.6kbit/s to 95 per cent of its urban and major provincial subscribers and 70 per cent of its rural and remote subscribers. 85 per cent of urban and major provincial subscribers and 60 per cent of rural and remote subscribers were capable of achieving data rates of 14.4kbit/s. A data rate of 28.8kbit/s was available to 60 per cent of urban and major provincial subscribers and 30 per cent of rural and remote subscribers.

It was identified that the effect of competition in the telecommunications market is most evident in metropolitan areas. Metropolitan subscribers are afforded a greater choice of carriers and ISPs with access to ISPs available at an untimed local call rate. Conversely, in many rural areas, Telstra remains the sole provider of data services through the standard telephone service, and a subscriber is restricted in his or her choice of ISP. Most significantly, of the total population of rural and remote subscribers approximately 37,000 do not have access to untimed local calls. Combined with the lower data rates experienced by rural and remote subscribers, significant disparity in the overall usage charges for equivalent data services using the standard telephone service was identified.

In assessing the current availability and usage of ISDN in Australia, analysis identified that although Telstra's carrier licence obligations will ensure ISDN will be available to at least 96 per cent of the Australian population on demand by the end of 1998, some 73,000 services only (predominantly non-residential) have been connected. This low usage of ISDN relative to other high and moderate income countries was found to be due in part to the high price of the ISDN product relative to the PSTN.

Assessment of projected availability of data services indicates that new satellite based data delivery systems and other technology solutions scheduled for implementation in Australia will substantially contribute to the data service market meeting demand. In this context, the contribution by various state governments to increasing data access in rural areas was noted. However the higher costs associated with ISDN and satellite options in comparison with data service delivery via the PSTN may limit affordable access to data services, particularly in rural areas.

Having regard to this analysis the following conclusions are drawn:

- **ISDN or broadly comparable 64kbit/s digital data services will be accessible to all people in Australia by the end of 1998 through Telstra meeting its licence condition and its proposed satellite based delivery system.**

- **The higher cost of ISDN or alternative satellite based data services, compared with the more limited but lower priced data services available through the PSTN, will remain as a limiting factor to affordable consumer access to data services, particularly in rural and remote areas.**

- **The availability of new technology solutions and new service providers (national and global) progressively over the next five years will provide market developed solutions to high data rate needs.**

- **International comparisons indicate that no country has specified a data rate capability as part of USO arrangements for the standard telephone service, apart from the inclusion of ISDN in USO arrangements in Germany, Denmark and Norway.**

Chapter 6 sets out the reasons government intervention might be justified in the market for the provision of data services to provide a data capability broadly comparable to a 64kbit/s channel. Discussion in this chapter centres on whether market failure exists in the provision of data services and if so, whether government intervention is warranted.

Analysis of current market conditions and projected availability of data services addressed in Chapter 5, supports the view that legislative obligations, technology solutions and competitive developments will combine to ensure that ISDN or broadly comparable 64kbit/s capable services will be accessible on demand by all Australians by the end of 1998.

The chapter considers the combination of factors which contribute to data service provision at lower data rates across the PSTN in rural and remote areas compared with metropolitan areas. These are broadly identified as including: an affordability gap; a profitability issue, which leads suppliers to invest not just in profitable markets, but the most profitable markets; and a timing element which refers to the time it takes new carriers to deploy infrastructure to offer data services. The extent to which government intervention could achieve legitimate equity goals or to ameliorate the disincentives resulting from current USO, untimed local call and price capping arrangements on service availability is analysed.

Having regard to this analysis the following conclusions are drawn:

- **Government intervention in relation to the provision of a 64kbit/s digital data service is not necessary or justifiable, except possibly on equity grounds because of the incentive structure created by current legislative arrangements.**

- **In the supply of other lower levels of data rate capability over the PSTN, equity, fairness and citizens' rights-type reasons may justify some intervention.**

Chapter 7 identifies a number of technical approaches for delivering a carriage service capable of carrying data at a rate broadly comparable to 64kbit/s supplied as part of the designated basic rate ISDN service. Four options are examined and two are eliminated. The analysis proceeds on the basis of two remaining options: a basic rate ISDN service; and a broadly comparable data capability using essentially satellite technologies. The benefits and the costs to the community from specifying such a digital data capability as part of the USO are identified. Finally the chapter comments on claims put to the inquiry by carriers.

An issue is whether the available approaches for delivering a carriage service at a rate broadly comparable to a 64kbit/s service as mentioned in subsection 141(2) of the legislation meet the legal criteria. While it may be technically possible to break up the standard basic rate ISDN service into separate 64kbit/s channels, the costs to consumers for customer equipment would be higher, and the benefits lesser, than for the standard ISDN service. Conditioning the standard telephone service for use by 56kbit/s modems is seen as impractical and, on Telstra's assessment, is not technically feasible.

The assessment focuses upon the other two identified approaches for delivering a carriage service under the USO. One such option is a basic rate ISDN service for delivery of the digital data service. In this context, the costs and benefits from prescribing a digital data service would only generate benefits for the 4 per cent of the Australian population who will not have access to an ISDN service after December 1998. The costs to the community would exceed the benefits by between $155 to $344 million over a ten year period. Further, if an ISDN service were to be specified, there would be significant implications for the universal service fund with the universal service provider's costs expected to exceed revenues by some $500 million over a ten year period. This would represent a 20 per cent increase in the USO contributions paid for 1996-97 with obvious consequences for competition in the industry.

Account is also taken of Telstra's announced satellite strategy as potentially providing a comparable data capability to all Australians by the end of 1998. As Telstra has already committed itself to the investment, there is likely to be no additional cost to the Australian community as a consequence of this satellite based service being specified as a prescribed service under the USO. Equally there would be no additional benefits from specifying the service as the service will be available from the end of 1998 anyway. Finally such an approach might impact unfavourably on potential supply by competitors.

Having regard to the analysis in Chapter 7 and its related Appendix, the following conclusions are drawn:

- **The costs to the community of specifying, as part of the USO, a carriage service broadly comparable to a digital data channel with a data rate of 64kbit/s to end-users as part of the designated basic rate ISDN service would outweigh the benefits to the community if it were provided solely by ISDN.**

- **The ACA has examined Telstra's claim that the costs of specifying ISDN services as part of the USO would exceed the expected benefits and has concluded that the claim can be substantiated. However, such a service providing two 64kbit/s channels and one 16kbit/s control channel exceeds the capability rate suggested by the legislation.**

- **On the basis that Telstra's proposed satellite access service meets the criteria specified in subsection 141(2) of the *Telecommunications Act 1997* then the Australian community would likely not incur additional costs as a consequence of a service broadly comparable to a digital data channel with a transmission rate of 64kbit/s being specified as part of the USO. Equally there may be no additional benefits from specifying such a**

service as part of the USO as the benefits would flow from its commercial availability at the end of 1998 in any event. However, this conclusion would not hold if price levels were unduly restrained by regulations.

- **Specifying as part of the USO any carriage service that meets the criteria of subsection 141(2) of the *Telecommunications Act 1997* would increase the universal service levy on carriers with the potential to increase telecommunications service prices, affect the profitability of carriers and impact unfavourably upon competition in the industry.**

- **An extension of Telstra's current licence condition to provide ISDN/64kbit/s to 100 per cent of the Australian population would have significant commercial impact upon Telstra. However, there would be little actual cost if the required capability was related to the criteria specified in subsection 141(2) and the obligation can be met by using Telstra's proposed satellite access data service.**

Chapter 8 presents an analysis of current usage of data services to support the common applications of facsimile and the Internet. These services are most commonly accessed via PSTN modems at data rates below 56kbit/s. Differences in market usage and demand are also identified for metropolitan and non-metropolitan areas. The analysis, especially for the Internet, draws upon a number of reports and surveys to provide a corroborated understanding of demand, costs and barriers relating to usage, particularly in rural and remote areas. The chapter draws upon the ACA's consultant's analysis of the benefits and costs of two data rate options—28.8kbit/s and 14.4kbit/s—being made available on a universal basis. The analysis is relevant to a consideration of whether some other alternative to a digital data capability specified as part of the USO might more efficiently and effectively address concerns about disparity of access.

An assessment of current demand for lower data rate options which support the commonly used applications is the basis for providing a picture of the broad community demand for data services. The growth in household ownership of facsimile machines has been an apparent development over a relatively short timeframe with almost 1 million, or around 15 per cent, of households owning facsimile machines.

The emergence of the Internet has significantly changed the market for data services. Personal and household use of the Internet has been doubling every year since 1996 and usage statistics show some 3 million Australians currently access the Internet at home, at work and other places. E-mail is the primary application. As at February 1998, some 1 million Australian households had home access. On some reasonable assumptions based on ABS household survey information as of February 1998 about ownership of computers in Australian households, it is likely that around 1.4 million households, or 20 per cent of all households, would have Internet access by February 1999. Households with high incomes tend to predominate in usage of the Internet. Internet access by householders in capital cities is more then double other areas. Only some 7 per cent of households outside capital cities access the Internet from home. Total household annual expenditure for Internet services is running around $211 million or $300 per household.

Internet applications have arguably greater benefits in rural and remote areas with farm usage being of particular significance. Policy makers need sufficient information on

which to base decisions about valuing business and residential usage of the Internet outside metropolitan areas. A more coherent and sustained approach to information collection is needed. The picture which emerges from the ACA's use of available survey information is that current usage of the Internet is particularly low in rural and remote areas and the usage charges of accessing the Internet are critical factors impeding the rate of take-up. Rural and remote Australians are particularly disadvantaged in accessing the Internet as they face a combination of commonly slower connection rates and timed call charges for ISP access. Lack of information and technical assistance with getting online also emerge as inhibiting factors.

Particular attention was paid to the data capability for customer access which might more efficiently and effectively support common applications especially for the Internet. As noted above, most Australians access the Internet via PSTN modems. The most disadvantaged users are those unable to receive 9.6kbit/s. Typically, 30 per cent in rural and remote areas are unable to receive 9.6kbit/s to support reasonable web browsing and facsimile services. Customers receiving a rate of 14.4kbit/s may not have an optimal rate but it is at the threshold of acceptable web browsing. Any data capability benchmark that might be contemplated for the access network might typically be at 28.8kbit/s. Data rates of 28.8kbit/s and 14.4kbit/s were subjected to cost/benefit analysis for availability under universal service arrangements. Costs outweigh the benefits of this availability.

Any target group for upgrading of data capability should involve those customers who fall in the 9.6kbit/s category, followed by those receiving less than 14.4kbit/s. The substantial majority of these are in rural areas. It would be prohibitively expensive to upgrade services on a random demand basis and any policy focus upon upgrading services with the lowest data capability would have to be on a co-ordinated basis. It is important to note that a substantial benefit of upgrading areas with the worst data rates is that the quality of the telephone services will likely also be significantly improved.

Having regard to the analysis in Chapter 8 the following conclusions are drawn:

- **The lack of access by rural users to ISP points-of-presence in their local call area is a significant factor affecting the price for the Internet in rural and remote areas.**

- **Rural and remote users are at the greatest disadvantage in understanding and utilising data capability for common applications. Internet interest and usage would be assisted by targeted information, training and technical assistance and hence may be a catalyst for ISP establishment.**

- **The ability of the existing terrestrial telecommunications infrastructure to deliver a reasonable data capability is an important factor which is impeding take-up of the Internet in rural areas, though less important than prices associated with Internet usage—upgrading the rural infrastructure to support higher data rates in rural areas, were this targeted, would assist in addressing the situation.**

- **A general upgrade to 28.8kbit/s or 14.4kbit/s would necessarily need to be done on an integral basis—possibly district by district—rather than according to random demand or on a service-by-service basis.**

- **The costs of making a 28.8kbit/s or 14.4kbit/s data rate service universally available under the USO or any other mechanism currently outweigh the consumer welfare benefits of this availability.**

Chapter 9 provides an overall conceptual framework and notes that, in the course of the inquiry, two additional conclusions emerge from the ACA's observations. These are:

- **Information available to policy makers and consumers would be assisted by inclusion of the capability of Telstra's access network—as well as those of other carriers—to support identified data rates on a disaggregated basis, perhaps to a regional level, in the Quality of Service monitoring regime.**

- **The information provided in this report will become dated very quickly because of the rapid rate of change that is occurring—both in the supply of data rate capability and the demand for, and use of it.**

1. Introduction

On 30 April 1998, in accordance with the requirements of section 141 of the *Telecommunications Act 1997* (the Act), the Minister for Communications, the Information Economy and the Arts, Senator the Hon. Richard Alston, directed the Australian Communications Authority (ACA), under section 486(1) of the Act, to hold a public inquiry to review whether a carriage service that provides digital data capability broadly equivalent to 64 kilobits per second (kbit/s), comparable to the capability provided by a basic rate Integrated Services Digital Network (ISDN) service, should be incorporated into the Universal Service Obligation (USO).

The ACA was also required to investigate the costs, benefits and risks of such a decision and other matters.

The ACA has completed this inquiry and this report details its findings.

1.1. Legislative Basis of the Inquiry

Under section 141 of the Act the Minister was required to cause to be conducted a review into the incorporation of a digital data capability before 30 September 1998.

1.2. The Scope of the Inquiry

The Minister's directions provide the terms of reference for the Digital Data Inquiry (see Appendix 1).

In summary, the Ministerial directions require the ACA to assess whether the benefits of specifying under the USO a carriage service that provides a digital data capability broadly equivalent to 64kbit/s comparable to the capability provided by ISDN, would outweigh the costs.

In making this assessment the ACA was directed to consider the following factors:

- the distribution of the costs and benefits within the community;
- the risks of any estimated costs and benefits not being achieved due to changes in technology, consumer preference or any other market changes;
- the current and projected availability of such services;
- the prices at which these services are, or are expected to be, available to end-users and the differences, if any, in terms of availability and price in metropolitan and non-metropolitan areas; and
- the applications that are either currently available or expected to be shortly available.

In addition, the directions requested that an assessment be made as to whether some alternative service, means or process might more efficiently and effectively address the concerns that would be addressed by specifying a digital data capability as part of the USO.

1.2.1. What is a data capability?

A 'data capability' refers to the ability of a carriage service to carry data. This capability is expressed in terms of a data transmission rate. Data transmission rates are critical to the functionality of a carriage service. This is because the rate determines both the type of applications that a service can support and the responsiveness at which they operate. Hence, a higher data rate enables a data service to support a wider range of applications and to run those applications more quickly.

The Minister's directions refer to a 'digital data capability'. Throughout this report this term is used to refer to a digital transmission at a rate broadly equivalent to 64kbit/s. The term 'data capability' is used in a more general sense, and encompasses data transmissions at lower rates which potentially could be provided by modems over analogue sections of the public switched telephone network (PSTN), as referenced in the Table 1.1.

The following tables illustrate the relationship between data rates and applications. Table 1.1 shows the average transmission times for various applications operating at different data transmission rates. Figure 1.1 shows the minimum data capability required to support various applications.

Table 1.1

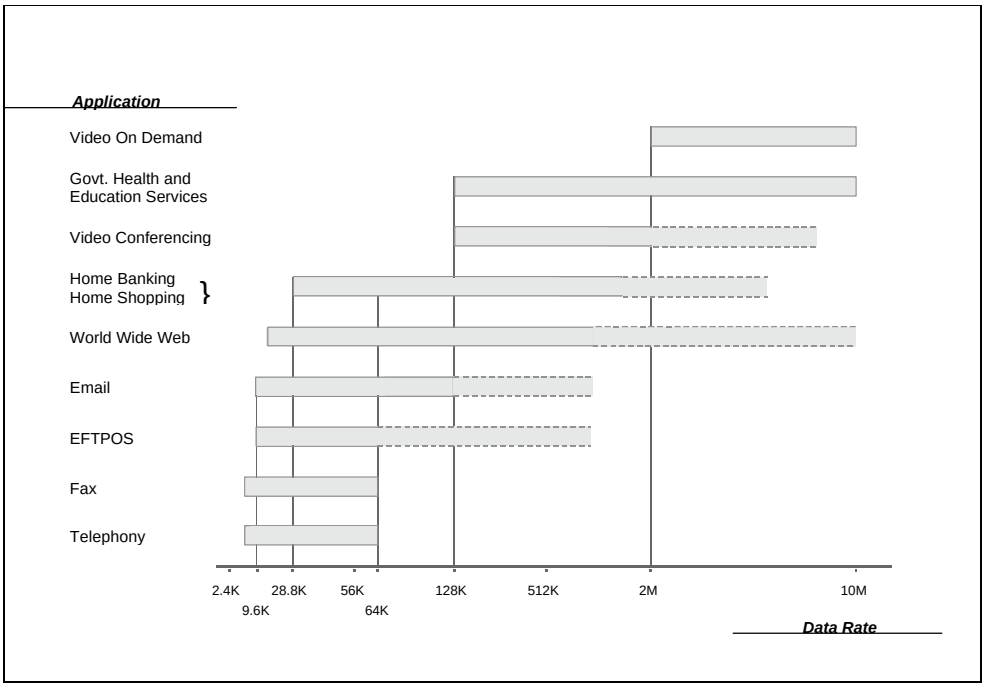
Impact of Transmission Rates on Response Times

Access Network	Short E-mail	Simple Web Page	Average Web Page	Complex Web Page
	1kbyte	20kbytes	50kbytes	100kbytes
2.4kbit/s PSTN modem	4 sec	1 min 14 sec	3 min 5 sec	6 min 10 sec
9.6kbit/s PSTN modem	1 sec	19 sec	46 sec	1 min 33 sec
28.8kbit/s PSTN modem	1 sec	6 sec	15 sec	31 sec
56kbit/s PSTN modem	1 sec	4 sec	9 sec	18 sec
64kbit/s ISDN B channel	1 sec	3 sec	6 sec	13 sec
128kbit/s ISDN 2xB channels	1 sec	1 sec	3 sec	6 secs

The response times assume that the call is already established. Estimates of the total call time, including call set up times, can be obtained by adding 35 seconds to the PSTN modem times and 1 second to the ISDN times.
Source: The Allen Consulting Group

Figure 1.1

Applications Supported By Different Data Transmission Rates



Source: the Review of the Standard Telephone Service, December 1996, p. 54; and ACA analysis.

1.2.2. What is 'ISDN'?

The Minister's directions to the ACA refer to a basic rate ISDN service.

Basic rate ISDN is a technical solution specifically designed for the transfer of digital data. It is comprised of two 64kbit/s channels supporting a total digital data capability of 128kbit/s. A third 'control' channel controls and co-ordinates data flow over these channels and can offer auxiliary data transmission up to 16kbit/s. Due to its high data capability an ISDN service can support more voice, data and facsimile applications, faster data applications or more data intensive applications such as digital imaging or video-conferencing, than can be supported by the standard telephone service.

1.2.3. What is the Universal Service Obligation ?

The Minister's directions required the ACA to evaluate the costs and benefits of providing an ISDN comparable digital data capability as a declared 'prescribed carriage service' within the USO under subsection 141(1) of the Act.

Chapter 3 of this report provides a full explanation and discussion of the legal framework of the USO.

1.3. Conduct of the Inquiry

The inquiry formally commenced on 16 May 1998. The legislative requirements placed upon the ACA when conducting a public inquiry are set out within Division 2, Part 25 of the Act.

This section outlines the process adopted by the ACA during the course of this public inquiry.

1.3.1. Public Notice

On 16 May 1998 a public notice providing details of the inquiry and calling for submissions was published in newspapers around Australia, including various state daily newspapers and over 48 rural and regional weekly publications.

1.3.2. Discussion Paper

The ACA released a discussion paper on 18 May 1998. Over 400 copies of the discussion paper were distributed by the ACA to a variety of carriers, service providers, industry bodies, consumer groups, academics, state and local governments and interested members of the general public. The discussion paper was also accessible from the ACA world wide web site (http://www.aca.gov.au) throughout the inquiry.

Within the discussion paper the context of the inquiry was set out and issues central to the ACA's inquiry identified. The discussion paper sought to stimulate consideration of the issues associated with the inquiry and to encourage written submissions from interested parties by 30 June 1998.

1.3.3. Use of Consultants

The ACA engaged the Allen Consulting Group to provide expert economic and technical advice during the course of the inquiry.

1.3.4. Community and Industry Consultation

During the course of the inquiry the ACA consulted widely with a broad range of individuals and bodies representing the interests and concerns of industry, consumers, carriers, service providers, state and local governments, business associations, academics and private citizens.

Public Hearings

The ACA advertised and conducted a series of public hearings in disparate parts of Australia. Table 1.2 shows the hearing dates and locations.

Table 1.2

Public Hearings conducted by the ACA

Venue	Date
Alice Springs	28 May 1998
Perth	2 June 1998
Dubbo	9 June 1998
Roma	10 June 1998
Sydney	17 June 1998

In the context of discussions during the public hearings, the following common themes emerged:

- an enhanced data capability would deliver great benefit to rural consumers particularly in relation to education, health and agriculture—it was argued that rural people had great incentive to maximise telecommunications improvements as it assisted in decreasing the isolation experienced in living and working in rural and remote Australia;
- lack of local call access is the significant issue affecting the price disadvantage for Internet usage in rural areas; and
- this, combined with the lower rates for data access experienced by regional, rural and remote consumers, was considered to place these consumers at a disadvantage in comparison to metropolitan consumers.

Submissions

The ACA received 89 submissions to the inquiry from a wide variety of sources including industry representative bodies, individuals, state and local governments.

The full list of submissions is at Appendix 2. A summary and discussion of the issues raised by the submissions, in direct consultations, and in the public hearings is in Chapter 4 of this report.

2. Opportunities for and Barriers to Data Access

This chapter discusses the public, market and regulatory context that relates to the provision and use of telecommunications services for the transmission of data.

2.1. Market Changes

The past ten years has seen dramatic changes in telecommunications in Australia.

In 1989 the Government implemented a restructuring of telecommunications. The reforms included the:

- establishment of AUSTEL as an independent regulatory body;
- retention of the basic monopolies of Telecom, the Overseas Telecommunications Company (OTC) and Aussat;
- introduction of competition in the provision of:
  - value added services;
  - customer cabling; and
  - the supply, installation and maintenance of customer equipment.

Further reforms affecting the structure and ownership of telecommunications were implemented in 1991 and 1992, and included:

- the merging of Telecom and OTC to become Telstra Corporation;
- licensing a national facilities-based network competitor, Optus, which took over the national satellite service with the purchase of Aussat;
- licensing three public mobile telecommunications service operators (Telstra, Optus and Vodafone);
- open competition in the areas of:
  - resale of domestic and international capacity; and
  - public access to cordless telecommunications services; and
- strengthening AUSTEL's regulatory powers.

On 1 July 1997 the current legislation, the *Telecommunications Act 1997,* came into force. This legislation established the opportunity for further competition in provision and operation of telecommunications infrastructure. Telstra's prices remained controlled under the *Telstra Corporation Act 1991* to ensure that, among other things, competition did not disadvantage consumers.

There are now 22 licensed carriers in Australia (as at 14 August 1998). This increasing level of competition has led Telstra to lower its prices, innovate and make new

investments. For the consumer, the most obvious impact has been the reduction in prices, in particular for overseas and long distance calls, and the increase in the range of available telecommunications services.

It is important to note, however, that the effect of competition has been more keenly felt in urban and regional areas. In rural and remote Australia, where standard telephone services are still almost exclusively provided by Telstra, the benefits from competition are not as evident. This is discussed further in Chapter 5.

2.2. Common Data Applications

As discussed in Chapter 8, the last few years has seen significant growth in the use of data applications in Australia—particularly facsimile and Internet services. Both of these applications utilise data modems (ie. devices that enable the sending and receipt of data streams) to transmit information and the majority of end users utilise the public switched telephone network (PSTN) for the transmission of data.

2.2.1. Facsimile

There are two major types of facsimile equipment: stand-alone facsimile machines (with an in-built modem) and facsimile modems connected to a computer, generally utilising a standard 'multi-purpose' modem. The vast majority of facsimile equipment in Australia conforms to the International Telecommunication Union (ITU) Recommendation T.4: *Standardisation for Group 3 Facsimile Terminals for Document Transmission*. A range of data rates for Group 3 facsimile terminals is supported by the ITU recommendation, including ITU-T V.34 transmission up to 33.6kbit/s (where implemented) as well as V.17 and V.29 protocols.

The V.17 protocol supports a maximum data rate of 14.4kbit/s. The earlier V.29 protocol supports a maximum rate of 9.6kbit/s. In a facsimile transmission, the data rate achieved is determined by the rate of the slowest machine. To illustrate this point, a transmission between a V.17 machine and a V.29 machine could not occur at a data rate above 9.6kbit/s.

2.2.2. The Internet

Internet-based applications currently in use broadly fall into two categories: electronic mail (person-to-person messaging known as e-mail) and world wide web based applications (ranging from information searching and downloading from the many thousands of world wide web Internet sites, to interactive 'chat rooms'). Access to the Internet is achieved through the use of data modems and connection to an ISP, which provides customers with the necessary interfaces to gain access to the data 'highways' which form the Internet.

2.3. Data Rates and Functionality

As noted in Chapter 1, the data rate at which a service operates is important because it defines its functionality—in other words the range of applications that can be satisfactorily supplied over a data service and the quality of the service.

While the driving force behind the demand for increased data rates has been the growth of the Internet, it is important to note that other online information and entertainment services, home banking, online government services and electronic commerce are currently available but their use is still fairly limited. Electronic mail (e-mail) is currently the predominant application in use (as discussed in Chapter 8).

As noted in Table 1.1, while access to the Internet is possible at very low speeds, such as 2.4kbit/s and 9.6kbit/s, the quality of the services—as measured by response times—is severely restricted, of which the dominant factor from the viewpoint of the user is the time taken in using the service. For example, at 2.4kbit/s it would take over three minutes to download an average web page and graphics would not be possible. In comparison, at 14.4kbit/s and 28.8kbit/s it would take 31 seconds and 15 seconds, respectively, to download the same page. The improvement in quality of service is not as noticeable once the data transmission rate is above 28.8kbit/s.

It is difficult to define a ‘reasonable’ data rate as this is, to a large extent, a value judgement—both e-mail and web-browsing applications are possible (and effective) at 14.4kbit/s. What is ‘reasonable’ varies depending on the requirements of the end user. The difference between a 14.4kbit/s rate and a 28.8kbit/s rate depends largely on the value users place on their time when browsing the Internet or downloading data—these activities will typically take twice as long at the slower rate. It may be frustrating for many users to browse web pages with complex graphics at a 14.4kbit/s rate, whereas it would be acceptable at a 28.8kbit/s rate. A 28.8kbit/s rate is likely to be more critical for business users, in order to conduct their affairs on a more economical basis. (Further comment of the utility of respective data rates is provided in Chapter 8.)

2.4. Achieving High Data Rates: The Problems

Whilst the majority of households and businesses in Australia are technically capable of accessing the Internet (the exceptions being almost all located in the most remote parts of the country) there is a significant variance in the data rates that are achieved, and hence the applications that are available for use. The factors that affect data rates are outlined below.

2.4.1. Telephone Service

The quality and structure of the network provided by the carrier is a major determinant of the data rate achieved by the end user. As noted above, in Australia the majority of data traffic occurs over the PSTN. The PSTN was originally designed to provide voice grade services only.

PSTN

The length and grade of the copper line from the customer's exchange to the customer's premises affects the data capability delivered by the network. As is the case with the ability to provide ISDN beyond a certain distance limit (see Chapter 5 for this discussion), at a cable length of 4 to 6 kilometres from the exchange the data carrying capability of the network diminishes, largely due to line attenuation problems. Extended line distances also increase the potential for extraneous interference, such as from electric fences in rural areas. To illustrate this problem, in almost all cases the PSTN cannot achieve 28.8kbit/s beyond this limit, irrespective of the quality and type of modem attached to the line. This problem is compounded when modem communication is between end-users, as the data capability is determined by the total line length of both customers from the exchange. For example, if both users are located 3 kilometres from their local exchange they will almost certainly not be able to achieve a data rate of 28.8kbit/s as the total line length equals 6 kilometres. As discussed in Chapter 5, the data rate capability of the PSTN in rural and remote areas of Australia is generally significantly lower than in urban and provincial areas, and the longer line lengths in these areas is a significant contributor to this situation.

The ACA also sought information from Telstra on the capability of its PSTN network to support a data rate of 56kbit/s through the utilisation of V.90 modems. Telstra advised as follows:

> To achieve this speed, Internet Service Providers (ISPs) must have digital access to Telstra's network and the (V.90) modem users must have PSTN connections with only one A/D [analogue to digital] conversion in the path. In other words, the end-to-end connection must have at most, half of a quantisation distortion unit (qdu). At this speed also, impulsive noise (eg electrical spikes from such sources as trams, trains, machinery, electric fences etc) is more significant. Increased noise resulting from impedance mismatching is also more limiting and "cross-talk" degradation is more significant. Even assuming that ISPs have digital access to Telstra's network, that impedance matching is correct and that there is only one analogue/digital conversion in the customers path, the CAN still remains a major limiting factor at this speed. Network experience to date indicates that the absolute highest speed reached with copper pairs under very limited conditions is 48kbit/s. In conclusion, it is not feasible for the network to support 56kbit/s.[1]

The maintenance of the PSTN is also an important factor in determining the data rate achieved by customers. Factors such as the age of the copper line, the material used in its insulation, the quality of joints, the proximity of lines to other cables (potentially causing line interference) can effect the data rate achieved. The type, age and quality of Customer Access Network (CAN) electronic devices are also potentially significant data rate limiting factors. In correspondence with the ACA, Telstra stated that in the next financial year it had budgeted $120 million specifically for CAN rehabilitation in key areas. In respect of this expenditure, Telstra noted that:

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[1] Telstra—ACA communications.

> Part of the expected benefits from the ..... expenditure will be in the region of 25,000 services having both improved performance, and data capabilities, typically up to 28.8kbit/s, predominantly in rural areas.[2]

One mechanism by which the data rates provided to customers might be improved is through an increased level of CAN rehabilitation, particularly in rural areas.

Appendix 3 contains a technical explanation from Telstra of the relationship between modem transmission characteristics and the characteristics of Telstra network, which can combine to degrade the performance of data transmission over the PSTN.

DRCS/HCRCS

Digital Radio Concentrator Systems (DRCS) typically only provide 2.4kbit/s data capability. Each system can provide services to up to 75 subscribers, but only 16 subscribers can use each system at any one time, which can create problems at peak times. Telstra has commenced a replacement program for the DRCS (known as RATE) which is focussed on replacing the existing DRCS with either a High Capacity Radio Concentrator System (HCRCS)—currently capable of supporting a data transmission rate of 19.2kbit/s—or other technology solutions.[3] DRCS networks are also affected by adverse weather conditions.

In its *Universal Service Plan*, Telstra states that approximately 'two thirds of Australia's land surface is serviced by 252 radio concentrator systems'.[4] The total number of radio concentrator system customers is around 19,000, consisting of 5,500 HCRCS and 13,500 DRCS customers.[5]

2.4.2. Customer Equipment

Customer equipment—in other words the facsimile, modem and computer in the customer's premises—is an important factor in determining the data rate that can be achieved by an end user.

The type of modem in use is a particularly important determinant of service levels. Modem technology has advanced rapidly in recent years. The more recent modem protocols (eg. V.34) tend to be more robust when encountering transmission impediments than earlier protocols (eg. V.32). Consequently, in many situations modems configured with these modern protocols can achieve a more rapid data transmission rate than modems configured with earlier protocols.

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2 Telstra—ACA communications.

3 Telstra—ACA communications. Note: whilst HCRCS are currently only capable of 19.2kbit/s, in time it is expected that they may be capable of 28.8kbit/s. See Chapter 5 for a more detailed discussion of this technology.

4 Telstra, Universal Service Plan, [http://www.telstra.com.au/corporate/docs/uso/final/index.htm], 1998, p.23.

5 Telstra—ACA communications

The V.34 protocol supports data rates up to 33.6kbit/s. The older V.32 bis protocol is limited to a maximum of 14.4kbit/s. The V.90 recommendation supports asymmetric data rates with up to 56kbit/s in the downstream path and up to 33.6kbit/s in the upstream path. Typically there is a range of data rates supported within a protocol such as V.34. This is negotiated by the send and receive modems pending the rate achievable across the established connection.

The quality of the modem is another variable in the data rate achieved. Modem prices vary considerably, with the more expensive modems generally providing more reliability and consistent data rates. A higher quality modem is generally attributed with having better software and hardware. For example a less robustly designed modem will not perform as well as a high quality modem when encountering transmission impediments and tends to operate at lower data rates under such conditions.

The capability of the end-user's computer transmission port between the computer and the modem, is also a factor. The Universal Asynchronous Receiver Transmitter (UART) makes up the serial port. It converts parallel bytes from the main computer processor into serial bits for transmission, and vice versa. In its submission to this inquiry Telstra states:

> the 'port speed', can also depend on the UART chip in the PC (eg. it is understood that to get transfer speeds and reliability above 19.2Kbit/s the PC should have a 16550 buffered UART installed, and the PC's operating system, software and COM driver must be able to support the buffering features of the 16550 UART chip).[6]

In its submission Telstra also states that 'common household telephone configurations can have adverse impacts on data transmission performance or reliability'. By way of example, Telstra notes that:

> telephones (particularly those with a memory-based function, eg stored numbers) or other equipment (eg alarm dialler) connected in parallel with the telephone line being used (use of a properly located and installed mode 3 socket should overcome this) for data transmission can adversely affect data transmission speeds.[7]

Another important factor is the correct setting of the equipment. This is particularly important for facsimiles—the 'handshake' nature of facsimile communications requires both facsimile machines involved in a data communication to be correctly configured to achieve the optimal transmission rate. Incorrect setting of equipment will often result in lower data transmission rates.

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6 Telstra, Submission to the Australian Communications Authority Public inquiry: Digital Data Review in relation to the Universal Service Obligation, June 1998, p.8.

7 Telstra, submission, p.8.

2.4.3. The ISP

The data capacity of an ISP's equipment will also affect the data rate that can be achieved by the ISP's customer. The capacity of the links between the ISP and the ISP's data supplier (eg. the ISP's link with Optus or Telstra or another high capacity data supplier) will also affect the rate achieved, as will the data capacity of the service from the customer to the ISP and the data links to the Internet at large. ISPs often package their products, in addition to pricing by access time, on the basis of quality of service (eg. ease of access, and responsiveness of operation after access is established).

2.4.4. The Internet Itself

There is a number of factors associated with the operation and commercial structure of the Internet that influence the data rate achieved by end-users when accessing the Internet. These include the data carrying capacity of the Internet backbone links (eg. between Australia and other countries) and the location of the data being sought—peak traffic periods may also decrease the data rates achieved.

2.5. The Price of Internet Usage in Metropolitan and Rural Areas

As discussed in Chapter 8, a key issue for rural and remote areas is that ISP points of presence are often located outside a customer's local call zone.[8] This means that many rural and remote customers have to pay long distance rates to access an ISP. Data from a recent report from the ABS[9] indicates that the two main reasons for households not obtaining Internet access were 'costs are too high' and a 'lack of interest'. The percentage of households claiming that costs were an impediment to obtaining Internet access was similar for capital cities and the rest of Australia (29.6 per cent and 30.4 per cent respectively), indicating that price is an issue across all market segments.

To examine the extent of the difference between rural and metropolitan Internet usage costs, the ACA conducted an analysis of publicly available ISP access charges and Telstra's tariffed call charges which identified some significant issues.

A comparison of annual rural and urban Internet access costs was carried out. Fixed costs of $1779.80 were assumed, comprising a computer ($1500), 56kbit/s modem ($140) and annual line rental ($139.80). These fixed costs are assumed to be common to all Internet access situations and are therefore not included for the purposes of comparison.

In summary that analysis indicates that there is little difference between the average costs per hour of access where a local ISP is available in an area with local call access. However, when access is required outside local call access areas, the call charges can represent up to 77 per cent of the total annualised ISP access and call charges at a

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[8] Whilst ISP charges are somewhat higher in rural and remote areas, most likely due to lack of competition, they are not significantly higher than in metropolitan areas.

[9] Australian Bureau of Statistics, *Household use of Information Technology*, Cat. No 8128.0, February 1998, p.21.

14.4kbit/s data rate based on 20 hours Internet access per month (assuming a single call duration of 30 minutes.) This disparity increases in areas where the data rate is considerably slower than 14.4kbit/s. The detail of this analysis of price disparities between rural and urban areas is provided in Chapter 8.

2.6. The Public Debate

With many Australians experiencing problems in achieving a 'reasonable' data rate, there has been an increasing call for high speed data services to be made available universally. This section provides a brief overview of the public debate that is the background to this inquiry—as detailed in submissions to this inquiry and recent media reports.

2.6.1. What are the perceived problems?

The public perceptions of the problems associated with achieving high data rates are focussed on access and affordability in rural and remote Australia.

Access for Rural and Remote Australia

The majority of submissions received by this inquiry focussed on the access problems experienced by rural and remote Australia.

The claimed data rates achieved by submitters located in these areas ranged from 2.4kbit/s to 9.6kbit/s, and many reported difficulties in achieving and sustaining connections to the Internet. The following extract from John Denham's submission describes the difficulties he experienced in establishing and maintaining an Internet connection.

> About two years ago we decided to establish an Internet link...It took us about two months, four modems, and an expensive consultant to establish a connection. The problem was that the telephone line would only support reliably 300bps or 1200bps, occasionally 2400bps. Most of the modems did not come with sufficient instructions to allow us to force them to use this low speed....The speed of communications places severe limitations on our ability to use digital communications. For e-mail, we can only send or received two or three pages...attachments of any size are out...For the World Wide Web, graphics of any kind are effectively unusable...A typical example of the time taken to use the World Wide Web is the Australian Communications Authority Website...where the first page (images off) too six minutes and forty seconds to download.[10]

Indications of similar problems were common amongst submissions from rural and remote areas. Many submitters also noted the disparity in data services between metropolitan and rural areas. Kevin Cole notes that:

> a baud rate of 2400 [ie. 2.4kbit/s] is often put as the basis entitlement for a subscriber. This is completely inadequate for either fax or graphic Internet use.

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[10] John Denham, submission.

> Fortunately the service technicians try a bit harder than that, but it is still a miserable service when compared to my city counterparts...[11]

Ross Wilson's submission concurred, calling for:

> the urgent upgrading of all rural telephone lines to a standard equal to that of urban users...[to] a standard...to enable rural users to make effective, noise free use of lines for data speeds of at least 33.6kb, and probably up to 56kb/sec.[12]

Many submitters also claimed that this situation was ironic, as they argued that rural and remote Australians, given their physical isolation from government and other services, are also those who extract the greatest benefit from the access to higher data rates. For example, the Isolated Children's Parents' Association of New South Wales noted that:

> One of the biggest issues for families living in isolated areas is overcoming the problems associated with getting their children to an educational facility or alternatively bringing education to their isolated homestead by way of distance education to isolated children will increase substantially if increases are made to data capacity of services.[13]

The Armidale City Council also noted that:

> The provision of telecommunications is important for all Australians but is more profound in remote areas. For example, many country people rely on mail order for goods - even the most basic goods...Health services in rural Australia are often inadequate...Rural residents often have to travel great distances to received adequate health care...Telemedicine offers the potential to deliver reforms to rural health care and the wider health system in Australia.[14]

This point was also made by the University of New England, which noted that:

> The major inhibitions to studying by distance education through electronic means are the cost of access and the lack of bandwidth to enable the efficient transfer of audio, graphic and video material and to provide for fast efficient "on-line" interaction between student and lecturer. Currently many students cannot access sufficient bandwidth to effectively download material and as the requirement for bandwidth increases (to allow for video streaming and interactive uses) these students will become further disadvantaged....A digital data capabilty of 64kbits/s would provide a significant upgrading of the educational experience for 'distance education' students and assist in overcoming the tyranny of distance which has contributed to the disadvantage suffered by people located in rural and remote areas of Australia.[15]

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11 Kevin Cole, Digital Upgrade to Universal Services, submission.

12 Ross Wilson, ACA Digital Data Review, Fascimile to Review Panel, submission.

13 Isolated Children's Parents' Association of NSW, Digital Data Review Discussion Paper, submission.

14 Armidale City Council, Digital Data Review, submission.

15 University of New England, Digital Upgrade to Universal Service—Public Inquiry, submission.

Some submissions have argued that with a substantial decline in services, for example banking, to rural and remote Australia over the past 20 years, access to the information super-highway is the only solution to the survival of towns in rural and remote Australia. For example, the Highway Safety Action Group of NSW stated:

> It is essential that reasonably priced access to telecommunications services be provided to rural and remote areas to service distance education, health, business and community needs and prevent further depopulation of regional Australia.[16]

This claim was supported by Advanced Measurement and Control Pty Ltd, which noted that:

> All Australian industry is now having to compete in a world market that necessitates a high level of efficiency. Such efficiency allows the production of goods and products with less labour. In the rural sector this has meant that the rural population has started to drop below the critical population levels required to provide efficient infrastructure and services...It is for this reason that this review must at least highlight the need for vastly improved rural communications in order that further steps can be made in ensuring that our rural industries do not collapse because of the lack of social services...[17]

And also supported by Stuart Hulme, who noted that:

> the two banks currently operating in Holbrook are now run by just a few staff each... Eventually, these two branches may close completely. I don't believe this to be necessarily a bad thing as long as there is some other alternative which provides as good as or better service than before. The advent of online banking may help to fill that gap.[18]

The Western Australian Government submission noted the benefits that will accrue to cities from improving data services in rural and remote areas:

> Movement of population to larger centres creates a need to construct additional infrastructure in the city whilst currently installed infrastructure is left idle in country towns.[19]

This is supported by the submission from Advanced Measurement and Control Pty Ltd, which notes that:

> Metropolitan areas such as Sydney are increasing their share of the NSW economy, a concentration which is occurring as a result of lower business costs. But congestion, pollution and social dysfunction is something that does not get recorded very well. Increasingly our public investment in infrastructure is used to ameliorate these problems and that is absorbing a large part of public investment

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16 Highway Safety Action Group of NSW Inc, Digital Data Review, submission.
17 Advanced Measurement and Control Pty Ltd, ACA Digital Data Review, submission.
18 Stuart Hulme, ACA Digital Data Review, submission.
19 Western Australian Government, Digital Data Review Submission to the Australian Communications Authority by the Government of Western Australia, submission.

> relative to an alternative, which is to encourage more of that business to the country areas...The question is not a technical one, but a social one. Society needs to determine if high quality telecommunications facilities should be provided to the country areas. Should everyone live in cities? Should everyone live in a distributed rural environment? Or should there be adequate facilities to enable both?[20]

And also by comments from McMillan, Evans and Associates, which noted that:

> Australia's population is concentrated in the "coastal fringe", particularly the major centres Sydney, Melbourne, Brisbane etc. Anecdotal evidence suggests this is not because people particularly want to live in the major cities, but they have to if they want access to jobs and services. In this day and age the key underlying cause of this concentration is communications. Businesses, and therefore people, concentrate in Sydney because Sydney has better and cheaper communications than the rest of the state. This trend towards concentration creates a number of problems for our society, particularly in Sydney where it has become necessary to introduce a number of measures to allow an even greater number of people to live in the same amount of space.[21]

Affordability for Rural and Remote Australia

Many submissions to this inquiry have noted that the problems with access in rural and remote areas are exacerbated by significantly higher prices. The perceived main reasons for higher costs were: the lack of local call access in rural and remote areas, compounded by the low data transmission rates; and the lack of competition, particularly in terms of access to an ISP.

The Connabarabran Shire noted that customers in rural and remote areas:

> should received a level of service comparable to people who live in capital cities. These people pay considerably more for their existing low quality service, as many of their calls are STD due to their isolation. This lower quality service equates to increased time costs with slow data transmission.[22]

The Western Murray Development submission noted:

> In a perfect world with perfect competition, price control arrangements would be unnecessary. In much of rural and regional Australia, there is currently no effective competition. Hence, there are no effective competitive pressures to bring about either greater level of innovation in the delivery of services or competitive pricing.[23]

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20 Advanced Measurement and Control Pty Ltd, submission.

21 McMillan, Evans and Associates, submission.

22 Coonabarabran Shire, submission.

23 Western Murray Development, Digital Data Review Submission to the Australian Communications Authority.

In its submission, the North Burnett Regional Economic Development Council Inc stated:

> We question TELSTRA's provision of BIGPOND to rural subscribers. To us it seems to be monopolistic (as we have no alternatives) and exploitative as we have to pay 7 times the city rates for connect time.[24]

The submission from the Western Murray Development notes that for rural and remote areas:

> The issue of affordability relates to that of effective demand. Affordability cannot be easily proscribed. What is more important, however, is to ensure that the cost of access in rural and regional Australia is no greater than the cost of access in the cities.[25]

2.6.2. Views on the Need for Universal Access

A number of submissions strongly argued that the unparalleled access to information and services that is provided by the Internet requires, for reasons of equity, that all people should have access. Concerns were also expressed that unless this occurs Australian society will become increasingly divided on the basis of those who are information rich and those who are information poor. For example, in its submission to the inquiry the Northern Territory Government states that:

> the information age is such that no individual will be able to survive without access to wide band communications.[26]

This is supported by a number of other submissions, including the Country Women's Association of New South Wales, which stated that it considered:

> Digital Data implementation to be an "essential service", and should not be provided on the basis of the ability of the consumer to pay for this implementation. This technology should be provided as a "blanket coverage" throughout Australia regardless of initial cost.[27]

In addition, the Northern Territory Branch of the Australian Computing Society noted that:

> In recent years the Internet and network technology has become an integral aspect the social, economic and cultural fabric of modern society. New communications products and systems have become essential to an individuals ability to acquire, sustain and develop marketable job skills and to be an informed and active participant in society.[28]

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24 North Burnett Regional Economic Development Council, Digital Data Review Submission.

25 Western Murray Development, submission.

26 Northern Territory Government, Submission to the Digital Data Review Public Inquiry.

27 Country Women's Association of New South Wales, Country Women's Association of New South Wales Submission of Digital Data Review to the Australian Communications Authority.

28 Northern Territory Branch, Australian Computing Society, ACA Digital Data Review, submission.

The Australasian Teleconferencing Association also note that:

> A digital data capacity of uniform quality and reliability, available to all Australians, regardless of where they live or conduct their business, is an essential prerequisite for our future as an information society in the next century.[29]

Given this general assumption, a number of submissions also supported the inclusion of a data capability under the USO, although the suggested rate at which it should be prescribed varied between 28.8kbit/s, 64kbit/s and 128kbit/s (and higher).

The North Burnett Regional Economic Development Council Inc. stated within their submission that:

> As a bare necessity we should have access to transmission speeds in excess of 28800 bit/s...[30]

The Australian Telecommunications Users Group (ATUG):

> strongly supports the inclusion of a 64kbps data capability in the service specification of the Standard Telephone Service supplied under the Universal Service Obligation.[31]

The Communications Expert Group (CEG) argued that:

> the ETSI ISDN service should be declared as service under the USO for the following reasons: Development and Maintenance of Australia's natural export advantage; Retention of population in rural areas; improve quality of life and services in rural areas.[32]

Two state Governments supported the prescription of a data service above 64kbit/s. The Northern Territory Government submission recommends that:

> any Universal Service Obligation (USO) upgrade should focus on service provision to high priority ares where there is a user demand and the required level of service should be at least 128 Kilobits per second (Kbps).[33]

The Western Australian Government submission recommends:

> there be a universal access to an ETSI standard digital data capability of 128kb/s available flexibly to users as either two 64kbit/s/sec services or as a single 128kb/s service, plus associated signalling.[34]

whilst the Tasmanian Department of Premier and Cabinet submission states that:

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29 Australasian Teleconferencing Association Inc, Submission by the Australasian Teleconferencing Association to the Australian Communications Authority Public Inquiry into Digital Upgrade to Universal Service.

30 North Burnett Regional Economic Development Council Inc., submission.

31 Australian Telecommunications Users Group, Digital Data Review.

32 Communications Expert Group, Digital Data Review, submission.

33 Northern Territory Government, submission.

34 Western Australia Government, submission.

> Tasmania will welcome the extension of the Universal Service Obligation to include a digital data capability. As a minimum this digital data capability must be of at least 144kbps and of flexible format to permit applications such as real time video that require channel aggregation.[35]

A number of previous reports also support the inclusion of a data service under the USO, the most prominent being the majority report of the Standard Telephone Service (STS) Review Group, which states that:

> A carriage service providing a digital data capability should be made a prescribed carriage service from 1 July 1998 to ensure that it is reasonably accessible to all Australians on an equitable basis wherever they reside or carry on business by 1 January 2000, unless such a prescription is not necessary... [36]

A number of submissions, however, whilst supporting the concept of better access to data services for all Australians, were reticent in supporting the inclusion of a data service under the USO prior to a careful analysis of the costs and benefits before a decision is made. Submissions that support this view point include the Victorian Government which argued that whilst 'all Australian citizens and businesses should have reasonable access to 'enhanced telecommunications services' irrespective of their location' a rigorous analysis of the costs and benefits of placing the service under the USO should first be carried out.[37] This argument was supported by submissions from the Business Council of Australia, which stated that:

> the Government should exercise extreme caution before deciding to expand the availability of a similar service nationwide by including this requirement in Telstra's USO.[38]

Similar arguments have also been put forward by Patrick Xavier[39] and the minority report of STS Review by Professor Henry Ergas.[40] Confusingly, given its support of the prescription of the 64kbit/s under the USO (as noted above) the majority report of the STS Review also notes that:

> in making this assessment, the decision-making framework set out in Chapter 7 should be applied, the key points of which are...weigh the benefits of intervention

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35 Tasmanian Department of Premier and Cabinet, submission.

36 Standard Telephone Service Review Group, *Review of the Standard Telephone Service, December 1996*, Department of Communications and the Arts, December 1996, p.167.

37 Victorian Government, Digital Data Review, submission.

38 Business Council of Australia, Submission to the Public Inquiry on the Digital Data Review.

39 Patrick Xavier, 'Universal Service and Public Access in the Networked Society, *Telecommunications Policy*, Vol 21, No. 9/10, 1997, pp.829-842. Xavier proposes a model to be used in determining whether a telecommunications service should be included under a USO. This article also provides a good review of the framework used by a number of other countries in deciding whether or not to incorporate new services into the USO.

40 Henry Ergas, "Review of the Standard Telephone Service: Minority Report", in Standard Telephone Service Review Group, Commonwealth Department of Communications and the Arts, 1996.

> against the costs, and the effects on other policy goals. Intervention should only occur where the benefits outweigh the costs.[41]

A 1997 study by Analysys for the European Commission concluded that a significant degree of penetration should be reached by a service before it comes under consideration for incorporation into the USO.

> Almost all of the organisations we spoke to were opposed to the concept of using universal service as a mechanism to drive the roll out of new technologies and stimulate economic development (e.g. the assertion that basic rate ISDN should be included in universal service in order to speed the diffusion of this service to the population as a whole). The belief that such an approach would lead to inefficient investments and that the costs would be spread over the industry cemented opposition from incumbent TOs[42], new operators, user associations and consumer associations (development agencies responsible for remote areas of the European Union were the only exception to this).
>
> Universal service should not be used as a means of initiating the roll-out of new services which have yet to find wide market acceptance. We recommend that for a service to be considered for inclusion in the universal service obligation it ought to have already grown to a 75% market penetration under normal market conditions.[43]

A few submissions also argued that telecommunications, and hence increased data rates, should be provided by the government—in a similar vein to the provision of postal and library services.

2.7. Summary

This chapter provides an overview of the data applications currently available to Australian telecommunications users, the means by which they are provided and the constraints on improved levels of data services. There is also a summary of the perceived problems and views on the need for improved access to data services.

The main issues to emerge from this overview are as follows.

- The data applications most commonly sought by end users are:
  - facsimile;
  - e-mail;
  - Internet access to the world-wide-web; and
  - online business information, education and entertainment services.

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41 Standard Telephone Service Review Group, p.167.

42 Telecommunications Operators

43 Analysys, *The Future of Universal Service in Telecommuncations In Europe: Final Report For EC DGXIII/A1*, 1997, p.123.

- It is difficult to define what constitutes a ‘reasonable’ data rate needed for the above services. In the end result it depends on the applications being required. An assessment is made of data rates appropriate for particular applications.
- Data rate capabilities through the PSTN are limited by both the length and grade of the copper line between the exchange and the customer. The data rate achievable between two users depends on the total distance between each customer and their respective closest exchange.
- Subscribers to DRCS are currently limited typically to 2.4kbit/s data capability but with an improvement to 19.2kbit/s possible through the current upgrade of DRCS to HCRCS.
- The cost of Internet usage in rural and remote areas is substantially increased where customer access is outside a local call zone or where there is not an ISP within the customers local call area.
- Concerns expressed about rural and remote area access to data services from submissions made to the ACA inquiry are summarised.

2.8. Conclusion

Having regard to the analysis in this chapter the following conclusion is drawn:

- rural and remote customers are at a disadvantage, compared with urban customers, in terms of the data rate capability available over the PSTN.

3. Legislative Framework of the USO and Related Issues

3.1. Background

The USO has been an integral feature of Australian telecommunications for many years. It was first codified in legislation in the *Telecommunications Act 1975*, with the then Australian Telecommunications Commission (Telecom) required to 'make its telecommunications services available throughout Australia for all people who reasonably require those services' as far as it considered reasonably practicable.[44] Telecom was specifically required under this Act to 'have regard to...the special needs for telecommunications services of all Australian people who reside or carry on business outside the cities'.[45] Telstra has been required to fulfil the USO under all subsequent telecommunications legislation (with the exception of the National Relay Service) and is the declared 'national universal service provider' under the *Telecommunications Act 1997*.

USO policy is based on the objective that the universal service obligation should be fulfilled as effeciently and economically as practicable.[46] The policy has been developed in recognition that universal access to telecommunications services is a principle of equity in Australian society. USO policy has also recognised that, in the absence of a legislative requirement to provide universal service, profit driven telecommunications carriers would generally not provide services to loss making areas. Loss making areas in Australia have historically been located outside urban areas, where the costs of supply and maintenance of services have not been fully offset by the revenue generated by services in and to these areas.

3.2. The Universal Service Regime under the Telecommunications Act 1997

Although the USO has formed part of telecommunications legislation for over 20 years, the legislated mechanisms related to the fulfilment of the USO have changed over time to allow for developments in technology and in the telecommunications industry. For example, with the introduction of competition in 1991, the then Government decided that all licensed carriers should contribute to the costs of provision of the USO. Accordingly, Optus and Vodafone were required to share the costs with Telstra with universal service levy payments calculated at the end of each financial year. In the 1996/97 financial year, Optus contributed $23.9 million and Vodafone $2.1 million to the total $251.6 million cost of provision of the USO. The *Telecommunications Act 1997* continues the requirement that all licensed carriers must contribute to USO costs. At 14 August 1998, there were 22 licensed carriers.

Under the *Telecommunications Act 1991* the USO was defined as the obligation to ensure that the standard telephone service and payphones were reasonably accessible to

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44 *Telecommunications Act 1975* (Cth), s.6(1)
45 *Telecommunications Act 1975* (Cth), s.6(2)
46 *Telecommunications Act 1975* (Cth), s.138

all people in Australia, on an equitable basis, wherever they resided or carried on business. A problem identified with the USO provisions in this Act was the absence of a clearly identified mechanism for upgrading the USO to include additional 'essential' telecommunications services. The *Telecommunications Act 1997* introduced a mechanism to enable such an upgrade, this being the concept of a 'prescribed carriage service'.

Section 149(1) of the *Telecommunications Act 1997* defines the USO as follows:

> For the purposes of this Act, the universal service obligation is the obligation:
>
> (a) to ensure that standard telephone services are reasonably accessible to all people in Australia on an equitable basis, wherever they reside or carry on business; and
>
> (b) to ensure that payphones are reasonably accessible to all people in Australia on an equitable basis, wherever they reside or carry on business; and
>
> (c) to ensure that prescribed carriage services are reasonably accessible to all people in Australia on an equitable basis, wherever they reside or carry on business.

No service has yet been specified as a 'prescribed carriage service'.

On 1 July 1998, the National Relay Service was incorporated into the USO. This service provides people who are deaf, hearing or speech impaired with access to the standard telephone service comparable to that access provided to other Australians.

The *Telecommunications Act 1997* also allows for additional purposes to be included in the definition of the standard telephone service. The mechanism for achieving this is through a regulation declaring a purpose to be a designated purpose for which the carriage services are provided. An example of such a purpose could be the provision of the carriage of data. The standard telephone service is currently defined as being a carriage service for the purpose of: voice telephony; or another form of communication that is equivalent to voice telephony; and a purpose declared by the regulations (of which there are currently none) to be a designated purpose.[47] Accordingly, there is currently no minimum data transmission rate defined as part of the USO. (However, the ACA's *End to End Network Performance Standard* requires fixed network carriers to support the carriage of voice band data communication at a minimum data rate of 2400bit/s.)

There is considerable flexibility under the *Telecommunications Act 1997* to enable upgrades to the USO in both a broad and targeted manner. The Minister's directions require the ACA to focus initially on whether a 64kbit/s digital data capability should be specified as a prescribed carriage service under the USO. This could be regarded as a targeted approach, as a prescribed carriage service is distinct and separate from the standard telephone service, enabling customers to discriminate in their choice of service

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[47] The 'standard telephone service' is defined in s.17 of the*Telecommunications Act 1997*

options. The following consequences of specifying a prescribed carriage service illustrate this point:

- a customer could request the supply of a prescribed carriage service but not request supply of the standard telephone service, and thereby choose to receive only the prescribed carriage service; or
- a customer could request the supply of a standard telephone service but not request supply of a prescribed carriage service, and thereby choose to receive only the standard telephone service; or
- a customer could request the supply of both a prescribed carriage service and the standard telephone service, and be entitled to receive **both** services.

A broad method of upgrading the USO would be to define additional purposes to be associated with the standard telephone service, such as a specified data carriage capability. The consequence of such a definition would be that all persons requesting supply of the standard telephone service would receive a service containing this additional capability, whether they required it or not.

The Telecommunications Bill 1996 Explanatory Memorandum[48] indicates the intended policy distinction between upgrading the capability of the standard telephone service and specifying a prescribed carriage service:

> The ability to change the standard telephone service ..... ensures that the basic service that will be of general appeal to most customers and can be adjusted where appropriate, while reserving the prescribed carriage service component of the USO to ensure there is reasonable access to services that may not be of general appeal.

3.3. Supply of Customer Equipment, Goods and Services under the Universal Service Obligation

The universal service provider must supply customer equipment for use in connection with the standard telephone service. This customer equipment is currently defined as a telephone handset that does not have switching functions. Under the *Telecommunications Act 1997*, the universal service provider is also required to supply equipment which enables equivalent access to the standard telephone service for people with a disability, in order to comply with the *Disability Discrimination Act 1992.* On 18 June 1998, the Executive Council made the Telecommunications (Equipment for the Disabled) Regulations, 1998, which define the types of customer equipment which would achieve equivalent access to the standard telephone service for people with a disability.

With a prescribed carriage service, no equipment need be prescribed for use with this service. For example, a data capable service could be prescribed without also prescribing a computer or a set top box. However, if customer equipment is specified in the

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[48] Telecommunications Bill 1996 Explanatory Memorandum (Cth), vol. 1, p.21

regulations for use in connection with the prescribed carriage service,[49] then the universal service provider must supply this equipment.

The *Telecommunications Act 1997* also allows for the specification of goods (other than customer equipment) and services (other than a carriage service) for use in association with the standard telephone service and prescribed carriage services. An example of a good which could be specified is a manual which explains the operation of a service, whereas an example of a service which could be specified is a customer helpline.

An issue which needs to be addressed in considering whether a digital data capability should become part of the USO is whether any customer equipment, goods or services need to be prescribed for use in connection with that capability, including any equipment, goods or services required by people with a disability to access that capability. An example of a good which may need to be specified is a line termination device, if it was considered important to ensure that a device which enabled interoperability between different suppliers' equipment should be installed at the customer premises.

3.4. Purpose and Scope of the Universal Service Obligation

The *Telecommunications Act 1997* establishes broad objects of telecommunications regulation in Australia. The main object (subsection 3(1)) is to provide a regulatory framework that promotes the long-term interests of end-users and the efficiency and international competitiveness of the Australian telecommunications industry. Other objects of the Act are set out in subsection 3(2), with paragraph 3(2)(a) stating that an object of the legislation is:

> to ensure that standard telephone services, payphones and other carriage services of social importance are:
>
> (i) reasonably accessible to all people in Australia on an equitable basis, wherever they reside or carry on business; and
>
> (ii) are supplied as efficiently and economically as practicable; and
>
> (iii) are supplied at performance standards that reasonably meet the social, industrial and commercial needs of the Australian community.

Section 138 of the *Telecommunications Act 1997* sets out the objectives of the universal service regime. These are to give effect to the policies: that all people should have reasonable access, on an equitable basis to the standard telephone service, payphones and prescribed carriage services; that the universal service obligation be fulfilled as efficiently and economically as practicable; that losses from the supply of universal services be shared among carriers; and that information on losses be open to scrutiny by carriers and the public.

The Telecommunications Bill 1996 Explanatory Memorandum defines the purpose of the USO as follows:

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[49] *Telecommunications Act 1997* (Cth), s.144(a)

> The USO's fundamental purpose is to safeguard access to a minimum level of essential telecommunications services for all persons in Australia. This recognises the fundamental importance of telecommunications in supporting effective participation in Australian society. The regime is constructed to ensure that access to a voice service, the 'standard telephone service', will always be available and cannot be altered, except by legislative amendment by Parliament. It is also recognised that the services people may need to have access to may evolve over time, for example to reflect changes in the uses of communications services. Thus the policy principle provides for people to be given reasonable access to services in addition to the standard telephone service by such services being made prescribed carriage services. Because universal service is a 'needs based' concept, the designation of a service as a USO service would depend on the need for it in the community.
>
> This principle is the basis for the USO.....In relation to the concepts of 'reasonable access' and 'equitable basis', it should be noted that these concepts are intended to relate primarily to access in geographical terms and equity in terms of equality of opportunity, rather than concepts of affordability. While affordability is clearly important to access in general terms, it is a matter which the Government considers should not be embedded in the USO itself, but should be tackled through other (transparent) mechanisms such as competition, price control and targeted assistance.[50]

Two fundamental concepts are thereby embedded in the principles of the USO:

(1) that services are *reasonably accessible;* and

(2) that services are provided on an *equitable basis*.

The policy principles contained in this statement are important in broadly defining the questions that need to be considered by the ACA in its Digital Data Inquiry.

3.5. Affordability of Services Provided under the USO

As indicated in the extract from the Telecommunications Bill 1996 Explanatory Memorandum quoted in the previous section, specifying a carriage service as part of the USO does not of itself determine that the service will be affordable to all Australians. In the absence of price control arrangements, the universal service provider is able to set its own charges for these services. However, Division 5 of Part 7 of the *Telecommunications Act 1997* allows for the regulation of universal service charges.

Under the current arrangements, the prices of specified Telstra services are regulated under provisions in the *Telstra Corporation Act* 1991 rather than those in the *Telecommunications Act* 1997. For example, a 7.5 per cent price cap applies to a basket of eight of Telstra's services: connections, line rentals, local, trunk and international calls, domestic and international leased lines and cellular mobile telephone services. The

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[50] Telecommunications Bill 1996 Explanatory Memorandum (Cth), vol. 1, p.86

Government is currently reviewing the arrangements that will apply beyond 31 December 1998 when the current price control, notification and disallowance determination expires.

The affordability of a service is clearly a significant determinant of whether a service is accessible to individuals. As will be discussed in more detail subsequently in this report, ISDN is available to approximately 96 per cent of the Australian population and yet there are currently only around 200 residential users of this service throughout Australia.

3.6. Regulation of Universal Service Charges

As noted above, Division 5 of Part 7 the *Telecommunications Act 1997* allows for the regulation of universal service charges. Under this Division, the Minister is able to declare that some or all of the services contained within the USO are subject to price controls. There is considerable flexibility in how any price controls may be structured. For example, a price cap or other price control arrangements could be developed for a service, and/or principles or charging rules could be developed and they must be complied with by the universal service provider.

The *Telecommunications Act 1997* (subsection 173(5)) allows the Minister to make a price control determination which allows for charging controls to be instituted for specified customer groups. In regard to this subsection, the Telecommunications Bill 1996 Explanatory Memorandum states that an intention of this policy is that:

> a price control determination be able to apply particular price controls in relation to more specific classes of customer, for example, educational institutions, medical facilities or public libraries. This would mean, for example, that where a prescribed carriage service is prescribed for the purposes of the USO, the Minister in a price determination could require that it be provided to schools, libraries and hospitals at a particular price, while it may be available to other customers at another regulated price, or even an unregulated price.[51]

Consideration of the community demand for an enhanced data capability also needs to encompass the extent to which this demand is limited by the current pricing of the relevant data services, particularly in regard to the need for the service in the community at large and by particular classes of customers.

3.7. Funding Arrangements for the USO

An object of Part 7 of the *Telecommunications Act 1997* is that the losses that result from supplying loss-making services in the course of fulfilling the USO should be shared among carriers.[52] Another objective is to minimise the distortion in competitive or

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51 Telecommunications Bill 1996 Explanatory Memorandum (Cth), cl 166, p.134

52 *Telecommunications Act 1997* (Cth), s.138(c)

financial performance that could be expected to arise if the cost of fulfilling the USO was borne solely by the universal service provider or a limited group of carriers.[53]

As all carriers contribute proportionately to the cost of fulfilling the USO, the inclusion of a data capability as part of the USO would increase the financial burden on all carrier licence holders. Policy decisions about the inclusion of such a service need to recognise that a significant increase in USO costs may have a detrimental impact on the operations of all carriers, particularly the smaller ones that may be less well positioned than the larger carriers to absorb an increase in their USO levy contributions. The right balance must therefore be struck between providing benefits to end users through the USO scheme and maintaining viable competition by providers of infrastructure and/or services.

3.8. Multiple Universal Service Providers

The *Telecommunications Act 1997* allows for multiple universal service providers to be declared for the purpose of provision of services contained within the USO.[54] Telstra is the current declared national universal service provider with the responsibility for the provision of all USO services, except the National Relay Service, throughout Australia. The *Telecommunications Act 1997* also allows for the declaration of *regional universal service providers*.[55] No regional universal service provider has yet been declared.

There is considerable flexibility in how arrangements can be structured for the delivery of universal services by multiple universal service providers. For example, a regional universal service provider could be declared for a specified geographic region and be required to provide all services contained under the USO. Alternatively, it may be required to provide only a subset of these services, such as payphones. Similarly, it is possible to have multiple national universal service providers with, for example, one universal service provider responsible for the provision of the standard telephone service throughout Australia and another universal service provider responsible for the provision of payphones throughout Australia. Furthermore, it is also possible to have multiple universal service providers competing in the same geographic area (ie. all of Australia, or a specified region) for the delivery of the same USO services, although it is difficult to envisage any circumstances where such an arrangement would be warranted.

The potential to have multiple universal service providers is relevant to the Digital Data Inquiry, in that it provides a mechanism for possibly reducing the costs of providing a data capability. This mechanism may be particularly relevant to the geographic regions of Australia where digital data and other data services are not provided on a level

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53 Note: subsection 146(2) of the *Telecommunications Act 1997* allows for regulations to be developed which would exempt certain carriers from making USO contributions. No regulations are currently in place.

54 Section 155 of the *Telecommunications Act 1997* allows for regulations to be developed which would declare 2 or more carriers to be national universal service providers. Section 156 of the *Telecommunications Act 1997* allows for regulations to be developed which would declare 2 or more carriers to be regional universal service providers.

55 Subsection 150(2) of the *Telecommunications Act 1997* allows for the Minister to make a written declaration stating that a specified carrier is the regional universal service provider for a specified service area.

commensurate with the availability of these services in metropolitan areas and where there is little competition in the provision of these services and possibly little prospect of competition in the immediate future.

3.9. Other Legislative Obligations and Policy Initiatives Related to the Inquiry

The preceding paragraphs outlined the legislative framework of the USO and the flexibility contained with the *Telecommunications Act 1997* in terms of structuring service delivery under that framework. Given that the Minister's directions to the ACA require it to consider, under (3)(f): 'whether some alternative service, means or process might more efficiently and effectively address the concerns that would be addressed by specifying a digital data capability as being part of the USO', it is important to note other legislative obligations and policy initiatives which are currently in place relevant to enhancing the provision of a data capability throughout Australia.

3.9.1. Telstra's Carrier Licence ISDN Obligations

The most important legislative obligation currently in place concerning a digital data capability is Telstra's licence condition requiring it to make available a service comparable to an ISDN 64kbit/s data channel. Section 66 of the *Telecommunications Act 1997* obliges the Minister to ensure that Telstra is:

- to have achieved by 1 July 1997, the availability, within 90 days of a request, to 93.4 per cent of the Australian population, of a digital data capability broadly comparable to that provided by a data channel with a transmission speed of 64 kbit/s supplied to end users as part of the designated basic rate ISDN service, and

- to achieve by 31 December 1998, availability of the comparable ISDN service, within 90 days of a request, to at least 96 per cent of the Australian population.

This requirement on Telstra is contained in *Carrier Licence Conditions (Telstra Corporation Limited) Declaration 1997*.

The carrier licence condition that Telstra achieve ISDN targets by specified dates is particularly relevant to this inquiry because a mechanism is currently in place to provide ISDN comparable services to the substantial majority of the Australian population. However, this licence condition does not require universal accessibility of an ISDN capability, as would be the case if this capability became part of the USO or the condition related to 100 per cent of the population.

Telstra's progress in achieving this licence condition and other related issues are discussed in Chapter 5.

3.9.2. Regional Telecommunications Infrastructure Fund (RTIF)—Networking The Nation

In December 1996 the Government announced a $250 million, five year program, the Regional Telecommunications Infrastructure Fund (RTIF), known as *Networking the Nation*. The objective of *Networking the Nation* is to assist the economic and social development of regional, rural and remote Australia by funding projects which: enhance telecommunications infrastructure; increase access to, and promote use of, services available through telecommunications networks; and reduce disparities in access to such services and facilities.

Projects successfully funded through the RTIF are varied and have included the provision of enhanced Internet access, improved telecommunications infrastructure (such as mobile telephony and points of presence), pilot projects to trial alternative means of service delivery, innovative technologies, video-conferencing facilities, e-commerce and community planning projects.

Further comment on the potential application of the RTIF in terms of enhancing the availability of a data capability is provided under Chapter 5.

3.9.3. ACCC Declaration Of ISDN

On 22 December 1997, the ACCC announced a public inquiry into competition in data markets with a view to determining whether to declare certain ISDN services, and whether to amend declarations for the digital data access service and transmission capacity. The significance of the ACCC declaring a service is that such a decision triggers standard access obligations and enables the ACCC to arbitrate the terms and conditions on which that service is supplied should commercial negotiations fail.

To declare each eligible ISDN service, the ACCC must be satisfied that to do so would promote the long-term interests of end-users of carriage services or of other services provided by means of carriage services.

Section 152AB of the *Trade Practices Act 1974* provides that, in determining whether end-users' long-term interests will be promoted by declaring an eligible service, the ACCC must consider the following objectives only:

- the objective of promoting competition in markets for carriage services and services supplied by means of carriage services;
- the objective of achieving any-to-any connectivity in relation to carriage services that involve communication between end-users; and
- the objective of encouraging the economically efficient use of, and the economically efficient investment in, the infrastructure by which carriage services and services supplied by means of carriage services are supplied.

In May 1998 the ACCC released *Competition In Data Markets Declaration of ISDN Services—A draft report on the declaration of originating and terminating ISDN services under Part XIC of the Trade Practices Act 1974*. This report states, that:

> Based on the material received to date, the Commission is of the view that declaration of the eligible ISDN services would be likely to promote competition in the markets for leased line and switched digital services. This is likely to lead to benefits for end-users, primarily in terms of lower prices for these services. Lower prices would be expected to increase the accessibility of data communications services for end-users, along with improved access to services such as the Internet.
>
> Declaration is also likely to result in the achievement of communication between end-users connected to different networks on a more timely basis. The impacts of declaration on the efficient use of, and efficient investment in, infrastructure are not expected to adversely affect end-users. While declaration is expected to impose administrative costs on Telstra, those costs appear reasonable. Furthermore, it appears that declaration is unlikely to deter efficient investment.

The ACCC has not yet released its final decision on the proposed declaration of ISDN services. Such a declaration has the potential to promote competition in the data services market, and through this, a better range and quality of products for consumers at a lower cost.

4. Analysis of Submissions

As part of the consultation process described in Chapter 1 of this report, the ACA invited interested persons and organisations to provide written submissions to its public inquiry. The ACA received 89 written submissions. A full list of submissions is at Appendix 2.

In addition to written submissions, opportunity was provided at each of the public hearings for interested persons to provide prepared oral submissions commenting on issues relevant to this inquiry. Submissions were received from carriers, various State governments, local governments, representative organisations and interested individuals. The following summarises the central themes expressed in submissions to the inquiry.

4.1. Demand for Applications

Individuals and organisations were encouraged to identify the demand for applications currently being accessed and applications that an enhanced data capability would enable to be accessed.

Where individual submitters identified demand for applications the most common examples given were fast Internet access, the ability to send and receive e-mails with attachments and fast and reliable facsimile transmission.

Submissions received from various state governments and other organisations highlighted the demand for applications related to the delivery of education, health and agricultural services. In its submission the Northern Territory branch of the Australian Computer Society stated that 'the Internet, since its implementation in Northern Territory education in 1995/96 is becoming a fundamental aspect of educational delivery and provision, particularly in light of developments in distance education and open learning.'[56]

Submitters noted that an enhanced data capability has the potential to supplement the existing delivery platforms for the provision of health services. In its submission the Queensland Telemedicine Network advised that 'Current telehealth practice incorporates video conferencing for consultations, counselling, support, education, training and administration; medical image and data transfer; and access to data bases and multimedia information'.[57]

4.2. Benefits Identified of an Enhanced Data Capability

Numerous individual submissions and submissions from regional organisations emphasised the benefits to rural and remote consumers from an enhanced data capability in terms of its ability to overcome the tyranny of distance and reducing the perceived gap

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56 Australian Computer Society—NT branch, submission.

57 Queensland Telemedicine Network, Submission to the ACA Inquiry on Digital Upgrade to Universal Service.

between the information rich and information poor affecting remote Australia. In her submission, Susan Bandias commented that 'telecommunications has been a fundamental aspect of overcoming the distance and isolation inherent in living and working in the Territory'.[58]

4.2.1. Education

The importance of an enhanced data capability in the delivery of education was highlighted by the 15 submissions received from education-specific organisations. The Association of Independent Schools of Western Australia[59] identified benefits in three key areas. An enhanced data capability would:

- improve the quality of education service delivery particularly to rural and remote areas thus promoting equity between country and city students and increasing participation rates of rural and remote students in secondary and tertiary education;
- enable the effective delivery of an improved quality of professional development to education staff in remote areas through video linked training, inservices and information dissemination; and
- provide a more direct means of communication for schools. This was seen as having the potential to improve the quality of school administration and to promote the flexible delivery of distance based education - identified by the Isolated Children's Parents' Association - Australia[60] as often the only type of education accessible in the outback.

The NSW Department of Education and Traning Distance Education Directorate[61] commented that an enhanced data capability would enable cost-effective provision of distance based education. In addition, the ability of data capability to complement traditional education delivery platforms was noted by a number of state governments and education-specific organisations.

4.2.2. Health

Health was identified as one area which had much to gain from an enhanced data capability. A number of submitters highlighted telehealth and video conferencing as being efficient and effective modes of health service delivery. Telehealth networks were seen as promoting equity in health service delivery by improving access to health services and information, particularly in rural and remote areas. In its submission, the

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58 Susan Bandias, ACA Digital Data Review, submission.

59 Association of Independent Schools of Western Australia, Submission to the ACA Inquiry on Digital Upgrade to Universal Service.

60 Isolated Children's Parents' Association—Australia, Submission to the ACA Inquiry on Digital Upgrade to Universal Service.

61 New South Wales Department of Education and Training Distance Education Directorate, Submission to the ACA Inquiry on Digital Upgrade to Universal Service.

Communications Expert Group[62] highlighted the ability of video conferencing to encourage the relocation of medical practitioners and other professionals thus increasing the number and availability of services to small regional centres.

Improved client health outcomes through decreasing patient travel time and improved speed of access to health services were cited by the Tasmanian Department of Community and Health Services.[63] A number of other organisations referred to the ability of an enhanced data capability to supplement existing health programs in rural areas and capitalise on the expertise of heath care providers such as the Royal Flying Doctor Service.

4.2.3. Primary industries

Submissions received from both individual pastoralists and state representative organisations highlighted two major benefits which would accrue in primary industries.

The Internet was seen as a means by which primary producers could access timely market, weather and other primary industry information and sustain competitive advantage and international competitiveness. For example, Stuart Hulme noted that 'access at any time of the day may give a business the edge it needs to keep going ahead.'[64]

It was also argued that primary industries had much to gain from information sharing and training on diverse subjects such as chemical handling, financial planning and the development of non-traditional income sources. Data services were seen as crucial in creating an opportunity for primary producers to access and generate sources of off-farm income. The Department of Primary Industries and Energy argued that an enhanced data capability was vital in developing new marketing initiatives in primary industries which would assist in the promotion of self-sufficient primary industries.[65]

4.2.4. Cost effective provision of government services

All state government submissions, a number of regional organisations and some individual submitters focussed on the benefit of an enhanced data capability in providing greater access to government services in a cost effective manner—particularly in the areas of health, education, law and order, training and employment assistance. Peter Toyne[66] commented on the benefits of an enhanced data capability in providing inservice training for remote agency staff; and in its submission, the Midwest Development Corporation spoke of the need to 'coordinate public sector telecommunications

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62 Communications Expert Group, Submission to the ACA Inquiry on Digital Upgrade to Universal Service.

63 Tasmanian Department of Community and Health Services, Submission to the ACA Inquiry on Digital Upgrade to Universal Service.

64 Stuart Hulme, submission.

65 Department of Primary Industries and Energy, Submission to the ACA Inquiry on Digital Upgrade to Universal Service.

66 Peter Toyne, Submission to the ACA Inquiry on Digital Upgrade to Universal Service.

management to provide shared network infrastructure, common standards and a common interface with the community'.[67]

Additionally, an enhanced data capability was also seen as assisting in a more culturally appropriate provision of service in that it enabled services to be provided to rural and remote communities without displacing residents, particularly members of remote Aboriginal communities.

4.3. Who Receives Benefits?

In determining where the potential benefits of including an enhanced data capability in the USO would lie, individual submission responses targeted individual benefit, whereas carriers, state governments and representative organisations broadly focussed on social or community benefit.

Individual benefit is derived by individuals accessing the increasing amounts of information provided via the Internet. As discussed previously, individuals will derive benefit from access to health, education and agricultural information and will benefit from cost-effective provision of government services.

A number of submissions argued that communications were essential in rural and remote areas as a means of improving the quality of life through increased social interaction. The ability of an individual, particularly in isolated areas, to communicate electronically, was seen as a way of alleviating the isolation associated with living in remote areas where traditional forms of communication (ie. postal services) are infrequent and subject to climatic forces.

An enhanced data capability was considered by many as a means of ensuring equity in the nation's commercial and economic infrastructure. The notion of providing regional, rural and remote customers with a responsiveness of service comparable with what is available in urban areas was discussed by many submitters including John Denham who stated that 'Although some rural customers … have a clear need for higher speeds, most will only need something about what is in fact available to the majority of urban customers'.[68]

A further individual benefit identified was that an enhanced data capability increased an individual's choice of where he or she resided. Provision of a standardised level of data service was seen to encourage decentralisation through telecommuting and removing the potential for 'discrimination on the basis of location'.[69]

State governments and representative organisations identified the positive impact of a reliable data communications platform on sustaining economic development of regional rural and remote areas. An enhanced data capability was seen by ATUG as 'making a

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67 Midwest Development Commission, Digital Upgrade to Universal Service Obligation, May 1998, (letter to the Minister.)

68 John Denham, submission.

69 McMillan, Evans and Associates, submission.

positive contribution to the welfare of rural communities and contributing to the philosophy of inclusion.'[70]

The ability of an enhanced data capability to encourage decentralisation of populations was seen by local governments and regional representative organisations as a way to address the ongoing population drift from regional areas as people leave country areas to access education and employment opportunities in metropolitan areas.

The social benefits of e-commerce as a marketing platform were seen by many regional organisations as vital in stimulating growth in existing markets and generating new marketing opportunities for depressed regional centres. As noted by the Isolated Childrens' Parents' Association NSW[71], the survival of remote communities is dependent on improved telecommunications and participation in the global economy. Promotion of local industries and the ability to attract new government, industrial and commercial enterprises to rural areas was seen by the Riverina Eastern Regional Organisation of Councils[72] as pivotal in generating and sustaining economic development in rural areas.

Similarly, the potential for enhanced data capability to assist in overcoming the withdrawal of banking and financial services from rural Australia and the subsequent impact on rural economies was highlighted. In its joint submission the Riverina Regional Development Board/Riverina Area Consultative Committee commented:

> Towns and centres which have a strong agricultural base rely upon backpackers and seasonal labour at key harvest times. Analysis of spending patterns indicate that backpackers spend a considerable amount of their earnings on food, entertainment and accommodation and are a major contributor to the tourism dollar. The removal of banking and financial facilities threatens the small businesses that provide goods and services for the backpacker market. It may also create difficulties in attracting backpackers and seasonal labourers during the peak harvest periods.[73]

4.4. Barriers to Extending the Availability of Data Capability

Submitters were encouraged to identify any factors which were considered to impact on benefits which may accrue as a result of an enhanced data capability being included in the USO. Responses were noted in five main categories.

4.4.1. Affordability

Individuals as well as representatives of rural interests identified affordability in the price of data access as the most significant barrier to data capability benefits. This view was

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70 ATUG, submission.

71 Isolated Children's Parents' Association of NSW, Submission to the Australian Communications Authority Digital Data Review Inquiry.

72 Riverina Eastern Regional Organisation of Councils, Submission to the ACA Inquiry on Digital Upgrade to Universal Service.

73 Riverina Regional Development Board & Riverina Area Consultative Committee, joint submission to the Australian Communications Authority Digital Data Review Inquiry.

supported by CTN which stated 'We believe the main restraints to households going online are price and operability of the new services.'[74] Rural customers consider themselves to be seriously disadvantaged compared with urban customers. Submitters argued that as usage rates in regional areas are calculated on timed/distance tariffs, rural customers pay more than the local call connection rates enjoyed by urban customers and those who can access points-of-presence. In relation to customer equipment expenditure, rural customers argue that to access faster data rates, they require more expensive customer equipment to overcome quality of service problems inherent in existing infrastructure.

An extrapolation of the issue of price affordability made in many submissions was that regional, rural and remote centres were not seen as commercially viable ventures and as a result, market forces were not operating in areas where Telstra is the sole provider of telecommunications infrastructure. It was argued that, in these regions, government intervention was required to deliver benefits such as lower connection and data access prices.

4.4.2. Low data rates

It was put forward that the average data rate in rural and remote areas was anywhere between 2.4kbit/s and 9.6kbit/s whereas urban rates averaged 14.4kbit/s to 28.8kbit/s. Further, many rural submissions stated that a data rate of 2.4kbit/s is inadequate for accessing online and other Internet applications. As discussed in Chapter 2, as data rates accessed by rural customers are significantly lower than urban customers, rural customers perceive they are doubly disadvantaged as it takes longer and costs more to complete identical tasks.

4.4.3. Quality of service/reliability

Particularly in rural areas, quality of service issues were identified as a significant barrier in preventing customers from benefiting from technological improvements in telecommunications. 'Microwave access to the more remote locations has been intermittent and has been subject to interference, particularly in the Wet season'.[75] Additionally, the tyranny of distance argument was prevalent in discussion on this issue as, particularly in remote areas, the distance to be travelled meant that access lines may take a significant amount of time to repair thus exacerbating isolation.

4.4.4. Skill shortage

An issue identified at the Dubbo public hearing as a barrier to benefits was the skill shortage in the area of system hardware and software maintenance. It was argued that an enhanced data capability would increase demand which in turn would encourage suitably qualified people to relocate to regional areas. This issue is closely linked to the

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74 Consumer Telecommunication Network (CTN), Submission to the Digital Data Capability Review.

75 Australian Computer Society—NT Branch, submission.

lack of availability of information technology training and support in rural areas contributing to a lack of knowledge of the benefits of a data capability.

4.4.5. Internet Service Provider issues

Congestion within Internet service provider networks was identified as a further barrier to benefits. 'For e-mail, we can only send or receive two or three pages, as the Internet Service Provider's Mail server apparently decides there is a problem with any e-mail taking more than three to four minutes, and disconnects'.[76] Additionally, it was suggested that as Internet access rates are based on hours used there was no incentive for Internet service providers to increase data rates. Many submissions argued that access rates should therefore be based on the amount of data accessed or downloaded.

4.5. Costs and Risks of Including a Data Capability in the USO

4.5.1. Customer identified issues

In identifying the costs and risks associated with incorporating an enhanced data capability in the USO, many respondents focussed on the costs and risks of not incorporating a data capability into the USO. Of significance to many submitters was the opportunity cost of Australia not being a part of the global economy and the costs of not capitalising on the 'hidden asset'[77] of rural and remote people. Specifically with reference to the primary and mining industries, the cost of being left behind modern business practices and developments and not remaining competitive was highlighted by a number of state governments including the WA Government which stated 'GDP figures may indicate that a region is rich, but the population is not large enough to provide a commercial return for providers considering regional investment in telecommunications'.[78] This view was supported by regional council organisations who commented that rural areas generate a high proportion of GDP and need to be able to access and utilise technology solutions so as not to withdraw from the global economy.

4.5.2. Equity in service provision

The social and economic cost of not maintaining equity in service provision between rural and urban customers was highlighted by submitters as exacerbating the gap between the information rich and the information poor. In its submission CTN commented:

> Our central concern in this debate is equity, ensuring the gap between the haves and have nots does not increase. At present, of the small proportion of Australians connected to the Internet, most are tertiary educated and on middle

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76 John Denham, submission.
77 Donna Wood, Submission to the Australian Communications Authority Digital Data Review.
78 Western Australian Government, submission.

> to high incomes. Without some regulatory intervention it is likely that this pattern will continue.[79]

It was noted that, particularly in rural areas, telecommunications is increasingly being viewed as the enabler and driver of economic and community development.

4.5.3. Supplier identified issues

Responses which focussed on the costs and risks of including an enhanced data capability in the USO identified the following concerns. The most significant issue raised was the risk and associated costs of specifying a technology or delivery platform which would rapidly become obsolete when taking into account the innovation explosion in information technology in the last few years.

To this end, carriers and state governments in particular stressed the need to specify a level of service as opposed to a mode of service and that any effort to mandate specific technologies should be avoided.

Submissions received from carriers and data technology organisations, warned that mandating technology specific outcomes pre-empted market forces and imposed unnecessary and uneconomic infrastructure costs on industry. This was seen as a deterrent to market entry and innovation in the data services market as incorporating a data capability into the USO could be reasonably expected to increase the total USO and subsequently the liability of individual carriers. Additionally it was considered that the cost burden of funding the USO could place upwards pressure on the prices of other telecommunications services. This concern was highlighted by CTN which stated 'Provision of digital data capability should not increase the price of any other telecommunications service covered by the USO'.[80]

4.6. Technology Alternatives

Submitters drew attention to the limitations of ISDN for customers living greater than five kilometres from an exchange and commented on the rapid development experienced in data services over the last few years with predictions made on potential future data service delivery platforms.

In its submission, Multimedia Victoria[81] commented that the availability and service quality of existing technologies and the roll out timetables and capabilities of new technologies needed to be considered to determine the best method of satisfying demand for data services.

Both individual and representative organisations reiterated that any option for enhancing data capability should not specify a particular technology solution but should concentrate on delivering applications in response to demand to ensure technology development is

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79 Consumer Telecommunications Network (CTN), submission.
80 Consumer Telecommunications Network (CTN), submission.
81 Multimedia Victoria, Submission to the ACA Inquiry on Digital Upgrade to Universal Service.

market driven. It was argued that the carriers would be best placed to determine the most appropriate delivery platform and to this end, many submitters stated that meeting demand in rural and urban areas may involve the implementation of a hybrid of technologies for effective and efficient data service delivery.

The range of data applications identified earlier in this chapter were seen to be supported by various service delivery platforms including: ISDN, xDSL, mobile services; satellite (LEO, MEO and VSAT), fixed radio access; optical fibre, pair gain systems, wireless local loop, CDMA and systems incorporating hybrid service satellite delivery and terrestrial based return.

Both Telstra and Optus contended that with current service availability, licence conditions and developments in the provisioning of satellite delivery of data services, the market would satisfy demand for data services for the majority of customers.

4.7. Policy Alternatives to Incorporating Data Capability in the USO

When considering alternatives to including an enhanced data capability in the USO, submissions contained some common themes. Many submissions argued for the inclusion of a data capability within the USO to ensure provision of a data service produced an 'obligation to equity of access rather than the opportunity for it to happen'.[82]

A number of submissions identified the alternative of providing access to an enhanced data capability at a community level so that customers could reasonably access the benefits of an enhanced data capability. In this respect, schools, health services and libraries were identified as appropriate recipients of an accelerated implementation of data capability. Many submissions noted that Internet access was becoming a core business for libraries, pastoralists and private enterprises in general.

With regard to education, a number of state governments have recently initiated programs to improve data access by school children in response to the recognition of Internet access as a key component of effective and efficient education provision. Through these commercially negotiated programs, state governments have influenced carrier infrastructure roll out in regional and rural areas.

4.8. Funding Issues

Many submissions considered the manner in which an enhanced data capability could be funded with many supporting the current mix of user pays and levies, provided that parity between rural and urban access prices was achieved.

Conversely, some respondents stated that there was potential for government intervention to distort market outcomes and result in diminished community welfare. It was noted that cross subsidies could 'prevent the most efficient technology and

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[82] City of Geraldton Library, Patricia E. Gallaher, Submission on Digital Upgrade to Universal Service.

economic solutions and be a barrier to innovation'.[83] Further it was argued that the provisions of the USO should not be used to generate demand or to anticipate future needs but should be implemented in response to clearly identified demand.

The legislative provisions contained in the Act which provide for the appointment of regional universal service providers through a competitive tendering process was noted as an appropriate avenue for the effective and efficient delivery of telecommunications services in regional or rural and remote areas where the absence of market forces may not encourage roll out of data service infrastructure.

With respect to pricing issues, a number of respondents identified the ACCC as the most appropriate forum to address pricing as a result of perceived market failure in data service provision. RTIF-type funding was considered appropriate and direct budget allocations and proceeds from the sale of Telstra were also prominent funding sources identified in submissions. In this respect, transparency was identified as a vital component of any funding mechanism adopted.

4.9. Other Issues

A number of other broad issues were raised in submissions and they are worth noting in the context of this inquiry. Many submissions stated that those who had the most to gain from access to enhanced data capability were those currently unable to access it. Many submissions supported the proposal of the United Graziers Association of Queensland that any review of data capability should require that 'those worst served are first served'[84] to ensure that further marginalisation of rural and remote areas is avoided.

Recent state government initiatives—particularly in the area of education—have complemented market developments. With reference to the 'connect-ed' program, the Queensland Government stated:

> This network initiative influenced Telstra to invest in an additional 29 Dial Connect Points of Presence throughout Queensland which are available for use by all government agencies and communities. The Queensland Government leveraged its own requirements to improve accessibility to digital data service and reduce tariffs for rural and remote communities.[85]

This statement recognises that commercially negotiated programs between state governments and carriers have increased the opportunity for regional and rural people to access data services—and that additionally, these programs influence carrier infrastructure roll out plans.

Many submissions considered that for Australia to fully benefit from and participate in the global economy, data capability should be available, on demand, to 100 per cent of the population. It was noted that the implementation timetable would be dependent on

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83 Nortel Australia Pty Limited, Submission to Digital Data Review.
84 United Graziers Association of Queensland, Submission to Digital Data Review.
85 Queensland Government, submission.

the technology solution adopted to enhance data capability. To this end, an implementation timeframe of between 12-24 months was considered reasonable.

In acknowledging the rapid development of telecommunications industry—particularly in the area of data services—many submissions argued for the provisions of the USO to be reviewed every 2-3 years.

4.10. Summary

Analysis of the 89 submissions noted the following points:

- The applications identified as required for participation in today's society were fast and reliable access to Internet, e-mail and facsimile. 64kbit/s was identified by the majority of individual submitters as being the minimum acceptable data rate.
- Benefits identified could be quantified as either accruing to individuals or to the community. The carriers, state and local governments emphasised the social benefits of a digital data capability, particularly through the effective and efficient provision of government services for education, health and primary industries.
- Although the majority of submitters identified benefits which would flow from an enhanced data capability, the only quantification of benefits was provided by Telstra.
- Inequity in terms of data access rates and price in rural areas was identified as the major barrier to the benefits of the full range of information services.
- Additionally, lack of awareness of the potential benefits of a data capability to rural areas was identified as a problem in a number of submissions.
- Individual and representative organisations argued for the inclusion of a data capability within the USO whilst the carriers considered that recent market developments, carrier licence obligations and proposed satellite delivery of data services would ensure the market would satisfy demand for data services.
- Recent state government initiatives, particularly in the area of access to data services by educational bodies, have complemented market developments and are expected to continue to do so.

5. Telecommunications Infrastructure: Delivering Data Services

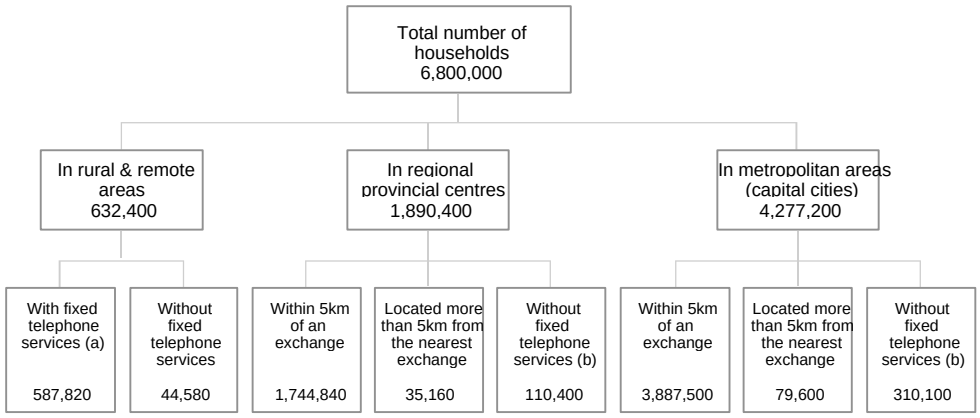
5.1. Introduction

This chapter addresses paragraph (3)(d) of the Minister's directions to the ACA. It describes the current availability of services to customers, including usage charges. Differences between metropolitan and non-metropolitan areas are also discussed, as is the impact of various government programs and assistance measures. It then goes on to suggest likely future developments on the assumption that current government policy settings are not changed.

Table 5.1 shows a segmentation of Australian households[86], grouped together according to types of locations and current telephone service connections. The information shown in this table will assist understanding of the number and locations of households that could request a data service.

Table 5.1

Market Segmentation



Note: The numbers of households in the groupings in the last row are necessarily approximate.
(a) includes DRCS
(b) assumed to be located more than 5 kilometres from the nearest exchange
Source: Australian Bureau of Statistics and The Allen Consulting Group.

The following sections address the current availability and pricing of data services. Data services provided via the standard telephone service (STS) are considered separately from those provided by ISDN.

5.2. Current Availability of Data Services via the Standard Telephone Service

There are now 22 licensed telecommunications carriers and approximately 580 telecommunications service providers.[87] They supply a wide range of telecommunications services across Australia.

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86 These figures include home-based businesses.

87 Figures correct as at 14 August 1998.

The rural and remote telecommunications market is currently dominated by Telstra, which has the majority of the telecommunications infrastructure and service investment outside the capital cities and major provincial towns. Optus has invested in infrastructure in five capital cities, in inter–capital links, and in digital mobile services in urban areas (including some provincial towns and larger regional centres), but has yet to extend these facilities to the less populated parts of Australia. Vodafone also provides mobile services in capital cities and some regional centres. Both Optus and Vodafone rely extensively on Telstra for the supply of services, as do the newer carriers. In addition to using Telstra infrastructure, AAPT, Primus and some other new carriers are also installing their own infrastructure in certain capital cities and on inter-capital links. AAPT is also investing in infrastructure in rural Victoria (as part of its contract with the Victorian Government to provide a wide area network connecting Victorian Government activities), and has shown some interest in investing elsewhere. The remaining carriers continue to focus largely on the metropolitan areas for their core business, but, as discussed later in this Chapter in relation to future developments, plans are increasingly being unveiled that contain business proposals that would affect other areas.

5.2.1. Metropolitan and Regional Centres

In provincial and country towns, the customer access networks, which connect customers' premises with local exchanges, are broadly equivalent to those in the metropolitan areas of the larger capital cities. As such, the technical issues associated with the supply of data services in metropolitan and regional centres are analogous.

Table 5.2 shows the extent of various levels of transmission rates available in regional centres and metropolitan areas.

Table 5.2

PSTN Data Transmission Rates in 'Urban and Provincial' Centres

Transmission Rate	2.4kbit/s	9.6kbit/s	14.4kbit/s	28.8kbit/s
Network Coverage	99%	95%	85%	60%

Note: The percentages are indicative only and for data rates of 9.6kbit/s and above use of a V.34 modem is assumed. These percentages do not apply to facsimile transmissions, which have different data transmission characteristics.
Source: Telstra.[88]

Whilst nearly all households in urban and regional areas can achieve a data rate of 9.6kbit/s over the PSTN (ie. adequate for Group 3 facsimile transmission), 40 per cent of households in these areas would not currently be able to achieve 28.8kbit/s—this equates to approximately 1.7 million metropolitan and 760,000 regional households. As noted in Chapter 2, a data rate of 28.8kbit/s is preferable for the operation of sophisticated Internet applications (eg. the use of web page graphics). The limitation on customers achieving data rates of 28.8kbit/s is most likely due to attenuation problems resulting from the length of copper wire between the customer premises and the local exchange. (Refer to Appendix 3.)

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[88] Telstra—ACA communications.

5.2.2. Rural and Remote Communities

Outside township areas, telephone services in rural and remote areas are typically supplied over Telstra's radio concentrator systems or over many kilometres of copper wire to an exchange in the nearest country town.

Table 5.3 shows the extent of various levels of transmission rates available in rural and remote areas.

Table 5.3

PSTN Data Transmission Rates In Rural Areas

Transmission Rate	2.4kbit/s	9.6kbit/s	14.4kbit/s	28.8kbit/s
Network Coverage	99%	70%	45%	30%

Note: The percentages are indicative only and for data rates of 9.6kbit/s and above use of a V.34 modem is assumed. These percentages do not apply to facsimile transmissions, which have different data transmission characteristics.[89]
Source: Telstra.[90]

Telstra advises that the DRCS is capable of supporting facsimile machines and modems at 2.4kbit/s, however some DRCS customers may experience difficulty in achieving this data rate.

Whilst the situation is better for the 1.1 million rural and remote customers connected to the PSTN by copper wire, 55 per cent of customers are unable to achieve network data rates of 14.4kbit/s, and 70 per cent are unable to achieve 28.8kbit/s.[91] Again, this is mainly due to the effect of long cable runs between customer premises and local exchanges in rural areas.

This means that the range of applications available to the majority of rural and remote households via their standard telephone service is limited and the quality of the data service available is often poor (ie. excessive download times).

5.3. Comparative Pricing of Data Services via the Standard Telephone Service

As noted in section 5.1 the impact of competition in the telecommunications market has been most keenly felt in metropolitan Australia, with competition between carriers and service providers leading to significant reductions in prices for telecommunications services. Metropolitan areas now often provide a choice between carriers (at least for business customers), and there is a plethora of ISPs from which to purchase an Internet service that is priced to meet individual requirements.

Whilst competition has to date had only a marginal impact on the number of carriers providing services in regional areas, there has been an increase in the number of service providers (ie. 2 to 3 ISPs per town).

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89 Telstra also advises that the equivalent network coverage for V32bis modems, operating at 9.6kbit/s and 14.4kbit/s, is 40 per cent.

90 Telstra—ACA communications.

91 Telstra—ACA communications.

In rural and remote Australia, however, the data services over the standard telephone service are still almost exclusively provided by Telstra, as only a handful of service providers have entered this segment of the market. Hence, the effects of price competition are not evident in these areas. In addition, connections in rural and remote areas have a number of other constraints.

Of the large population of rural and remote customers, 37,000 households and farming families do not have access to untimed local calls[92]—in other words customers in this category always incur timed call charges when logging onto the Internet or when sending a facsimile. Even where rural and remote customers do have access to an untimed local call rate, a large number have to make an STD call to connect to an ISP, due to the limited number of ISPs within rural areas. This statement is supported by the Farmwide Survey which found that 60 per cent of respondents were not able to access an ISP using a local call and 33 per cent considered this to be a significant inhibitor in accessing online services.[93] As noted previously, these problems are compounded by lower data rates available over the PSTN and this requires that rural and remote customers need to maintain longer connections than metropolitan customers to complete identical tasks.

5.4. Current Availability of Data Services via ISDN

As discussed in Chapter 1, an ISDN basic rate service provides two channels (referred to as B channels), which can be used for either data or voice transmission, each with a 64kbit/s data rate capability.

Chapter 3 explains that section 66 of the *Telecommunications Act 1997* obliges the Minister to impose a licence condition on Telstra to provide access to a specified data capability for specified percentages of the population over time. The licence condition requires that :

- by 1 July 1997, the availability, within 90 days of a request, to 93.4 per cent of the Australian population, of a digital data capability broadly comparable to ISDN at 64kbit/s; and
- by 31 December 1998, availability of the comparable ISDN service, within 90 days of a request, to at least 96 per cent of the population.

Telstra has advised that a capability to service 96.3 per cent of Telstra's customers within 90 days of receiving a request for connection was reached in May 1998.[94] It

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92 Minister for Communications, the Information Economy and the Arts, Media release 'Government extends untimed local calls to remote Australia', 10 July 1998. (The Commonwealth Government's announcement on the abolition of timed local calls is specifically linked to the privatisation of Telstra.)

93 James Fergusson, Farmwide Internet Service Pilot—Online Results Report and Research Methodology Critique, May 1998**.** It should be noted that while it is possible to draw some broad conclusions and useful information from the Farmwide Internet Services Pilot, the results of this study should be treated with caution, as the survey contains a number of methodological flaws (as discussed in Chapter 8.)

94 Telstra—ACA communications. The 96.3 per cent figure quoted in this reference, which relates to the availability of a connection for an ISDN comparable service 'within 90 days of a request', appears to be inconsistent with Telstra's statement in its submission to the inquiry (referenced

should be noted that 'Telstra's customers' is not synonymous with the Australian population. In its submission, Telstra has advised that 'Telstra's commitment is based on the percentage of telephone customer access lines that could be supplied with ISDN'.[95]

5.4.1. ISDN Coverage

Telstra's switching and transmission systems are almost entirely digital with the exception of the Customer Access Network. In other words, the digital transmission of the network reaches nearly all local exchanges, but goes no further—except where a customer has ISDN connected, in which case digital transmission extends to the ISDN terminal adaptor (ie. to the customer).

As noted in Chapter 2, for digital transmission between a local exchange and a customer's premises to be technically feasible, the end–to–end attenuation of the relevant copper local loop must be within a specified parameter, otherwise the signal will be too weak or distorted to be processed at the receiving end. Such attenuation depends critically on the length of the copper wire, as well as the gauge or diameter of the cable used and a number of other factors. (Refer to Appendix 3.)

Given these engineering issues, Telstra has calculated that on average, it can provide ISDN services where the length of copper wire between the customer's premises and the exchange is less than 5 kilometres. Telstra estimates that 96.3 per cent of its customers' premises are within this distance of a local exchange. Approximately 2 per cent of customers in urban areas are located more than 5 kilometres from a Telstra telephone exchange and hence cannot obtain ISDN.[96]

5.4.2. Take-up of ISDN

By the end of 1998, a minimum of 96 per cent of the Australian population will have access, on demand, to a digital data capability, significantly exceeding the performance criteria of one 64kbit/s bearer channel suggested by subsection 141(1) of the *Telecommunications Act 1997* and set out in Telstra's licence condition.

Despite its widespread availability, the take-up of ISDN has been slow. As at June of this year, Telstra had 73,028 services connected. Virtually all of these are business customers, with the number of household subscribers in the low hundreds.

Compared to other countries, Australia has one of the lowest rates of ISDN subscription. In 1996 high income countries averaged 14.38 B–Channels per 1000

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elsewhere in this report) that 'By the end of 1998, Telstra plans to have extended access to ISDN services, within 3 months of a request, to all but 3.7 per cent of its ordinary telephone services in operation.' The ACA sought clarification on this issue from Telstra, which advised that both statements were correct. Telstra noted that during the remainder of 1998, it would be increasing the number of exchanges where ISDN services could be provided 'on demand', while correspondingly decreasing the number of exchanges sites where a 90 day provisioning period for ISDN services applies. Telstra advised, however, that the 96.3 per cent ISDN availability figure would not change during the remainder of 1998.

95 Telstra—ACA communications.

96 Telstra—ACA communications.

inhabitants and 2.67 B-Channels per 100 main lines. These indicators are both 10 times the Australian rate. This is shown in Table 5.4.

Table 5.4

International ISDN Subscription Rates—1996

Country	ISDN Subscribers ('000)	B–Channel Equivalents (a) ('000)	B–Channels per 1000 inhabitants	B–Channels as % main lines
Germany	1,945.00	5,150.00	62.87	11.68
Switzerland	125.81	399.18	56.22	8.78
Luxembourg	3.91	14.07	34.07	5.76
Norway	43.99	148.71	33.85	6.09
France	427.00	1,800.00	30.84	5.47
Finland	28.98	88.57	17.28	3.15
Denmark	29.86	89.57	17.02	2.76
United Kingdom	260.00	969.13	16.67	3.16
Austria	42.02	122.56	15.21	3.24
Sweden	19.70	100.00	11.31	1.66
United States	878.40	2497.69	9.37	1.46
Portugal	19.73	18.21	8.25	2.20
Belgium	54.56	73.29	7.24	1.58
Japan	530.05	828.53	6.60	1.37
Italy	104.58	364.21	6.35	1.44
Netherlands	100.00	95.00	6.14	1.17
Singapore	5.37	10.73	3.53	0.69
Spain	35.41	96.04	2.45	0.62
Canada	2.90	41.50	1.42	0.24
Australia	35.00	23.60	1.32	0.27
New Zealand	0.40	2.42	0.68	0.15
High Income (b)	4,714.00	13,036.29	14.38	2.67
World	4,767.15	13,153.76	2.29	1.79

Notes: (a) B–Channel equivalents converts the number of ISDN subscriber lines into their equivalent voice channels. The number of basic rate subscribers is multiplied by two and the number of primary rate subscribers is multiplied by 23 or 30 depending on the standard implemented.

(b) Includes countries not shown in table.

Source: International Telecommunication Union[97] and The Allen Consulting Group.

The failure of ISDN to achieve significant market penetration levels in Australia is not because Australians are reluctant users of telecommunications services, or because there is a general lack of telecommunications infrastructure investment. On the contrary, by world standards, Australians are intensive users of telecommunications services and equipment as exemplified by PC and Internet usage in Table 5.5.

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[97] International Telecommunication Union, *World Telecommunication Development Report 1998*, Table A13.

Table 5.5

International PC and Internet Usage

Country	PCs per 1000 persons (1996)	Internet users per 1000 inhabitants (1996)	Internet hosts per 1000 persons (Jan 1997) (a)	Average annual growth of Internet hosts per person (July 92–Jan 97)
Finland	195.2	1678.4	55.5	54.1
Norway	284.5	1138.2	39.4	51.2
Australia	311.3	1092.2	28.5	50.0
Sweden	214.9	904.7	26.4	51.0
New Zealand	266.1	840.3	23.6	54.0
United States	362.4	787.8	38.4	52.4
Canada	243.6	667.5	20.4	51.8
Netherlands	232.0	580.0	17.5	51.4
Denmark	304.1	570.1	20.4	59.6
Luxembourg	n.a.	557.2	8.5	58.4
Japan	128.0	556.6	5.9	61.6
Switzerland	408.5	521.1	18.2	45.8
Singapore	216.8	492.7	n.a.	n.a.
United Kingdom	192.6	430.0	10.1	49.4
Austria	148.9	372.3	11.4	51.5
Germany	233.2	305.2	8.8	52.2
Belgium	167.3	295.3	6.4	53.4
Portugal	67.4	231.5	2.6	54.1
Spain	94.2	133.7	2.8	53.0
Italy	92.3	101.9	2.6	55.5
France	150.7	85.7	4.2	48.2
High Income (b)	222.8	498.7		
OECD			14.9	52.3
World	4.7	91.9		

Notes:
(a) An Internet host is a domain name that has an Internet Protocol Address record associated with it. This means any computer system connected to the Internet (via full or part–time, direct or dial-up connection)
(b) Includes countries not shown in table.
Source: International Telecommunication Union[98] and The Allen Consulting Group.

One contributing factor in the slow take-up of ISDN could be the inflexibility of the service in comparison with alternative data services. The technical standards on which Telstra's service is based do not allow for the (2B+D) package of two 64kbit/s channels and one 16kbit/s channel to be broken up into separate product offerings. A customer wanting a single 64kbit/s service would have to subscribe to (and pay for) the whole package. There are many applications for which transmission rates less than 64kbit/s are very suitable.

[98] International Telecommunication Union, *World Telecommunication Development Report 1998*, Table A19.

For households, the greater functionality afforded by two 64kbit/s channels is apparently not sufficiently useful to make it worthwhile to pay the market price. This also appears to be the case for most businesses.

5.5. The Price of ISDN

The market demand for ISDN is substantially influenced by price. Telstra's charge for connection to the service is $295 plus a monthly rental that varies by product (ISDN Standard, ISDN Premier etc). The products with more expensive rentals have larger call allowances. For example, On Ramp Premier has a monthly rental of $200 and includes $180 of local data calls. On Ramp Standard has a monthly rental of $60 but includes no call allowance.

The price of Telstra's On–Ramp service varies according to:

- whether voice calls, data calls or videoconferencing calls are made;
- the time of the day when the call is made;
- the length of the call; and
- the distance of the call.

The main difference between the price of ISDN and calls using data modems over the analogue PSTN (its nearest substitute), is that ISDN local calls are timed; in addition, data calls and voice calls are priced separately.[99]

The fact that ISDN local calls are timed does not mean they are necessarily more expensive than calls over the PSTN. Using ISDN, a five minute local voice call would cost 26 cents at day rates and 20 cents at night and economy rates, compared with the fixed 25 cents over the PSTN. A local three minute ISDN data call costs 20 cents at any time of the day.

Typically, however, data calls are much longer than this, with 20 minutes being the industry average for an Internet call. At day rates, a 20 minute local ISDN data call costs 71 cents, almost three times Telstra's PSTN untimed local call price of 25 cents. Even the ISDN night and economy rate price, at 40 cents, is much more expensive. With longer ISDN local data calls, the price difference is even more pronounced: $1.91 for an hour at day rates, and $1.00 for an hour at night or economy rates. Table 5.6 summarises the differences:

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[99] Telstra advises that it cannot delineate between voice and data calls over the PSTN.

Table 5.6

Comparison of ISDN and PSTN charges

Item	PSTN	ISDN (OnRamp 2)
Installation charge	$120	$295
Annual access charge	$240	$720
Local call charge for 20 minutes(1)	25¢	71¢ day rate 40¢ at other times
Customer equipment costs	Modem $250	Terminal adaptor $650

Note: (1) 20 minutes is generally accepted as the average time for an Internet session; the price difference is larger for longer holding times.
Source: Telstra and The Allen Consulting Group.

Given the differences between these two sets of charges, the PSTN plus modem option is almost always significantly cheaper for virtually all users, particularly those accessing the Internet and other online services from a personal computer. This is also the case for users requiring two services to their premises—the combination of ISDN installation and access charges is higher than the installation and rental charges for two analogue PSTN exchange lines.

5.5.1. International Comparisons

International comparisons of ISDN prices were made by the Communications Research Unit of the Department of Communications and the Arts in August 1998. Tables 5.7 and 5.8 show comparisons for connection, rental and usage charges. Exact comparisons cannot be made, given the different features associated with ISDN services in different countries. Generally, however, Australia has relatively expensive connections and rental charges, but average usage charges.

Table 5.7

Comparison of basic rate ISDN connection and rental charges and call allowances in Australia and other countries, at August 1998 (Australian dollar equivalents)

Country	ISDN provider	ISDN product (2B+D)	Connection	Rental per annum	Average annual fixed cost[1]	Annual call allowance
Australia	Telstra	OnRamp 2	$295.00	$720.00	$818.33	None
		OnRamp 2 Light Call Plan	$295.00	$840.00	$938.33	$240 local data calls
		OnRamp 2 High Call Plan	$295.00	$2,400.00	$2,498.33	$2,160 local data calls
Canada	Bell Canada	Bell Centrex Microlink ISDN	$230.30	$1,123.97	$1,200.73	Unlimited local
France	France Telecom	Numeris Duo	$189.11	$662.30	$725.33	None
UK	British Telecom	BT ISDN 2e	$270.67	$1,462.75	1,552.97	$628.84
USA	Ameritech (Indiana)[2]	ISDN	$212.48	$1,903.90	$1,974.72	n.a.
	Ameritech (Michigan)[2]	ISDN	$204.12	$672.79	$740.82	600 Calls
	Bell Atlantic (Maryland)	ISDN	$209.14	$391.50	$461.22	None
	Pacific Bell (California)	ISDN	$267.27	$491.89	$581.81	None
	US West (Utah)	Basic Service Metered	$184.04	$783.00	$844.35	None
		Basic Service 200 hours[3]	$184.04	$1,365.23	$1,426.59	1200 hours
		Basic Service Flat Rate	$184.04	$3,692.80	$3,755.51	Unlimited

Notes:
[1] Connection charges averaged over 3 years.
[2] Annual access charges do not include taxes.
[3] 200 hours per month inclusion is single channel; equates to 100 hours per month full ISDN service.
Source: Websites of the listed companies, US Consumer Project on Technology www.cptech.org/isdn.
Communications Research Unit, DOCA

Table 5.8

Cost of 20 hours of local data calls at peak period in Australia and other countries, at August 1998 (Australian dollar equivalents)

Country	ISDN provider	ISDN product (2B+D)	Cost
Australia	Telstra	OnRamp 2	$49.93
Canada	Bell Canada	Bell Centrex Microlink ISDN	$0
France	France Telecom	Numeris Duo	$96.09
UK	British Telecom	BT ISDN 2e	$110.93
USA	Ameritech (Michigan)	ISDN	$10.17
	Bell Atlantic (Maryland)	ISDN	$80.31
	Pacific Bell (California)	ISDN	$49.64
	US West (Utah)	Basic Service Metered	$120.46

Note: 20 hours of calls calculated at 30 x 1 minute calls, 30 x 4 minute calls, 15 x 15 minute calls, 14 x 30 minute calls and 9 x 45 minute calls.
Source: Websites of the listed companies, US Consumer Project on Technology www.cptech.org/isdn Communications Research Unit, DOCA

More relevant than comparisons of absolute prices are comparisons of ISDN charges relative to PSTN charges. As noted above, PSTN charges in Australia are much lower than ISDN charges, particularly for local call data transmission. This is not the case in other countries, as Table 5.9 shows.

Table 5.9

ISDN Usage Charges in OECD Countries

	Telephone usage	Data communication usage
The same as PSTN	All OECD PTOs except listed below	Finland, Spain, Sweden, UK, Japan (64kbit/s)
The same as PSTN plus additional call set up charge	Belgium, Denmark, Netherlands	Belgium (further additional call set up charge) US (additional surcharge)
Similar to PSTN		More Expensive France, Ireland, Italy (non–packet), Japan (384kbit/s, 1.4 Mbits/s), Netherlands Less Expensive Norway (plus call set up)
The same as X.25 Independent of Distance		Austria, Denmark, Italy (packet), Japan (packet), Luxembourg, Switzerland)

Source: Committee for Information, Computer and Communications Policy, *Information Structures: Their Impact and Regulatory Requirements*, OECD, 1997.

In addition to international comparisons of ISDN pricing an assessment has been undertaken of the extent to which other ISDN capability, or a data capability generally, may be included in a USO. Although nearly all OECD countries have a universal service obligation for telecommunications only Denmark, Germany and Norway have specified ISDN as part of their USO. The ACA is not aware of any international examples where a data capability generally is prescribed in a USO. In the USA limited support is given for some higher bandwidth services but only for certain classes of customers. In its relevant order the Federal Communications Commission (FCC) concluded that:

> certain higher bandwidth services should be supported under section 254(c)(3) [of the *Telecommunications Act 1996*] for eligible schools, libraries and health care providers...[however]...[w]e conclude, except...with respect to [the above users] that voice grade access, and not high speed data transmission is the appropriate goal of universal service policies at this time because we are concerned that supporting an overly expansive definition of core services could adversely affect all consumers by increasing the expense of the universal service program and, thus, increasing the basic cost of telecommunications services for all.[100]

5.5.2. Conclusion Regarding ISDN Pricing

While ISDN offers greater data rates than the PSTN, this superior quality is not sufficient to induce large numbers of people to purchase ISDN services. This is mainly because of the price of ISDN in comparison to the price of PSTN calls.

While Telstra (and all other carriage service providers supplying the standard telephone service) remains obligated to provide the option of untimed local calls in most areas of Australia, a surge in household demand for ISDN is unlikely. Business demand is also likely to be low, in particular as the option of accessing arguably superior technologies, such as asymmetric digital subscriber line (ADSL), will probably soon be available.

5.6. Current Government Assistance Strategies

The Commonwealth, and state and territory governments are all currently planning for, or implementing, a range of initiatives to improve access to data services. These initiatives are outlined below.

5.6.1. Commonwealth Government

In 1997 the government established the National Office of the Information Economy (NOIE). One of its roles is to develop, coordinate and overview broad policy relating to the regulatory, legal and physical infrastructure environment for online services.

NOIE works closely with the Online Council, a forum for Commonwealth, State and Territory Government Ministers and local government to consider and reach agreement on national strategic approaches to the use of information and communication services.

The major Government program related to the provision of data services is *Networking the Nation*, which aims to assist the economic and social development of regional and rural and remote Australia, by funding projects which:

- enhance telecommunications infrastructure and services;

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[100] Federal Communications Commission (USA), CC Docket No. 96-45, paragraph 64.

- increase access to, and promote the use of, services available through telecommunications networks; and
- reduce disparities in access to such services and facilities.

Through the Regional Telecommunications Infrastructure Fund (RTIF), the program is allocating $250 million over five years (1997-2002). Funding is allocated in two categories:

- project funding—for proposals that have been developed to meet communications needs identified by regional, rural and remote communities; and
- development funding—to help communities lacking the resources and expertise to research and develop funding proposals.

Successful projects provided through the RTIF are varied and have included the provision of enhanced Internet access, improved telecommunications infrastructure (such as mobile telephony and points of presence), pilot projects to trial alternative means of service delivery, innovative technologies, video-conferencing facilities, e-commerce and community planning projects.

5.6.2. State and Territory Governments

Each state and territory government has developed (or is in the process of finalising) its strategies for the provision of information technology services. Whilst the specific programs that flow from these strategies vary considerably, reflecting the individual needs and concerns of each state and territory, they cover the same broad areas:

- education;
- call centres;
- health and community services;
- libraries;
- one stop shops; and
- the Internet.

In concert with the provision of data capable infrastructure, each state and territory is establishing complementary programs such as: assisting the development of regional ISPs; raising awareness of the benefits of information technology; and providing communities with access to the training and education necessary to utilise new technology solutions.

A detailed summary of the major programs and activities taking place in the states and territories is provided at Appendix 4.

5.6.3. Local Government

The Australian Local Government Association (ALGA) has developed a Local Government Electronic Information Strategy (LGEIS) that aims to make local government:

- more efficient and effective in decision-making;
- improve Council performance and service delivery; and
- promote local and regional development.

158 local councils around Australia are currently online with their own website.

5.6.4. Other Initiatives

In addition to government initiatives, some individuals and community groups are working to improve access to information technology in their communities. The best example of this is the development of telecentres.

The *Telecentres Program* began as a multi-purpose self help program administered by the Commonwealth Department of Primary Industries and Energy (DPIE). It aims to help address service delivery, information and other needs arising from remoteness and isolation by providing grants to help rural communities access modern information technology resources. Telecentres were developed with the aim of:

- increasing local employment prospects (particularly self-employment);
- improving business enterprises;
- delivering community services (ie. delivery of education and training); and
- having reasonable prospects of becoming self sufficient (in terms of operating costs) within two years.

The DPIE program is still in operation, although on a smaller scale. The RTIF has also funded the development of telecentres, upon application from individual communities. The Australian Rural Telecentres Association (ARTA), the national association of community based telecentre organisations, acts as the representative organisation for member telecentres.

In Western Australia telecentres operate differently, as they are supported and funded by the state government. The majority of telecentres became involved in formal education programs under the sponsorship of the Western Australian TAFE External Studies College, and are now part of the state government's telecentre program. The Western Australian Government recently allocated $1.8 million to speed implementation of this program, with the aim of expanding the 41 centre network to as many as 100 centres over the next three years.

The development and performance of telecentres throughout Australia has been varied. Some have been very successful and are going from strength to strength. Others have closed. The facilities of each telecentre also vary, depending on community needs and

requirements. For example, approximately 19 telecentres are equipped with ISDN for videoconferencing.

5.7. Future Developments

A previous section of this chapter described the current situation in terms of consumer access to services and how current policy settings affect service availability or access. This section suggests how service availability and access will change over the next few years. It assumes no government intervention beyond current programs (ie. RTIF and state or territory programs outlined above).

Accurate forecasts are difficult at a time of rapid development in national and global technologies and services. However, establishing a reasonably conservative view on how service availability will develop over the next five years or so assists the overall analysis.

5.7.1. Technological Developments

Table 5.10 summarises the main data service delivery mechanisms—those currently in use (either in Australia or overseas) or likely to be available within a five year time frame.

Table 5.10

Summary of Technology Options

Access Technology	Infrastructure	Range (from local exchange or base station to customer premises)	Indicative Digital Transmission Rates	Comments
ADSL, HDSL, VDSL	Copper wire	5km	Upstream: 256kbit/s Downstream: 6Mbit/s	Requires copper wire local loop Cost effective for urban areas only
DAMA	Geostationary satellite	No limit	9.6kbit/s, 16kbit/s, 19.2kbit/s	Radio spectrum required
DRCS	Fixed radio	50km Up to 9 repeaters 50km apart	2.4kbit/s	Not suitable for digital transmission Radio spectrum required
HCRCS	Fixed radio	50km Up to 9 repeaters 50km apart	14.4kbit/s, 19.2kbit/s	Radio spectrum required 28.8kbit/s planned(c)
HFC	Optical fibre & co-axial cable	Local (a)	Up to 10Mbit/s	Cost effective for urban areas only
ISDN	Copper wire	Up to 5km from exchange	64kbit/s, 128kbit/s, 2Mbit/s	
LEO	Orbiting satellite	No limit	9.6kbit/s	Radio spectrum required
Microwave Radio	Fixed radio	Multiples of 40km—no limit	Up to 155Mbit/s	Radio spectrum and line of sight required
MEO	Orbiting satellite	No limit	(b)	Radio spectrum required
Powerline	Electric power lines	Limited to existing electricity network	Up to 1 Mbit/s	Commercial viability yet to be proven in Australian conditions
PSTN via modem	Copper wire	Up to 5 – 10km from local exchange	From 2.4kbit/s to 56kbit/s depending on condition of the local loop	
VSAT	Geostationary satellite	No limit	Upstream: up to 512kbit/s Downstream: up to 30Mbit/s	PSTN & ISDN can be used for upstream links Radio spectrum required
Wireless Local Loop (WLL) (narrowband) **proprietary** **CDMA**	Fixed radio	70—90km[101]	Wireless IP 19.2kbit/s Asynch. 28.8kbit/s 64kbit/s	Radio spectrum required
Wireless Local Loop (broadband) **LMDS**	Fixed radio	Limited	Up to 6Mbit/s	Radio spectrum required

(a) Range determined by number of people using the service rather than the characteristics of the cable.
(b) No indicative transmission rates available as no service yet in operation.
(c) HCRCS is now capable of 14.4kbit/s and 19.2kbit/s. Over time it is expected to be capable of 28.8kbit/s.
Source: The Allen Consulting Group and Telstra.

[101] The ACA understands that wireless local loop technology currently deployed in Australia has a maximum range of 10-15 kilometres. Trials are being conducted in Australia of Trans European Trunked Radio Access, which 'is reported to be able to operate as a wireless local loop at up to 100km between the remote subscriber and the local exchange' as reported in: Derek Rogers & Reginald Coutts (CTIN), Wireless Options for Extending Broadband Interactive Services, CIRCIT Research Report No. 20, June 1998, p.17.

There is a number of significant technological developments in service delivery mechanisms that could improve the overall availability of data services, reduce costs or enhance the data transmission rates available for data services. They fall into three distinct categories, as outlined below.

5.7.2. Fixed Wire Services

The traditional method used for connecting customers' premises to local telephone exchanges consists of analogue equipment operated over pairs of copper wires on poles and in ducts, pipes or directly buried, and referred to as the 'local loop'. The characteristics of these connections vary considerably and most local loops are not capable of transmission rates that are consistent with the maximum rate of many currently available modems. Under the ACA's *End-to-End Network Performance Standard*, carriers are required to support the carriage of voice band data communication over the PSTN at a minimum data rate of 2400bit/s. There is no mandated requirement to support a faster data rate over the PSTN when utilising the standard telephone service.

There are, however, new technologies available that can upgrade the local loop performance to enable the provision of consistent and improved electromagnetic characteristics to support a higher guaranteed digital transmission rate.

There are also digital subscriber loop (xDSL) technologies under development and similar, high capacity, local loop service solutions being developed specifically for delivering broadband services to the home. These services are expected to allow high data rate Internet access, including downstream transmission rates up to approximately 8Mbit/s. ADSL systems are being trialed by many carriers around the world. These could provide—as a typical configuration—a telephone service, an upstream digital channel in the range 64kbit/s to 1Mbit/s, with a downstream channel in the range 1.5Mbit/s to 8Mbit/s. Like ISDN, xDSL services are designed to use the existing copper wire in the local loop, but will deliver much greater data rates than the 128kbit/s delivered by ISDN.

The other significant development in the fixed wire area is the roll-out of hybrid fibre coax (HFC) cable systems in metropolitan and other urban areas. Primarily intended for delivering cable TV programmes, HFC systems can also be used to provide telephony services and, via 'cable modem', data services in the range 512kbit/s to 10Mbit/s. It should be noted, however, that installing HFC systems represents the most expensive service delivery option (discounting a fully optical fibre network or a satellite network) and appears to be commercially feasible only in reasonably dense urban areas.

Considerable resources have been allocated to attempts to develop local loop bypass systems using existing electricity distribution networks for transmitting telecommunications traffic. Although some pilot schemes are in operation in Europe, at transmission rates up to 1Mbit/s, it is not clear whether such systems are feasible in Australia where many local electricity lines are overhead and do not have the required electromagnetic characteristics for carrying data. An alternative approach is to use the electricity distributor's poles and ducts to accommodate cable to customers' premises.

5.7.3. Terrestrial Wireless Services

Wireless Local Loop (WLL)—also known as Fixed Radio Access—is a relatively new development which was originally driven by the strong desire of new market entrants to bypass the local loops of incumbent carriers in newly deregulated jurisdictions, particularly in North America.

The take up of WLL technology has so far occurred mainly in developing countries, where there is less fixed wire access in place.[102] It should be noted that unlike the fixed wire options described above, terrestrial and satellite wireless systems involve the use of radio spectrum, and a carrier intending to offer such a services has first to obtain a radiocommunications licence from, in Australia's case, the ACA.

WLL typically does not provide universal coverage of a given service area—for example, the Nortel Proximity I WLL system currently being deployed by Telstra in Australia has a maximum operating range of around 10-15 kilometres, with a significant percentage of customers in a standard local call zone unable to receive any service from this technology from one base station. (WLL is a 'near line of sight' service, requiring the customer antenna to be more or less directly in view of the WLL base station.) Accordingly, a combination of technologies is usually required to provide full coverage in an area serviced by a single WLL base station.

WLL has often been cited as a low cost technology option, having a significant advantage over fixed wire options through being capable of rapid deployment. However, a number of recent articles on WLL deployment have argued that the costs of deployment of this solution have been considerably greater than those originally predicted,[103] and take up in developed countries has been relatively slow.

A recent CIRCIT report notes that:

> With multiple line capability, less precise network planning criteria, medium band data rate capability, PSTN-like quality, and substantial cost savings, fixed wireless access systems are ideally placed as an access technology for rural telecentres.[104]

As a result of recent developments, two categories of WLL products have emerged in the market place:

- narrowband fixed radio access, up to 64kbit/s; and

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[102] A list of recent international WLL contracts is provided in Communications International 'Loot for Loop', June 1998, p.34—almost all of these contracts are in developing countries.

[103] For example, see Paul Gannon 'Out of the Loop', Communications International, April 1998, pp.52-55, which discusses briefly the disappointing progress in Ionica's deployment of WLL in the United Kingdom. Paul Golden's 'Ionica working to fix network', Global Wireless, March-April, 1998, pp 15-17 also discusses Ionica's low take-up rate, noting that Ionica, which offers WLL coverage to some 2 million homes in the UK, had signed up just over 35,000 WLL customers since its establishment in June 1996.

[104] Rogers & Coutts, p.20. This report provides a good overview of emerging wireless and satellite technologies potentially suitable for deployment in rural areas.

- broadband fixed radio access—local multipoint distribution systems (LMDS)—up to 6Mbit/s, intended for the business market.

The narrowband systems are designed to deliver telephone and data services in urban and rural environments; the operating range depending on the spectrum bands and protocols used. The use of code division multiple access (CDMA) protocols is expected to lead to higher data rates.

Other developments are in terms of line-of-sight microwave radio systems. These systems have been in use in urban and rural Australia for many years to provide point-to-point links. The latest available systems are capable of supporting up to 155Mbit/s over long distances, with the use of repeater stations at 40 kilometre intervals. Such systems can be used to extend network access to remote communities such as mines and larger isolated population centres, depending on local conditions.

5.7.4. Satellite Based Services

Geostationary Satellite Systems

Considerable advances have been made in very small aperture terminal (VSAT) technology during the past few years. Originally providing transmission rates limited to 9.6kbit/s, VSAT systems now in operation support downstream rates in excess of 512kbit/s. These advances have led to considerable numbers of VSAT systems being installed around the world, leading to production economies and lower unit prices for antennae and other customer equipment, as well as lower operating costs for carriers.

Some vendors have developed Internet specific VSAT products, including asymmetric systems configured to reflect a particular characteristic of Internet traffic—namely the ratio between *upstream* and *downstream* traffic (the former refers to data packets sent from the user's personal computer to a host computer, eg. a Web server, the latter refers to data packets sent from the host computer to a user's computer). In most Internet applications the amount of upstream data is only a fraction of the downstream data—upstream/downstream ratios in the region of 1 to 20 are not uncommon for users browsing Web pages. Many vendors and carriers have taken advantage of this imbalance to reduce their costs and prices by offering 'asymmetric' products and services to customers operating Internet services, including corporate customers operating inhouse Intranet systems.

Another relevant VSAT development is demand activated multiple access (DAMA), a configuration that assigns satellite circuits to customers on-demand in line with call characteristics, thereby achieving a more efficient use of expensive satellite capacity. Although intended primarily for 'thin route' applications, data transmission rates of 16kbit/s are currently possible on DAMA systems and this limit may increase in future. DAMA is a commercially proven technology that provides particularly cost effective telephony for low density areas.

Orbiting Satellite Systems

Low earth orbit satellites (LEOs) and medium earth orbit satellites (MEOs) are attracting considerable interest as global, location independent, communications systems, well suited to the needs of customers in remote areas.

However, current generation LEOs are optimised for voice telephony and have only a maximum data transmission rate of 9.6kbit/s which, given the anticipated price of the service, is likely to limit its use for data services.[105] The market for LEO services is likely, at least initially, to be limited to users willing to pay a premium for mobility in remote areas. The configuration, in its present form, is not relevant to the provision of widespread data capability but this is likely to change as more services specifically designed to provide data services become available in the period 2001-2003.

MEO systems and products are less developed but are expected to offer significantly higher data rates than LEOs. The price performance and hence commercial viability of MEO systems have yet to be demonstrated in the Australian context.

5.7.5. New Technology Scheduled for Implementation in Australia

Some Australian carriers already are planning to introduce some of the new technologies identified in the previous section. Telstra is trialing Nortel's 'Proximity I' WLL system in some 'country' areas, although the ACA understands that the number of customers currently connected to WLL systems is less than 1000. This system does not currently support ISDN, and provides a maximum data rate of 28.8kbit/s. Telstra has noted that the cost effectiveness of this solution in the Australian environment has still to be proven.[106]

AAPT have purchased spectrum licences in the recent ACA auction of 800Mhz and 1.8Ghz spectrum. This spectrum is ideally suited to CDMA technology. Industry observers have speculated that AAPT plans to use this spectrum to deploy CDMA access services.

Optus currently provides the Mobilesat service, which is essentially a mobile voice service which Optus states will, by the end of 1998, provides a 4.8kbit/s data capability—it currently provides 2.4kbit/s. (Optus also provides Datareach and Fastdata, which are high data rate services intended for corporate customers—Fastdata is being evaluated for remote area application.) Optus has stated it is also evaluating a number of future satellite initiatives, and is:

> currently trialing an asymmetric Internet data service, where a PSTN modem is used to request information and navigate through the Internet, and a high speed broadcast satellite is used to deliver the Internet information to the user. While the service does not have the overall two way capability of ISDN, it nevertheless is capable of down-loading Internet information at rates equivalent to or better than circuit switched ISDN.[107]

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105 User charges in excess of $1.50 per minute have been quoted within the industry.

106 Telstra—ACA communications.

107 Optus—ACA communications.

Teledesic Australia has applied for a carrier licence to enable it to supply satellite based data services that provide 'user selectable' data rates of between 16kbit/s and 64Mbit/s. The service is expected to commence operation in 2003. In addition, SkyBridge recently announced plans to introduce its LEO system to enable world wide access by 2001. It is planned that the system will deliver downstream data rates of up to 20Mbit/s to residential users, with 2Mbit/s on the return link.

In a media release on 28 May 1998, Telstra announced plans to introduce three separate satellite services, supplied respectively by Hughes/Ericsson, Scientific Atlanta and Gilat. Telstra has advised that the Hughes/Ericsson asymmetrical service, 'will offer comparable throughput for Internet Access to an ISDN line or a 56kbit/s modem.'[108] In addition to a voice service, the Scientific Atlanta DAMA system can currently support a symmetric 14.4kbit/s facsimile and data service, with higher data rates potentially supported in the future. The DAMA service will be supplied primarily to customers in remote areas who have requested the standard telephone service, in order to assist Telstra in meeting the service connection periods specified in its Universal Service Plan. The Gilat system is a VSAT type symmetric system—it would typically be used for such applications as 64kbit/s file transfer or video-conferencing.

As referenced in Chapter 2, in rural and remote areas Telstra is also upgrading its DRCS systems with HCRC systems. With developments in technology solutions, Telstra expects new HCRC systems to support 28.8kbit/s within approximately two years.

5.7.6. Technology Trends and Future Developments

The costs of all telecommunications switching and transmission systems continues to fall. As new technologies are taken up in the market, subsequent developments in technology solutions and economies of scale are expected to further reduce unit costs. For example, Telstra expects the incremental capital cost to a subscriber of a satellite based asymmetric service to fall from around $4,000 to around $1,000 by the year 2000. An Optus spokesperson recently stated that the price of VSAT terminals could drop from the current $8,000 to $2,000 if global demand reaches 100,000 per annum.

> In parallel with falling equipment costs, the technical performance of many products is likely to improve as the technology becomes better established, hence leading to higher data transmission rates and improved reliability.[109]

In view of significant differences in both the demand and supply aspects of these developments, the three market segments (metropolitan, regional and rural and remote) are discussed below.

Metropolitan Areas

The capital cities and surrounding suburbs are currently the main investment targets for all carriers, with the exception of a few that have obtained licences for the specific

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[108] Telstra—ACA communications.

[109] Rob Nicholls, Technology Mix for Rural Wireless Local Loop, Optus Communications, Rural Telecommunications Conference, AIC, Sydney, 15-16 June 1998.

purpose of installing and operating infrastructure on interstate links and other trunk routes or satellites. This focus on metropolitan areas is likely to continue with more sophisticated and higher data rate services being offered to residential and business customers. Examples of relevant infrastructure investments include the extensive roll-out of broadband cable by Telstra and Optus in the larger capital cities and the installation of CBD optical fibre systems by AAPT, Primus, Spectrum and other carriers in Sydney, Melbourne and Canberra. Many industry observers expect Telstra soon to commence implementing ADSL systems in the customer access network in areas not served by its broadband network. There is also increasing interest in installing WLL systems.

The effect of these developments will be to extend the range of data services currently available in metropolitan areas and so to increase customer choice. It seems highly probable that over the next few years all households in metropolitan areas will have access to continuing improvements in data capable services.

Regional Centres

Provincial and country towns typically have a diverse economic base in spite of their modest populations. In addition to significant numbers of residential households, each characteristically supports a considerable number of local businesses, as well as a range of government offices and establishments—Commonwealth, state and local government.

Government bodies are likely to play a particularly important role in establishing and maintaining demand for data services in regional centres. Government agencies, as well as the larger private businesses with a commercial presence in regional centres, are likely to demand enhanced data services particularly for communications with relevant capital cities. (As discussed previously, this demand is already being generated by some state governments.) Because of this strong demand, carriers can be expected to enter the market to meet the needs of larger public and private enterprises. A spin-off is that the services provided will also be available to small businesses and domestic users.

New service providers using new delivery platforms such as wireless local loop, VSAT based solutions, and low and medium earth orbit satellite systems are also emerging.

Existing carriers with aspirations to develop as nation-wide service providers (ie. Optus or AAPT) may promote the creation of affiliated operating entities in regional centres as feeder networks—much like the smaller regional airlines affiliated with the major airline companies. They may also affiliate with major global service providers who will be keen to access Australian markets.

A contra risk is that ‘whole-of-government’ purchasing contracts, particularly for state or national coverage, could discourage the emergence of regional telecommunications companies and inadvertently reduce investment and innovation in these markets.

The effect of these developments is that households and businesses in regional centres are expected to have adequate access to data capable services, although in the absence of effective competition, there may not be sufficient downward pressure on prices.

Rural and Remote Areas

The service supply issues for rural and remote areas are more difficult.

Firstly, the cost per customer of supplying terrestrial services in these areas will remain significantly higher than in more densely populated areas.

Secondly, there is a possibility that the current major fixed line infrastructure-based telecommunication service providers (Telstra, Optus and AAPT), may regard these areas as a market of marginal significance. This outlook is inevitable in an environment where securing market share in metropolitan and regional centres would be a higher commercial priority. Contributing to the supply of services in rural and remote areas may still be seen in social rather than commercial terms. The past reliance on the universal service obligation as a means of ensuring a supplier reinforces this view.

Thirdly, there is a perception that remote Australia is a small market and, therefore, of low commercial priority compared to the total Australian market. The distinctive features of these areas, such as low population and revenue base, and physical isolation from capital cities, are a significant disadvantage for an industry environment based on economies of scale. However, the emerging satellite services have the potential to address disadvantages of isolation and low population density.

In terms of developments in the availability of ISP services, the RTIF secretariat have advised that within five years it expects that the RTIF program will have helped to ensure that in all but the most remote parts of each state and territory there is greater choice of ISP services, with prices at, or approaching, those available in metropolitan areas. This choice will be provided through a network of public access points across each state or territory, and through commercial investment (in part encouraged by the RTIF), providing availability through both physical and virtual points-of-presence.[110]

5.8. Summary

This chapter contains an overview and analysis of the current telecommunications infrastructure in Australia and its capability to provide data services at various data rates. It also provides details of comparative pricing for data services through the PSTN and by ISDN, including some overseas comparisons. The chapter indicates probable short and longer term developments that will provide high data rate services.

The overall situation is summarised in the Table 5.11.

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[110] Response to ACA request for information from RTIF Secretariat, Department of Communications and the Arts, 1 July 1998.

Table 5.11

Assessment of Geographic Markets

Segment	Issues Affecting the Supply of Data Services
Metropolitan Areas	Large number of market participants and consumer choice.
	New high capacity systems for customer access being deployed.
	Competitive pricing.
Regional Centres	Points of presence and service availability in major centres.
	Limited choice and prices likely to be higher than capital cities because of underlying higher costs and limited competition.
	Important role for state & territory governments in establishing demand and contracting with suppliers to be present in the market.
	New technologies such as WLL is likely to reduce costs and improve service delivery.
	Development of regional telephone companies could price and improve service delivery.
Rural & Remote Areas	Continued gaps in service delivery because market is seen as not very profitable and because of higher costs of supply.
	Where services are supplied prices will be significantly higher than elsewhere.
	Emerging satellite services have the potential to address current disadvantages.

Source: The Allen Consulting Group.

The main points to emerge from the analysis are as follows.

- The Telstra PSTN is currently capable of providing data services at a data rate of 9.6kbit/s to 95 per cent of its urban and major provincial subscribers and 70 per cent of rural and remote subscribers. A data rate capacity of 14.4kbit/s is available to 85 per cent and 60 per cent respectively of suburban/provincial subscribers and rural and remote subscribers but a data rate of 28.8kbit/s is available to only 60 per cent and 30 per cent respectively of these subscribers.

- The price of PSTN based data services is significantly higher in rural and remote areas where customers do not have local ISPs and have much lower data rates available than in urban and provincial centres.

- Whilst by end 1998 ISDN will be available on request to 96 per cent of the Australian population, as at June 1998 only some 73,000 services had been connected and virtually all of these are business customers. There are estimated to be only about 200 domestic users of ISDN.

- The level of ISDN usage is low in comparison with other comparable 'high income' countries.

- The price of ISDN services in Australia is expensive compared with data services available through the PSTN and is relatively expensive when compared with ISDN rates in comparable overseas countries.

- Whilst ISDN has been prescribed in a USO in three OECD countries, no examples have been found where a general data capability has been specified in a USO.

- Satellite based data delivery systems are expected to be available by the end of 1998 that will provide 64kbit/s (or broadly equivalent) data rate capacity.
- Other technology solutions are available that could be used to provide data services to supplement the current fixed telecommunications network.
- Further developments in technology such as LEO and MEO satellite systems planned for 2001 to 2003 will be capable of providing selectable high data rate services to all parts of Australia.

5.9. Conclusions

Having regard to the analysis in this chapter the following conclusions are drawn:

- ISDN or broadly comparable 64kbit/s digital data services will be accessible to all people in Australia by the end of 1998 through Telstra meeting its licence condition and its proposed satellite based delivery system;
- the higher cost of ISDN or alternative satellite based data services, compared with the more limited but lower priced data services available through the PSTN, will remain as a limiting factor to affordable consumer access to data services, particularly in rural and remote areas;
- the availability of new technology solutions and new service providers (national and global) progressively over the next five years will provide market developed solutions to high data rate needs; and
- international comparisons indicate that no country has specified a data rate capability as part of USO arrangements for the standard telephone service, apart from the inclusion of ISDN in USO arrangements in Germany, Denmark and Norway.

6. Rationale for Government Intervention in the Provision of a Digital Data Capability Broadly Comparable to a 64kbit/s Channel

The Minister's directions require the ACA to have regard to factors and conditions which make it desirable for government to intervene in the provision, by the market, of a carriage service that provides a market digital data capability broadly comparable to that provided by a 64kbit/s data channel supplied as part of a designated basic rate ISDN service (paragraph (3)(c)).

As noted in Chapter 2, there is community concern that Australia not become divided on the basis of access to data services. While these concerns are understandable they need to be considered in the context of other products and services which are important for participation in society—for example, food, clothing and shelter.

Governments do not generally intervene in markets to ensure accessibility—for example, there is no legislated universal entitlement to food or clothing, or price controls to make them affordable to all. Instead, taxation measures and social security payments are usually used to re-distribute benefits and to boost the relative disposable incomes of low income households with individual purchasing decisions left to the individual.

Governments do intervene in some markets. Healthcare, education and housing are three examples—so too is telecommunications. The usual reasons for intervention are: to correct for market failures in an attempt to make market outcomes more efficient; to produce public goods and promote strategic national benefit[111] and to improve equity or fairness of market outcomes.

Other less common reasons for intervention include where the service or good is considered essential, where the provision of a service requires compulsory access to land[112], or where their provision affects the rights of citizens.[113]

This chapter explores the issues surrounding the possible need for government intervention regarding the availability of a digital data capability broadly comparable to a 64kbit/s ISDN channel: is there a need for the Commonwealth Government to intervene in the workings of the telecommunications market for this type of digital data capability; why not leave it to the market to sort out who buys and sells high capacity digital data services—and at what price?

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111 Examples relevant to telecommunications include national security and defence, emergency services and disaster recovery, and surveillance associated with crime prevention.

112 Part 24 of the *Telecommunications Act 1997* establishes arrangements that deal with the need for a carrier to have access to land to install infrastructure.

113 Max Neutze, *Funding Urban Services. Options for physical infrastructure*, Allen & Unwin, 1997.

6.1. Market Failure

6.1.1. Market Failure Generally

The announced and planned developments set out in the previous chapter suggest that the market, if left to its own devices and with current regulatory arrangements, will ultimately deliver the socially desirable level of digital data capability specified in the Minister's directions to all Australians.

The Australian telecommunications market is now open to competition in both service and infrastructure provision. However, this has only been the case since July 1997. Although limited infrastructure competition has been allowed since 1991, the evidence indicates that the competitive supply of infrastructure and services will, over time, provide the desired outcome in regard to access to a digital capability broadly equivalent to 64kbit/s.

Using economic principles there are sound arguments to suggest that there are now no inherent technical impediments which would result in the market for digital data services failing: entry is now possible in all markets; technology solutions that can promise high data capability, eg. via satellite, are developing rapidly and costs should be comparatively low; anti-competitive behaviour is regulated under Part XIB and under other parts of the *Trade Practices Act 1974*; and services can be declared for access where this is in the long term interests of end users.

This conclusion, however, does not necessarily apply to lower levels of data capability provided over the PSTN because there are numerous policies that apply to telecommunications that may hinder digital data capability being provided where it should be in a socially desirable time scale and that may result in data rate capability and price of service acquisition also being sub-optimal. This is because of the way in which those policies may affect the incentives for carriers and potential carriers to supply such services, and how service providers can make use of capacity purchased from carriers. The Australian telecommunications market for data capability and service is inextricably linked to the market for voice because of the potential for common use of infrastructure. This introduces many complexities into judgements about the outcome of normal supply and demand interactions. Three examples illustrate this point.

- The USO arrangements, whereby Telstra is compensated for its net losses from the provision of loss making standard telephone services, will discourage new entry into these markets—at the same time, unless the incremental revenue to Telstra from the provision of higher data capability rates were greater than the costs there would be no incentive for Telstra to provide such a service.

- The untimed local call obligations—which cover both voice and certain kinds of data for residential customers—when coupled with the price caps on Telstra also mean that incentives for new entry are reduced (and also must affect Telstra's incentives to make network upgrades).

- The licence condition on Telstra to provide access to a basic rate ISDN service to 96 per cent of the population by the end of 1998 will in turn affect the

incentive structure for other carriers to enter the market for the provision of other data service types.

Reasons for the unavailability of PSTN-based digital data services in some areas can be summarised as:

An affordability barrier:

The absence of availability in an area may be because the price at which consumers in that area are prepared to pay for the service is less than the price at which carriers and service providers are prepared to supply the service (ie. it is not profitable).

A timing barrier:

There may have been insufficient time from when the Australian market has been opened to competition for new market entrants to enter the market and provide services. It may be that service availability will be provided in the (near) future as new technologies become available and carriers and service providers begin operation.

A profitability and management focus barrier:

It is possible that pre–1997 carriers may not have been willing to supply a digital data capability in rural and remote areas even if it were profitable to do so. At a time of great expansion in telecommunications, carriers are not just looking for any profitable opportunity, but the most profitable opportunities to maximise their returns to shareholders. They are also looking to minimise market share loss and would, therefore, be expected to invest their scarce and limited capital and management resources into the most profitable ventures first and into markets where they most fear loss of share. The provision of digital data capability to rural and remote areas may not rank high in terms of profitability, and hence may not be a project that receives capital.

A regulatory barrier:

The presence of various policies in current and past legislation may inhibit an optimal market outcome eventuating.

That the current USO arrangements may be discouraging new entrants from providing services is recognised by Optus in its submission. The current price control arrangements may be affecting the relative profitability between rural and remote and regional and metropolitan areas with the outcome being that carriers are not prepared to incur substantial capital costs to upgrade services of their own volition in all areas, unless this can be done in a cost-effective way eg. using a satellite-based solution.

Although there are no fundamental technical economic conditions for believing that there will be a failure in the market providing optimum levels of digital data capability over time, the legacy from the outcome of current and previous government policies regarding market entry, price control, untimed local calls and the USO arrangement for the standard telephone service raise a question about the outcome from relying solely on the

market itself to produce the appropriate result as regards the availability, data rate and price of digital data capability over the PSTN.

The above discussion highlights a substantial potential policy issue: introducing new policies in regard to the provision of data capability—particularly via the USO arrangement—on top of existing legislative arrangements may further reduce the scope for efficient market-based outcomes. For example, prescribing any data capability under the USO is likely to exacerbate any existing problems associated with monopoly provision of services, as it would discourage new entry by underpinning the losses of the universal service provider.

6.1.2. Providing Public Goods

There are two essential characteristics of a public good. First, once the 'good' is supplied other consumers may use the 'good' without adversely affecting other consumer's use of the good or increasing the costs of provision. The second characteristic is that others cannot be excluded from benefiting from the good (ie. it is too costly or impractical to exclude those that benefit.)

Government intervention in the supply of public goods is justified on the basis that competitive markets will tend to restrict supply, and not make the investment necessary to maximise community welfare. It does not automatically follow, however, that because a service is a public good it should be supplied by government. Rather, it suggests some form of government intervention may be desirable—for example, public funding. A service is also not a public good merely because it is used by government agencies that supply public services such as library, education and health services.

Upgrading the telecommunications network to make available a 64kbit/s service (or another minimum specified data transmission rate) does not satisfy either of the criteria for a public good as:

- the part of the network that needs to be upgraded or changed is the local access component—the link between the home or business and the (nearest) telephone exchange (by either wire or wireless means);
- the addition of another user does impose additional costs; and
- those that benefit from the upgrade or change can be excluded from benefiting—it is easy to exclude those that will not pay.

6.1.3. Correcting for Market Externalities

Externalities occur where the provision of a service will generate costs or benefits not considered by participants in the market. For example, businesses in a market where there are significant external costs, such as pollution which causes sickness (health costs), will tend to ignore these costs in making production decisions and decide on production levels higher than are socially desirable. On the other hand, where there are beneficial externalities, businesses in the market will tend to under-supply the service. In

these circumstances government intervention can improve community welfare by encouraging production at efficient levels.

The ACA received a number of submissions suggesting the provision of a digital data service will generate benefits not considered by the market. The types of external benefits suggested fall into four main categories:

- benefits in the supply of other services to consumers (eg. education, health and justice services provided by governments and banking and other services provided by private entities);
- benefits by way of improving the competitiveness or viability of rural and mining businesses;
- what is sometimes called a 'network externality'—the benefit a distant network user obtains when another user is connected; and
- benefits by reducing or avoiding congestion, pollution and infrastructure costs associated with the growth of populations in the major cities.

Each of these suggested areas are discussed in turn below.

Benefits to Other Service Providers

The supply of enhanced digital transmission rates over telecommunications networks is likely to generate benefits for the groups that use the services, consumers of the various services supplied and the suppliers of that capability. These benefits may occur through reducing the cost to consumers in accessing services (eg. travelling costs to banks, re-location to undertake education for students) or, alternatively, in reducing costs to service providers, such as banks. The suppliers of the capability will in turn receive revenue for use of it. For many government agencies operating on fixed budgets such reduced costs can mean the agencies are able to increase the level of service provided. Similarly, reduced costs to consumers can mean they are able to access services that they previously could not afford. These were common issues raised in submissions, as demonstrated in the following examples.

> The issue of the importance of digital data standard telecommunication services in assuring the availability of banking services may be extrapolated to the availability of many other commercial and government services in rural communities.[114]
>
> The cost of providing adequate telecommunications infrastructure is a barrier to the introduction of telehealth facilities in rural and remote areas. Telehealth has the potential to improve timely access to health services and health information for rural and remote areas.[115]

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[114] Department of Primary Industries and Energy, submission.
[115] National Telehealth Committee, submission.

> The major inhibitions to studying by distance education through electronic means are the cost of access and the lack of bandwidth to enable the efficient transfer of audio, graphic and video material and to provide for fast efficient 'on-line' interaction between student and lecturer.[116]
>
> The efficient administration of a school is an important factor in reducing costs and freeing more funds for educating students. A reliable Wide Area Network [that requires an advanced digital communications system] to all schools will support..... Improved Productivity.[117]
>
> If the community chooses to access services in traditional rather than online means in part because of the poor quality of data communications service and/or lack of affordability, this presents a cost to government and the community.[118]

There are, however, few arguments that support the view that these types of benefits are in fact ignored by the market in the provision of data capability and the presence of these benefits are not, in themselves, a reason for government intervention.[119] This is illustrated in the following example on the benefits to education that could be produced from providing digital data services.

From the education service provider's perspective, telecommunications is an input (albeit possibly an important one) which it can purchase in the market as it does for other inputs such as books. Assuming an education service provider wishes to maximise educational outcomes, it will determine how best to allocate its resources to achieve that result. If educational outcomes are improved by providing say, Internet access to all schools, education providers will devote more of their resources to establishing this capability. The Queensland Government's 'connect-ed' project where it has contracted with a telecommunications company to provide Internet and Intranet capability to every school within Queensland, is an example of the education provider's purchasing decision being directly affected by the perceived benefit to education from access to a digital data service. The Education Department of Western Australia stated in its submission that it was currently involved in negotiations with a telecommunications company to provide ISDN services throughout Western Australia. This example also shows that education providers, as purchasers of telecommunications services, take into account the educational benefits to the extent they fall on education service providers.

The same argument also applies to consumers of education services. Take for example the educational benefits that could accrue to children in households connected to the Internet. These households purchase telecommunications services in the market and receive the additional educational benefits that result from an improved digital data service. Putting aside considerations of equity which are addressed later, these households would therefore be expected to consider the education benefits in deciding

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116 University of New England, submission.

117 Education Department of Western Australia, submission.

118 Office of Government Information Technology, submission.

119 This is considering these types of benefits separately from the benefits that might accrue because of equity or fairness, ie. it does not include judgements such as whether or not the costs of education should be the same for country residents as for city residents.

whether or not to pay more for digital data services where a choice is available—and suppliers would undertake investment decisions based on expected demand at various prices. Consumers would also consider other benefits such as the increased profitability of, say, a farm or business that might result from access to a digital data telecommunications service.

The above examples do not mean benefits to education from increased access to or improved data capability will not occur—they will. Rather, they suggest such benefits are not externalities but rather directly influence a customer's willingness to pay in order to be able to receive such services and, through those prices, the willingness of carriers and service providers to supply capability and services.

It is also worth noting that under the Commonwealth Grants Commission arrangements the state and territory governments that face relatively higher costs of providing health and education services (say because of high telecommunications costs in rural areas) receive adjustments in their share of revenue payments from the Commonwealth.

Competitiveness and Viability of Rural and Mining Industries

A large number of submitters claimed including a digital data communication rate of over 64kbit/s in the USO would substantially increase the productivity and competitiveness of industries in the rural sector, including primary production and mining, as noted in the following examples.

> Digital data services would provide for enhanced competitiveness of rural industries, particularly agriculture[120]
>
> The agriculture, forestry, fishing, mining and energy industries are all potential users of digital data to enhance their productivity and sustainability, by use of information delivered in a timely manner to support their production and market decisions[121]
>
> This increased use of the Internet and associated technologies may lead to improved business management and improved profitability of agribusiness and small business[122]

For the same reasons outlined in the previous section, the existence of these benefits to these industry sectors are not really external to the market and therefore the 'externalities' argument for government intervention is not supported. Telecommunications services are an important input to these industry sectors as are other important inputs such as financial, banking and accountancy services, machinery and fertiliser. The fact that a service is an important input does not in itself suggest government intervention is desirable.

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120 New South Wales Farmers' Federation, submission.
121 Department of Primary Industries and Energy, submission.
122 Queensland Government, submission.

Network Externality

The network externality argument relies on the view that part of the benefit of connecting an additional subscriber to a telecommunications network will accrue to the other subscribers already connected to the service as they will now be able to call the additional subscriber. A number of submitters suggested that this is a benefit that would result from prescribing a digital data service as part of the USO.

> people being able to communicate via email or fax may generate network externalities and positive benefits for other network users[123]

> Quite rightly the public discussion document has recognised not only the benefits to individuals that can not currently receive such a service but the benefits to existing users and service providers by the network that is generated.[124]

Buyers and sellers in the market would, however, be expected to consider these benefits in their decision-making processes. In establishing the price charged for connecting a subscriber, a carrier would be expected to take into account both the revenue stream it is likely to receive from the subscriber through connection to and usage of the network as well as an increase in the revenue stream from existing subscribers calling the new subscriber. As the benefit to a subscriber will be greater the more people that can be contacted using the service, the buyer's willingness to pay for a service connection and usage levels will also be affected. This suggests that 'network externalities' are likely to be dealt with by the market in the absence of government intervention.

Avoiding congestion or pollution and infrastructure costs

A small number of submissions suggested that a failure of the government to support the provision of advanced digital communications services to rural areas would accelerate the movement of people to cities. It is argued that this would result in increased costs to society in the form of increased pollution costs, increased congestion on metropolitan roads, and increased infrastructure costs (mainly roads). Such costs, it is then argued, could be avoided by the government supporting or subsidising the provision of advanced telecommunications to rural and remote areas. Some examples follow.

> Movement of population to larger centres creates a need to construct additional infrastructure in the city whilst installed infrastructure is left idle in country towns.[125]

> concentration [of the population in major centres] creates a number of problems for our society, particularly Sydney where it has become necessary to introduce a number of measures to allow even greater number of people to live in the same amount of space....Government now has the opportunity to solve this problem once and for all .... by making the same standard of communications universally

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123 Optus, submission.
124 Gascoyne Development Commission, submission.
125 Western Australian Government, submission.

available throughout the whole country (not just the 5% of the land mass that supposedly cover 95% of the population.)[126]

While some of these arguments do have validity, it is not clear that such costs would in fact be avoided. Providing a digital data service could, as other submitters claim, change the way that companies and governments provide services, facilitating the closure of regional branches as more business is done online. Instead of avoiding the costs associated with increased urban concentrations it could, therefore, have the opposite effect by encouraging greater centralisation.

To the extent that subsidising the provision of a digital data capability in rural areas has a significant external impact by enabling state and local government to avoid additional infrastructure costs in major cities, then it would be worthwhile for those governments to introduce their own programs to support telecommunications infrastructure development in rural areas.

6.2. Providing Essential Services

Whether a service is 'essential' has been suggested by a number of commentators as a necessary criterion for a service to be included as a part of the telecommunications universal service.[127] Essential is usually taken to mean essential to the well-being of individuals or essential for the maintenance of public health or public safety.[128] The United States *Telecommunication Act 1996* requires a service to be essential if it is to be part of the US universal service arrangements.

The Australian *Telecommunications Act 1997* does not state that the objective of the universal service arrangements is to ensure 'essential' services are provided, although it is an object of the legislation to ensure 'carriage services of social importance' are accessible and supplied as efficiently and economically as possible.[129]

The Standard Telephone Service Review Group (1996) considered the 'social importance criterion' comprises two elements:

- the current and likely future take-up of the service where the service is reasonably accessible; and
- an assessment of the importance of the service in meeting social needs, such as the production of public goods or enabling citizens participation in society.

A number of submissions contended a digital data service was essential because of its importance in doing business or to participate in society.

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126 McMillan, Evans and Associates, submission.

127 Bureau of Transport and Communications Economics, *Communications Futures Project*, AGPS 1995. OFTEL, *Universal Telecommunications Services; A Consultative Document on Universal Service in the UK*, 1997. Xavier, P. *Universal service and public access in the networked Society*, Telecommunications Policy Vol 21, No 9/10, 1997. See also Neutze.

128 For example, the failure of water supply to city residents could threaten life.

129 *Telecommunications Act 1975* (Cth), s.3(2)(a)

> In the current telecommunications climate data transfer mechanisms are essential for both business and social operations.[130]
>
> The telephone and facsimile are essential business tools. Data communications, email and Internet access are in the process of becoming equally essential.[131]
>
> New communications products and systems have become essential to an individual's ability to acquire, sustain and develop marketable skills and to be an informed and active participant in society.[132]

In view of the low number of households and businesses currently connected to a high digital data rate service of 64kbit/s or greater (ie. those with an ISDN connection—approximately 200 residential and 75,000 business services), the arguments in support of a digital data capable service being essential are very weak.

In terms of maintaining an individual's well-being or the maintenance of public safety, the essential nature of communications is largely limited to the emergency call function attached to the standard telephone (voice) service, and for voice communications only—it does not yet extend to a digital data capability in any form.

This conclusion does not seek to discount the arguments put forward by submitters supporting government intervention because a digital data service would be of social or business importance, nor does it suggest that a digital data service is not of 'social importance'. Rather, the arguments put forward in relation to social or business importance are more based on socio-political reasons for government intervention such as equity, fairness, citizens' rights to participate in society, or assistance to specific industries considered deserving and not the essentiality of the service *per se*. These issues are discussed in the next section.

6.3. Improving Equity, Fairness and Citizen Rights

Apart from improving the economic efficiency of market outcomes, which seek as their ultimate goal the maximisation of community welfare, governments intervene to:

- improve the fairness or equity of market outcomes
- redistribute wealth within society
- maintain and enhance democratic institutions and citizens' rights.

It is common for governments to provide a minimum level of some services, such as education, health and welfare to all citizens as a right, irrespective of their ability to pay the cost. That governments intervene to ensure these services are available to everyone reflects the unwillingness of society to leave to market forces the distribution of the benefits of these particular services among citizens. These services are sometimes referred to as 'merit goods'.

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130 Gascoyne Development Commission, submission.
131 Armidale City Council, submission.
132 Australian Computing Society—Northern Territory Branch, submission.

The financial arrangements underpinning Australia's federal system of government recognise governments' role in affording citizens' access to services. For example, the Commonwealth Grants Commission formula for revenue sharing is based not just on population but also the cost state and territory governments face in providing services to citizens.

Further arguments supporting government intervention to provide data capability are that the future ability of citizens to exercise their rights and fulfil their obligations as citizens will increasingly depend upon access to a digital data communications capability.

Commonwealth, state and territory government agencies, to varying degrees, are implementing online services provision including:

- electoral enrolments;
- driver and vehicle licences;
- payments—including utilities and local government accounts;
- registrations of births, marriages & deaths; and
- service requests.

In its submission to the inquiry, the Office of Government Information Technology draws attention to *The Government Online Project—Year 2001* which is intended to make all appropriate Commonwealth Government services available over the Internet throughout Australia. Initiatives such as this are dependent on the supply of adequate data communications services.

For these reasons it would seem that many citizens, particularly those residing in rural areas, see telecommunications services as government provided services, just like libraries, social security and roads and not as a service provided in the open market like insurance, financial advice and fertiliser. They therefore expect the service to be accessible to all, and provided at the same price to all, irrespective of the costs.

When equity or citizens' rights-type objectives are involved, decisions no longer simply involve questions about whether the economic benefits exceed the costs. Even if the measurable and other benefits are judged to be less than the costs (ie. there is a net cost), the value to society from achieving the equity objectives may still warrant government intervention in the market. Intervention then becomes a matter of value judgement, best determined by the Parliamentary process and about which objective economic analysis can add little—except to identify and quantify, where possible, the costs of the judgements, their likely distributional effects, and the intervention strategy which would be the most effective and efficient (ie. the least distorting).

The concepts of equity or fairness are nonetheless prone to differing interpretations.

One view of equity is that users of a service should pay the additional cost associated with providing the services they use. This concept of equity would suggest that those who live in areas where it is more costly to provide a telecommunications service should face higher prices.

Another view of equity is that users should be charged according to the benefit they derive from using the service. This concept of equity would suggest that users, say in remote areas of Australia, or industries that are likely to benefit more from a high data rate telecommunications service, should pay more than those who stand to benefit less from such a service.

A third view of equity is that users should pay according to their ability to pay. This would suggest that the price of a telecommunications service should vary according to a person's financial circumstance—their income and assets.

A fourth view of equity is that users should all pay the same, regardless of financial position, the benefits they receive or cost of providing the service.

Strictly speaking, the current universal service arrangement is about the supply of a service rather than its affordability, which is currently dealt with through Telstra's price cap arrangements. As detailed in Chapter 3, the USO concept as provided for in Australia's legislation is on the basis of the service being 'reasonably accessible' and supplied on an 'equitable basis'. Many submissions received suggest that 'reasonably accessible' includes, to some extent, the idea that the service must not be priced beyond people's means—that it must be affordable. The fact that the legislation provides for reimbursement of the USO provider is explicit recognition by Parliament that services would be supplied in some instances at a price that would not cover the cost of provision, ie. the price to some customers would be less than cost, making the service more affordable to those customers.

The explanatory memorandum to the Telecommunications Bill states that 'while affordability is clearly important...it should not be embedded in the USO itself but should be tackled though other mechanisms such as competition, price control and targeted assistance'. This would suggest that reasonably accessible should be taken to refer mainly to availability and not price. Considering the other objects of the *Telecommunications Act 1997*, for example, that services are to be supplied as 'efficiently and economically as practicable' (section 3), then equity could be taken to mean that people should pay according to the cost of the services they consume—at least up to some maximum level, such as is set for Telstra's access charges for the standard telephone service, or set through some overall pricing constraint, such as maybe contained in a CPI-X formula. This is also consistent with the view that equity refers to equality of opportunity—that all Australians have the opportunity to purchase a telecommunications service.

Were the government to consider it worthwhile to prescribe a service that supplied, on demand, a digital data capability broadly comparable to a 64kbit/s ISDN channel as part of the USO to guarantee the service is made available, taking into account the relative costs and benefits of doing so, the philosophy behind current arrangements could be continued by establishing a regulated price for the service that allowed the universal service provider(s) to charge a 'reasonable' price in order for costs to be recovered and addressing any further affordability concerns through targeted assistance to customers. Such a regulated price would, however, inevitably mean that there would be geographic areas where prices were below the actual cost of supply.

6.4. Conclusions

Having regard to the discussion in this chapter, the following conclusions are drawn:

- Government intervention in relation to the provision of a 64kbit/s digital data service is not necessary or justifiable, except possibly on equity grounds because of the incentive structure created by current legislative arrangements; and
- in the supply of other lower levels of data rate capability over the PSTN, equity, fairness and citizens' rights-type reasons may justify some intervention.

7. Prescribing a 64kbit/s Comparable Service—the Costs and Benefits

In accordance with subsection 141(3) of the *Telecommunications Act 1997*, paragraph (1)(b) of the Minister's directions to the ACA requires the ACA to review whether the benefits to the community from specifying, as part of the USO, a carriage service broadly comparable to that provided by a data channel with a data transmission speed of 64kbit/s supplied to end-users as part of the designated basic rate ISDN service would outweigh the costs to the community.

This chapter sets out the ACA's findings as to the likely benefits and costs from specifying such a service. It does not seek to analyse the costs and benefits of specifying a service capable of transmitting data at rates significantly less than 64kbit/s—that is done in Chapter 8.

The possible approaches to delivering a 64kbit/s service are discussed prior to the estimated costs and benefits from specifying such a service being presented.

This chapter also addresses paragraphs (1)(c), (3)(a) & (3)(b) of the Minister's directions to the ACA. These paragraphs require the ACA: to assess whether there is sufficient evidence to substantiate any claim by a carrier about whether costs to the community from specifying a 64kbit/s capability outweigh the benefits; and to have regard to the distribution of the costs and benefits to the community and the risks of the estimated benefits not being achieved due to changes in technology, consumer preferences or other market changes. A conclusion is also drawn in respect of paragraph 1(a) of the Minister's directions.

7.1. Possible Approaches

There is a number of possible approaches to delivering a service capable of transmitting data at a rate broadly comparable to a single 64kbit/s ISDN bearer.

(a) A basic rate ISDN service. This service provides two 64kbit/s channels plus one 16kbit/s control channel which can also offer auxiliary transmission up to 16kbit/s. It exceeds the capability rate suggested by the legislation and would result in the provision of a service that would exceed the requirements of most users.

(b) Breaking up the standard basic rate ISDN service so that a single 64kbit/s bearer is supplied to an end-user.

(c) Conditioning the telephone voice service channel to be able to accommodate the full use of modems that are able to transmit data at a rate of 56kbit/s.

(d) Providing the stated comparable capability using satellite or other technologies.

A detailed examination of the benefits and costs of (b) and (c) was not undertaken for the following reasons.

The cost of providing a single 64kbit/s ISDN service, option (b), is likely to be the same or higher than the provision of the full basic rate ISDN service due to higher equipment cost.[133] The basic rate ISDN service is supplied in accordance with an established internationally recognised European standard (ETSI). The price of ISDN suitable equipment manufactured to this standard is comparatively low because of economies of scale in production and competition in the market place. While it may be technically possible to break up the standard basic rate ISDN service into separate 64kbit/s channels, the ensuing equipment prices would be much higher, as it would require the manufacture of specially made equipment for which there is currently no established standard.[134] In addition, the benefits to end-users of a single 64kbit/s service would be less than those associated with ISDN because of reduced functionality.

Option (c), conditioning the telephone voice service channel for use by 56kbit/s modems, is impractical as Telstra has advised that it is not technically feasible for the PSTN to support 56kbit/s. Furthermore, even assuming the technical problems could be overcome, this option would not lead to a substantial increase in functionality, and hence benefits to the end-user, over and above the benefits obtained from a lower data rate such as 28.8kbit/s, would not be sufficient to warrant the substantial cost of such an upgrade.

7.2. The Costs and Benefits

If a 64kbit/s digital data capability were to be prescribed under the USO by requiring basic rate ISDN services to be made universally available, the costs to the community would exceed the benefits by between $155 to $344 million over a ten year period.[135]

Appendix 5 sets out how these estimates have been calculated. This assessment is based on a number of assumptions. The main assumptions are that:

- the costs and benefits from the decision to prescribe the service would only be generated in relation to the 4 per cent of Australia's population who will not have access to an ISDN service after December 1998 (Telstra advised that 'by the end of 1998, Telstra plans to have extended access to ISDN services within 3 months of a request, to all but 3.7 per cent of its ordinary telephone services in operation'.)[136]
- ISDN price levels remain constant; and

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133 The other costs of providing and operating a single 64kbit/s channel would be expected to be similar to the costs of providing a full ISDN service.

134 As there is no technical standard available to provide this capability on a commercial basis, Telstra is currently unable to offer a single B channel service to customers.

135 Using a discount rate of 3 per cent.

136 Telstra, submission, p.12.

- take-up rates among the 4 per cent group initially reflect the take-up rates within the rest of Australia and increasing each year by 2 per cent of standard telephone services supplied to this group ie. an additional 7400 customers take up the service each year.

With regard to option (d) or the provision of a comparable service via satellite, Telstra advised in its submission that Telstra 'will, by the end of 1998, make available a digital data capability broadly comparable to that of a basic rate ISDN channel' and that 'while this development is focussed on meeting the needs of rural and remote customers for data applications and access to information services, the service will be ubiquitously available'.[137] This position is reiterated by Telstra in an attachment to its submission.[138] Telstra further advised the ACA that 'the Basic Speed Satellite access will offer comparable throughput for Internet Access to an ISDN line or a 56kbit/s modem.'

On 28 May 1998 Telstra issued the following statement:

> Telstra today unveiled its multi-million dollar satellite strategy which will extend the availability of telephony, data and Internet to potentially all country customers before the end of 1998...Telstra's infrastructure investment will allow corporations and governments to offer their customers functions such as e-mail, EFTPOS, file transfer and telemetry. These capabilities will support interactive distance education, telemedicine and functions such as electronic inventory control for the mining and agriculture sectors and future e-commerce possibilities.[139]

If this satellite based service achieves the throughput claimed by Telstra, then it is likely to be a service broadly comparable to a data channel with a transmission rate of 64kbit/s that is, a service that satisfies the criteria specified in subsection 141(2) of the *Telecommunications Act 1997*.

As Telstra has already committed itself to expend the investment required to make this satellite based service available, then arguably the Australian community would incur no additional costs as a consequence of the Government prescribing as part of the USO a service with the performance described in subsection 141(2) of the Act. There is a number of reasons, however, why its prescription may not be a wise policy.

The conclusion that option (d) would result in no additional costs is made on the basis that the service provider would not be constrained from charging a reasonable price to cover costs. Telstra has advised the ACA that satellite service access charges for the satellite based service that would be broadly comparable to that of a basic rate ISDN channel could be around $600 per annum for the customer and that the customer would have to purchase additional equipment (antenna and receiver) costing around $1200. Usage charges would also be incurred. (This compares with ISDN prices of $295 connection, plus at least $650 in customer equipment, $740 per annum access charges, and usage charges of between 7 to 34 cents per minute for distances greater than 25 km.)

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137 Telstra, submission, p.12.
138 Telstra, Attachment 1 of submission, p.22.
139 Telstra press release, "Telstra puts the Outback in front", 28 May 1998.

On the same basis, it can also be argued there would be no additional benefits flowing to society as a consequence of prescribing the service because the service will be available from the end of 1998 anyway. To the extent that there is a concern about guaranteeing availability to all Australians of a service broadly comparable to a data channel with a transmission rate of 64kbit/s, this could be done by extending the percentage of Australia's population covered in Telstra's licence condition from 96 per cent to 100 per cent.[140]

Furthermore, as Telstra is already committed to offering the satellite based services from the end of 1998, the estimated benefits for the ISDN option ((a) above) may be substantially reduced as a result of reduced take-up rates for Internet access because potential customers use this satellite based service instead. On this basis, benefits from the ISDN option would be reduced by at least $60 million over the ten year period, increasing the net cost to the community were that option to be pursued.[141]

As indicated above, the currently available information about the likely charges for the satellite service *vis a vis* an ISDN service, suggests that annual connection charges and equipment costs to customers would be roughly comparable. However, there is no information available on comparative usage charges. Depending on what those comparative charges turn out to be, concerns may arise about equity of treatment between ISDN users and users of satellite digital data services. Were equity concerns to arise (ie. if the overall service charges to customers with access to satellite services were higher than for those with access to ISDN services) they could be addressed through regulation of the maximum prices that could be charged by Telstra for specified satellite based services or dealt with by other means such as direct subsidies.

However, as there are also many adverse consequences from the presence of price control arrangements and subsidies, some of which were discussed in Chapter 6, these consequences would need to be carefully considered before adopting such policies.

7.3. Distribution of the Costs and Benefits

As discussed above, specifying a service with a data transmission rate broadly comparable to a 64kbit/s ISDN channel as part of the USO would have little impact in terms of costs and benefits to the community. If the access costs of acquiring the capability are met entirely by each household purchasing the service, then the distribution of the costs will largely mirror the distribution of the benefits.

There would, however, potentially be an impact on the universal service fund as the universal service provider would be able to claim reimbursement where it supplies the service and it results in a net universal service cost for a financial year (calculated by the

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[140] The obligation in section 66 of the Act relates only to a service supplied to 96 per cent of the population. Were there a legal concern about whether or not the satellite delivery option met the capability criteria because of its asymmetric nature, a licence condition could be drafted that specifically requires Telstra to make such a service available to the 4 per cent of the population not covered by the section 66 obligation.

[141] This figure has been estimated by adjusting the estimated consumer surplus in Appendix 5 on the basis that there would be no consumer surplus associated with Internet access via ISDN.

formula of avoidable cost minus revenue forgone). Specifying such a service, even without price control, is likely to result in some increase to the universal service fund, which would mean all other carriers would face additional costs in making contributions to this fund.

It is difficult to assess where the incidence of these additional costs would ultimately fall. To some extent, the industry would pass on the added impost through higher prices of services to residential and business consumers. These costs, in terms of higher prices for services, could well fall upon customers in metropolitan areas and in markets where Telstra's services are not subject to price cap controls.

The current price control arrangements on Telstra reduce the ability of the industry to increase prices generally for services subject to price control because if they did so, their service offerings would not be competitively priced compared to Telstra's prices for those services. As a result, an increase in USO contributions will, to some extent, also affect profitability of carriers which would in turn reduce returns to shareholders and affect investment decisions. Thus Telstra's market dominance in non-metropolitan areas may be entrenched and there may be a reduction in risk-taking by market participants.

Were an ISDN service specified (as opposed to a service broadly comparable to a 64kbit/s service), it could be expected on the basis of current ISDN price levels that costs to the universal service provider would exceed revenues by (roughly) $500 million over a ten year period (around $50 million per annum). Compared with universal service fund costs of around $250 million per annum in recent years, this would represent a 20 per cent increase in USO contributions to be made by carriers.

On the other hand, extending Telstra's current licence condition requiring Telstra to make available a 64kbit/s comparable service available to 96 per cent of the population to 100 per cent of the population would not affect the universal service fund. In this case, provided that prices were not capped to levels below that necessary to cover reasonable costs, there would be no additional cost impact on Telstra, although there may be an impact in terms of reducing the corporation's flexibility to make decisions about which services it wishes to offer. This could in turn potentially affect its share price, should the market view such reduced flexibility as a constraint on Telstra's ability to direct investment to maximising the value of the company to its owners.

While establishing a legislative requirement to ensure such a service is made available through the USO mechanism or a licence condition does not generate any additional tangible economic benefits to the community, Australian households and businesses could still benefit by such a decision as it would afford them greater confidence and security that the service will be provided—that is, it would reduce risks to consumers.

Should prices be regulated to levels requiring Telstra to supply the service at a price below the reasonable cost of supplying the service (for example, to subsidise certain customers to make the service affordable for equity reasons) there would be a change in the distribution of costs and benefits.

Regulations imposing low prices would increase the costs borne by the telecommunications industry. If the obligation were through a licence condition on

Telstra, then the cost of any price subsidy would be borne by Telstra and would ultimately fall on shareholders and the Government.

Were the service to be specified under the USO, and prices controlled, the lower the constraints on price levels the bigger would be the impost on the carriers. This would have the same effects noted above and in Chapter 6—increasing prices in some markets, reducing the profitability of all new carriers, and discouraging investment in infrastructure.

The provision of any subsidies through price control or via more direct means would affect the distribution of the benefits. Regulations setting maximum prices would, for example, have the greatest benefits to customers in areas where the cost of provision of the service is high (ie. primarily in rural and remote areas). As high-income households are currently the dominant users of the Internet, it is likely that the dominant beneficiaries of mandated provision of service with price controls would be high income households, particularly those in rural and remote areas.

7.4. Risks of the Estimated Costs and Benefits Not Being Achieved

In relation to option (d)—involving the provision of the capability using a satellite service which Telstra has committed to make available from the end of 1998—a risk in the near to medium term to the costs and benefits not being achieved is that Telstra's proposal will not eventuate. This might happen because of some technological problem with the service (eg. satellite failure), if Telstra changes its decision or for some other reason the project fails.

These risks would, however, be balanced to the extent that other carriers and carriage service providers, including satellite operators, are able to continue to supply the service should Telstra or its partners fail to do so.

An added risk associated with imposing a legislative obligation or licence condition on Telstra is that it may be discouraged from pursuing other activities that might better meet consumer needs.

In relation to option (a)— the ISDN option—there is a very high risk that the estimated benefits would not be realised because satellite technology would provide a service that will adequately meet customer needs at a lower price.

7.5. Evidence to Substantiate Carrier Claims that Costs Exceed Benefits

Sub-section 141(4) of the *Telecommunications Act 1997* states:

> If:
>
> (a) a carrier makes a submission to the review; and
>
> (b) the submission includes a claim that the costs to the community resulting from so specifying that carriage service would outweigh the benefits to the community from so specifying that carriage service;

the review is to include an examination of whether there is sufficient evidence to substantiate the claim.

Paragraph (1)(c) of the Minister's directions to the ACA requires the ACA to undertake this examination.

The carriage service referred to in subsection 141(4) is the one specified in subsection 141(2)—a carriage service that provides a digital data capability broadly comparable to that provided by a data channel with a data transmission speed of 64kbit/s supplied to end-users as part of the designated basic rate ISDN service.

Subsection 141(5) requires that the determination of the comparability of the digital data service is to be solely on a comparison of data transmission speeds available to an end-user.

Three carriers made submissions to the Inquiry: Optus Communications; Vodafone; and Telstra.

7.5.1. Claims by Optus

In its submission Optus did not claim the costs to the community of prescribing a digital data capable service would exceed the benefits to the community. However, Optus did note that the mandation of a digital data capability through the USO would likely lead to significant increases in the costs of supplying such a service in contrast to allowing competitive forces to provide that capability. In any case, Optus noted it did not have access to Telstra's costing information and therefore was unable to make an explicit claim as to the costs and benefits of prescribing a service that would satisfy the criteria specified in subsection 141(2) of the Act. Rather, Optus submitted there were other more cost-effective and less competition damaging ways for the Government to achieve desired policy objectives. Optus contended that:

- a digital data capability is already widely available and its reach is steadily increasing;
- the appropriate role of the USO scheme is to ensure availability at prices which are equitable between users;
- further modification of the USO arrangements will undermine progress made in implementing and administering current arrangements;
- alternative measures can address concerns about access to Internet based services, such as call subsidies;
- many of the services perceived to have public benefits are being delivered without government intervention;
- mandating the provision of a digital data capability would encourage and subsidise the use of inefficient technology; and

- there is strong positive scope for targeted, efficient, cost effective and less distorting assistance to complement market delivery using mechanisms similar to the successful Rural Telecommunications Infrastructure Fund (RTIF) scheme, as opposed to providing subsidies through price regulation.

7.5.2. Claims by Vodafone

Likewise, Vodafone did not claim in its submission to the inquiry that the costs to the community would exceed the benefits. Vodafone contended:

- if the Government were to prescribe a 64kbit/s digital data capability, the provision of this service 'should be opened up to other carriers through a tendering arrangement'[142];
- achieving 'equity' between metropolitan and country areas will come at a cost that will ultimately be paid by the end-user, and therefore the Government should compare the relative costs, type and number of affected users, priority for action and timeframes for each rural initiative under consideration; and
- the net universal service cost should be capped, with any changes being achieved within the current level of around $250 million per annum.

On the basis of the Vodafone submission to the inquiry it is, therefore, also not necessary for the ACA to examine whether there is sufficient evidence to substantiate the claims made by it.

7.5.3. Claims by Telstra

In its submission to the inquiry, Telstra claimed 'the costs of extending the definition of the standard telephone service to encompass a digital data capability clearly outweigh the possible benefits of such extension. This is the case, even when generous estimates of benefits and extremely conservative estimates of cost are considered.'[143]

The ACA is therefore obliged to examine whether there is sufficient evidence to substantiate the claim made by Telstra.

It needs to be noted here that Telstra also provided estimated costs and benefits that would be produced as a result of extending to all Australian consumers universal access to a 'medium' rate PSTS of 28.8kbit/s. With a digital data transmission rate of 28.8kbit/s this service would not provide a digital data capability broadly comparable to that provided by a data channel with a data transmission rate of 64kbit/s supplied to end-users as part of the designated basic rate ISDN service. Telstra's claims as to the costs and benefits of such a service are therefore not matters to which subsection 141(4) of the Act applies, and no further examination of those claims are necessary here for that purpose.

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142 Vodafone, Digital Data Review—Comments by Vodafone, submission.

143 Telstra, submission, p.5.

The material which Telstra relied on in making its claims are contained in its submission dated 30 June 1998 (Telstra's submission), a response to a request for information from the ACA dated 30 July 1998 (Telstra's answers), and a report tendered to the inquiry by Telstra prepared by Tasman Asia Pacific Pty Ltd, titled 'Estimating the community benefits of universal access to improved digital data capabilities' and dated June 1998 (the TAP report). Other material used to substantiate claims of costs and benefits is a press statement released by Telstra on 28 May titled 'Telstra Puts the Outback in Front' (Telstra's press statement).

7.6. Telstra's Submission

The estimates in Telstra's submission of benefits to be derived from specifying a digital data service of the type referred to in section 141 of the Act are those prepared by Tasman Asia Pacific Pty Ltd.

The estimates of benefits are based on the proportion of customers that take up ISDN. Tasman Asia Pacific suggests a low take-up would be likely, around 2 per cent. It also provides estimates of benefits for higher take-up rates of 5 per cent and even 20 per cent.

Telstra's submission states:

> It is not practical in this Submission to canvas all of Telstra's data services. Moreover, the specialised nature of most of them makes them unsuitable for inclusion in the USO. Accordingly, and consistent with the review's terms of reference, this submission considers three main options by which digital data capability can be extended to all Australian consumers:
>
> - universal access to digital data capability broadly comparable to that provided by a data channel with a data transmission rate of 64 kilobits per second (kbit/s). The example considered in this paper is universal access to a basic rate ISDN service;
> - universal access to a medium speed PSTS of 28.8kbit/s; and
> - an evolutionary option, based on retaining the present STS but in which the currently unmet needs are met through the progressive roll-out of RATE, of satellite service and of new mobile technologies.[144]

Telstra's submission sets out Telstra's estimates of the capital costs associated with the ISDN option[145], that is, on the assumption that the digital data capability envisaged by subsection 141(2) of the Act is achieved by the USO provider supplying an ISDN service.

Based on these capital costs and the TAP report, Telstra claims the benefits from 'extension of the ISDN network' to be from $112 million to $1.1 billion over a 5 year period, and that the 'capital cost associated with an extension of the ISDN network is

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144 Telstra, submission, p.11.

145 Telstra, submission, Table 3 and p.11.

$2.5 billion equating to an annual capital cost of between $543 million and $684 million.'[146]

The Telstra submission indicates that 'Telstra is about to commence trials of two satellite based data delivery systems which will, by the end of 1998, make available a digital data capability broadly comparable to that of a basic rate ISDN channel (and enable additional facilities and services)',[147] and 'for those isolated rural and remote locations where OnRamp 2 is not currently available, Telstra is about to commence trials of two satellite-based data delivery systems which will, by the end of 1998, make available a digital data capability broadly comparable to that of a basic rate ISDN channel'.[148] Telstra does not, however, offer any cost estimates of providing the digital data capability through this or any other means.

Telstra's estimates of costs are limited to one means of achieving the desired digital data capability, ie. via supplying ISDN services.

Telstra does not comment on why the type of services Telstra proposes to supply using the satellite based data delivery systems would not satisfy the capability suggested by subsection 141(2) of the Act. Telstra does, however, mention that 'the proposed satellite data service for businesses and other organisations with substantial data requirements.....employs fast bi-directional transmission', and that 'the satellite data service proposed for small businesses and residential consumers is a hybrid service [using a standard telephone service and modem] to transmit data to the ISP and a high speed satellite link is used to deliver data from the ISP back to the customer (with a level of throughput similar to the performance of ISDN)'.

Telstra's cost estimates appear to be unrelated to the number of ISDN subscribers in the group who would actually request an ISDN service if it was available.

It is therefore not surprising that if a comparatively lower take-up rate is assumed (2 per cent, 5 per cent and 20 per cent) for estimating the benefits, that costs exceed benefits.

However, even under more reasonable assumptions the ACA has assessed that the costs to the community would be greater than the benefits to the community were a carriage service specified requiring the supply of ISDN services. As indicated above, the ACA estimates that the net cost over a ten year period of doing so would be between $155 to $344 million.

7.6.1. Further material supplied by Telstra

The ACA put to Telstra the following request:

> On 28 May 1998 Telstra issued a press release entitled "Telstra Puts Outback in Front" which discussed extending the availability of data services to all country customers before the end of 1998. Provide information on the data rates to be

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146 Telstra, submission, p.17.
147 Telstra, submission, p.12.
148 Telstra, Attachment 1 of submission, p.22.

> supported by this initiative, the pricing of the data services....and other information relevant to the data capability of this service.

In it response dated 30 July 1998, Telstra stated:

> The Basic Speed Satellite access will offer "comparable throughput for Internet Access to an ISDN line or a 56 kbit/s modem". (Throughput is not the same as data rate. The data rates on satellite services are hundreds of kbps shared amongst many users, so what counts to the end user is the throughput, which is constrained by the whole network and not just the satellite portion.)
>
> The prices for Satellite Access to the Internet have not yet been established (which is one of the reasons for the NFF Trials) but an anticipated cost might be $50/month.
>
> Satellite Services for organisations are customer designed and would vary considerably in price.
>
> It is expected that it will cost less than $130 a month for the Internet Service (all up cost of a basic service not including additional mbyte download fees). Typical users' ISP bill might approximate 16 hrs/mth @ $5/hr = $80, Satellite service costs approximately $50, This would total $130/month.
>
> An indicative price for equipment might be between $1,000 and $1,200 (depending on antenna size).
>
> A PC, of course, would be additionally required.

Telstra later clarified that:

> the Telstra Press Release of May 28 listed three separate satellite systems, Hughes/Ericsson, Scientific Atlanta and Gilat. The Telstra response to the ACA's [request] referred only to one of those, the asymmetric Hughes/Ericsson basic speed satellite access service, which "will offer comparable throughput for Internet Access to an ISDN line or a 56 kbit/s modem". The response provided costs only in relation to that technology. The Scientific Atlanta system provides a symmetric 14.4 kbit/s data service for the USO telephone product and requires a larger home antenna, higher power home amplifier and has a bigger power requirement. The Gilat system is a VSAT type system and provides symmetric capability. It would typically be used for such applications as 64kbit/s file transfer or video conferencing.[149]

7.6.2. Telstra's Press Statement

Telstra's press statement states:

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[149] Telstra—ACA communications.

> Telstra today unveiled its multi-million dollar satellite strategy which will extend the availability of telephony, data and Internet to potentially all country customers before the end of 1998....
>
> Scientific Atlanta, Hughes/Ericsson and Gilat will provide the satellite equipment. ....
>
> Looking ahead, combined universal service obligations and a plan to invest $300 million in the next three years, Telstra anticipates investing around $1 billion in country Australia...

7.7. Findings in Relation to Telstra's Claims

An examination of the material available to substantiate Telstra's claims (Telstra's submission, Telstra's answers and the press release) indicates:

- that Telstra's claim that the costs of prescribing ISDN services as part of the USO would exceed the expected benefits is substantiated;
- satellite based data delivery systems as described by Telstra in its answer to the ACA's request appears to be a means of supplying a digital data capability broadly comparable to that provided by a data channel with a data transmission rate of 64kbit/s associated with a designated basic rate ISDN service provided to all people in Australia on request;
- Telstra intends to make a comparable service available to all people in Australia through a combination of ISDN and satellite based data delivery systems; and
- Telstra has not estimated the costs to the community that would be a consequence of prescribing the digital data capability specified in subsection 141(2) of the Act if that service was supplied by a variety of means including via the satellite based data delivery systems, or the benefits that might result.

7.8. Conclusions

- The costs to the community of specifying, as part of the USO, a carriage service broadly comparable to a digital data channel with a data rate of 64kbit/s to end-users as part of the designated basic rate ISDN service would outweigh the benefits to the community if it were provided solely by ISDN.
- The ACA has examined Telstra's claim that the costs of specifying ISDN services as part of the USO would exceed the expected benefits and has concluded that the claim can be substantiated. However, such a service providing two 64kbit/s channels and one 16kbit/s control channel exceeds the capability rate suggested by the legislation.
- On the basis that Telstra's proposed satellite access service meets the criteria specified in subsection 141(2) of the *Telecommunications Act 1997* then the Australian community would likely not incur additional costs as a consequence

of a service broadly comparable to a digital data channel with a transmission rate of 64kbit/s being specified as part of the USO. Equally there may be no additional benefits from specifying such a service as part of the USO as the benefits would flow from its commercial availability at the end of 1998 in any event. However, this conclusion would not hold if price levels were unduly restrained by regulations.

- Specifying as part of the USO any carriage service that meets the criteria of subsection 141(2) of the *Telecommunications Act 1997* would increase the universal service levy on carriers with the potential to increase telecommunications service prices, affect the profitability of carriers and impact unfavourably upon competition in the industry.

- An extension of Telstra's current licence condition to provide ISDN/64kbit/s to 100 per cent of the Australian population would have significant commercial impact upon Telstra. However, there would be little actual cost if the required capability was related to the criteria specified in subsection 141(2) and the obligation can be met using Telstra's proposed digital data satellite access service.

8. Data Services: Current Usage and Demand

This chapter presents information on the current usage of commonly available data services and the markets for these services, focusing primarily on Internet services such as web browsing and e-mail, which are most commonly accessed using PSTN modems at data rates below 56kbit/s. The demand for these services is also assessed. Differences in market usage and demand for services are also identified for metropolitan and non-metropolitan areas of Australia. Analysis of the usage of lower data rate options (lower than the 64kbit/s option discussed in the previous chapter) was undertaken to assist in addressing section 3(f) of the Minister's directions, namely:

> whether some alternative service, means or process might more efficiently and effectively address the concerns that would be addressed by specifying a digital data capability as part of the USO.

An assessment of the current demand for services using lower data rate options more commonly used throughout Australia provides a more comprehensive picture of the broad community demand for data services. This assessment also assists in identifying potential mechanisms for addressing this demand.

At the end of this chapter, a summary is provided of the conclusions of the ACA's consultant's analysis of the benefits and costs of two data rate options—28.8kbit/s and 14.4kbit/s—being made available on a universal basis. Appendix 6 provides the consultant's detailed cost-benefit analysis of these options.

8.1. Facsimile Services

A recent report from the ABS[150] recorded that as of February 1998 there were 989,000 households owning or paying for a facsimile machine—or just below 15 per cent of all Australian households (refer Table 8.1). This is an increase from around 10 per cent in 1996 and 5 per cent in 1994.[151] (This data includes both stand-alone facsimile machines and facsimile modems.) Although this data indicates a continuing rapid increase in the household take-up of facsimile machines, the percentage of total households with this equipment is still relatively small. In capital cities, as of February 1998, 16 per cent of households had facsimile machines, compared with 12.1 percent in the rest of Australia.

Table 8.1 demonstrates the growth in household ownership of facsimile machines between 1996 and 1998.

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150 *Household Use of Information Technology*, 1998.

151 *Takeup of Information and Communications Technologies in Metropolitan and Non-Metropolitan Areas*, p.5

Table 8.1

Households Owning/Paying for Facsimile Machines

	Capital Cities '000	Rest of Australia '000	Australia '000
February 1996	413	201	613
February 1998	683	306	989
Per cent change from February 1996	65%	52%	61%

Source: Household Use of Information Technology, ABS cat. 8128.0, February 1998.

One analysis of facsimile machine take-up rates notes that the current usage rate by 15 per cent of all Australian households:

> is close to the proportion of Australian households operating home businesses, and may reflect the utility of such facilities in business applications rather than the more generalised household application of email, internet and other data services.[152]

8.2. Internet Growth

While there has been significant growth in Internet applications, it is difficult to develop an accurate picture of that growth. This is largely because of different methodologies in the collection of the data, making comparisons difficult. A brief summary of some recently available data follows.

In 1998 the ABS collected data on personal and household use of the Internet. The ABS reports that this figure has been doubling every year since 1996—in the twelve months to February 1998, 1,038,000 Australian households had home access to the Internet, compared to 250,000 in the 12 months prior to February 1996.[153]

The ABS data provides a general picture of current usage of the Internet, identifying that in the twelve months to February 1998 approximately 3,032,000 million Australians over the age of 18 accessed the Internet—at home, at work and in other locations. This equates to 23 per cent of the population over the age of 18. ABS personal data figures relate only to Australians over the age of 18. It can be assumed that Internet usage by Australians under the age of 18 would increase these figures. As noted in Chapter 5, most state governments have provided (eg. NSW) or plan to provide in the near future (eg. the Queensland Education Department's *connect.ed* program) Internet connections for primary and secondary schools.

The *stats. electronic commerce in australia*[154] report released by the Department of Industry, Science and Tourism in April 1998, states that the number of Internet users in

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152 Department of Communications and the Arts, p.5.

153 Australian Bureau of Statistics, *Household Use of Information Technology* and *Use of the Internet by Householders.*

154 www. consult and Department of Industry Science and Tourism (DIST), *stats. electronic commerce in australia,* April 1998.

Australia has increased from about 500,000 in June 1995 to 1.6 million at the start of 1998.[155]

As indicated in Table 8.2, the *Internet Industry Almanac* states that the number of Internet users in Australia grew substantially between 1994 and 1997.[156]

Table 8.2

Australian Internet Users per 1000 People: 1994-1997

1994	1995	1996	1997
33	**66**	**108**	**178**

Source: Internet Industry Almanac.

Internet growth rates are not abating—predictions of future growth rates indicate that current levels of growth will continue over the next three to five years.

In addition, industry analysts predict that the range of services and applications available on the Internet will only increase. For example, it is anticipated that in the near future the technology will be available to provide video-on-demand, video conferencing and live music via the Internet. These applications will require much higher data rates—for example, video-on-demand would require in the vicinity of 2Mbit/s.

8.3. Determining the Demand for Internet Services

There is little comprehensive statistical information on the usage of, or demand for, data services in Australia. The recent ABS reports—*Household Use of Information Technology*[157] and *Use of the Internet by Householders*[158] enable a broad analysis of Internet market and usage trends.

8.3.1. Usage of the Internet

The ABS household survey provides the following information about the usage of the Internet and ownership of computers by Australian households, as of February 1998:

- 2.9 million households had at least one computer (42.6 per cent of all households);
- 0.9 million of these had home Internet access (13 per cent of all households); and
- 0.5 of the 2.9 million stated their intention to obtain Internet access over the next 12 months.

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155 The number of business and government users excludes e-mail only users through corporate gateways.

156 Juliussen, Egil and Petska-Juliussen, Karen (editors), *Internet Industry Almanac*, 1998, p.302. The Almanac also compares this information to growth rates in other countries.

157 Australian Bureau of Statistics, *Household Use of Information Technology*.

158 Australian Bureau of Statistics, *Use of the Internet by Householders.*

Assuming that the stated intention to obtain Internet access were realised, 1.4 million (20.5 per cent of all households) would have Internet access as of February 1999.

Table 8.3 demonstrates that households with higher incomes predominate in usage of the Internet.

Table 8.3

Households Accessing the Internet from Home, February 1998

	'000	Per cent
Household Income		
$0–$14000	56	4.6
$14001–$27000	60	5.3
$27001–$44000	103	8.8
$44001–$66000	153	14.2
over $66000	301	27.0
not stated	181	17.2
Region		
Capital Cities	672	15.8
Rest of Australia	182	7.2
Australia	854	12.6

Source: Household Use of Information Technology, February 1998.

Internet access by householders in capital cities is more than double that in other areas of Australia—only 7.2 per cent of households outside capital cities access the Internet from home. This is significant in terms of a potentially larger market penetration for Internet services in rural areas. This information also needs to be assessed in the context of the rapid growth in Internet usage in Australia discussed earlier in this chapter.

8.3.2. Usage of Internet Applications

The ABS information on household usage of applications supported by the Internet (Table 8.4) provides a very broad indication of usage of these applications. The primary usage of the Internet by households is for e-mail—the ABS data shows that e-mail usage among households that access the Internet is almost universal. In comparison, just over 40 per cent of households which access the Internet use 'Other Internet Services' (such as browsing the world wide web), which is perhaps a surprising statistic given that ISPs typically package e-mail access with services such as web browsing. Another 14 per cent of households with Internet access apparently do not know whether they use other Internet services. This could be because the person answering the ABS survey did not know what Internet services other members of the household were using. This suggests that only about 5 per cent of Australian households use non–e-mail Internet services from home.

Interestingly, the relatively greater usage of 'Other Internet Services' (eg. web browsing) is in lower income households, compared with higher income households. No doubt age demographics influence this statistic.

Table 8.4

Households Accessing the Internet from Home, February 1998

	E-mail			Other Internet Services		
	Yes %	No %	Don't Know %	Yes %	No %	Don't Know %
Household Income						
$0–$14000	100.0			66.4	33.6	
$14001–$27000	100.0			69.1	22.2	8.7
$27001–$44000	93.1	6.9		39.9	42.8	17.3
$44001–$66000	92.0	5.4	2.5	36.0	51.2	12.8
over $66000	99.8	0.2		41.2	49.6	9.6
not stated	88.7	7.7		29.0	44.1	26.9
Region						
Capital Cities	96.2	2.3	1.5	37.9	47.2	14.9
Rest of Australia	91.9	8.2		53.1	36.4	10.5
Australia	95.3	3.5	1.2	41.1	44.9	14.0

Source: Household Use of Information Technology, February 1998.

More disaggregated information on Internet usage is contained in the *Stats. Electronic Commerce in Australia*[159] report. This report, which is not limited to household information as is the ABS survey, is the first in a quarterly series to be produced by DIST. In the foreword to this publication, the Hon. John Moore, Minister for Industry, Science and Tourism, notes that obtaining reliable information on electronic commerce in Australia has been difficult. Accordingly, he states that the DIST report has:

> been published ..... in response to widespread industry and government concern about the lack of current, reliable industry and online statistical information.[160]

The DIST report should assist in filling in an information gap in one area of Internet usage. As noted further in this chapter, there is clearly a need for such data to be developed to assist policy development for Internet usage in Australia and the implications this has for provision of infrastructure.

The DIST report summarises the Internet usage profile as follows:

> The percentage of Internet users who cite online shopping as their primary Internet activity is only 0.5%. Email (23%), Business Research (20%), Entertainment (14%) and Academic Research (11%) are the primary uses of the Internet.
>
> When asked to identify all categories of Internet activity some 21% of the Internet users selected online shopping, compared with 88% who selected "Email", 65% who selected "Entertainment" and 53% who selected "Business/Research".

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159 www.consult and Department of Industry, Science and Tourism, 1998.

160 www.consult and Department of Industry, Science and Tourism, p.1.

> This suggests that about 21% of Internet users view online shopping as a secondary or "derivative" Internet activity. Given that current regular Internet users number some 1 million, this suggests "hardcore" online shoppers number only about 5,000, while "sometime" online shoppers number more than 200,000.[161]

The Internet usage categories of 'News & Reference', 'Academic/Research' and 'Education' all figure prominently as important areas of Internet activity when users identified all their areas of Internet activity—all categories fell in the range of 50-65 per cent.

The following broad conclusions can be drawn from the DIST and ABS reports:

- e-mail is currently the primary Internet application;
- research—whether business, academic or forming part of education—is a significant component of Internet usage; and
- e-commerce is yet to become a significant Internet application.

8.3.3. Expenditure on Internet Services

In order to assess the benefits that consumers receive from Internet services, it is necessary to have information on expenditure on Internet services. Table 8.5 provides information on household expenditure on these services.

Table 8.5

Household Expenditure on Internet Services, Year to February 1998

Expenditure Range	Number of Households ('000)	Proportion of Household with Internet Access
Nil	47	6.7
$1–$100	163	23.3
$101–$250	229	32.6
$251–$500	133	19.0
$501–$1000	51	7.2
over $1000	24	3.5
Don't Know	55	7.8
Total	702	100.0

Source: Household Use of Information Technology, ABS, February 1998

The total shown in the table—702,000 households—is the number of households where the household or home based business incurred the cost of using the Internet. This is significantly less than the total number of households with Internet access (854,000). Discussions with the ABS indicate that the remaining 152,000 households probably had their expenses paid for by employers, and so this expense is actually business expenditure.

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[161] www.consult and Department of Industry, Science and Tourism, p.12.

Using the mid–points of the ranges for each expenditure category, and imputing a median value for the 'don't knows' and 'nils'[162] implies total household annual expenditure of $211 million, or $300, on average, per household which paid for Internet services.

8.4. Barriers to Internet Access

Table 8.6 identifies some barriers to Internet Access for the 2 million households in Australia with computers and which do not have access to the Internet.

Table 8.6

Main Reason Why Households With Computers do not Have Access to the Internet (per cent)

Household Income	Costs are too high	Lack of Interest in Internet	Poor Computer Capacity	Adequate Access Outside Home	Other (1)	Don't Know
$0–$14000	57.3	17.6	14.0	1.4	8.3	1.4
$14001–$27000	41.0	28.3	9.9	0.7	16.9	3.2
$27001–$44000	36.6	25.0	9.5	6.9	19.3	2.6
$44001–$66000	24.4	31.7	14.0	6.3	22.6	1.1
over $66000	21.4	31.0	8.0	11.9	26.8	0.9
not stated	23.2	31.0	4.4	7.2	30.3	4.1
Region						
Capital Cities	29.6	29.1	8.4	7.9	22.1	2.8
Rest of Australia	30.4	28.3	12.0	5.2	22.3	0.8
Australia	29.9	28.8	9.7	6.9	22.5	2.1

Source: Household Use of Information Technology, ABS 8128.0, February 1998.
Note: (1) Includes privacy concerns, lack of confidence/skill with computer, poor opinion of Internet, lack of access to ISP and inadequate telecommunications infrastructure.

Some conclusions from this data are:

- both the perceived 'high cost' and 'lack of interest' in the Internet are the most significant reasons for not obtaining Internet access;
- data on the 'high cost' and 'lack of interest' in the Internet is uniform between capital cities and the rest of Australia;
- as could be anticipated, the perceived 'high cost' of Internet access is a particularly significant issue to lower income households; and

[162] The 47,000 households with nil expenditure probably had their Internet service costs bundled into the price of a modem and/or computer.

- 'inadequate telecommunications infrastructure' is identified in the lower order of main reasons why households with computers do not have access to the Internet.

8.5. Internet Usage in Rural Australia

A number of submissions argued that data services in rural and remote areas provide greater benefit to end-users than in metropolitan areas, as discussed in more detail in Chapter 4. Some benefits noted were:

- the ability of data services to diminish the impact of isolation of people living in rural and remote areas—they generally have less access to information sources, such as a wide range of newspapers, magazines, etc; and television services;
- e-mail is likely to be of more use to someone in a rural area where conventional physical mail services can be slow and intermittent;
- as a potential means of counteracting the population drift to regional and metropolitan areas through enabling better education and telecommuting opportunities;
- overcoming the impact of withdrawal of banking and financial services in smaller townships; and
- saving travel time and expenses in obtaining information through undertaking online interaction.

8.5.1. Data on Rural Internet Usage

The data on Internet usage in rural areas of Australia is not extensive. As discussed earlier in this chapter, the February 1998 ABS data indicates that Internet access by households in capital cities is more than doubles that in other areas of Australia, noting that there are many urbanised regional centres located within these 'other areas'.[163] The *Australian Farm Surveys Report 1998* (June 1998) from the Australian Bureau of Agricultural and Resource Economics (ABARE) provides a recent perspective on the business use of computers and online services by the Australian farming community.[164] Telstra has also provided the ACA with a report entitled *Farmwide Internet Services Pilot Online Results Report and Research Methodology Critique*, which provides more detailed information on usage of the Internet by farmers.[165]

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[163] A forthcoming ABS Agricultural Survey, expected in September 1998, should provide a more extensive basis to analyse Internet usage in rural Australia.

[164] Jayne Garnaut and Caroline Rasheed, "Computers—Use in management and electronic commerce in Australian farming" , in *Farm Surveys Report 1998*, pp.54-59

[165] Fergusson, 1998. This report is not publicly available.

8.5.2. Australian Farm Surveys Report 1998

The ABARE *Farm Surveys Report 1998* contains information on farm business usage of computers, modems and the Internet from surveys conducted during the 1996/97 year. To obtain this information, a number of questions relating to computer use were appended to the standard farm survey questions posed by ABARE. As the ABARE survey questions were directed specifically at farm business usage of these services, it can be assumed that usage would have been greater if non-business usage had also been included in the survey data.

The most significant conclusions from the ABARE report are:

- over a third of Australia's farm businesses use a computer (37 per cent);
- use of computers on broadacre and dairy farms has more than doubled since 1993-94; and
- of the 37 per cent of farm businesses using a computer, 25 per cent of these use a modem for the farm business, with over half of this 25 per cent using their modem to access the Internet and send e-mail messages (as identified in Table 8.7).

Table 8.7

Use of computer, by broadacre zone, 1996-97 (Broadacre and dairy farms)

	Population	Computer a	Modem b	E-mail c
	no.	per cent	per cent	per cent
Total	83,949	37 (5)	25 (9)	61 (15)

Source: Jayne Garnaut and Caroline Rasheed, Australian Farm Surveys Report 1998, June 1998.

a Expressed as a percentage of all businesses. b Expressed as a percentage of businesses that used a computer. c Expressed as a percentage of businesses that used a modem.
Note: Figures in parentheses are relative standard errors, expressed as percentages of the estimates

Table 8.8 provides a more detailed breakdown of the usage of modems by farm businesses and the activities for which they are utilised.

Table 8.8

Modem use in broadacre and dairy industries, 1996-97

	All industries—proportions of farms that used a modem for farm business (per cent)
Obtain Information	76 (6)
E-mail	61 (8)
Internet Access	58 (8)
Buying or selling goods or services	19 (36)
Other	16 (26)

Source: Jayne Garnaut and Caroline Rasheed, Australian Farm Surveys Report 1998, June 1998.

Note: Figures in parentheses are relative standard errors, expressed as percentages of the estimates.

The ABARE report identifies approximately 5.6 per cent of farm businesses utilising e-mail and 5.4 per cent accessing the Internet for business purposes (of the 83,949 survey target population). Although not directly comparable, this data equates with the 7.2 per cent of households in non-metropolitan areas accessing the Internet (for any purpose) from home, as recorded in the ABS February 1998 survey (refer Table 8.3).

It could be expected that the usage of the Internet for business purposes by farm businesses would be greater than household usage of the Internet, as businesses arguably have a greater need for access to the information resources of the Internet. (In comparison, the DIST *stats. electronic commerce in Australia* states that at the start of 1998 1.09 million of the 1.6 million Internet users in Australia were 'commercial Internet users'.)[166] Possible reasons for a low farm business usage of the Internet are contained in the data in Table 8.9, where problems with phone services are identified as a significant factor in not having a modem (by farm businesses using a computer). In addition, the cost reason may relate, at least in part, to phone usage prices. This is broadly consistent with the information in Chapter 5 on the lower data rates supported by Telstra's PSTN in rural areas. However, the primary reason identified by farm businesses with a computer for not having a modem was the perception that it was not useful, leading to a conclusion that an enhanced awareness of the benefits of the Internet may stimulate demand in this market.

Table 8.9

Main reason for not having a modem, farms without a modem but using a computer, 1996-97

	All industries (per cent)
Not useful	41 (7)
Too costly	22 (12)
Problems with phone service	12 (17)
Not technically familiar	6 (25)
Other	19 (10)

Source: Jayne Garnaut and Caroline Rasheed, Australian Farm Surveys Report 1998, June 1998.
Note: Figures in parentheses are relative standard errors, expressed as percentages of the estimates.

The ABARE data supports conclusions elsewhere in this report that:

- programs directed towards improving the understanding of the rural community about the utility of the Internet and online information sources should assist in stimulating growth of these services;
- addressing the costs of Internet services is another important factor in stimulating Internet demand; and

[166] www.consult and Department of Industry, Science and Tourism, p.9.

- addressing the data capability provided by the rural network should increase the demand for Internet services.

As noted in the DIST *stats: electronic Commerce in Australia* report, it is important that policy makers have sufficient information on which to base policy decisions when assessing business and residential usage of the Internet. Regular and comprehensive surveys on specific market sectors are needed for this purpose.[167]

8.5.3. The Farmwide Survey

The *Farmwide Internet Services Pilot Online Results Report and Research Methodology Critique* (the 'Farmwide survey') provides information on a range of issues associated with the usage of the Internet by the farming community.[168] Farmwide is a program organised by the National Farmers' Federation (NFF) in which 1000 members of the NFF were selected to participate in an online services pilot. The aim of the initial trial was to:

- ascertain perceptions and actual performance of the PSTN to deliver online services to rural and remote customers and to collect data to help determine the viability of making a range of access products available to deliver online services;
- measure the usage of online services among rural and remote customers; and
- gather market information about online applications of value to rural and remote customers.

The 'pilot' commenced on 24 April 1996. The survey data is based on a sample size of 365.

Before discussing the results of this survey, however, it is important to note that there are sampling biases inherent in the survey methodology. There is no random sampling in the survey. The Farmwide pilot was voluntary and it would be expected that farmers interested in the Internet would volunteer to participate. A strong indicator of this sampling bias is that 83 per cent of the pilot participants already had a computer, which contrasts markedly with the 37 per cent of farm businesses with computers identified in the ABARE report. In many respects the survey is more appropriately considered as being a survey of farmers interested in the Internet and who are generally computer literate. There are other methodology issues which suggest considerable caution should be exercised in interpreting the results from the Farmwide survey but some important information can be drawn from this data.

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[167] Recommendation 16 of the 1996 *Review of the Standard Telephone Service* similarly concluded that statistics on the 'use of information and communications technology and services' should be enhanced. Recommendation 22 of *rural&regional.au/for all* (March 1997), also recommended that, among other things, needs assessment and demand analysis should be supported by government.

[168] The critique analyses the methodology employed in the survey and the conclusions which can be drawn from the survey results.

8.5.4. Significant findings of the Farmwide Survey

Barriers to Internet access

The two main reasons cited by farmers for not accessing online services prior to the trial commencing were:

- no local call access to the Internet (33 per cent); and
- not knowing what was involved in getting online (29 per cent).

60 per cent of the respondents did not live within a local call of an ISP and consequently, as discussed later in this chapter, would incur significantly higher call charges than customers with an ISP in their local call area. A small number of trial participants were accessing online services before the trial commenced—of these, 50 per cent incurred STD call rates in obtaining this access.[169]

The two main reasons farmers cited for deciding to participate in the Farmwide trial were to gain access to local call charges (29 per cent)[170] and to obtain support in getting online (29 per cent). The next most significant reason identified was to obtain training (14 per cent), which, along with obtaining support in getting online, emphasises the importance of education and technical assistance in stimulating demand for Internet services in rural areas.

Two important points emerge from the analysis of the Farmwide data in relation to the proximity of respondents to an ISP. Firstly, the critique of the Farmwide survey notes that:

> farmers who experienced extremely slow connection speeds during the trial (2.4 to 7.2 Kbps) were significantly less likely to live within a local call of an Internet Service Provider (90%).[171]

Customers contained in this group would benefit most from either improving PSTN data rates or encouraging the availability of ISPs in local call areas. They incur timed call charges for ISP access which are compounded by the longer time taken to transmit or receive data. Consequently, there are marked difference in the effective prices of services in these rural areas, in comparison with other rural areas and particularly metropolitan areas.

Secondly, the Farmwide survey critique states that:

> as far as farmers are aware, only a third (35%) of Internet Service Providers within local proximity have been established for more than 12 months.[172]

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169 The 1997 IPAC report, *rural& regional.au/for all*, lists the regional centres with at least one Internet point of presence (p.82.)

170 All farmers obtained the equivalent to local call access as part of the trial.

171 Fergusson, 1998, p.31.

172 Fergusson, 1998, p.31.

This point indicates that the ISP market is going through a dynamic phase which is resulting in a rapid expansion of services to rural areas. A policy issue for consideration is the extent to which the market will deliver ISP points-of-presence to rural areas and the extent to which this market might be stimulated in these areas.

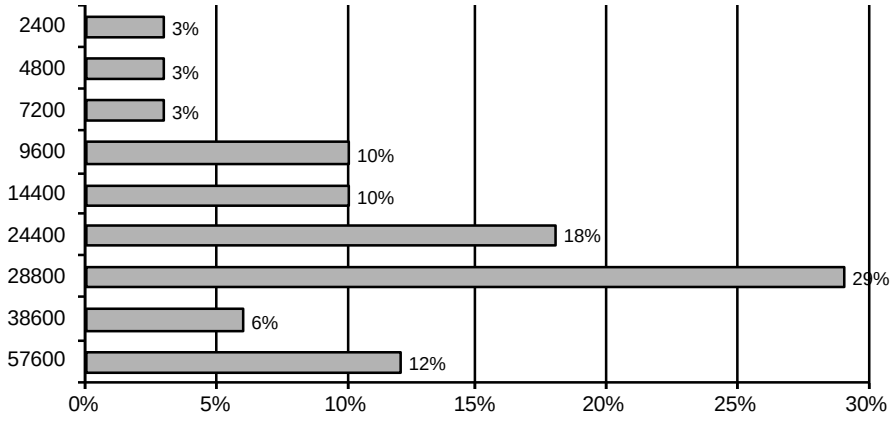
Ability of the PSTN to support modem connection rates

Figure 8.1 shows the usual modem connection rates of respondents, 47 per cent of whom achieved rates of 28.8kbit/s or greater, whilst 19 per cent achieved rates under 14.4kbit/s. It is notable that this information varies significantly from the information on transmission rates Telstra has estimated are typically provided in rural areas (refer Chapter 5). For example, Telstra estimated that typically only 30 per cent of respondents would achieve a rate of 28.8kbit/s in rural areas, whereas 47 per cent of respondents in the Farmwide survey state they typically achieved this rate.

The Farmwide survey transmission rate data, however, is probably unreliable as a broad indication of data rates for two reasons. Firstly, the modems provided to farmers as part of the Farmwide trial delivered a maximum data rate of 28.8kbit/s—18 per cent of respondents stating a connection rate above this level. This result questions the ability of respondents to correctly ascertain the connection rate they were achieving. (The Farmwide survey critique notes that some software data rate recording problems were encountered.) Secondly, the ACA understands that, before commencing the trial, Telstra tested participant lines to ascertain their proper functionality and they repaired any defective lines. This work may have improved the data capability of these lines in comparison with non-participant lines in rural areas. Problems in accurately identifying the data rates received by customers underscore the need for a transparent, robust and statistically valid means of measuring customer data rates.

Figure 8.1

Usual/Most Common Connection Rate (Asked of: all pilot participants)



Source: James Fergusson, Farmwide Internet Services Pilot Online Results Report and Research Methodology Critique, May 1998.

The Value and Use of Internet Services

The Farmwide survey demonstrates that the survey population was interested in using the Internet for a variety of activities: as a source of information to help manage their farms, buying and selling products and services, banking, filling in forms online and education or training. The ability to rapidly obtain up-to-date information through the Internet was appreciated.

Over half the farmers participating in the Farmwide survey consider the Internet to be a worthwhile investment from a business point of view, with 40 per cent withholding their judgment on this issue. Only 1 per cent said it was not a worthwhile investment. Most farmers expressed positive sentiments about the Internet, with a high recognition of the benefits it provided to their family, the broad social benefits and the time-saving potential of this service.

Consistent with information derived from other reports referenced in this chapter, e-mail emerges from the survey as the most commonly used Internet service (Table 8.10). Nearly half the farmers surveyed said they used e-mail at least twice weekly and 20 per cent said they used it daily. Eight-five per cent of farmers predicted they would be likely to use e-mail more often than their current usage.

Table 8.10

Frequency of Usage

Frequency of Usage	E-mail	Internet	Bulletin Board Services	Chat Services
Use Daily	20%	10%	3%	–
Use two or three times a week	26%	43%	6%	2%
Total—use at least twice a week	46%	52%	9%	2%

Source: James Fergusson, Farmwide Internet Services Pilot Online Results Report and Research Methodology Critique, May 1998.

There seems to be little doubt that farmers in the survey find the Internet to be a valuable service from both a business and social viewpoint, with clear intentions to use it more frequently in the future.

8.6. Comparison of Rural and Metropolitan ISP Charges and Call Charges

As discussed in Chapter 2 and earlier in this chapter, the ACA conducted an analysis of pricing of data services in metropolitan and non-metropolitan areas of Australia, to obtain information on whether there are any pricing differences for data services in these areas. This analysis demonstrates significant price differences between these areas.

An analysis was conducted based on the cost components of 20 hours Internet access per month (assuming a single call duration of 30 minutes) for subscribers with and without untimed local call dial up access, at a data rate of 14.4kbit/s. It was assumed that an increase in data rate from 14.4kbit/s to 28.8kbit/s would halve the number of hours spent accessing the Internet per month. The BigPond Frequent User Plan, which offers 20 hours access per month for $35 ($1.75 per hour), the BigPond Rural Access rate ($7 per

hour) and the OzEmail casual rate ($5.00 per hour) were used as the basis for this assessment.

In the assessment of Internet usage where no local call dial up access was available, Telstra's economy rate of 10 cents per minute for the 50-85 kilometre band was assumed.

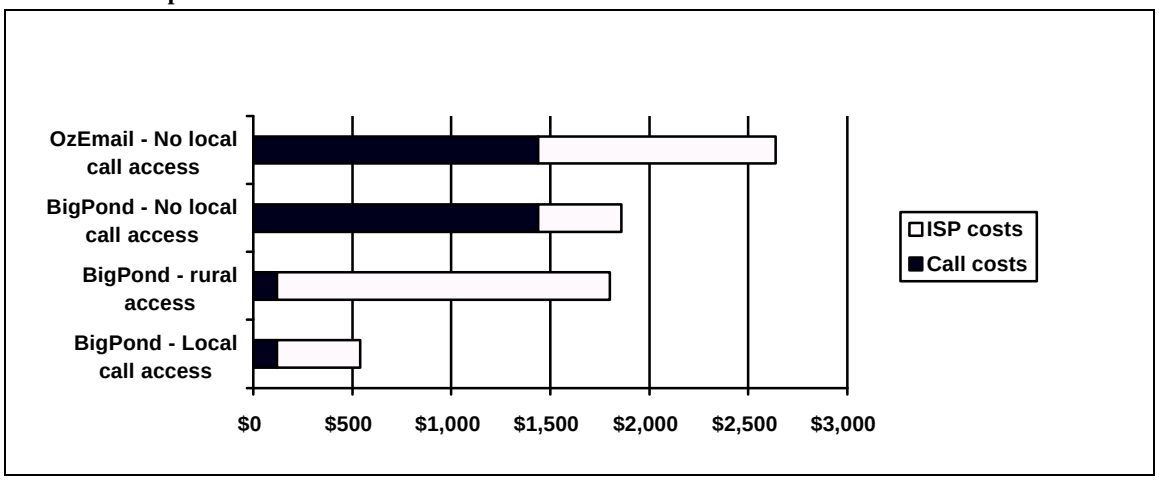
8.6.1. Comparison of ISP charges and Telstra call charges at 14.4kbit/s data rate

Cost of access based on 14.4kbit/s options

Figure 8.2 compares the charges for access on an annualised basis, for various assumptions. At a data rate of 14.4kbit/s the most economical options were those with local call dial up access. With no local call access, the call charges were a significant proportion of the total expense, with the BigPond with no local call access annual call charges accounting for 77 per cent of total charges and OzEmail annual call charges accounting for 54.5 per cent.

Figure 8.2

Cost of Access per Annum at 14.4kbit/s



Source: ACA analysis

8.6.2. Comparison of ISP charges and Telstra call charges at 28.8kbit/s data rate

Cost of access based on 28.8kbit/s options

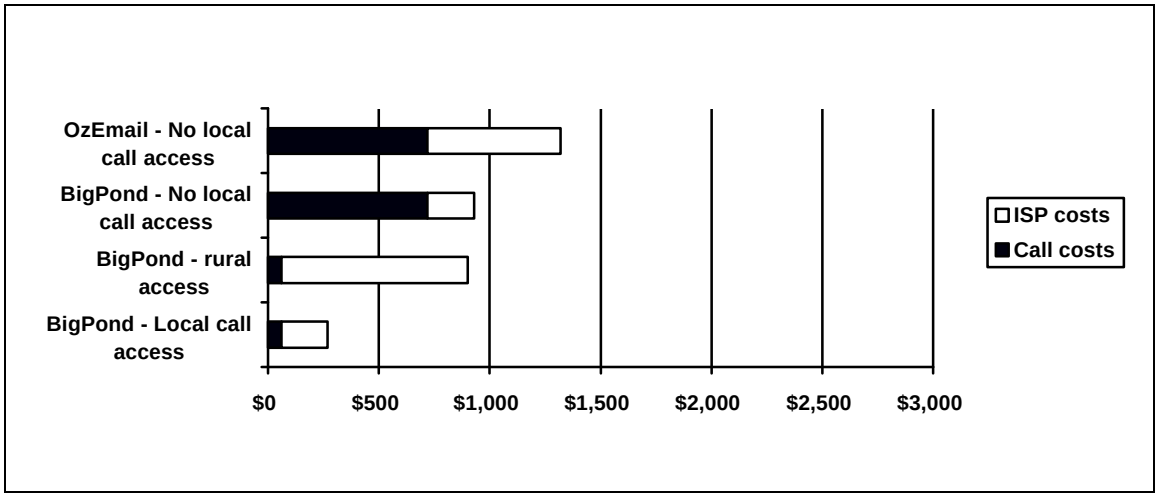
The relativities in the discrepancies in costs are broadly similar at the 28.8kbit/s data rate, but the annual cost is significantly less. (See Figure 8.3).

In terms of Internet service provider costs, BigPond Rural Access service at $7 per hour and OzEmail's casual rate of $5 per hour contributed substantially to the total costs of both services. However, analysis of 10 local rural ISPs, 10 local metropolitan ISPs and 10 multi-location ISPs showed negligible price differences among each group with the average rural ISP price being $2.01 per hour, the metropolitan price being $1.49 per

hour and the multi-location ISP charging an average of $1.54 per hour for 20 hours access per month.

Figure 8.3

Cost of Access per Annum at 28.8kbit/s



Source: ACA analysis

Conclusions of Pricing Analysis

The most significant conclusions from this analysis are:

- at the 14.4kbit/s data rate, where local call access is not available, call charges could represent up to 77 per cent of the total of the ISP and call charges incurred by the customer; and
- many rural customers are doubly disadvantaged when accessing the Internet, as call charges may be greater and data rates obtained by rural customers are generally slower than for urban customers (refer Chapter 5 for discussion of this issue).

The increased cost for rural customers in accessing the Internet was highlighted in a number of submissions, as reflected in the following comment:

> the fact that our exchange will only support low speed fax speeds results in a substantial increase in revenue for Telstra that we greatly resent. It is bad enough having a poor line, but to be charged more for it adds insult to injury.[173]

It is understandable that rural and remote customers are concerned that in situations where timed Internet calls are made, their usage charges are higher because of the inability of the PSTN to deliver more rapid data rates.

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[173] Denham, submission.

8.7. Areas Where Access to Common Data Services Cannot be Provided

In Chapter 5, Tables 5.2 and 5.3 identified the data rate capability of Telstra's PSTN using a V.34 modem protocol. These tables have been combined (refer Table 8.11) to demonstrate that rural areas are relatively poorly served in comparison with metropolitan areas, in terms of the data capability available with Telstra's PSTN.

Table 8.11

PSTN Data Transmission Rates—Urban & Provincial/Rural Areas

Transmission Rate	2.4kbit/s	9.6kbit/s	14.4kbit/s	28.8kbit/s
Urban & provincial centres Network Coverage	99%	70%	45%	30%
Rural Areas Network Coverage	99%	95%	85%	60%

Note: The percentages are indicative only and for data rates of 9.6kbit/s and above use of a V.34 modem is assumed. These percentages do not apply to facsimile transmissions, which have different data transmission characteristics.[174]
Source: Telstra.[175]

The data in Table 8.11 demonstrates that, other than the 1 percent of customers in both 'rural' and 'urban & provincial' areas unable to receive 2.4kbit/s, the category most disadvantaged is the 30 percent in rural areas unable to received 9.6kbit/s. These customers do not have access to reasonable web-browsing services, and their facsimile services will typically operate at a rate well below 9.6kbit/s. Utilisation of e-mail services would be feasible for these customers, although the use of these services would be diminished if the transmission of e-mail attachments is involved.

Although customers typically receiving a rate of 14.4kbit/s would not have an optimal web browsing capability, many observers consider this rate to be at the threshold of acceptable web-browsing.[176] Facsimile and e-mail services—two of the three data services identified in this chapter—are more acceptable at this rate than is web browsing.

This analysis leads to the conclusion that the highest priority target for upgrading a data capability should involve those customers who fall in the less than 9.6kbit/s category, followed by those customers receiving less than 14.4kbit/s. The substantial majority of these customers are in rural areas. In this regard, many DRCS customers, who have historically been the worst served in terms of a data capability, are currently being upgraded to a 19.2kbit/s data capability through migration to HCRCS systems under Telstra's RATE program. (The ACA understands that this program is scheduled for completion in 2001.) The Telstra customers in remote areas to be served by its proposed DAMA satellite service will also receive 14.4kbit/s as part of their service.

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174 Telstra also advises that the equivalent network coverage for V32bis modems, operating at 9.6kbit/s and 14.4kbit/s, is 40 per cent.

175 Telstra—ACA communications.

176 For example, the Online Council submission to the inquiry states: 'The following data rates for digital applications.....would be widely regarded as providing the minimum level of service...[the data rate for reasonable web surfing is] 14.4 kbps (some would say 19.2 kbps).'

Any focus upon upgrading services with the lowest data capability would have to take account of the need for such an upgrade to be on a co-ordinated basis such as district by district. In most circumstances it would be prohibitively expensive and impractical to upgrade services on a random demand or service-by-service basis. It is important to note that a substantial associated benefit of upgrading areas with poor data rates is that the quality of the telephone services would often also be significantly improved. As noted in Chapter 2, Telstra's CAN rehabilitation program will typically deliver a 28.8kbit/s data capability and improved service performance to those 'predominantly rural areas' receiving the rehabilitation work.

Any data capability benchmark that might be contemplated for an upgrade to the access network might typically be set at 28.8kbit/s, because, as mentioned in Chapter 2, this is the data rate which most satisfactorily supports common applications currently available. Further, the cost of upgrading to a lesser benchmark such as 14.4kbit/s is comparable to an upgrade to 28.8kbit/s.[177]

8.7.1. Take up of the Internet and USO policy

According to the USO policy adopted in most developed countries, a service which has a low level of take up would not normally become a candidate for inclusion in the USO. For example, as referenced in Chapter 2, a major study of universal service by Analysys for the European Commission concluded that a significant degree of penetration should be reached by a service before it comes under consideration for incorporation into the USO, and that 'for a service to be considered for inclusion in the universal service obligation it ought to have already grown to a 75% market penetration under normal market conditions'.[178]

The level of Internet usage in Australia falls well short of this—13 percent of all households (as at February 1998). This would suggest that alternative approaches are needed to increase the level of take up of the Internet, if it is considered of sufficient social and economic importance to achieve this goal.

8.8. Cost/Benefit Analyses of 28.8kbit/s and 14.4kbit/s Data Rate Options

The ACA's consultant's cost/benefit analysis of making a 28.8kbit/s and 14.4kbit/s data rate universally available concluded that the costs of universal availability currently outweigh the consumer welfare benefits. This analysis is provided as Appendix 6. It is focused primarily on the 28.8kbit/s option, on the basis that information relating to that option could also be used to estimate the benefits from the lower data rate option.

The ACA considers that the information on cost per service utilised in the consultant's analysis is conservative, in the sense that the cost options represent the theoretical lowest cost options. (The consultant was requested to choose the lowest cost options in its analysis—and not to be restricted to technologies currently used in Australia.) In its

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[177] Further comment on comparing the costs of upgrading the 14.4kbit/s and 28.8kbit/s data rate options is provided in Appendix 6.

[178] Analysys, p.123.

analysis of the costs per service in rural areas, the consultant has chosen wireless local loop as the lowest cost option. As noted in Chapter 5, wireless local loop is still being evaluated by Telstra in terms of whether it is an economical service option in Australia. Nevertheless, even with the use of these conservative figures, the consultant's analysis concludes that the costs of making either a 14.4kbit/s service or 28.8kbit/s service universally available outweighs the consumer welfare benefits.

Other findings of the consultant's analysis are:

- that if a data capability were to be mandated, 28.8kbit/s should be the data rate option chosen;
- that household expenditures would have to increase significantly beyond current expenditures on Internet services for the welfare benefits to equal the costs of a universally available 28.8kbit/s data capability;
- however, if current trends continue, the benefits of a 28.8kbit/s service being made universally available will exceed the costs (no prediction is made on when this may occur).

Telstra employed the services of Tasman Asia Pacific Pty Ltd to undertake, among other things, an analysis of the benefits of upgrading Telstra's PSTN to support a data rate of 28.8kbit/s. In its submission to the inquiry, Telstra compared the benefits derived from this analysis with its own estimate of the costs of such an upgrade, concluding as follows:

> The gross gain in consumer surplus associated with upgrading the PSTS to 28.8 kbit/s is estimated to fall between $1.4 billion and $1.9 billion over a 5-year period, depending upon penetration rates and consumer valuation of increased speeds. Again the expected costs far outweigh these potential benefits. The total estimated capital cost associated with an upgrading of the PSTS to 28.8 kbit/s is $4.0 billion equating to an annual capital cost of between $728 million and $978 million.

As with the consultant's analysis, the costs of upgrading the PSTN to support a data rate of 28.8kbit/s were found by Telstra to substantially outweigh the benefits of such an upgrade.

8.9. Summary

This chapter provides an analysis of applications that depend on data capability provided by telecommunication carriers. Some conclusions are also drawn on possible priorities for improvement. The chapter also incorporates the results of consultant cost/benefit analysis of possible inclusion of a data rate capability in the USO of either 14.4kbit/s or 28.8kbit/s.

The main points to emerge are as follows.

- There is strong growth in the household use of facsimile services, either stand-alone facsimile machines or facsimile modems. Such machines typically use data rates up to 14.4kbit/s.
- The usage of Internet services is currently at around 13 percent of all households (as of February 1998), with e-mail currently the most used application—high income households predominate in usage of the Internet.
- People who have computers but do not have access to the Internet see the high cost of access as the main disincentive.
- High cost is a particular disincentive to Internet access in rural areas compared with urban and provincial areas (see also the analysis in Chapter 2). The difference in costs results from:
  - the high cost of data calls when outside a local call area;
  - the need to use ISPs who are outside a local call area; and
  - cost is exacerbated through relatively slow data rates available in many rural and remote areas. (This is illustrated by an analysis of comparative costs of an average Internet access at either 14.4kbit/s and 28.8kbit/s.)
- Training and information on Internet and related data services, particularly in rural and remote areas, would improve the level of usage of the Internet.
- A summary is provided of a cost/benefit analysis by the ACA's consultant of the options of incorporating a data capability in the USO at either 14.4kbit/s or 28.8kbit/s which indicates that the costs of universal availability currently outweigh the consumer welfare benefits. (Telstra's analysis also supports this conclusion.)

8.10. Conclusions

Having regard to the information and analysis in this chapter—and in Appendix 6—the following conclusions are drawn.

- The lack of access by rural users to ISP points-of-presence in their local call area is a significant factor affecting the price for the Internet in rural and remote areas.
- Rural and remote users are at the greatest disadvantage in understanding and utilising data capability for common applications. Internet interest and usage would be assisted by targeted information, training and technical assistance and hence may be a catalyst for ISP establishment.
- The ability of the existing terrestrial telecommunications infrastructure to deliver a reasonable data capability is an important factor which is impeding take-up of the Internet in rural areas, though less important than prices associated with

Internet usage—upgrading the rural infrastructure to support higher data rates in rural areas, were this targeted, would assist in addressing the situation.

- A general upgrade to 28.8kbit/s or 14.4kbit/s would necessarily need to be done on an integral basis—possibly district by district—rather than according to random demand or on a service-by-service basis.
- The costs of making a 28.8kbit/s or 14.4kbit/s data rate service universally available under the USO or any other mechanism currently outweigh the consumer welfare benefits of this availability.

9. Conclusions

9.1. Overview Comments

A considerable amount of information and analysis has been presented in earlier chapters of this report. Before stating the conclusions drawn from that material, it may assist understanding to make overview comments as a conceptual framework to the more detailed conclusions which follow.

Provision of a telecommunications service under USO arrangements involves the concept of access to a minimum service guaranteed in terms of availability but unlikely to be delivered universally without some form of non-commercial intervention. Related to this are the notions of a service essential for participation in society and of equity concerning reasonable terms for provisioning and access. Issues of affordability are associated with provision of a USO but, as referenced in the ACA's *Discussion Paper*, these are treated separately in the Australian context mainly because of the introduction of competition and associated tariff rebalancing flowing from the 1991 telecommunications legislation.

Generally, the provision of a minimum service as a USO has meant voice telephony, which in the Australian context is expressed as the standard telephone service. This involves a relatively unambiguous functionality although, importantly, the definition is in terms of a service rather than a technology.

In considering the matter of a data rate capability which might be prescribed as part of the USO a number of broad observations can be made. Unlike the relatively homogeneous nature of the standard telephone service for voice communications, the issue of quantifying the capacity of a data service becomes a central issue. The application and service characteristics of a data service are not immediately self-evident and this complicates the identification of what might, or should, be considered for universal availability.

A focus upon data rates *per se* (eg. 9.6kbit/s or 28.8kbit/s) is not directly helpful and a more productive approach is to consider the applications to be supported (facsimile, e-mail, Internet, etc.) and related transaction times and costs to users. This focus upon functionality can then be related to appropriate data rates needed to support identified applications. In a USO context, the risk is that inclusion of any level of data capability will result in the costs of the USO rising with consequences for prices to all consumers—both residential and business—and the overall competitiveness of the Australian economy.

The ability of the PSTN to support data applications by the use of dial-up modems is an ingenious development of technology which can operate over a voice channel which has enhanced the utility of the pre-existing infrastructure. Such a development was not originally factored into the fundamental design of the PSTN and it now competes with other data products based on non-circuit switched architectures. At the same time, users get substantial benefits, with many residential and small business users utilising the PSTN for their data applications and modern society is becoming increasingly dependent on this arrangement. Furthermore, it is a provision of telecommunications

legislation that most residential users continue to have access to untimed local data calls. The common applications are readily identified as facsimile, e-mail and Internet browsing. Even for these applications there is evolutionary change, however, and e-mail is increasingly a substitute for facsimile.

The data rates which users commonly experience on their 'standard' phone lines through the connection of dial-up modems depend on a number of variables including the capability of customer equipment and the inter-exchange network provided by the carriers. An important factor, however, is the capability of the customer access line which may vary for many reasons including physical conditions of the line and the distance from the nearest local exchange. The proportions of customers that can be supported with PSTN access and reasonable data capability varies according to location (eg. metropolitan, rural or remote) and according to the data rate required (eg. 14.4 or 28.8kbit/s).

The general perception of rural and remote users is that they are at a disadvantage compared to metropolitan users, in terms of obtaining satisfactory data rates and the call charges incurred. It is this disparity which they most wish to see addressed by government. A significant factor in this current disparity is the situation concerning the CAN. An improvement in the ability of the in-place terrestrial PSTN to handle higher specified data rates involves high costs associated with upgrading of the CAN. Empirical information supports the perception that, on average, rural and remote users can expect less data utility from their current phone line, and thereby incur higher call charges for data, compared with metropolitan users.

The introduction of full and open competition as provided for under the *Telecommunications Act 1997* is an important addition to the context within which regulatory intervention needs to be considered. Competition is a vital new element of government strategy for encouraging improvements in the provision of services and reductions in prices. Thus the likelihood that the market will deliver outcomes affecting the urban/rural disparity—whether through the entry of new carriers or carriage service providers, the responses of incumbent carriers, or other factors affecting market behaviour (eg. the application of new technologies or declarations by the ACCC affecting access rights)—needs to be factored into the analysis. There is evidence, especially through the activities of some state governments in addressing their communications needs on a whole of government basis, that market outcomes, not previously likely, are emerging. There is also evidence that technological developments, particularly with satellites, offer further scope for the provision of affordable data services in the near future.

In the context of dynamic market behaviour and the continuing emergence of new technologies, there is a risk that regulatory intrusion may not only get it wrong on the grounds of economic efficiency but may also preclude the application of other technology solutions by new providers. For example, a decision to require an upgrade of Telstra's PSTN to, say, a data capability for 28.8kbit/s under a USO arrangement would incur an enormous cost for infrastructure upgrade (Telstra's capital cost estimate is $3.95 billion). Such levels of expenditure, which necessarily would require commitment to roll out over many years, would have serious consequences for other carriers obliged to share in the USO costs. For Telstra itself there is also the risk that, because of an imposed commitment, such investments could later become stranded if

market response was not forthcoming. At the same time, there could be disincentive to competitive behaviour.

Such considerations are evident in the Report of the Review of the Standard Telephone Service[179] which spoke of a cautiously expansive agenda 'because of the pace and unpredictable direction of technological change and demand, and the costs of inaccurately anticipating them'. That Review proposed a decision making process for determining whether the level of service required under the universal service arrangements should be enhanced. Among those elements was an assessment of whether the services under consideration were of social importance.

As noted elsewhere in this report, the incidence of Internet usage in Australia is 13 per cent of households although a higher proportion (42 per cent) have computers. Of course, Internet usage is growing rapidly although still a long way short of an everyday application for most Australians, whether located in metropolitan or rural areas.

The considerable risks associated with regulatory intervention on the supply-side for the provision of data capability suggest consideration of a range of approaches as a better strategy to address the urban versus country access disparity. Such approaches whether affecting affordability, demand aggregation, or incentives for local entrepreneurs, could be designed to assist the provision of infrastructure and service by carriers that support the provision of data capability but do so in response to demand. To grow the market in these ways leaves decisions about capability and technologies largely in the hands of carriers. The challenge is to identify the impediments to desired outcomes and use targeted strategies that address those impediments in ways that do not provide a disincentive to emerging market and carrier initiatives, nor bestow competitive advantage (albeit indirect) upon any party.

In reporting upon the Minister's directions the ACA also records two additional observations associated with its work. First, in the course of its inquiry the ACA had need for a considerable amount of information, specifically concerning the ability of Telstra's access network to support commonly used data applications. It is evident that Telstra's internal information about the capability of its CAN is not supported by transparent methodology nor is it highly disaggregated below the broad categories of metropolitan, rural and remote. Telstra has itself committed to a $120 million work program associated with access network rehabilitation and may contemplate further funding of initiatives. Apart from the direct benefit for data access, such expenditure will benefit the underlying service performance of the CAN. Second, it is the ACA's view that rapidly changing market conditions and applications emerging through newly deployed technology solutions, including competitive satellite systems, will quickly outdate the information in this report. These observations are reflected in its conclusions.

In the context of submissions, research and the analysis contained in this report the following conclusions, with relevant chapter references, are identified:

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[179] Report of the Standard Telephone Service, December 1996, p.3

9.2. Conclusions

- **Rural and remote customers are at a disadvantage, compared with urban customers, in terms of the data rate capability available over the PSTN. (Chapter 2)**
- **ISDN or broadly comparable 64kbit/s digital data services will be accessible to all people in Australia by the end of 1998 through Telstra meeting its licence condition and its proposed satellite based delivery system. (Chapter 5)**
- **The higher cost of ISDN or alternative satellite based data services, compared with the more limited but lower priced data services available through the PSTN, will remain as a limiting factor to affordable consumer access to data services, particularly in rural and remote areas. (Chapter 5)**
- **The availability of new technology solutions and new service providers (national and global) progressively over the next five years will provide market developed solutions to high data rate needs. (Chapter 5)**
- **International comparisons indicate that no country has specified a data rate capability as part of USO arrangements for the standard telephone service, apart from the inclusion of ISDN in USO arrangements in Germany, Denmark and Norway. (Chapter 5)**
- **Government intervention in relation to the provision of a 64kbit/s digital data service is not necessary or justifiable, except possibly on equity grounds because of the incentive structure created by current legislative arrangements. (Chapter 6)**
- **In the supply of other lower levels of data rate capability over the PSTN, equity, fairness and citizens' rights-type reasons may justify some intervention. (Chapter 6)**
- **The costs to the community of specifying, as part of the USO, a carriage service broadly comparable to a digital data channel with a data rate of 64kbit/s to end-users as part of the designated basic rate ISDN service would outweigh the benefits to the community if it were provided solely by ISDN. (Chapter 7)**
- **The ACA has examined Telstra's claim that the costs of specifying ISDN services as part of the USO would exceed the expected benefits and has concluded that the claim can be substantiated. However, such a service providing two 64kbit/s channels and one 16kbit/s control channel exceeds the capability rate suggested by the legislation. (Chapter 7)**
- **On the basis that Telstra's proposed satellite access service meets the criteria specified in subsection 141(2) of the *Telecommunications Act 1997* then the Australian community would likely not incur additional costs as a consequence of a service broadly comparable to a digital data channel with a transmission rate of 64kbit/s being specified as part of the USO. Equally there may be no additional benefits from specifying such a service as part of the USO as the benefits would flow from its commercial availability at the end of**

1998 in any event. However, this conclusion would not hold if price levels were unduly restrained by regulations. (Chapter 7)

- **Specifying as part of the USO any carriage service that meets the criteria of subsection 141(2) of the *Telecommunications Act 1997* would increase the universal service levy on carriers with the potential to increase telecommunications service prices, affect the profitability of carriers and impact unfavourably upon competition in the industry. (Chapter 7)**

- **An extension of Telstra's current licence condition to provide ISDN/64kbit/s to 100 per cent of the Australian population would have a significant commercial impact upon Telstra. However, there would be little actual cost if the required capability was related to the criteria specified in subsection 141(2) of the *Telecommunications Act 1997* and the obligation can be met by using Telstra's proposed digital data satellite access service. (Chapter 7)**

- **The lack of access by rural users to ISP points-of-presence in their local call area is a significant factor affecting the price for the Internet in rural and remote areas. (Chapter 8)**

- **Rural and remote users are at the greatest disadvantage in understanding and utilising data capability for common applications. Internet interest and usage would be assisted by targeted information, training and technical assistance and hence may be a catalyst for ISP establishment. (Chapter 8)**

- **The ability of the existing terrestrial telecommunications infrastructure to deliver a reasonable data capability is an important factor which is impeding take-up of the Internet in rural areas, though less important than prices associated with Internet usage—upgrading the rural infrastructure to support higher data rates in rural areas, were this targeted, would assist in addressing the situation. (Chapter 8)**

- **A general upgrade to 28.8kbit/s or 14.4kbit/s would necessarily need to be done on an integral basis—possibly district by district—rather than according to random demand or on a service-by-service basis. (Chapter 8)**

- **The costs of making a 28.8kbit/s or 14.4kbit/s data rate service universally available under the USO or any other mechanism currently outweigh the consumer welfare benefits of this availability. (Chapter 8)**

- **Information available to policy makers and consumers would be assisted by inclusion of the capability of Telstra's access network—as well as those of other carriers—to support identified data rates on a disaggregated basis, perhaps to a regional level, in the Quality of Service monitoring regime. (Chapter 9)**

- **The information provided in this report will become dated very quickly because of the rapid rate of change that is occurring—both in the supply of data rate capability and the demand for, and use of it. (Chapter 9)**

Appendix 1

The Minister's Directions

On the 30 April 1998, Senator the Hon Richard Alston, the Minister for Communications, the Information Economy and the Arts, issued the ACA with the following directions.

Commonwealth of Australia

Telecommunications Act 1997

Directions under section 486

(1) I, RICHARD KENNETH ROBERT ALSTON, Minister for Communications, the Information Economy and the Arts, direct the Australian Communications Authority (the ACA) under subsection 486(1) of the *Telecommunications Act 1997* (the Act), to hold a public inquiry under Division 2 of Part 25 of the Act to review the following matters:

(a) whether a carriage service that provides a digital data capability broadly comparable to that provided by a data channel with a data transmission speed of 64 kilobits per second supplied to end-users as part of the designated basic rate ISDN service should be specified, on and after 31 December 1998, in regulations made for the purposes of subsection 141(1) of the Act;

(b) whether the benefits to the community resulting from so specifying that carriage service would outweigh the costs to the community from so specifying that carriage service; and

(c) if:

(i) a carrier makes a submission to the review; and

(ii) the submission includes a claim that the costs to the community resulting from so specifying that carriage service would outweigh the benefits to the community from so specifying that carriage service;

whether there is sufficient evidence to substantiate the claim.

(2) I direct the ACA under paragraph 486(3)(a) of the Act to consult with the following persons, bodies or agencies in connection with the conduct of the inquiry:

(a) carriers;

(b) carriage service providers;

(c) representatives of end-users;

(d) representatives of business consumers

(e) representatives of residential consumers;

(f) representatives of rural consumers.

(3) I direct the ACA under paragraph 486(3)(b) of the Act to have regard to the following matters in the conduct of the inquiry:

(a) the distribution of the costs and benefits to the community from specifying the carriage service referred to in paragraph (1)(a) for the purposes of subsection 141(1) of the Act, including the impact on small businesses, metropolitan and non-metropolitan areas, and on telecommunications industry participants;

(b) the risks of the estimated costs and benefits not being achieved due to changes in technology, consumer preferences or other market changes;

(c) the extent to which there are factors or conditions which make it desirable for the government to intervene in the provision by the market of services of the kind referred to in paragraph (1)(a);

(d) the current and projected availability of services of the kind referred to in paragraph (1)(a) in Australia, including the prices at which these services are, or are expected to be, available to end-users and the differences, if any, in terms of availability and price in metropolitan and non-metropolitan areas;

(e) the applications, either currently available or expected to be shortly available, that services of the kind referred to in paragraph (1)(a) will provide to end-users;

(f) whether some alternative service, means or process might more efficiently and effectively address the concerns that would be addressed by specifying a digital data capability as being part of the USO.

(4) The ACA must give a copy of its report to me under subsection 495(2) of the Act by no later than 15 August 1998.

Dated 30 April 1998

Richard Alston
Minister for Communications, the Information Economy and the Arts

Appendix 2

List of Submissions

The ACA received 89 written submissions to the inquiry.

Aboriginal Education & Training Council	Advanced Measurement and Control	Airnorth
Armidale City Council	Association of Independent Schools of Western Australia	Australasian Teleconferencing Association
Australian Computing Society - NT Branch	Australian Information Industry Association	Australian Society of Exploration Geophysicists
Australian Telephone Users Group	Susan Bandias	Bass Coast Network
Murray Bent	Broken Hill City Council	Broome Shire Council
Business Council of Australia	Catholic Education Office of Western Australia	Centre for Telecommunications Information Networking
CIRCIT	City of Geraldton Library	Kevin Cole
Communications Expert Group	Communications Research Unit	Commuters' Council of NSW
Consumers' Telecommunications Network	Coonabarabran Shire Council	Country Women's Association of NSW
John Denham	Department of Primary Industries and Energy	ECI Telecom
Education Network of Australia Reference Committee	Eicon Technology	Michael Elijah
Graeme Erbs	Richard Ferrers	Gascoyne Development Commission
Jim Graham	Highway Safety Action Group - NSW	Stuart Hulme
Hume Shire Council	Hutchison Telecoms	Isolated Children's Parents' Association - Australia
Isolated Children's Parents' Association - NSW	Isolated Children's Parents' Association - NT	Maranoa Information Management Committee
McMillan, Evans & Associates	Midwest Development Commission	Multimedia Victoria
Murray Regional Development Board	National Office of Information Economy	National Rural Health Alliance
National Telehealth Committee	Nortel	North Burnett Regional Economic Development Council
Northern Territory Government	NSW Dairy Farmers' Association	NSW Department of Education & Training - Distance Education Directorate
NSW Farmers' Federation	Office of Government Information Technology	Optus Communications

LIST OF SUBMISSIONS

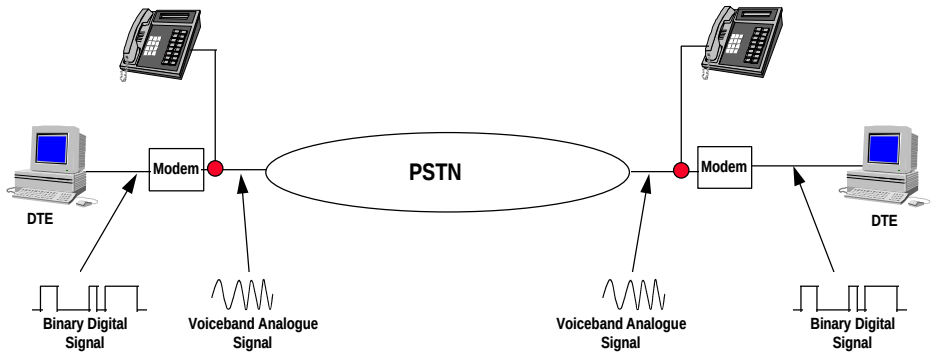
Outback Regional Development Organisation	Mr/s Parkins	Pastoralists' Association of West Darling
Project TV	Queensland Government	Queensland Telemedicine
Riverina Eastern Regional Organisation of Councils	Riverina Regional Development Board	SA Farmers' Federation
Small Enterprise Telecommunications Centre	South Australian Regional Development Association	South West Strategy Group
Tim Svenson	Tasmanian Department of Community and Health Services	Tasmanian Department of Premier and Cabinet
Tasmanian Society for Information Technology in Education	Telstra	Peter Toyne
Traditional Credit Union	Truro Partnership	United Graziers Association of Queensland
University of New England	Vodafone Network	Western Australian Education Department
Western Australian Government	Western Murray Development	Ross Wilson
Donna Wood	Yapakurlangu Regional Council	

Appendix 3

The following appendix was provided to the ACA by Telstra during the Digital Data Inquiry.

Network Impairments Affecting The Transmission of Data Over The PSTN

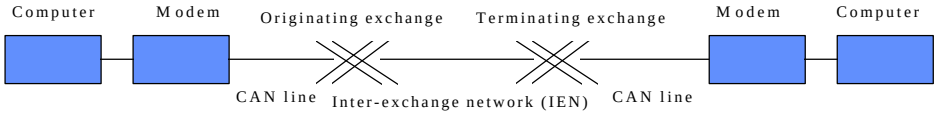
There are several known impairments which individually and collectively degrade the performance of data transmission across the PSTN. To better illustrate how these impairment behave, a typical network configuration for data transmission via modems is illustrated below.



Excluding impairments which may result from the use of particular modem types, network impairments comprise:

- Noise
- Group Delay Distortion and Attenuation/Frequency Distortion
- Difference in Terminating Impedance
- Echo Return Loss
- Impulsive Noise.

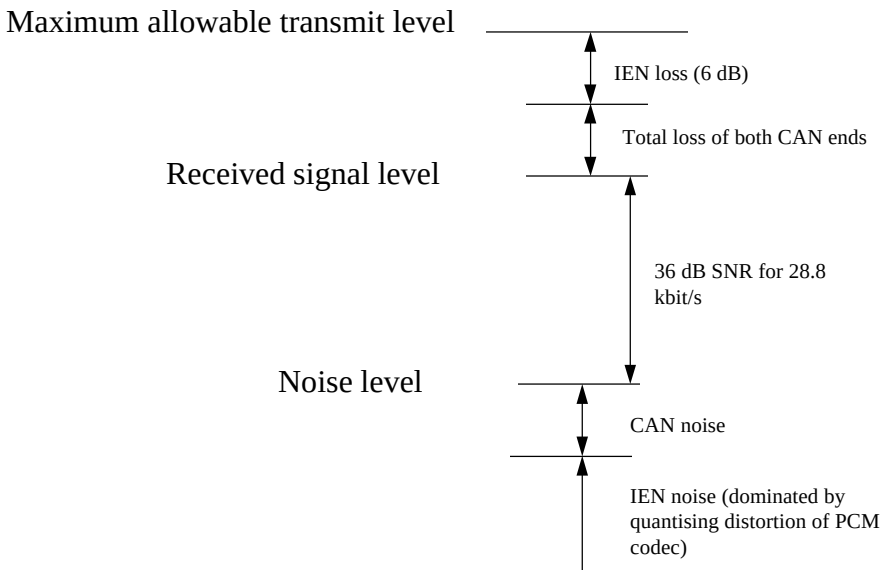
At an end-to-end service level a typical configuration for data transmission, based on the use of modems, includes a customer computer and modem equipment, a Customer Access Network (CAN) line, an originating exchange, an Inter-Exchange Network (IEN), a terminating exchange, another CAN line and a distant ISP modem or a distant computer modem.



Schematic diagram of a typical network connection

1. Signal-to-noise ratio (SNR)

1.1 Passive cable CAN



From Telstra's experience with a number of modem models, it is estimated that a V.34 modem requires a SNR of 36 dB to work at 28.8 kbit/s. Given

- the typical noise performance of Telstra's CAN and IEN and
- the type of cable gauge used in the CAN

the total length of both CAN ends have to typically be less than 4 km for a V.34 modem to work at 28.8 kbit/s. This analysis assumes the PCM codecs used in our network (mainly in our IEN) are better than the minimum specification given in ITU-T Recommendation G. 712. Note that the network coverage at 28.8 kbit/s for V.34 modems would be 0% if the PCM codecs in the network were exactly at the minimum requirement of G.712.

In the estimation of network coverage given to ACA, it has been assumed that the CAN on the ISP side has zero loss (ie. ISP is in close proximity to the exchange or connected by appropriate electronics)

1.2 CAN line with non-integrated digital electronics

The use of non-integrated digital electronics introduces one more PCM link to the connection, hence it increases the level of quantising noise.

A CAN line with non-integrated digital electronics would need to be converted to integrated digital electronics to support V.34 at 28.8 kbit/s

2. Group Delay Distortion and Attenuation/Frequency Distortion

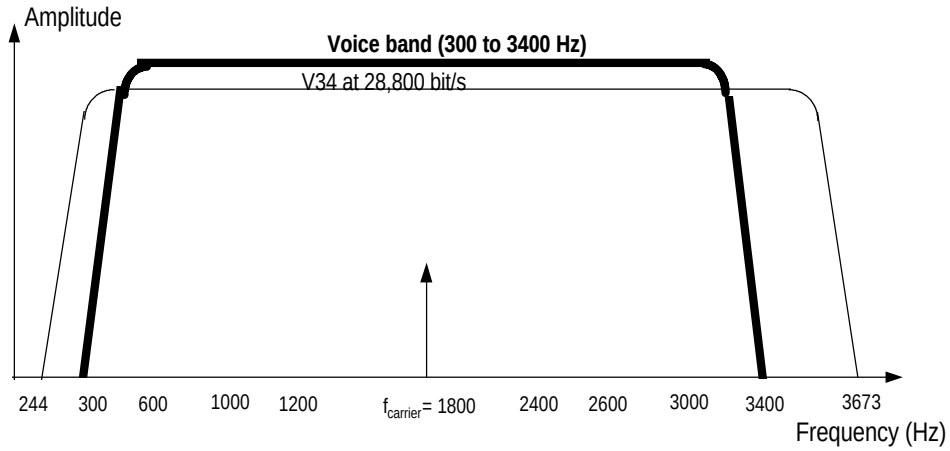
2.1 Distortion by passive CAN cable

V.34 has adaptive equalization capability which can compensate for the attenuation frequency distortion caused by cable.

2.2 Limitations of PCM codecs used in the network (mainly in the IEN)

Some PCM codecs used in the network have been found to have narrower bandwidth than others although all meet the ITU-T requirement of having a minimum bandwidth from 300 to 3400 Hz (standard voice frequency band).

At 28.8 kbits/s, the modem signal occupies a bandwidth from 244 Hz to 3673 Hz which is slightly larger than the designed bandwidth of the network, therefore it is affected by the network bandwidth. It has been found that PCM codecs with narrower bandwidth reduce the coverage of modems.



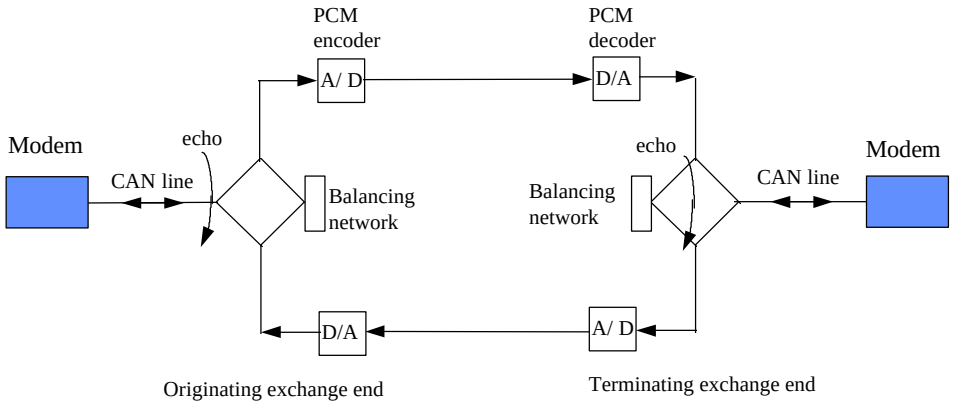
Exchange frequency response and modem signal bandwidth

3. Difference in Terminating Impedance

For optimal results, the line must be terminated in a matching impedance (or electrical load). In a case where the line is mismatched, eg terminated at one end by a 600 ohm resistive (frequency independent) load and at the other end by a complex (frequency dependent) load, the frequency response of the line in one direction will be different from that in the other direction. This asymmetry becomes serious in short lines (less than 2 km) when the response increases with frequency in one direction but decreases with frequency in the opposite direction. Modems with equalisation algorithm assuming symmetric lines may fail to train (adapt) in this situation, or may reduce the modem speed.

4. Echo return loss

Modem impedance mismatching at the originating and the terminating end causes echo. Since the echo is attenuated by the CAN line, it affects modems on short CAN lines more than than those on long CAN lines.



Impedance mismatching causing echo

Modem impedance is not regulated by ACA technical standard TS 002 and in the field the termination will vary widely making it difficult to reduce near and far end echo.

5. Impulsive noise

Rural customer lines are affected by impulsive noise with the most common source being poorly maintained electric fences. The best network solution to support 28.8 kbit/s is to use optical fibre digital transmission for a major length of the line. Whilst predominantly a rural problem, impulsive noise may be a problem also in non-rural areas. The major sources in these cases tend to be electrical spikes induced by such equipment such as electric motors or power switching equipment.

6. Customer premises equipment (CPE) issues

Multiple CPE connected in parallel with modems alter the impedance of the line and this degrades the echo return loss.

Transmit levels of modems also affect the performance: a level too low will lower the SNR, too high a level will overload the PCM codec in the exchange and increase the echo signal to a level which may affect the adaptive equalisation process.

There are no compatibility requirement for modems. They therefore may not necessarily comply with ACA Technical Standard TS 002, eg. with respect to specified CPE output impedance.

CPE design is a major factor in overall data performance.

7. Conclusion

These impairments may exist alone or in combination. Dealing with them requires an anlalysis of the factors operating on any one particular connection. The type and performance of the customer equipment particularly the modem have a significant bearing on the overall performance of and end-to-end data session experienced by a user. Modem technology is continually advancing and newer types and higher quality (generally more expensive) modems are generally likely to deliver better results.

Appendix 4

State and Territory Government Strategies for the Provision of Information Technology Services

AUSTRALIAN CAPITAL TERRITORY

STATE-WIDE STRATEGY	EDUCATION	CALL CENTRES	HEALTH, COMMUNITY SERVICE AND LIBRARY	ONE STOP SHOP AND INTERNET STRATEGY	RTIF FUNDED INITIATIVES
Canberra Wired Community Information Strategy for the ACT. Aims to: • encourage an information rich environment that enhances quality of life for all Canberrans; and • position the ACT Govt as a leader in the provision and delivery of public information services. Via: • Development of public access points as sources of community information, including libraries, shopfronts, shopping centres and bus interchanges **Office of Information Technology and MultiMedia.** Formed in 1998 to: • provide policy advice on whole-of-Govt communication, IT and multimedia management issues; • provide policy advice on making the ACT a leading edge technology centre; and • assist regional business to undertake and grow technology export products.		**13ACT1.** Single telephone number contact point established in 1997. Precursor to planned establishment of ACT Govt Call Centre (currently being developed).	Dial up access to Library and Information Service's catalogue. Public access internet terminals installed in all libraries. **ACT LawNet.** Enables all ACT legislation to be accessed electronically. ACT Electricity and Water (ACTEW) Pilot Project of "fibre-to-the curb" broadband cabling soon to commence. The trial will include the following services: • telehome working; • electronic library; and • virtual shopfront.	**AUSTOUCH on the Internet.** Information on all aspects of Govt services, based on information available at AUSTOUCH touch-screen kiosks, available via the internet. Planned developments include: • the introduction of bar code readers for bill payments; • internet-compliant kiosks; • electronic postcards that visitors can send anywhere in the world, free of charge. Internet site development will include more interactive pages and greater emphasis on the provision of services rather than purely information.	**Australian Capital Region.** $0.045m. Strategy will describe the region's current infrastructure and capacity, and current and potential demands for enhanced IT usage. Further RTIF proposals under development.

NEW SOUTH WALES

STATE-WIDE STRATEGY	EDUCATION	CALL CENTRES	HEALTH, COMMUNITY SERVICE AND LIBRARY	ONE STOP SHOP AND INTERNET STRATEGY	RTIF FUNDED INITIATIVES
Information Management and Technology Blueprint - A well connected future. Strategic framework for the creation of accessible and responsive Govt services and their delivery to the community, providing for better utilisation of the Govt's IT resources. Accompanied by the Policy and Guideline Framework which is updated regularly to provide direction and guidance to agencies in implementing the Govt's IT strategies. **Year 2000 Millennium Strategy** aims to raise awareness of, and to assist government agencies and small to medium enterprises in, dealing with Year 2000 rectification. Initiatives underway include: • Year 2000 Business Risk Analysis Methodology, period panel contracts; • Year 2000 Website; and • regional and metropolitan awareness seminars. **connect.nsw Implementation Framework** outlines agency requirements and initiatives to implement the connect.nsw strategy across Govt, inclusive of electronic service delivery, integrated govt, electronic commerce activities and networked communities. **Office of Information Technology** established 1997.	All schools in NSW are connected to the internet and 55,000 computers have been delivered to students and libraries. NSW TAFE is developing and delivering training over the internet. Further development of the Education Sector under Service NSW will provide a cohesive, comprehensive and integrated site that delivers educational and library information at all levels of learning, to all sections of the community	Govt approach to call centres includes: • investment attraction activity, which focuses on opportunities for companies to set up call centres in NSW; and • Govt's own use of call centres, improving call centre services within the Govt's integrated service delivery framework.	**NSW.net.** Electronic information network for NSW Councils and Libraries. Offers unlimited internet services for 100 central public libraries and local authorities. **Country online.** Program provides after hours access to school Internet facilities by the the broader community. Initiated in 25 NSW rural schools.	**connect.nsw.** Internet strategy designed to improve Govt services and service delivery to the community. Part of this strategy is **Service NSW** an online guide to NSW Govt information and services. Key features: • the electronic service and information delivery channel for Govt services; • a single electronic access point for Govt services; and • 160 agency web sites connected to Service NSW with an additional 900 links to information services. Further development of Service Sectors under Service NSW will provide ease of access to information, and services from the 'client's perspective'. **Govt Access Centre.** Single shop front trial being undertaken in 7 rural locations across the state. The community can access multiple govt services at a single point. The Service NSW single Internet site supports this single shop front approach. Tender process underway for the **Government Network Service (GNS)** to provide data telecommunications facilities throughout NSW government agencies and to establish remote and rural points of presence, which can be also used by the private sector.	The RTIF board provided $2.639m funding for 16 NSW projects in the first 2 rounds of funding. NSW submitted 29 projects for funding in the third funding round. Govt established a state RTIF Advisory board that advises the RTIF Secretariat about NSW proposals to ensure the projects: • comply with the Govt's strategies and objectives. • do not duplicate other initiatives; and • realise synergies with other RTIF and NSW Govt projects.

NORTHERN TERRITORY

TERRITORY-WIDE STRATEGY	EDUCATION	CALL CENTRES	HEALTH, COMMUNITY SERVICE AND LIBRARY	ONE STOP SHOP AND INTERNET STRATEGY	RTIF FUNDED INITIATIVES
Darwin 2010. Providing for Darwin to become a strategic location to support NT, national and international business. **The Living Lab.** Development of smart partnerships with private companies and Govt agencies to apply innovative technologies throughout the NT. **Transforming the Track into the Superhighway.** NT Govt endorsed approach to tackling issues relevant to the Information Age. Strategies still being developed include: • Advanced Communications Strategy looking at the issues required to provide suitable world class telecommunications and other infrastructures for the NT; • Geographic Information System that incorporates all NT Govt information that has, or can have, a geographical reference; • Information Industry Development Strategy aimed at increasing the use of new technologies and e-commerce in the NT; and • strategy to develop the e-commerce capabilities of local business, including those businesses located in the regional and remote parts of the NT.	**Education 2000**. $0.075m. Provide minimum ISDN quality connections to the 179 NT schools. (10 currently on the ISDN network, further 70 able to be connected, remaining, 97 need satellite-based services). Broadband connections will allow NT schools to: • access external education systems; • develop IT courses and content, • prepare students for new information industries; and • provide required IT skills for workforce.	Consultancy being prepared to consider: • the competitive position of the NT in attracting a private firm to establish a call centre locally; and • the viability of establishing a govt call centre.	**Health and Community Service.** New advanced information system, including video conferencing for training specialists. **Hospital Information Services.** New advanced hospital information system, including patient assessment on computer screen. **Police Communications Network.** Providing information to the community via the internet. **Library System Replacement Project.** Catalogue NT community, Govt and the University libraries in a single system, provided on an internet interface. In the future will potentially include full text of documents. The NT Govt is participating in **Online Australia Day** and has applied to NOIE for Online Australia Regional Summits to be held in Alice Springs and Katherine during October 1998.	**Government On-Line.** Electronic service delivery of NT Govt's information, services and facilities. Reviewing **NT Govt Internet Site** to increase the amount of information provided by Govt agencies, the development of on-line service delivery, and the competitive positioning of the NT in the global information economy. Specific projects include: • the development of a business entry point to compliment the Commonwealth Govt business entry point; • a tourism entry point for all tourist activities in the NT; • a single entry point for the NT. NT Govt is investigating the implementation of kiosks and community access centres to enable community access to Govt information and services to be offered on-line.	**Electronic Outback.** $3.2m. To provide 66 remote and largely indigenous communities in the NT with access to modern communications services and technology, with a major roll-out of telecommunications infrastructure to the communities. **Network the Northern Territory.** $16m. Established to facilitate the rollout of high speed, broadband network. Has the capability to connect non-Govt users to the NT Govt Wide Area Network and enhance access to Govt and business systems for NT Govt agencies located in remote and regional areas.

QUEENSLAND

STATE-WIDE STRATEGY	EDUCATION	CALL CENTRES	HEALTH, COMMUNITY SERVICE AND LIBRARY	ONE STOP SHOP AND INTERNET STRATEGY	RTIF FUNDED INITIATIVES
A strategic plan is currently being developed.	**Connect.Ed.** Part of a multi million dollar contract with Telstra to rollout ISDN like services to 1300 schools across the state.	A call centre strategy is currently under development.	Queensland Health has allocated $1.5m from its capital works program over the last three years to develop telehealth services. There is now a network of over 110 videoconference systems in health facilities across the State, some capable of teleradiology applications, in addition to 45 sites capable of audiographic conferencing.	The Govt has been utilising the one stop shop concept for a number of years through its Queensland Government Agent Program (QGAP). It currently has 44 QGAP offices across the State. The **Queensland Online** project will establish an electronic one stop shop which will provide services through a range of technologies (eg internet, kiosks, call centres etc).	**Farmwide.** This project will result in the establishment of an additional six internet points of presence in the more remote parts of the State. **Wide Bay 2020.** This project will establish a digital network covering the Wide Bay Region. The network will provide internet access at the cost of a local call to all the residents within the region. The applicant will also: • act as a network wholesaler to commercial ISPs, using their bulk puchasing power to lower telecommunications costs; and • hold information, training and awareness sessions throughout the region. Local councils will also be encouraged to provide public access to the internet within the locality. **Regional Community Information Network.** This project will establish a community based ISP, providing local call access to southern Queensland. The project will also provide public access centres, training services and on-line information. **Women's Justice Network** $1.324m. This project will establish a three year pilot to provide a network of 16 video conferencing sites throughout South West Queensland. These sites will: • enable women to access independent, confidential legal advice; • train existing community workers in participating service organisations to become legal information workers; and • provide these workers with resources including a PC video link and log-in access to the Legal Aid information database.

SOUTH AUSTRALIA

STATE-WIDE STRATEGY	EDUCATION	CALL CENTRES	HEALTH, COMMUNITY SERVICE AND LIBRARY	ONE STOP SHOP AND INTERNET STRATEGY	RTIF FUNDED INITIATIVES
Information Technology 2000 Vision (IT2000) aims for SA to gain recognition as an international IT centre of excellence. **Contract with AAPT.** $100m. To provide savings of up to 40% on STD and IDD calls for SA business.	**DECSTech 2001.** $15m (to date). This Department of Education and Community Services (DECS) project is the focus for implementing **Creating the Information Society, A Plan for Information Technology 1996 - 2001.** It aims to provide: • access to global information throughout SA educational institutions; • interaction with national and international learning communities; • curriculum reform to ensure technology competence for all staff; • training and development to enhance technological competence of staff; • flexible delivery of curriculum; and • flexible delivery of training and development. The IT Plan goals for 2001 are to connect DECS schools, units and administration sites through: • local area networks; • wide area networks; • ISDN (entry level broadband) services; • provision of one computer for every five students in schools; • administration computers for all pre-school sites; • trialing of experimental applications such as videoconferencing; and • training and development in administration and curriculum uses of communications and information technology.		**Telemedicine.** SA established Australia's first Telepsychiatry service in October 1995 following extensive trialing. It is now considered a mainstream delivery tool and the Department of Telemedicine is a unit within the Country Health Division of the South Australian Health Commission. The following services are provided: • psychiatric assessment; • discharge planning; • education; • interstate supervision of psychiatric registrars; • case conferencing; • emergency consultation; and • psychopharmaceutical enquiries. **Health-On-Line.** A seed funding project providing medical product information and developing line educational material and training materials for the health industry.	**South Australian Central Internet Project.** $0.5m in seeded funding. Comprehensive index of South Australian information, web sites and online resources from business, community and Govt has been developed.	**South East Health Service Video Conferencing.** $0.282m. The project will extend the delivery of health and community services across this region using video conferencing links as a trial to evaluate costs and benefits for the State's Regional Health Services, community service providers, health practitioners and the regional community. **Coorong Microwave Communication Project.** $0.507m. Funding for infrastructure to encourage telecommunications service providers to establish higher capacity, and cheaper data and voice links in the area. **Regional Internet Services.** $1.125m. The project will provide internet points of presence to 10 regional communities to supply local call internet access. Establishment and operational financial support is being provided by NTN and the applicants. Training in internet and e-mail use will be provided for the applicants' staff and the community at each centre over the three years.

TASMANIA

STATE-WIDE STRATEGY	EDUCATION	CALL CENTRES	HEALTH, COMMUNITY SERVICE AND LIBRARY	ONE STOP SHOP AND INTERNET STRATEGY	RTIF FUNDED INITIATIVES
Networking Tasmania Project (NTP). $50m agreement between Telstra and the Tasmanian Govt designed to bring ATM frame relay and other advanced services to Tasmania. **Directions Statement.** The Tasmanian Govt identified information technology and advanced telecommunications as providing greatest potential for long term growth within Tasmania. As such these areas were targeted for upgrading.	**Directions for Education.** $48m. A three year project that will provide a large infusion of information technology equipment and infrastructure into Tasmanian schools, including: • at least one modern computer for every five students; • a lap top computer for every full time teacher; • cabling of schools to provide high speed local networks connecting school computers; • connection of schools to communications infrastructure with a high digital data transmission rate capable of delivering internet and other services; • use of video conferencing and related technology to improve the teaching and learning of students in remote schools and the delivery of professional development programs; • provision of advice to schools on quality digital educational resources for staff and students; • access to professional development for teachers to enable them to use the new technologies; and • community access to the Internet, though use of the TALIS library system in local libraries.	**Call Centre of Excellence - 1997.** Part of the Tasmanian Govt's Directions Statement, which seeks to establish Tasmania as a living lab for call centre research and development in South East Asia and the Pacific regions.	**Community Access Strategy.** Tasmanian Govt strategy to provide equity of access to online services.	**One-Stop-Shops.** Tasmanian Govt has established a single coordinated approach to all over-the-counter transactions with Govt agencies including bill paying and obtaining licences.	**Telehealth Tasmania Network.** $5.596m. This project aims to develop a statewide network of over 40 telehealth facilities to provide: • access to specialist services; • wider choice of health services and providers; • enhanced links between rural and remote GPs and their patients; and • integrated networks for active management and participation in the health of the community. **OPEN-IT.** $0.250m. A strategic plan to establish an integrated approach to the implementation and delivery of online education and training resources through all education sectors. **Tasmanian Electronic Commerce Centre (TECC).** $4.5m. Aims to increase the uptake of electronic commerce across Tasmanian industry. **Service Tasmania Project.** $3m. Streamline the delivery of Govt services and enhance their accessibility to the community in rural and remote areas. **Tasmanian Integrated Community Network Process and Marketing.** $1.5m. For the development and implementation of a coordinated and consultative community network to assist communities identify telecommunications issues, options and technology requirements. **Community Access Centre Project.** $6m. To develop community access centres throughout Tasmania.

VICTORIA

STATE-WIDE STRATEGY	EDUCATION	CALL CENTRES	HEALTH, COMMUNITY SERVICE AND LIBRARY	ONE STOP SHOP AND INTERNET STRATEGY	RTIF FUNDED INITIATIVES
Victoria 21. Objectives: • citizens, Govt and business applications of multimedia communications and information services will surpass international benchmarks; • creation of wealth and jobs through sustained growth; and. • recognition as a centre of excellence in the global info economy by 2001. Funding allocations (over three years) include: • $47m. Innovative multi-media projects; • $110m. Infra-structure investments to support business process re-engineering within Govt; and • $13m. **Multimedia 21 Fund** for development of creative multimedia commercial products.	**Learning Technologies in Victorian Schools 1998-2001.** Planned expenditure: • $80m on new technology in schools; • $56m on teacher training; and • $51.4m (over 2 years) to – provide a minimum 64kbit/s link to all schools and TAFEs; and – additional funding for provision of computers for teachers and schools.	Proactive campaign to attract international call centres as part of investment recruitment activities.	**VICNET.** Electronic networking infra-structure established on the base of State public libraries. Key features: • web site generates overs a million 'hits' a week; • provides affordable access to networked information, and • is a focus point for Govt and community groups to publish their own information on the internet. Complementary Programs include: • **SKILLS.NET.** Aims to build community skills and familiarity with networked information. Provides funding to local community projects that provide internet skills development and fulfil community needs. Will provide internet skills to more than 40,000 Victorians over the next three years; • **Telemedicine** - The Victorian Deparment of Health is currently running telehealth programs in the following areas: – telepsychiatry; – telerehabilitation; and – teleradiology; and • **Webspinners.** Structured training and work experience program for young people aged 16-19 years. Provides participants with the basic skills required for entry level employment in the multimedia industry.	**VIC-ONE.** Contract with AAPT Networks to build, own and operate a WAN establishing a single data network connecting more than 3100 Govt sites. Provides: • standard operating environment across Govt; • link between all Govt departments and agencies, regardless of location; • broadband capability (ie rapid data exchange); • seamless interaction between computer systems; • 'any point-to-any point' communication; and • use of latest technology (ie. video conferencing and telemedicine links). Once established, services will be generally marketed to community and business users. **Online Government 2001.** In partnership with the private sector (**maxi)**. By 2001 will bring all appropriate Govt services and information online. Aims to: • improve public sector service delivery; • over time, to reduce service costs and the cost to citizens of doing business with Govt. Features: • same content delivered over kiosks, the internet and interactive voice response telephony; • 'client focus' (ie. consumers only need to know the service they want to access, not the particular government agency); • digital signatures; and • smart cards. When fully developed, will provide single point of entry for all Govt and business services.	At 30 June 1998 approximately $1.6m (or 6% of the state's total allocation) had been granted to various projects. The Govt established a Victorian RTIF Board to provide advice to the Commonwealth Board on Victorian projects. The aim is to ensure there is no duplication of activity and that potential synergies are realised. Specific programs include: **avNET.** $0.610. The avNET (Alpine Valleys Network) project will extend the communications of North East Victoria so that education, training and support programs for economic, community and cultural purposes can be provided. Services will include local call internet access and a range of internet services for local business, community groups and individuals. **WPD/Bass Coast-Technology Centre and IT Platform.** $84m. Establishment of a 'Technology Centre' in Wonthaggi to provide information technology training, graphic design, electronic publishing, multimedia development and business facilitation.

WESTERN AUSTRALIA

STATE-WIDE STRATEGY	EDUCATION	CALL CENTRES	HEALTH, COMMUNITY SERVICE AND LIBRARY	ONE STOP SHOP AND INTERNET STRATEGY	RTIF FUNDED INITIATIVES
Government Strategies. (endorsed 1998): • Telecommunications; • Online Services; • Technology Rationalisation; • Industry Development; and • Information Management. **Boshe Report:** Statewide assessment of communications services available and services needed but not yet available, and the impact of improved communications on economic and social development and employment. Results from the audit will see future policies for the nine regional centres developed. **IT Infrastructure.** $10m. Upgrade infrastructure, especially in rural areas. **Office of Information & Communication.** Established to coordinate and develop information and communication policies and strategic direction for the state.	**Technology in Schools Project:** $20m (3years). Project to support five initiatives: • Technology for schools; • Internet in the curriculum; • Innovation in the classroom; • EdNet; and • Satellites in schools. **Technology for Schools Program.** $17.8m of further funding during 97/98-00/01 for: • **The Ednet Project.** $5.2m to extend the Education Department's WAN to all schools and districts • **Computer in Schools Project.** $10.96m for provision of an additional 5000 computers in both rural and metropolitan schools. • **Library Information System Project.** $1.65m to install library information software packages in 200 small Govt primary schools across WA. $1m for communications '**Smart Use'**, including the internet and e-commerce. **Partnership with WA Universities.** All public universities working with Office of Information and Communications to increase knowledge and acceptance of Online services.	Bill payment, interactive voice response and call centre contracts have been awarded to assist the integration of call centres within agencies.	**Telecentres**. Over 100 Telecentres have been established in rural and remote communities. Enables communities to have access to information and communication services. In some areas this includes video conferencing and internet access. Over the next 12 months internet access will be increased. **Online Communities.** Project to put rural communities online. Three communities are currently advancing this project.	**Online WA.** Currently preparing tender for Phase 1 "Single Window": • Phase 1 - internet based; and • Phase 2 - call centres and smart cards. **Business and Investment Embassy**. Interactive marketing vehicle for business and investment opportunities. Will become the "business channel" for the WA "single window". 450,000 **ECARDS** have been distributed by the Hospital Benefit Fund of WA. The card: • carries HBF membership information; • up to $1000 can be placed on the card; • rechargable; and • used by 1000 WA businesses.	**WA Telecentre Initiatives Fund.** $1.8m. Extension of WA Telecentre programme. **TeleYouth.** $0.050m. Department of Commerce and Trade through the WA Telecentre Support Unit will introduce rural and remote youth to new opportunities by establishing an on-line TeleYouth Network.

Appendix 5

A5. Costs and Benefits of Specifying an ISDN Service as part of the USO

A5.1. Costs of Supplying Basic Rate ISDN

The initial costs incurred as a consequence of prescribing ISDN as part of the USO would be limited to the supply of ISDN services to the 4 per cent of the population not covered by the licence condition.[1] Telstra is already required by a licence condition to be in a position to make available, within 90 days of a request, a carriage service that provides a digital capability broadly comparable to that provided by an ISDN channel to 96 per cent of Australia's population by 31 December 1998. It is fulfilling this obligation by providing access to a basic rate ISDN service.

No change would be expected in service take-up rates among the 96 per cent group as a consequence of prescribing ISDN as part of the USO and hence there would be little, if any, costs or benefits flowing from such a decision related to that group.

A5.1.1. ISDN Cost Elements

Supplying an ISDN service to a customer comprises the cost elements outlined below and summarised in Table A5.2.

A5.1.2. Network Switching and Inter-exchange Transmission

ISDN requires a digital switching and transmission network. Telstra has advised that it will, by the end of 1998, have extended its programme to convert to digital its switching exchange systems and inter-exchange transmission capabilities to all but 70 exchanges[2]. Except for the 70 non-digital exchanges, digital switching and transmission costs have already been incurred, and therefore no additional costs in relation to these parts of the network would be required as a consequence of prescribing a basic rate ISDN as part of the USO.

For the 70 non-digital exchanges, it is reasonable to assume that over the next few years Telstra would, in the absence of any additional government requirements, continue to convert its exchanges and inter-exchange transmission systems to digital operation. Prescribing ISDN as part of the USO would, however, be expected to require Telstra to

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1 The universal service obligation levy could, however, increase as Telstra could claim re-imbursement for supplying services at a loss to the 96 per cent of the population that will be covered by the licence condition by December 1998. This would represent a transfer from other carriers to Telstra rather than a net increase in costs to society. Under current arrangements, the supply of any services at a loss as a result of Telstra's licence condition are funded by Telstra.

2 Telstra, submission, p.12.

make these upgrades earlier than it would otherwise have done. The digital switching conversion costs attributable to prescribing an ISDN service would, therefore, be limited to only the costs incurred in making the expenditure earlier - not the capital amount of the upgrade.

At reasonably low levels of demand, it is also reasonable to assume that no additional inter-exchange transmission infrastructure expenditure would be required because existing infrastructure would carry the load. If, however, demand increased significantly, for example as a result of altering the price levels of ISDN compared to the standard telephone service, traffic levels over current infrastructure could approach capacity and require additional infrastructure spending to avoid congestion.

The cost estimates provided by Telstra for establishing an ISDN capability do not include such additional switching and inter-exchange transmission costs.

Telstra's figures for this category of costs are based on cost estimates of connecting customers served by the 70 non-digital exchanges to digital exchanges.

A5.1.3. ISDN Capable Transmission to Local Exchange (local access)

There must be a transmission mechanism between the local ISDN-capable digital exchange and the customer premises. For most households and businesses no additional network expense is likely to be incurred beyond a line card in the local exchange. However, for households and businesses further than 5 km from a digital exchange or sub-exchange, the cost of providing local ISDN access increases substantially.

In its submission to this Inquiry Telstra stated that:

> By the end of 1998, Telstra plans to have extended access to ISDN services within 3 months of a request, to all but 3.7 per cent of its ordinary telephone services in operation. Therefore, a universal ISDN service would require providing ISDN access to the remaining 3.7 per cent of telephone services, This 3.7 per cent includes some DRCS radio services, landline services where the physical loop is too long for the ISDN technology and about 30 000 services connected to some 70 exchanges which have no ISDN transmission.[3]

Telstra also advised that the capital cost of providing transmission links between a digital exchange and a customer premises for the 3.7 per cent of Telstra's access lines mentioned above would total $2.495 billion[4]. This included use of HCRCS, Fixed Radio Access (FRA) and optical fibre cable with an associated remote integrated multiplexer, ISDN repeaters and satellites. (Note that some of these transmission mechanisms have not been developed for ISDN communications to date and Telstra advises these costs are estimates which could vary up or down by as much as 15 per cent.) A break down of these costs is shown in Table A5.1.

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[3] Telstra, submission, p.12.

[4] Telstra, submission, Table 3.

Table A5.1

Capital Costs - ISDN access for remaining 3.7 per cent of Telstra's access lines that will not have access to ISDN services by January 1999

Item	Cost ($ million)
High Capacity Radio Concentrators	96
ISDN Repeaters	174
Fixed Radio Access	143
Optical Fibre plus mulitplexer	154
Satellite	1 928
Total	$2,495

Source: Table 3 of Telstra's submission.

The largest and most significant cost is for satellite based services. Telstra advises that the satellite costs are based on satellite ISDN services being provided to 20 per cent of the 370,000 services that will not have ISDN available by the end of 1998 (the remaining 3.7 per cent). The cost of the satellite based service has assumed per service costs of $25,000. This amount includes: the provision of a larger and more powerful satellite earth station with an independent solar or mains power supply as customer equipment; satellite airtime costs nine times greater than a terrestrial voice service; equipment required at the Telstra earth station; and equipment to connect the service into the ISDN exchange switches.

Consultants engaged by Telstra, Tasman Asia Pacific Pty Ltd, estimated the number of services without an ISDN capability at the end of 1998 will be 370,000.[5]

Using these estimates of the potential number of customers and Telstra's cost estimates, the average capital cost of establishing ISDN capable local access can be estimated on a per service basis at $6,750 (see Table A5.2).

A proportion of capital expenditure would be incurred irrespective of the number of households and businesses in the 3.7 per cent group that take-up the service because some infrastructure needs to be in place so the service can be supplied within a specified period (such as within 90 days of a request). Also some infrastructure would provide services to a number of customers (eg. radio based apparatus might serve a number of customers). However, it is unlikely that all the infrastructure Telstra has indicated would be required would need to be installed immediately. For example, with satellite based technology Telstra could purchase satellite airtime from various satellite operating companies on the basis of demand, and follow a similar approach for earth station installation at customer premises.

[5] A straight percentage of the Australian population would suggest a somewhat lower figure, but there are complex issues requiring assessment in order to independently judge the number of households to which ISDN capable services is not available at the 96 per cent population coverage level.

A5.1.4. ISDN Line Card and Network Terminating Unit

The customer's access port at the exchange needs to be changed to an ISDN terminal or line card. This is matched at the customer's premises with a network termination unit and 'terminal adapter' into which customer equipment is connected. Supplying and installing these items incurs a cost of about $590 per customer.

A5.1.5. ISDN Customer Equipment

The fourth cost element is the customer equipment, such as an ISDN compatible telephone or fax machine and/or an ISDN computer connection card. At a minimum, this equipment would cost about $650 per customer.[6] In practice a customer is likely to purchase more equipment.

A5.1.6. Operating and Maintenance

The final cost element is the operating and maintenance costs in supporting an ISDN service over and above the operating and maintenance costs of supporting a voice grade PSTN service. These are on-going costs, and are likely to be small given that Telstra would continue to be obliged to provide a standard telephone service.

Table A 5.2

Costs to Supply ISDN to Customers not already covered by Telstra's licence condition

Cost Element	Cost Incurred Per Service	Comment
Exchange and inter-exchange transmission	Zero or small	Perhaps a small additional cost due to conversion to digital exchanges being brought forward
ISDN Local Access	$ 6,750	This is an average figure. Aggregate capital expenditure likely to be more in the earlier years.
ISDN Line Card and NTU	$ 590	
ISDN Customer Equipment eg. computer card	$ 650	Cost likely to be more as customers will want other customer equipment besides an ISDN computer card.
Operating and Maintenance	Small	
Total Cost per Customer	$ 8,190	

ACA analysis

The $6,750 figure (Table A5.2) is the average unit cost for supplying ISDN services to all 370,000 customers, ie. a take-up rate of 100 per cent. Telstra advises that for meeting a

[6] Telstra separately estimated the total capital cost of the equipment required by customers to use the ISDN on the basis that such equipment would cost $1045 per customer for an ISDN telephone, facsimile terminal or digital 'modem'. However, customers could choose to just have a digital modem which can be purchased singly for $650 if all they were concerned about was obtaining better access to the Internet.

lesser take-up rate the unit cost would be over $13,000 per service. The cost estimates used for comparison purposes to the benefits assumes that 25 per cent of capital costs were unrelated to demand, and not a simple per unit cost of $6,750. Telstra provided estimates of costs based on lower take-up rates on 7 August 1998. These latter figures from Telstra confirmed the ACA's estimates of overall costs.

A5.2. Benefits of Supplying ISDN Service

As discussed in Chapter 6, no significant positive externalities have been identified that would suggest there are benefits from the supply of a basic rate ISDN service to people that are not caught by consumers' willingness to pay to receive the service. On this basis, a measure of the gross benefits of prescribing an ISDN service as part of the USO is given by the willingness of customers (including households, businesses, and government agencies) to pay for the supply and use of the ISDN service, over and above what they are prepared to pay for the standard telephone service. Part of this gross benefit is paid by consumers to the service supplier (a transfer). The benefit remaining is the consumer surplus.[7]

Estimating the benefits to the community depends critically on judgements as to consumers' preferences:

- How many people will consider it worthwhile to buy the service at given connection and usage prices—what will be the take-up rate?
- What is the number and distribution of people willing to pay more than these prices, and by what amount?

A5.2.1. Take-up of ISDN

Current take-up levels of ISDN in Australia are low. Telstra advises that at 17 June 1998 it was supplying some 75,000 basic rate ISDN services. Only 8,000 services are supplied outside metropolitan and central business districts. There are about 200 household subscribers to the service; the rest are businesses and government. This suggests current basic rate ISDN take-up comprises about 0.7 per cent of standard telephone services supplied.

In its submission to this inquiry, Telstra stated:

> The current demand for Telstra's basic rate ISDN services which include MICROLINK and OnRamp 2, is predominantly characterised by large business

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[7] In a non-competitive market the price paid by consumers may include a monopoly price component over and above marginal costs, in which case some net benefit will accrue to the supplier of the service (called producer surplus) rather than the consumer. In a regulated market, such as services provided under the USO, the price paid may not cover all the resource costs of supply. Note that there will also be producer surpluses to the extent that some suppliers are prepared to supply the market for less than the market equilibrium prices.

> users; 55 per cent of services in operation are for large corporate businesses and governments; 15 per cent are for medium to large businesses; 30 per cent for small businesses; and less than 1 per cent for residential users.[8]

The reasons for low demand for ISDN services are most likely because of the relative price of ISDN compared to its nearest substitute - the PSTN. An IT manager of one company stated in advice to the ACA's consultant:

> We looked at getting ISDN but it was too expensive for our needs. We have a permanent connection to our ISP—24 hours per day, 365 days per year—and it costs us a flat 25 cents. With ISDN, we'd pay thousands of dollars per year in calling charges. We use the web for research all the time, but it's just not worth the extra cost just to be able to look up some sites or download files a bit faster. We don't need videoconferencing and we don't transfer large amounts of data, so we're quite content with a 56k modem over the phone line.[9]

This quote highlights that a prominent distinguishing feature between ISDN and a standard telephone service is that all calls over ISDN are timed. The fact that ISDN calls are timed does not mean they are necessarily more expensive overall than the PSTN. For example, under Telstra's current pricing arrangements a local ISDN voice call typically costs 26 cents at day rates (for 6 minutes) and 20 cents at night and economy rates (for 6 minutes), compared with 25 cents (untimed) over the PSTN. A local three minute ISDN data call costs 20 cents at any time of the day.

However, typically, data calls are much longer than this, with 20 minutes being the industry standard for an average Internet call. At day rates, a 20 minute local ISDN data call costs 71 cents, almost three times the PSTN local call cost of 25 cents. Even the ISDN night and economy rate price for a 20 minute local call, at 41 cents, is much more expensive. With longer ISDN local data calls, the price difference is even more pronounced: $1.91 for an hour at day rates, and $1.00 for an hour at night or economy rates. Table A5.3 summarises the differences.

Table A5.3

Comparison of ISDN and PSTN charges

Item	PSTN	ISDN (OnRamp 2)
Installation charge	$120	$295
Annual access charge	$240	$720
Local call charge for 20 minutes	25¢	71¢ day rate 41¢ at other times
Customer equipment costs	Modem $250	Terminal adaptor $650

Note: 20 minutes is generally accepted as the average time for an Internet session; the price difference is larger for longer holding times.
Source: The Allen Consulting Group

[8] Telstra, submission, p.11.
[9] The Allen Consulting Group report to the ACA.

The differences between these two sets of charges are such that the PSTN/modem option is almost always significantly less expensive for virtually all users, particularly those accessing the Internet and other online services using a personal computer. This conclusion also extends to users requiring two services to their premises, ISDN installation and access charges being higher than the installation and rental charges for *two* PSTN exchange lines.

This conclusion is supported by Telstra, which stated in its submission that 'Residential demand for ISDN is likely to remain constrained by the very low charges for access to the PSTS'.[10]

However, where reasonable Internet access is not possible over the standard PSTN service, the ISDN 'take-up rate could be higher than other comparable areas'—[11] such an argument is based on the reasonable assumption that there is a high unmet demand for Internet services in rural Australia because such communications would ameliorate the impacts of geographic distance.[12] This high demand for Internet access would flow through to demand for ISDN connections even when subscribing to an ISDN service would result in significant additional costs on consumers (connection charges, rental, usage and customer equipment).

If failure to obtain a good Internet connection was a significant factor in determining take-up of ISDN at this point in time, it would be expected that there would be higher residential take-up rate of ISDN of those customers within the 96 per cent group of the population covered by Telstra's licence condition and whose telephone service does not support high rate Internet access. With only 200 residential ISDN customers across Australia there is not a strong case to suggest this is, in fact, the case.

Further, the suggestions that take-up rates for Internet access will not be high is supported by recent research that indicates the reasons given by households for lower take-up rates in non-metropolitan areas, which have half the take-up rate of metropolitan areas, is not the unavailability of the service.[13]

Based on the current Australia-wide average take-up rates for basic rate ISDN (0.7 per cent), prescribing ISDN as part of the USO would initially result in some 2590 services being supplied to the 370,000 customers that will not have that option from January 1999.[14]

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10 Telstra, submission, p.3.

11 Tasman Asia Pacific Pty Ltd, Report to Telstra June 1998, page 12 discusses such claims including from the Kondinin Group, Groves and the Farmwide study.

12 Tasman Asia Pacific Report, page 14.

13 Communications Research Unit, Commonwealth Department of Communications and the Arts, 'Takeup of Information and Communications Technologies in metropolitan and Non-metropolitan Areas', July 1998.

14 As it is the large corporates in capital cities that dominate ISDN service take-up, using the national average will over-estimate the take-up among the 4 per cent not covered by Telstra's licence condition.

As noted above there may be higher (but unmet) demand for Internet services in rural and remote areas than in metropolitan areas which potentially will result in higher demand for ISDN services. Even if this assumption is correct, take-up rates might increase only marginally at best.

A reasonable maximum initial take-up rate would be 2 per cent or 7400 basic rate ISDN services, comprising 0.7 per cent representing customers who could not previously obtain ISDN and 1.3 per cent representing customers that would not normally purchase ISDN but who would do so in order to obtain Internet access. This is three times the national average take-up rate.

A5.2.2. Future Demand for ISDN

Data provided to this inquiry by Telstra suggests demand for ISDN services, although from a low base, is growing strongly at least in the business sector.

Commenting upon demand levels the ACCC in its draft report on the declaration of originating and terminating ISDN services under Part XIC of the *Trade Practices Act 1974* stated:

> While the current level of demand for switched ISDN services may be low, determination of relevant markets involves considering not only existing competition but also the potential for competition. The OECD notes that Internet users are beginning to generate 'the first significant growth in the use of ISDN by business and residential customers'. Furthermore, it is expected that end-users' requirements for digital carriage services will expand from Internet access to other applications. In this regard, Telstra is marketing ISDN services as a 'small office, home office' product for small phone systems, remote access to networks and video conferencing.[15]

It could be argued that demand or take-up rates for ISDN will continue to increase at existing price levels. For the business sector existing annual growth rates of ISDN take-up of about 0.3 per cent of the standard telephone service could be expected to continue. As discussed above, it might also be argued there is higher demand for ISDN in the 4 per cent population group because ISDN would be purchased as a means to obtain Internet access.

ABS surveys[16] show that another 500,000 households nationwide indicate an intention to obtain Internet access over the next 12 months. This implies a growth rate of around 7 per cent of households connecting to the Internet per annum based on PSTN access. However, it is unlikely that this growth rate would be realised when households or businesses have to pay the additional charges associated with an ISDN service. The following cost/benefit analysis is based on an additional 7400 ISDN services being supplied every year.

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15 Page 15.

16 ABS, 'Use of the Internet by Householders', ABS cat 8147.0, Feb 1998.

A5.2.3. Estimating Consumer Surplus

Estimates of consumer surplus with high confidence levels cannot be made because the services in question are new, with no well established market from which consumer preferences or valuations of services and demand levels can be estimated. Approximation of consumer surplus can be obtained by making assumptions about how take-up of the service will be affected by changes in prices.

A very broad first order approximation assumes that consumer surplus is related to the aggregate expenditure on the service and that changes to take-up are affected proportionally to changes in prices.[17] On this basis a very broad approximation would suggest that for the 702,000 Australian households or home businesses accessing the Internet the consumer surplus is $105 million per annum ($150 per household).[18]

Another method relies on a methodology developed by US economist Professor Jerry Hausman.[19] This method still relies on assumptions of likely take-up rates and how these rates might change with price, but also includes factors such as income levels of households, and before and after expenditures on services. This later methodology is the one used in this report (including in Appendix 6) to estimate the benefits from requiring a 28.8kbit/s service to be provided universally, but the results from Telstra's consultants Tasman Asia Pacific Pty Ltd based on the former method, are reported for comparison purposes.

Table A5.4 sets out broad approximations of the increase in aggregate consumer surplus from prescribing ISDN using the Hausman formula for a ten year period. The calculations assume: take-up rates will increase by 10 per cent for every 10 per cent reduction in

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17 That consumer surplus is equal to total expenditure divided by twice the price elasticity of demand, with a linear demand function.

18 Assuming price elasticity of demand is equal to -1.0, that is for a 10 per cent price increase there would be a 10 per cent demand decrease.

19 The key formula for determining consumer welfare is

$$CV = \left[\frac{(1-\delta)}{(1+\alpha)} y^{-\delta} (p_1 x_1 - p_0 x_0) + y^{(1-\delta)} \right]^{1/(1-\delta)} - y$$

where CV is compensating variation (a precise measure of welfare closely related to consumer surplus), δ is the income elasticity of demand, α is the price elasticity of demand, p0x0 and p1x1 are 'before' and 'after' expenditures and y is consumer income. (With new goods or services, p0x0 is zero, by definition.)

It turns out that, in practice, the important parameters are α and p1x1, with the measure of CV not at all sensitive to δ or how y is measured. Thus, the consumer benefits of enhanced digital data services will be larger the more they spend on these services and the smaller is the price elasticity of demand. As noted above, for the households that purchase Internet services, average annual expenditure is $300. Assuming a price elasticity of demand of –1.0, and values of 2.0 for δ and $67,000 for y (per household disposable income in current dollars), this implies a per household benefit of $150. This benefit is the benchmark against which the benefits from a digital data capability are to be compared in a cost–benefit analysis.

price[20]; initial take-up of the service will be 2 per cent of the 370,000 households not covered by Telstra's licence condition with a growth rate of 7400 services per year. The calculations also assume that those that take-up the service pay the current price of ISDN.[21] A discount rate of 3 per cent is used.[22]

Household expenditure on Internet services is increasing. The calculations in Table A5.4 therefore provide estimates for a household expenditure of: $300 per annum on the Internet (ISP charges only) reflecting the current national average for households connected; $700 per annum reflecting an intermediate amount[23]; and $1400 per annum Internet spending, reflecting the claims of Madden and Simpson of the average expenditure on broadband services for residential customers.[24]

Table A5.4

Aggregate Consumer Surplus for providing 370,000 households and businesses with access to ISDN (NPV over ten years at 3 per cent)

Consumer Expenditure on Internet excluding additional charges for ISDN ($ pa/customer)	Consumer Surplus[25] ($ million)	Gross Benefit[26] ($ million)
$ 300	$ 201	$ 501
$ 700	$ 269	$ 569
$ 1400	$ 388	$ 688

ACA analysis

Telstra's consultants, Tasman Asia Pacific Pty Ltd, estimated consumer surplus to be between $30 to $660 million (NPV over a 5 year period at 7 per cent). Its estimates reflect different assumptions on take-up rates (2-20 per cent) and how take-up might change. Tasman Asia Pacific's estimates were also made on the basis that each household spent some $2500 more per annum to be able to access the Internet. Adjusting Tasman Asia Pacific's estimates - using similar take-up rates and extending the analysis for ten years instead of five - suggests that its estimates of consumer surplus would have been between $247—$554 million (but note that the upper figure is based on unrealistically high take-up rates).

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20 Price elasticities of demand will vary over time as will expenditure levels. There may be an initial 'bandwagon' effect. However, it is very difficult to predict and the broad range of outcomes covered by the assumptions already allow for take-up rates well beyond what could reasonably be expected.

21 A connection charge of $295, an additional annual rental of $720, as well as purchase an ISDN computer card for $650.

22 Ten year Treasury bond rate (real).

23 The National Farmers Federation trial (Farmwide study) indicates farmers in that trial are spending around $600 per annum on the Internet.

24 Madden and Simpson's estimates are quoted in the Tasman Asia Pacific Pty Ltd report to Telstra.

25 Assuming a price elasticity of demand of -1.

26 This is the sum of consumer surplus and $300 million (NPV) in consumer expenditure associated with ISDN only. The consumer expenditure estimate does not include spending on ISDN usage charges to the carrier or Internet usage charges to the ISP. This is because ISDN operating and maintenance costs and ISP costs have not been included in the cost estimates. Not including these items will reduce both the benefits and costs, arguably by a roughly similar amount.

A5.3. Costs and Benefits Compared

Based on estimates of likely take-up of ISDN, and on the basis that current ISDN prices remain unchanged, it is concluded that the benefits to the community from prescribing ISDN as part of the USO would range from around $501 to $688 million over a ten year period comprising some $300 million in consumer expenditure (which represents a transfer payment from consumers to the USO carrier) and a consumer surplus of between $201 to $388 million. The upper level figure would only be achieved if households and home-businesses substantially increased their expenditure on Internet from $300 per annum to $1400 per annum. The high end of the adjusted Tasman Asia Pacific Pty Ltd estimates are judged to be beyond the range of reasonableness as it assumes take-up rates of 20 per cent, some 30 times more than current ISDN take-up rates.

The cost to the community is the cost incurred by the universal service provider plus the costs to consumers of additional customer equipment. These costs will depend on the likely take-up rates of ISDN and how much expenditure must be made initially, irrespective of the take-up levels. Over a ten year period, on the basis of the take-up rates and prices used to estimate the benefits, the costs incurred would amount to some $843 million.[27]

It is therefore concluded that costs to the community would exceed benefits by between $155 million to $344 million (net present value over 10 years).

Table A5.5

Costs and Benefits - ISDN Service in USO ($ millions)[28]

Costs to Community	Benefits to Community	Net Cost to Community
$ 843	$ 501 – $ 688	$ 155 - $ 344

ACA analysis

[27] Net present value over ten years at 3 per cent discount rate. Based on: 25 per cent of capital expenditure not related to demand and incurred in year one; and assets depreciate in value by 10 per cent each year.

[28] These figures are discounted values over 10 years at a discount rate of 3 per cent.

Appendix 6

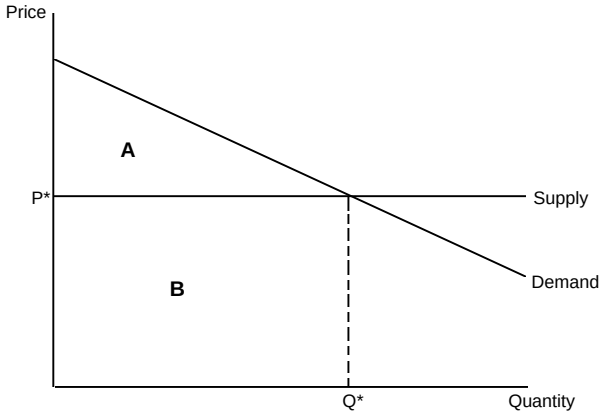
A6. The Benefits and Costs of Digital Data Services: Analysis undertaken by The Allen Consulting Group[1]

A6.1. The Consumer Welfare Benefits of Digital Data Services

The welfare benefit to consumers from the purchase of any goods and services is the consumer surplus, depicted in Figure A6.1. Consumer surplus is the area A under the demand curve[2] and is the difference between what consumers would have been prepared to spend for their purchases (as given by the demand curve) and what they actually spend. For a given pair of price and quantity, the larger is the price elasticity of demand (the more responsive consumer demand is to price changes) the flatter is the demand curve and the smaller will be the consumer surplus.[3] This means that, when demand is responsive to price changes, expenditure needs to be higher to generate the same consumer benefits than when demand is unresponsive. As shown below, this has important implications for whether the benefits of a high bandwidth digital data capability are likely to be at least equal to the costs of its provision.

Figure A6.1

Consumer Surplus



1 Some minor editorial changes have been made to the text provided by the The Allen Consulting Group—the consultant's analysis was provided to the ACA as part of a more comprehensive report and has been edited to read as a stand-alone document. The term 'digital data capability' in this analysis is not used in the same sense as in the ACA's report—the consultant's use of this term and the terms 'bandwidth' and 'speed' is in a colloquial sense which includes both high and low rate data capabilities (such as 14.4kbit/s and 28.8kbit/s.)

2 As a measure of consumer welfare, consumer surplus is theoretically flawed because it does not take into account the effect of price changes on consumer income, although it is often approximately correct. A better welfare measure is compensating variation, which does take such changes into account, and this is what is estimated below. (See Jerry A. Hausman, "Exact Consumer's Surplus and Deadweight Loss", *American Economic Review*, 71, September, 662–76, 1981.)

3 In the (unlikely) case that demand is infinitely price elastic, the demand curve is horizontal at the price P*, and there is no consumer surplus at all.

Expenditure by consumers is given by the area B implying that there is a relationship between expenditure and consumer surplus. In fact, it is approximately true that consumer surplus is equal to expenditure divided by twice the price elasticity.[4] To illustrate, if the price elasticity of demand for current Internet services is –1.0 (so that price changes lead to equiproportionate changes in demand) then this would mean that the associated national consumer surplus is about $105 million per annum.

When there are no market failures or distortions it follows automatically that consumer surplus is always positive for a finite elasticity of demand, and therefore that society's welfare is always enhanced by the production and consumption of the good or service in question. But in this case, with respect to efficiency, there is no public policy decision to make. In the case of market failure, such automatic societal benefits do not necessarily follow, and it is the job of cost–benefit analysis to determine whether the production, or increased production, of a good or service is in society's interests. This becomes a matter, conceptually, of determining whether the sum of consumer surplus and consumer expenditures (the "benefits") exceed the value of the resources used up in production (the "costs").[5] But this amounts to no more than determining whether consumer surplus is positive.[6] [7]

When equity issues are involved, it might be decided that, even if the aggregate benefits are less than the aggregate costs, the distribution of the benefits and costs are such as to warrant production of the good or service in question, or justify regulations of market processes. But this is purely a matter of value judgment, to be determined by the political process and about which economic analysis has nothing to say—except to point out the cost, in terms of efficiency foregone, of those value judgments.[8]

A6.1.1 Estimating Consumer Welfare

The particular problem in calculating the consumer welfare benefits of enhanced digital data services is that these would be, if they existed in the marketplace, new goods. This creates peculiar theoretical and practical problems in the welfare calculation.[9] However,

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4 With a linear demand function and a price elasticity of –1.0, it is exactly true.

5 Department of Finance, *Handbook of Cost–Benefit Analysis*, AGPS, Canberra, 1997.

6 Assuming that producers gain no rents, or producer surplus. If so, then producer surplus should also be counted as part of the benefits.

7 In traditional cost–benefit analysis, there is a stream of benefits and costs over time, which have to be discounted to arrive at the present value of benefits and costs. This raises a number of tricky issues, such as the choice of discount rate, but the principle is the same.

8 Equity judgments can be formalised in cost–benefit analysis by specifying a social welfare function, which includes a parameter that indexes aversion to income inequality. But both the choice of social welfare function and parameter values involve inherently subjective value judgments.

9 Shane M. Greenstein and Pablo T. Spiller, "Estimating the Welfare Effects of Digital Infrastructure", NBER Discussion paper 5770, September 1996, summarise the problems thus:

> "…Despite the explosive growth in recent commentary about the development and impact of digital infrastructure, there have been few attempts to estimate the magnitudes of the economic gains associated with improving information infrastructure…This should not be a surprise. Some well known problems in the economics of technology, infrastructure and measurement make this estimation particularly difficult. First, calculating the economic trade–off between old and new technologies or equipment requires knowledge about the benefits associated with modern facilities relative to those arising from existing ones. Yet, it is difficult to measure levels of quality and quantity of infrastructure, let alone differences between old and new. Second, although infrastructure improvements may reduce the costs of providing new services and increase the quality of old services, the exact

in a series of papers, the economist Jerry Hausman has developed a methodology for estimating the benefits to consumers of new goods or services, and has applied this methodology to various telecommunications services in the United States.[10]

The key formula for determining consumer welfare is

$$CV = \left[\frac{(1-\delta)}{(1+\alpha)} y^{-\delta} (p_1 x_1 - p_0 x_0) + y^{(1-\delta)} \right]^{1/(1-\delta)} - y$$

where CV is compensating variation (a precise measure of welfare closely related to consumer surplus), δ is the income elasticity of demand, α is the price elasticity of demand, p0x0 and p1x1 are "before" and "after" expenditures and y is consumer income. (With new goods or services, p0x0 is zero, by definition.)

It turns out that, in practice, the important parameters are α and p1x1, with the measure of CV not at all sensitive to δ or how y is measured. Thus, the consumer benefits of enhanced digital data services will be larger the more they spend on these services and the smaller is the price elasticity of demand.

As noted above, for the households that purchase Internet services, average annual expenditure is $300. Assuming a price elasticity of demand of –1.0, and values of 2.0 for δ and $67,000 for y (per household disposable income in current dollars), this implies a per household benefit of $150. This benefit is the benchmark against which the benefits from a digital data capability are to be compared in a cost–benefit analysis.

A6.1.2 Benefits and Costs Compared

This section compares the benefits and costs of introducing a digital data capability of 28.8kbit/s. Our analysis concludes that the minimum cost technology options for obtaining a 28.8kbit/s digital is:

- for metropolitan areas and regional centres, PSTN via modem, with a total capital cost per SIO of $1185 (made up of $935 network capital cost and $250 CPE cost); and
- for rural and remote areas, wireless local loop, with a capital cost of $1530.

The benefits are calculated using the Hausman formula above. Since there is no way of precisely knowing the price elasticity or amount that will be spent on digital data services, a range for each is used in the benefit calculation. A crucial point is that it is the

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benefits associated with these changes may be difficult to trace. Third, questions about economic benefits require information about the demand for the incremental improvements associated with modernization. Measuring demand for such change requires information about users' valuation, which are also hard to learn…Finally, multiple information technology markets comprise the information infrastructure, but at best, any study can only focus on a few markets at a time. (p1)

10 Jerry A. Hausman, "Valuation of New Goods Under Perfect and Imperfect Competition", in *The Economics of New Goods*, edited by Timothy S. Bresnahan and Robert J. Gordon, University of Chicago Press, 1996; "Valuing the Effect of Regulation on New Services in Regulation", *Brookings Papers on Economic Activity Microeconomics*, 1997, pp1–44; "Cellular Telephone, New Products and the CPI", NBER Discussion Paper 5982, March 1997.

incremental benefits that are relevant i.e. the benefits of a digital data capability less the $150 of benefits per household currently being obtained.[11] Another key point is that the benefits so calculated are, conceptually, net of operating costs, so no allowance needs to be made for these. (This is because such operating costs are assumed to be met by consumer expenditures, and it is the surplus net of expenditure that is the welfare measure.) Finally, it is assumed that an enhanced digital data capability will not generate capital cost savings associated with the PSTN, as households will still use the PSTN for their voice communications.

The benefits are assumed to accrue over a ten–year period and are assumed to grow in line with real household expenditure, at a rate of 3 per cent per annum. However, to obtain the present value of the benefit stream, they are discounted at a rate of 3 per cent annum (the current real 10 years bond rate).

Three values are assumed for the price elasticity of demand, –1.0, –2.0 and –4.0. Rather than arbitrarily select values for household expenditures, Table 5.6 below shows the annual expenditure (rounded to the nearest $10) required for breakeven between benefits and costs, for each of the price elasticities.

Table A6.1

Breakeven Level of per annum Household Expenditures on Digital Data Services (Current Expenditure =$300 p.a.)

	Price Elasticity= –1.0	Price Elasticity= –2.0	Price Elasticity= –4.0
Metropolitan and Regional	$540	$800	$1340
Rural and Remote	$600	$910	$1510

The Allen Consulting Group

The analysis shows that household expenditures would have to increase significantly beyond current expenditures on Internet services for the welfare benefits to equal the costs of a 28.8kbit/s digital data capability. Assuming an elasticity of –1.0 (i.e. the same as assumed exists currently) expenditures would have to increase from the current $300 per annum to $540 per annum, an increase of 80 per cent. With Internet usage growing rapidly, both within and among households, this growth should be attainable. The increase in household consumer welfare would be $110 per year. With larger price elasticities, expenditures would have to increase by considerably more to generate the required consumer benefits.

In rural and remote areas, because costs would be higher, expenditures would have to rise by more than in metropolitan and regional areas to break even. With an elasticity of –1.0, expenditures would have to double. The increase in household consumer welfare would be $150 per year.

[11] In other words, if a household is currently accessing the Internet via the PSTN, and it upgrades its digital data access to ISDN (say), the incremental benefits to the household will be the benefits of Internet access via ISDN less the foregone benefits of Internet access via the PSTN.

While the increase in household expenditures necessary for benefits to equal costs is large in proportionate terms, the absolute amounts are small enough to make this task quite achievable. Recent changes in patterns of household expenditure provide evidence of a trend towards higher expenditure on the Internet and other services delivered via digital data facilities. A continuation of this trend, bolstered by improved quality of Internet services resulting from an enhanced digital data capability, would lead to the cost–benefit test being passed.

A6.1.3 Sensitivity and Risks of the Analysis

The cost–benefit analysis presented above can be considered a central case, around which could occur a range of uncertain outcomes. This section considers the sensitivity of the results to different assumptions and other variables.

Equality of Current Expenditure by Region

The above calculations are based on the assumption that per household expenditure on Internet services is equal in different regions, for those households that purchase those services. There is no way of knowing whether this is true with data that are currently available. It is conceivable that households in rural and remote areas might spend more than the national average (purchasing about the same quantity of services, but at higher prices e.g. long distance calls to ISPs); or they might respond to higher prices by purchasing many fewer services and so spend less. Table A6.2 reports the breakeven calculations for regional and remote households by alternatively assuming that they currently spend $450 per household and $150 per household.

Table A6.2

Breakeven Level of per Annum Household Expenditures for Rural and Remote Households

	Price Elasticity= –1.0	**Price Elasticity= –2.0**	**Price Elasticity= –4.0**
Assumed Current Expenditure			
$450	$750	$1130	$1880
$300	$600	$910	$1510
$150	$450	$680	$1140

The Allen Consulting Group analysis

Table A6.2 shows that with a price elasticity of –1.0, the required breakeven increase in expenditure is $300, regardless of whether current expenditure is high ($450) low ($150) or at the current national average ($300). However, for larger elasticities, this conclusion does not follow: the larger is current expenditure, the greater the necessary increase in expenditure for benefits to equal costs.

Large Reduction in the Price Elasticity

A further possibility is that, in the future, the Internet will become a necessity of life, implying a very small price elasticity, say, –0.2. Then, the required increases in

expenditure for benefits to equal costs will be very small: for metropolitan and areas, expenditures will need to rise by $15 per annum to $320, and in rural and remote areas, to $360.

Falls in Costs of Provision

The commercial reality of the market is that technological innovation will drive costs down. With a price elasticity of –1.0, the required expenditures will, relative to the baseline above, fall roughly in the same proportion as costs.

With larger elasticities, however, the required expenditures will change relatively little. Thus, if the price elasticity of demand for digital data services is high, expenditures on those services will still have to rise significantly for consumer welfare benefits to match costs, even if, as expected, technological improvements cause costs to fall.

Downturn in the Economy

Although it is virtually impossible to predict precisely when the next big recession will hit the Australian economy, it is certain that another recession will occur, sooner or later. In all likelihood, given the timing of previous post–war recessions, at least one other recession will occur over the ten year period postulated in the cost–benefit calculation.[12]

How a recession would affect the benefit–cost calculations would depend on when it occurred and how household demand for Internet services would be affected. As it turns out, however, under reasonable assumptions, the conclusions reached above would be unaltered by a recession. For example, suppose that a one–year long recession results in zero growth in household spending on Internet services, instead of the baseline assumption of 3 per cent growth. The required increase in spending to offset the recession year is trivial, especially if the recession occurs late in the ten year projected period (when its effect would be heavily discounted).

Thus a short–term downturn in the economy would not materially affect the results of the cost–benefit analysis.

Fast Growth in Demand

Rather than the 3 per cent per annum growth in Internet demand assumed in the central analysis, it is possible that growth, per household, will be higher, (implying an increase in the proportion of household spending on Internet services). Table A6.3 shows breakeven expenditure (in the first year) if such expenditure grows at 6 per cent per year (and so increases each year in present value terms). While there is some reduction in required expenditure, the essential conclusion remains unchanged—for benefits to at least equal costs, a large increase in expenditure will be required. For a more conservative growth estimate, this conclusion would be reinforced.

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[12] The last three recessions were in 1974-75, 1981–82 and 1990–91 i.e. at intervals of about eight years.

Table A6.3

Breakeven Level of per annum Household Expenditures on Digital Data Services, 6 per cent growth p.a. (Current Expenditure =$300 p.a.)

	Price Elasticity= –1.0	Price Elasticity= –2.0	Price Elasticity= –4.0
Metropolitan and Regional	$510	$760	$1270
Rural and Remote	$570	$850	$1420

The Allen Consulting Group analysis

A6.2. Distribution of Benefits and Costs

A6.2.1 Distribution of Benefits

The above analysis shows the increase in expenditure required if consumer benefits on digital data services are to be at least equal the resource costs. An important question is how these benefits and costs are going to be distributed in the population. The data in Table 8.3 show that, currently, high–income households are the dominant users of the Internet. Therefore, initially at least, it is these households who will be the dominant beneficiaries of an enhanced digital data capability and the services that can then be accessed. Table 8.3 also showed that households in capital cities access the Internet at over the twice the rate than households in the rest of Australia, so again, the initial presumed benefits to capital city vis-à-vis other households will be in this proportion.

Over time, the pattern of household Internet access by income level might well change. It seems reasonable to presume that Internet access by household income could follow the patterns previously exhibited by televisions, video recorders and other items of household consumption—i.e. initially consumed by high income households, and later consumed by households lower down the income scale. If so the distribution of benefits in the future of an enhanced digital capability might be more evenly distributed than currently.

Predicting such an outcome for capital city vis–à–vis other households (or metropolitan vis–a–vis rural) is more problematic, however, because of structural problems in rural telecommunications markets.[13] Here it seems likely that, in the absence of some government action, the benefits of an enhanced digital capability are unlikely to reach rural (and remote) households, because they are unlikely to be able to access that capability, even if they are willing and able to pay for it.

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[13] The consultants characterise these weaknesses as;

- high telecommunications costs and prices relative to other parts of Australia, due largely to the relative isolation of customers;
- relatively low service penetration levels;
- low overall levels of investment by carriers relative to their investments in more populated areas of Australia; and
- reliance on the monopoly USO service provider, and consequent lack of competition in the supply of services.

A6.2.2 Distribution of Costs

If the costs of acquiring this capability are met entirely by the households purchasing the services, then the distribution of the costs will be identical to the distribution of benefits. To the extent that the costs of provision are subsidised in some way (e.g. by the general community) then this outcome will not generally be obtained, and the distribution of the benefits will be different from the distribution of the costs.

This need not necessarily be undesirable, especially if it results from a transparent policy decision to subsidise certain segments of the population. For example, the Government could decide, for equity reasons, to subsidise high–speed Internet access in rural and remote areas.

The distribution of benefits and costs might also not coincide for other reasons. For example, if a carrier has pricing power in one telecommunications market, and can therefore charge prices in excess of costs, it might choose to cross–subsidise its operations in other markets. Thus, a carrier might, for strategic reasons, under–charge for enhanced digital data access with the intention of recouping any losses elsewhere.[14] Such hidden cross subsidies would be inimical to economic efficiency.

A6.2.3 Non–Household Benefits

The cost–benefit analysis above estimates benefits for households, based on household expenditure patterns. It can be argued, quite reasonably, that households will not be sole beneficiaries of an enhanced digital data capability. Providers of health, education, library and government services will also benefit, as will many businesses. This will be particularly the case in rural and remote areas, where efficient provision is currently constrained by inadequate digital data capability.[15]

However, because it is households who are the ultimate purchasers of education, health, library services etc, conceptually, the cost–benefit analysis should still be conducted at the level of the household. When these services are facilitated by an enhanced digital data capability, households will be indirectly purchasing the digital data services, whose cost will be incorporated in the final price of the health, education etc service being purchased.

A precise calculation of how much extra expenditure on health, education etc services would be required to pass the cost–benefit test would be very difficult. Amongst other things, it would require knowledge of the proportion of total service delivery costs that would be accounted for by digital data services. However, even in the absence of this information, the same qualitative conclusion reached above would hold: for the cost–benefit test to be passed, expenditure on final services would have to increase

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[14] For example, Deutsche Telekom charges very low prices for its ISDN services, with the result that ISDN demand in Germany is, by far, the largest in the OECD. However, this appears to be a "loss leader" strategy by Deutsche Telekom that is aimed at benefiting its ISP subsidiary.

[15] The submission by the Northern Territory Government to the Digital Data Review provides a comprehensive list and discussion of the services whose delivery would be improved by an enhanced digital data capability.

substantially. After all, the point of introducing an enhanced digital capability, in this context, would be to provide more (or higher quality) health, education etc services. If this did not occur, it is difficult to see how the benefits of providing those services via a digital data capability could be equal to, or greater than, the costs of doing so.

Where the indirect provision of digital data services to households would most likely be very different from the direct provision would be in the distribution of the benefits and, especially, the costs. Government services are not, in general, provided on a "user pays" basis and so it would be likely that taxpayers in general would bear the costs, while the benefits would go to those people who avail themselves of those services. This in itself need not present particular issues for public policy, as this situation applies to all government services, not just those delivered by a telecommunications medium.

A6.2.4 Pricing Scenarios

The cost–benefit analysis in this chapter make no reference to the price of digital data services. For ease of exposition and calculation, the implicit assumption is that services are priced at their marginal cost, hence social welfare is synonymous with consumer welfare.

In practice, this might not be so, for a number of reasons, discussed below.

Large Fixed Costs

If fixed costs of producing a digital data service are sufficiently large relative to operating costs, the average cost of production will always be declining as volumes expand. Pricing at marginal cost will then be infeasible, as this will imply a price per unit of output which less than average cost. The (consultants') analysis suggests that this might be a realistic description of the digital data technologies considered in the report. In such circumstances the provider of the service will make a loss.

The remedy for this situation is to recover fixed costs by setting prices above marginal costs. However, provided markets are reasonably competitive, this need not imply the existence of producer surplus (or monopoly rents), thus the assumption of the cost–benefit analysis that social welfare is synonymous with consumer welfare still holds.[16]

Exercise of Market Power

Another possibility, of course, is that a carrier that possesses and exercises market power will provide digital data services. In such a case, part of the consumer benefits will be redistributed to the carrier, and part will be lost altogether (this is the efficiency cost of market power). If this was to occur, the cost–benefit test would be much harder to pass, even if the associated producer surplus is counted in the social welfare calculation. For any given level of consumer expenditures, social welfare would be lower than under

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[16] It is often thought that declining average cost implies a natural monopoly, but in the case of multi–product firms, this is not true. Viable competitive markets can exist in industries where production technologies exhibit high fixed costs. This is particularly relevant to telecommunications.

competitive markets, possibly much lower. This in turn implies that the required level of consumer expenditure on digital data services to pass the cost–benefit test would have to be much higher than if markets are competitive.

A6.3. Costs and Benefits of a 14.4kbit/s rate

With a lower data rate comes lower benefits. This effect was illustrated in Figure 1.1, which showed that a connection at a lower rate than 28.8kbit/s would deny users a more effective access to multimedia Web sites, and other Internet applications, with the exception of electronic mail. At 14.4kbit/s e–mail messages can be sent and received at convenient speeds, provided that the sizes of attached files are restricted. Access to Web sites would obviously be slower at this data rate.

The difference in costs between upgrading a subscriber line to 14.4kbit/s service instead of a 28.8kbit/s service is small. Most of the cost of upgrading a line is incurred by the labour required to visit sites, inspect plant, test circuits and, if required, replace cable and equipment. Such costs are independent of the data rate to be provided. Figures provided by Telstra for upgrading all relevant subscriber lines actually show an increase in costs for upgrading to the lower data rate, presumably due to lower economies of scale; the number of lines involved being estimated to be 2.3 million instead of 4.6 million.

Thus specifying a data rate of 14.4kbit/s would effectively allow users access to facsimile and electronic mail only, and the resulting utility, and hence benefit, would be much reduced. This reduction in benefit would not be matched by a corresponding reduction in cost and therefore the gap between the cost and benefit would be greater than for 28.8kbit/s.

Telstra estimates that 75 per cent of existing subscriber lines already have a 14.4kbit/s capability; this compares with 55 per cent for 28.8kbit/s. Consequently, the cost of upgrading all existing lines to 14.4kbit/s would be less than for 28.8kbit/s—by approximately $1.3 billion (Telstra estimate).

A6.4. Conclusions

A digital data capability of 28.8kbit/s should provide considerably more functionality than Internet access over the PSTN. This in itself should stimulate demand for digital data services. However, if the Government is going to mandate a digital data capability, then the benefits of doing so should be at least as large as the resource costs used up in providing the associated services. The cost–benefit analysis presented here shows that unless Internet access becomes such a necessity that its demand becomes essentially unresponsive to price changes, household expenditures on digital data services will have to increase significantly above current levels, for the incremental benefits to match the incremental costs. This will be especially so in rural and remote areas, where the costs of implementing a digital data capability are likely to be higher than in metropolitan and regional areas. Technological improvements which drive down costs will possibly reduce the amount by which expenditures need to increase (though not if demand for digital data services is very responsive to price changes).

Evidence exists from household expenditure patterns of a trend towards higher expenditure on the Internet and other services delivered via digital data facilities. Although the statistical data available at the time of writing are not comprehensive, in view of the likelihood of increased household expenditures on the Internet and other online services, and the downward trend in technology costs, it seems likely that the incremental benefits will reach the same levels of incremental costs.

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GLOSSARY

ABS: Australian Bureau of Statistics
ACA: Australian Communications Authority
ACCC: Australian Competition and Consumer Commission
ADSL: Asymmetric Digital Subscriber Loop. A high-data rate modem technology that can provide data services over existing telephone lines. Called asymmetric because the downstream data rate (from the network to the PC) is faster than the upstream data rate (from the computer to the network).
ATM: Asynchronous Transfer Mode. ATM is a high data rate packet switched networking technology that is designed to provide fast seamless integration of all types of information such as voice, video and data for applications such as multimedia**.**
ATUG: Australian Telecommunications User Group
Broadband: In general, wide bandwidth equipment or systems that can carry signals occupying a large portion of the electromagnetic spectrum. A broadband communications system can simultaneously accommodate television, voice, data, and many other services.
BSEG: Broadband Services Expert Group
CAN: Customer Access Network
CDMA: Code Division Multiple Access
CIRCIT: Centre for International Research on Communication and Information Technologies
CTN: Consumers' Telecommunications Network
DAMA: Demand Activated Multiple Access
Data capability: The ability of a carriage service to carry data.
Digital data capability: The ability of a carriage service to carry data at a rate broadly comparable to a data channel with a transmission rate of 64kbit/s supplied to end-users as part of the designated basic rate ISDN service.
DIST: Department of Industry, Science and Tourism
DOCA: Department of Communications and the Arts
DRCS: Digital Radio Concentrator System. A rural/remote system utilising digital radio to provide telephone services.
ETSI: European Telecommunications Standards Institute
FCC: Federal Communications Commission
FMO: Future Mode of Operations. Telstra's network modernisation program.
FRA: Fixed Radio Access
GEO: Geostationary Equatorial Orbit. A special geosynchronous orbit which is circular and lying over the equator such that the satellite seems to remain stationary in the sky as seen from a location on the surface of Earth.
HCRCS: High Capacity Radio Concentrator System
HFC: Hybrid Fibre Coaxial. A physical broadband network consisting of both fibre optic cabling and co-axial cabling.
ICPA: Isolated Children's Parents' Association
ISDN: Integrated Services Digital Network. An end-to-end data communications system that uses optic fibres, coaxial cables or microwave links to simultaneously transmit voice and digital data. Wideband ISDN transmits data at 64kbit/s or greater, while broadband ISDN can transmit data at up to 155Mbit/s.
ISP: Internet service provider
ITU: International Telecommunication Union
kbit/s: Kilobits. A bit rate expressed in thousands of bits per second.

LAN: Local Area Network. A private data communication network connecting terminals usually within a limited geographical range, and operating at high speed.
LEO: Low Earth Orbit
LDMA: Local Multipoint Distribution System
Mbit/s: Megabits. A bit rate expressed in millions of bits per second.
MEO: Medium Earth Orbit
NFF: National Farmers' Federation
OECD: Overseas Economic Community Development
OnRamp: Product name for Telstra's ETSI compliant BRA or GBA ISDN service.
Point-of-presence: Physical access point to a long distance carrier interchange
PSTN: Public Switched Telephone Network
PSTS: Public Switched Telephone Service
RATE: Remote Australia Telecommunications Enhancement
RTIF: Regional Telecommunications Infrastructure Fund
Satellite System: A space system that consists of one or more artificial earth satellites.
SIO: Services in Operation
STRG: Standard Telephone Review Group
STS: Standard Telephone Service
USO: Universal Service Obligation
UART: Universal Asynchronous Receiver Transmitter
VSAT: Very Small Aperture Terminal. A satellite dish between 1.2 and 1.8 metres in diameter, typically located at a retail or other remote location as an endpoint of VSAT network.
xDSL: Family of Digital Subscriber Loop Technology (eg. ADSL, VDSL, HDSL)
WLL: Wireless Local Loop
WWW: World Wide Web. Internet platform capable of supporting multimedia applications such as voice, graphics, text and video transmissions.