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Executive Summary

In late 1997, the Department of Industry, Science and Tourism (DIST) commissioned this scoping study on industry development activities in telemedicine in Australia. The study was undertaken by John Mitchell & Associates and involved extensive consultations and research.

Definition

The definition of telemedicine is a complex matter, not least because the term 'telehealth' is gaining in popularity as a replacement for 'telemedicine'. Telemedicine is a term under threat because of the inevitable convergence of technology, so that it will, in future, be difficult to separate telemedicine from other electronic health care activities.

For this scoping study, telemedicine was defined as consisting of the following components:

- the delivery of health services (including clinical, educational and administrative services)
- at a distance
- through the transfer of information, including audio, video and graphic data
- using telecommunications
- and involving a range of health professionals, patients and other recipients.

For some people, the telemedicine industry consists of the vendors of the key equipment, such as videoconferencing. For others, the telemedicine industry consists of the users and end users of telemedicine technology. Research for this study suggests that most people involved with telemedicine have difficulty seeing the industry as a range of technologies, markets and customers. Many buyers see one slice, such as videoconferencing technology, and no more.

It is a concern that few telemedicine industry stakeholders have a clear picture of how information technology and electronic commerce will impact on telemedicine over the next 2-3 years.

Comparisons with USA and Asia and Market Size

The telemedicine industry in Australia is in an embryonic stage, there is a lack of healthy competition and the barriers to the industry’s development are substantial. In comparison, the telemedicine industry in the USA has many mature aspects, such as industry associations, research bodies, journals, healthy competition, private investment and high levels of use in some instances. On the other hand, substantial
obstacles still need to be overcome, before the industry takes off in the USA in a
dynamic, enduring manner.

Telemedicine development in Asia is uneven. Activities in most countries are limited,
however, plans for telemedicine in Malaysia and Indonesia are very extensive. Many
Asian countries are looking to fellow Asian countries to access telemedicine services or
to supply services, so the market potential for Australia is reduced.

While Australia lacks many of the sophisticated aspects of the telemedicine industry in
the USA, such as professional and industry associations, journals, research bodies and
technology expositions, Australia’s pace in installing new sites is comparable. As at
early 1998, there are around 250 functioning videoconferencing-based telemedicine
sites in Australia, compared to approximately 30 sites in 1994. This estimate of 250
includes both the State based facilities and those owned by private health practitioners
and hospitals. Teleradiology sites number approximately 150.

Estimates of the growth of the telemedicine industry in Australia, based on
consultations for this study, are:

- 1997 $24m
- 1998 $36m
- 1999 $54m.

Telemedicine needs to be seen as part of a new, flexible way to deliver health services
and as part of the growth of information technology, nationally. Telemedicine's
integration with other information and communication technologies will also add
considerable value to the Australian economy and could permanently change aspects
of the delivery of health care.

It is interesting that both the Health On Line (1997) report and Telehealth in Rural and
Remote Australia (1997) emphasised the lack of reimbursement for doctors in
telemedicine as a barrier. In California, where some teleconsultations have been
refundable since late 1996, surprisingly there was not a significant increase in services
in 1997.

**Competition, Costs, Benefits and Export**

Telemedicine in Australia would benefit from healthy competition between suppliers
of similar products and services. In some sections of the telemedicine market, such as
the provision of videoconferencing and of related peripheral equipment, the market is
dominated by one or two suppliers. Interviews for this study revealed that even these
companies would prefer a more vibrant, competitive environment.

There are a number of contentious issues in the Australian telemedicine community
regarding the cost benefits of telemedicine. Firstly, there is disagreement that a major
benefit of telemedicine is that it will address the significant lack of services in rural
areas. Secondly, there is debate about whether telemedicine is cost effective.

Telemedicine provides a vehicle to improve medical education and training and health
services in urban, rural and remote communities, but there is ongoing debate about its
cost effectiveness. There is also a problem of increasing expectations, when the
telecommunications infrastructure in many parts of rural Australia cannot provide a reliable telephone service.

It is easy to be carried away by the potential of the new technologies to deliver new services to rural and remote areas in particular. Concrete, tried and proven case studies are needed to demonstrate the issues involved and to assist in the embedding of the services into the mainstream of health care delivery.

**Industry Development and National Coordination**

There has been little discussion about how Australia could develop a strong, local telemedicine industry. Most of the attention in Australia has been on developing a variety of telemedicine applications, and speculating about export opportunities, not on developing a new industry. The cautious approach to exporting telemedicine in *Health On Line* (1997) contrasts with the urgent tone of the ‘Goldsworthy Report’ (1997) which advocates the development of an ‘Australian Inc’ export culture for information industries through the establishment of an export working group under the auspices of the Information Industries Council.

This study of telemedicine in Australia suggests that some of the major barriers to telemedicine adoption relate to the nature of the industry, including the immaturity of the industry, the limited telecommunications infrastructure, the lack of appropriate dialogue between vendors and buyers about solutions required and the lack of partnerships in the industry. There are, of course, other substantial organisational, financial and attitudinal barriers to telemedicine adoption.

While there is encouragement for a national coordinating organisation in telemedicine, there is little agreement about whether it be focused on technology matters, such as the availability of infrastructure or standards; strategic planning; policy development; promotion; evaluation; marketing; or other issues. It may be unwise to burden any one national organisation involved in telemedicine with too many functions, particularly if there could be conflict within the organisation between commercial and Government agendas.

The telemedicine industry would benefit greatly by being part of a national approach to industry development. Of particular note is the call for Government to provide infrastructure, reduce obstacles, facilitate investment and build wealth through research and development.

The major roles that interviewees want Government to take are leadership, a regulatory approach in terms of ensuring a consistent approach across Government portfolios, providing forums for dialogue and laying off government intellectual property rights to the private sector willing to assume commercialisation risks.

The interviewees for this study accepted that industry needed to provide leadership by nurturing consumer confidence and comfort with new systems and providing self-regulation by developing collaborative relationships with consumers.
Summary

Telemedicine is currently a fragmented, immature industry in Australia. If it is to develop and to influence the delivery of health care services in Australia, and to live up to its potential, it will need to be integrated effectively with mainstream health care. To achieve this integration, actions are required by all parties, including Government, businesses and consumers.

Recommendations

It is recommended that:

1. National workshops involving the full range of stakeholders in the telemedicine industry be conducted, to consider the findings of this report.

2. An industry association for telemedicine be formed.

3. A comprehensive database of the stakeholders in the telemedicine industry be developed.

4. Statistics regarding the economic size and impact of the telemedicine industry be collected and maintained.

1. Context for the Telemedicine Industry Scoping Study

Brief

In early 1997, the Department of Industry, Science and Tourism undertook extensive consultation with key industry players and concluded that a concise scoping study was necessary to identify and bring together information on the increasing number of organisations interested in developing the telemedicine industry in Australia. It was also felt necessary to assess the scale and extent of the existing and emerging opportunity, to serve as a basis for a future industry development strategy.

This scoping study will be the base document for a national workshop involving industry stakeholders and subsequently a capabilities publication for the industry to be used by all active and potential national business and government players.

DIST’s view is that the industry comprises hardware and software systems, the various forms of carriage services required by telemedicine and the telemedicine content generated by providers and the user community.

A full copy of the brief is set out in Appendix 1.

Methodology

The methodology for the project included the use of emailed survey forms, face to face interviews, telephone interviews, web searches and a literature search of telemedicine publications. The interview and survey questions are contained in Appendix 2 and the list of persons contacted is set out in Appendix 3.

International trends were also evaluated by the consultant’s independent attendance at the world’s largest teleconferencing conference, TeleCon, in Anaheim California, in November 1997, where the latest telemedicine technologies were showcased. TeleMed 111, an annual conference in telemedicine, also in the USA in November 1997, provided further insights into the major trends in the telemedicine market in the USA. Additionally, TeleMed Asia 97 in Kuala Lumpur, September 1997, provided summaries of the current developments in Asia, particularly plans in Malaysia associated with the Multimedia Super Corridor.

National context

Three national Government reports issued in 1997 provided a framework for the study. While each of the reports focus on different aspects of the information industries, and all recommend different strategies regarding government intervention or other action, they are consistent in advocating a national, collaborative approach to industry development.

The three 1997 reports are:
• A national policy framework for structural adjustment within the new Commonwealth of Information. A report to the Minister of Communications and the Arts from the Information Policy Advisory Council, July 1997


Two of the above reports are referenced frequently, in the second half of this report – the ‘Goldsworthy Report’ and ‘Health On Line’.
2. Definitions of Telemedicine

The definition of telemedicine is a complex matter, not least because the term 'telehealth' is gaining in popularity as a replacement for 'telemedicine'. Telemedicine is a term under threat because of the inevitable convergence of technology, so that it will, in future, be difficult to separate telemedicine from other electronic health care activities. Telemedicine as a concept may eventually disappear, as telemedicine practices become part of mainstream health care delivery.

Following is a discussion of various definitions of telemedicine.

Breadth of definitions

There are a variety of definitions of telemedicine and it is important to tease out the elements of each definition. Some samples follow.

California’s 1996 Telemedicine Development Act used the term ‘medical services’ in defining telemedicine as the “use of information technology to deliver medical services and information from one location to another.”

The definition used by the Sub-Committee of the Australian Health Ministers’ Advisory Council (AHMAC) emphasised health services, as opposed to medical services:

Telehealth or telemedicine is the name given to a health delivery system which provides health related activities at a distance between two or more locations using technology assisted communications. (p. 2)

This definition is close to one offered by Feedback Research Services in the United States: “Delivery of health care information and/or services using advanced communications technologies such as interactive video to eliminate cultural, geographic, social, or temporal barriers.” (http://www.feed-back.com/abtelmd2.htm)

Steidl’s (1993) definition emphasises transmission of images via telecommunications:

Telemedicine is the transmission of images, voice and data between two or more health units via telecommunications channels to provide clinical advice and consultation, education and training services. (‘Exporting Medical Services to Asia Pacific: The Potential of Telemedicine’, p. 9)

Bashshur (1995) sets out six essential characteristics of telemedicine systems:

(1) the geographic separation between provider and client during the clinical encounter (telediagnosis) or between two or more providers during a consultation (teleconsultation); (2) the use of telecommunication and computer technology to enable, facilitate, and possibly enhance the interaction between provider and client (or provider and provider) as well as the transfer of information; (3) appropriate staffing to perform all necessary functions within such systems; and (4) the development of an organizational structure uniquely suitable for implementing telemedicine systems. Two additional parameters were considered important for maximizing the effectiveness of telemedicine systems, namely: (5) the development of clinical protocols for triaging clients to appropriate diagnostic and treatment sources; and (6)
the development of normative standards of behaviour to replace the norms of face-to-face contact between client and provider (or provider and provider). (Bashshur, Rashid L, 'Perspective: On the Definition and Evaluation of Telemedicine' Telemedicine Journal, Vol. 1, No. 1, 1995, p. 21-22)

The definitions of telemedicine set out above tend to have the following common elements:

- delivery of health services (clinical, educational and administrative services)
- at a distance
- through the transfer of information, including audio, video and graphic data
- using telecommunications
- involving a range of health professionals, patients and other recipients.

For this scoping study, telemedicine will be defined as consisting of the above components.

Two categories of telemedicine

Two ways to categorise telemedicine have become popular: by medical specialty or disease category on the one hand, and according to the various processes of health care on the other (Lobley, D, 1997, p. 122). For example, medical specialties have given rise to the plethora of names with the prefix tele, such as tele-oncology, tele-cardiology, tele-renal, tele-orthopaedics. Grigsby et al (1995) proposed a classification of telemedicine according to the various processes of health care, as follows:

1. initial urgent evaluation of patients, triage decisions and pre-transfer arrangements;
2. medical and surgical follow-up and medication checks;
3. supervision and consultation for primary-care encounters where the physician is not available;
4. routine consultations and second opinions based on history, physical examinations and available text data;
5. transmission of diagnostic images;
6. extended diagnostic work-ups or short-term management of self-limited conditions;
7. management of chronic diseases requiring a specialist not available locally;
8. transmission of medical data;
9. public health, preventive medicine and patient education.

Lobley (1997) argues that Grigsby’s approach is superior in “facilitating research on variables such as costs, access, acceptability and the effects on practice patterns”. (p.122)

Definition influenced by prevailing attitudes

Until the mid-1990s, telemedicine was popularly defined as the use of telecommunications and information technology to connect a doctor at one site to a patient, over a distance. The emphasis was on the standard doctor consultation, using technology to bridge the distance.
In the last few years, the term ‘telehealth’ has quickly grown in popularity, and telemedicine is out of favour in some quarters. Telemedicine, for some people, suggests ‘medicine’ and therefore doctors and often males, while ‘telehealth’ includes all health professionals such as community health workers. This inclusiveness is an important issue: for instance, in some telehealth networks, particularly links to the patients’ homes, the main users are nurses, not doctors; and in some mental health networks, the main users are psychologists, not medical doctors.

As an example of the types of debates about definitions in this field, Henry Smith argues for the use of the term ‘behavioural telehealth’ instead of ‘telemental health’ in relation to a large mental health project currently being conducted in the USA:

‘behavioural telehealth’ embraces the opportunities available to behavioural service providers as we hurtle into the post-industrial world; the term ‘telemental health’ carries historical baggage and... inappropriate historical limitations. (email, 16 January 1998, Telehealth list server).

Telehealth is also gaining popularity over telemedicine because networks are being used for a multitude of health related purposes, not just clinical diagnosis. Other services provided on networks include health information and education, health administration and professional development.

The new movement towards managed care, the promotion of wellness over treatment, and the concept of a health plan for life are all adding to the weight behind the use of the term telehealth instead of telemedicine. Health Online (1997), comments

The Committee recommends the use of ‘Telehealth’ defined as ‘health care at a distance’ as a standard term within Australia and in international discussions and negotiations and considers that the term Telemedicine does not encompass the broad spectrum of health care delivered by the way of interactive videoconferencing technologies. (p. 8)

Given that the brief for this study used the term telemedicine, it will be used throughout this document, with the expectation that telehealth may emerge as the dominant term in the health field, in the near future.

**Definition influenced by reduction in costs**

The definition of telemedicine now has been widened to include other than just senior medical staff, partly because of the reduction in the costs of videoconferencing technology. In the early 1990s, telemedicine consultations often involved expensive videoconferencing systems and it was felt that the doctor would be the pre-eminent user. The last few years have witnessed the introduction of desktop videoconferencing equipment, which is more affordable and likely to become ubiquitous in the future. When desktop videoconferencing is comfortably merged with live videoconferencing, the composition of the telemedicine end-user group could change dramatically.

Many organisations have already decided that videoconferencing technology is affordable for more than just the senior clinicians in a hospital unit. For instance, at The Queen Elizabeth Hospital in Adelaide, South Australia, within the Renal Unit - which covers four locations - there are nine desktop videoconferencing units and four large videoconferencing group system. The user group includes senior clinicians, registrars, interns, pharmacists, dietitians, clinical nurse managers, liaison nurses, dialysis nurses and patients. In these sorts of extended health care environments, telehealth seems a more apt description than the narrower term telemedicine.
Definition influenced by available technology

Telemedicine is sometimes defined in terms of the technologies used in the remote delivery of health services. For instance, Health On Line (1997) defined telemedicine as ‘the practice of medicine and delivery of health care between two distant locations by the use of interactive videoconferencing facilities.’ (p. xii) Elsewhere in their report, the Standing Committee also noted that ‘Telehealth has been practised via telecommunications technologies for almost one hundred years’ (p.9), through the use of telegraph, telephone and wireless. For instance, the Royal Flying Doctor Service has used these telecommunication technologies for remote diagnosis and prescribing treatment, only using the air evacuation service ‘in cases of serious care’. (p.9)

There are a number of major groupings of telemedicine technologies:

- telephone, fax, email technologies
- videoconferencing technology
- teleradiology technology
- telepathology technologies
- online health information, using the World Wide Web
- medical records available over LANs and WANs.

The pervasive telephone technology deserves special comment. Although health professionals have used the telephone for over 100 years, including for diagnosis in emergencies, the term ‘telemedicine’ is not normally attached to providing advice over the phone. It is interesting to note that Health On Line (1997) acknowledged the use of the telephone but did not recommend remuneration for health professionals who use it. Call centres are an exception: often privately owned, with funding provided by health insurance companies, they are able to charge for phone consultations between patients and their health staff. The advent of call centres may force a change in thinking about whether telephone consultations are telemedicine.

In the early 1990s, telemedicine technology was predominantly seen as videoconferencing technology. However, videoconferencing is now being challenged for its pre-eminence by:

- the fast take-up of teleradiology equipment in the mid-1990s
- new interest in health information, provided on the Internet
- the recent arrival of call centres as examples of telemedicine.

CASE STUDY: WOMEN’S AND CHILDREN’S HOSPITAL, ADELAIDE

In 1994, most telemedicine projects involved either videoconferencing or teleradiology. By 1998, that simple dichotomy is being made obsolete. A sign of the way telemedicine’s boundaries are shifting out is provided by the Women’s and Children’s Hospital (WCH) in Adelaide, South Australia, which is introducing telemedicine in 1997-98 on a number of simultaneous fronts: through videoconferencing, through World Wide Web activities, through the use of converging technologies and
telemedicine-to-the-home, and through a major teleradiology undertaking. The transmission of images at the WCH involves the use of ISDN and POTS networks, the Internet and an Intranet. The use of call centres and alternative transmission paths to patients’ homes are also being examined. Videoconferencing technology being used or investigated at WCH includes large rollabout room systems, small group videoconferencing systems, and desktop and laptop systems. WCH has also formed an alliance with the North Western Adelaide Health Service, called Telehealth Partners, to share expertise and to benefit from collaborative telehealth activities.

There is increasing importance in the telemedicine literature on ‘store and forward’ technology, such as the transfer of pathology images or the transmission of email messages, rather than real-time, synchronous conferencing. This change is being fuelled by the global diffusion of the Internet and the increasing power of desktop computing:

Whilst some telemedicine applications, particularly those for urgent care and telepsychiatry, require real-time consultations, this is not always the case. For example, the ease with which specialists can collaborate in store-and-forward fashion has helped make teleradiology the most widely used application today. (Reimbursement for teleradiology has also helped dissemination of the service.)

Additionally, with the increasing integration of Web-based information retrieval and exchange, and movement toward the computer-based patient record, telemedicine is migrating to the desktop. (Telemedicine and Telehealth Networks, April 1997, p. 19)

The future of the term telemedicine

There are arguments for and against promoting the term telemedicine (or telehealth). Arguments against it include:

- telemedicine is simply a way of providing health care – it is not an end in itself
- with the convergence of technology, particularly with the access to the electronic patient record becoming more and more prominent, it will be difficult to separate telemedicine from other health related activities that use information and communication technologies
- telemedicine is merely a branch of health informatics.

Arguments for a separate, continued focus on telemedicine include:

- telemedicine is still in its infancy and time is needed to develop experience, skills and protocols
- telemedicine deserves special attention, to stimulate the extension of health services to the needy, the disadvantaged and the remote
- telemedicine requires new work practices and to ensure it becomes embedded, sufficient time is needed to negotiate those new work practices.
Given the speed with which new technologies are being developed, and given the convergence of telecommunications and information technology at the desktop, and given the move to new paradigms about how health care should be delivered, there are two likely developments in the long term future:

• the practice of telemedicine will become more prominent

• it will become increasingly difficult to differentiate telemedicine from many other uses of technology in the delivery of health care.

Surface level issues are:

• how long should telemedicine be viewed as a separate strand in the health care industry?

• why should telemedicine be viewed as a separate strand?

Deeper level issues are:

• how can the practice of telemedicine improve the quality of health care, be cost effective and extend the reach of health services?

• how can the practice of telemedicine be effectively integrated with other health care delivery, to provide optimum services?
3. Definitions of the Telemedicine Industry

This chapter demonstrates that we are on the cusp of the further and continuing expansion of the definition of the telemedicine industry.

Definition of an industry

There is no set definition of an industry and it is becoming increasingly difficult to define an industry’s boundaries, particularly in any areas that involve fast-changing information and communications technologies. Other factors that are blurring the boundaries of industries include globalisation and deregulation.

An industry can be defined loosely by

- the types of technologies used
- the markets
- or the stakeholders (e.g. customers, vendors, suppliers, users).

Narrow, restrictive definitions of the telemedicine industry

Research for this study suggests that most people involved with telemedicine have difficulty seeing the industry as a range of technologies, markets and customers. Many buyers see one slice, such as videoconferencing technology, and no more. Very few people in Australia have a comprehensive view of the telemedicine industry in Australia. For most people, the telemedicine industry consists of the major equipment vendors, a number of integrators and the buyers. This narrow view is problematic where such people are in decision making positions within institutions and are making purchases that will have an impact on the organisation for the next 2-3 years.

One reason for this narrow definition is understandable: videoconferencing has so dominated the health market in Australia, that some people not only see telemedicine as videoconferencing, they see telemedicine as represented by one brand of videoconferencing equipment.
The narrow definition provides a barrier to development of the industry. It provides no profile for a wide range of software developers, equipment providers, transmission providers and knowledge workers who see themselves as part of the industry but are not readily acknowledged as part of it. Examples of these players will be provided during this report.

The definition of telemedicine as videoconferencing is also patently wrong, firstly because teleradiology is a pervasive and significant aspect of telemedicine and the technology used in sophisticated teleradiology systems is not videoconferencing.

This narrow definition of ‘telemedicine as videoconferencing’ does not stimulate adequate focus on key issues for developing the industry, such as:

- identification of the major environmental trends that may have an impact on the industry over the next three years
- an examination of the industry’s internal strengths and weaknesses
- an examination of the industry’s external opportunities and threats
- identification of barriers to entering the market
- the needs of various segments of the market
- the availability of core and peripheral equipment
- the quality of systems integration
- an understanding of customer motivations and unmet needs
- the opportunity to offer value-added aspects of products and services
- barriers to customer adoption.

In a healthy, vibrant telemedicine industry, these sorts of issues would have a public focus. The evidence provided through this report suggests that the telemedicine industry in Australia is not debating these sorts of issues in any depth and hence the industry is faltering, not thriving. Appropriate forums, associations and groups are needed in the telemedicine industry, to continually address these fundamental issues.

**Industry stages**

The issue of what assistance the Commonwealth should provide to the telemedicine is fundamental to this report, and will be discussed directly in the final chapter. Whether assistance is provided to an industry by Governments, and the type of assistance provided, is sometimes determined by the stage the industry has reached. Lewis et al (1993) set out four stages of an industry:

- embryonic - when firms might try to establish technology leadership and set the industry standard with product development
- growth - when firms seek economies of scale and market share
- maturity - when firms seek a return on investment, where the focus is on marketing and service, rather than on technology and product development
• decline - where firms seek to maximise cash flow.

The evidence set out in this report suggests that the telemedicine industry is still in the embryonic stage in Australia. A concerted effort on a number of fronts - political, bureaucratic, industrial, social - is needed to move telemedicine to the growth stage.

**Stakeholder model of the industry**

Porter (1980) provides a useful guide to studying any industry, and his model could be applied to telemedicine in Australia. In Porter’s economic model, four sets of stakeholders compete and interact in an industry:

- buyers
- suppliers
- potential entrants to the industry
- substitutes.

In a vibrant industry, the four stakeholder groups are all affected by industry competition and subsequently benefits flow to all the successful firms’ stakeholders: their investors and staff, the customers and the general community.

Based on the interviews for this scoping study, when the stakeholder model is applied to the telemedicine industry in Australia, it is clear that the industry is dominated by “buyers” from the public sector – particularly government and hospital administrators. Understandably, most of these administrators may see telemedicine as a government service, and hence not as a business. Due to government requirements to follow due process with regard to purchases, telemedicine suppliers are usually kept at arm’s length from the buyers: a regrettable and dominant feature of the
telemedicine industry in Australia. The following diagram represents this profile of a strong buyer presence and the weaker identities of other groups.

Diagram 3.2: Porter’s stakeholder model applied to the telemedicine industry in Australia, with dotted lines denoting weakly defined components

**Factors impinging on a competitive industry**

In the Porter (1980) model of industry, five sets of factors impinge on the competitive situation:

- entry barriers, such as economies of scale, brand identity, distribution channels, cost advantages, government policy
- rivalry determinants, such as industry growth, product differences and diversity of competitors
- determinants of supplier power, such as supplier concentration and the importance of volume to suppliers
- determinants of buyer power, such as bargaining leverage, buyer concentration, buyer volume and price sensitivity
- determinants of substitution threat, such as relative price performance of substitutes and buyer propensity to substitute.

During the research for this study, interviewees did not use Porter’s jargon but they did complain about the factors impinging on competition in the telemedicine industry. For instance, frequent comments related to:

- the high cost of establishing a national distribution network in a country the size of Australia (entry barrier due to geography)
• the risk of selling telemedicine services or products, given the barriers to telemedicine, for instance from the lack of a fee structure for telemedicine consultations (entry barrier of government policy)

• the risk in promoting a new brand of say videoconferencing equipment in Australia, when another brand was very dominant (supplier power)

• the lack of choice for buyers (buyer power)

• the fear that technology based on the plain old telephone service (POTS), such as POTS based videoconferencing or radiology, would render obsolete those technologies based on ISDN (substitution threat).

From the evidence gathered for this study, it is clear that key suppliers in the telemedicine industry are frustrated by the lack of competition in the industry. A healthy, competitive industry is more attractive to all industry players than a weak industry. To ensure the telemedicine industry becomes vibrant, and that the above barriers are overcome, effort is required from the full range of stakeholders, not just Government or vendors.

**Summary**

In the previous chapter it was argued that the definition of the term telemedicine is changing, due to the development of new technologies, the convergence of technology and changes in attitudes about the delivery of health care.

In this chapter it was argued that the telemedicine industry in Australia is in an embryonic stage, that there is a lack of healthy competition and that the barriers to the industry’s development are substantial.
4. Telemedicine in the USA: signposts for Australia

The United States of America provides a rich case study of the telemedicine industry in one country expanding on the one hand and hampered by a range of obstacles on the other hand. The case study also provides a useful reference point for analysing the condition of telemedicine in Australia.

Nature of the industry

The telemedicine industry in the USA is quickly becoming more complex: markets are increasing in number and size, the customer base is growing and the number and quality of technologies are increasing substantially each year. The USA has adopted telemedicine enthusiastically and provides most of the telemedicine technology used in Australia.

Sophisticated aspects of the industry include, firstly, the leadership of the American Telemedicine Association, particularly through its refereed journal, Telemedicine and its annual Conference. Secondly, direction is provided by the ‘industry’ magazines, Telemedicine Today and Telemedicine and Telehealth Networks. Thirdly, the USA is progressive in passing telemedicine legislation, notably the Californian State legislation in late 1996 and the Federal legislation in July 1997. Fourthly, USA research organisations such as the Telemedicine Research Centre, the Centre for Telemedicine Law and the Telemedicine Information Exchange provide a knowledge base for telemedicine development. Fifthly, the Association of Telemedicine Service Providers (ATSP), profiled in a later chapter of this report, provides an example of collaboration in the industry.

ATSP, in conjunction with Telemedicine Today (August 1997), identified a total of 339 programs as active in 38 States in 1996, providing 21,000 patient/physician interactions in one year. The total number of telemedicine sites was estimated to be 1,032 in 1996, with a doubling predicted for 1997. Most of the existing sites are publicly funded but the recent changes in legislation are an indication that remuneration for telemedicine consults may eventually become common, stimulating private enterprise, so the number of sites may grow quickly in the future. Telemedicine and Telehealth Networks, June 1997, p. 25) provides this summary:

- Telemedicine is maturing, moving beyond the affirmation-of-concept stage to the testing grounds of healthcare delivery. Implementers are investing their own funds for program start-ups and measuring their success through cost-effectiveness and patient outcomes.

- Clinical specialties such as radiology and cardiology continue to claim the top telemedicine application spots, but home healthcare is emerging as a major contender. Use of the Internet for telemedicine applications illustrates the impending merger of information systems, patient records, and interactive consulting at the desktop.

- At the same time, underutilization of telemedicine services continues to nag program managers. Physician acceptance and equipment functionality are primary operational problems.
Comprehensive, up-front needs assessment by managers may alleviate the acceptance problem. In regard to equipment, vendors need to tailor products more closely to those needs, and provide better service after the sale.

Our survey of 296 telemedicine and teleradiology program managers, on which these findings are based, paints a revealing picture of the state of telemedicine in 1997. Of the 296 managers contacted, 121 responded to our eight-question survey, yielding a 41% response rate. (p. 25)

Telemedicine and Telehealth Networks’ key findings from its first annual program management survey include:

- Teleradiology, telecardiology, teledermatology, psychiatry, and emergency medicine are the top clinical applications in use at telemedicine sites.
- Filling a specialty access need is the number-one reason hospitals embark on telemedicine services, followed by the need to use staff resources more efficiently.
- More sites are investing their own funds in telemedicine equipment and services instead or relying on grant funding.
- Interactive video is a major component of telemedicine services, but use of the Internet for store-and-forward image and video transmission, patient records, and patient consulting is on the rise.
- Most programs do not measure the success of their telemedicine efforts, but among those who do, cost savings and better patient outcomes are important indicators of success.
- An overwhelming majority of managers believe their telemedicine and teleradiology services are under-utilized.
- Physician acceptance is the primary challenge telemedicine programs face, closely followed by equipment functionality. (June 1997, p. 26)

The maturing nature of telemedicine in the USA stems from the following motivations identified by participants in the national survey:

Other motivations cited illustrate the growing maturity of telemedicine. Filling a specialty access need has historically been a primary driver behind telemedicine. But increasingly, telemedicine implementers are seeing the service as a way to increase operational efficiency through better use of staff resources (18.3%), provide rapid information transfer (13.3%), achieve better physician collaboration (12.2%), compete in managed-care climates (11.3%) and provide medical education (7.8%). (Telemedicine and Telehealth Networks, June 1997, p. 27)

**New trends and market growth**

The latest USA telemedicine market developments include:

- the growth in the number of desktop videoconferencing workstations,
- the growth of telemedicine-to-the-home
- the stimulus provided by recent (July 1997) Federal legislation regarding reimbursement for telemedicine consultations
- the use of the Internet to provide online health information, such as Iowa’s Virtual Hospital, and for email exchanges between a requesting doctor and a specialist
- the integration of the electronic patient record with both live and store-and-forward telemedicine technology.

It is estimated that telemedicine-to-the-home is to be the largest single application increasing the market in the next few years.
The availability of desktop videoconferencing systems is also likely to drive expansion of the market. However, desktop units are expected to be used in community health care, health information, staff contact and education and training, and not in clinical situations.

USA telemedicine expenditure

The USA Government Accounting Office (GOA) report to Congress, Telemedicine (1997), identified that ‘nine Federal departments and independent agencies invested a minimum of $646m in telemedicine initiatives for fiscal years 1994-96’ (p.21). The Department of Defence alone invested $262m. Three other departments, the Department of Veterans Affairs, the Department of Health and Human Services and the Department of Commerce each invested over $100m on telemedicine in this period.

Legislation and reimbursement

California’s Telemedicine Development Act (1 January 1997) required private third party health care providers to establish reimbursement policies for telemedicine-related services that are equivalent to face-to-face visits.

The July 1997 passage through the Congress of bills related to the reimbursement of telemedical consultations for rural Health Personnel Shortage Areas was a milestone for telemedicine. The legislation provides reimbursement for all eligible Part B Medicare services at normal co-pay rates, but does not cover facility or transmission costs. It is estimated that between $100-200m will be paid each year, as a result.

Medicaid reimbursement for telemedicine-mediated medical consultations is provided in Arkansas, Georgia, Montana and West Virginia and non-videoconferencing applications such as remote cardiac and foetal monitoring, telepathology and teleradiology have been reimbursed by Medicare, for some time, on a national basis.

Teleradiology dominance

Telemedicine Today conducted a survey of the 52 vendors of teleradiology equipment in the USA in 1997. The survey proved conclusively that teleradiology continues to lead the way in clinical telemedicine:

There are at least 10, and more likely 15 or more, diagnostic teleradiology cases for each video patient-clinician consultation. Not only is there a lot of teleradiology activity... there is also a fair amount of money being spent on teleradiology equipment. A recent Frost & Sullican estimate placed the 1996 world sales of teleradiology products at about $89 million. If PACS were considered in the equation, this figure would obviously be much higher. (Telemedicine Today, Oct 1997,p. 18)

Telemedicine Today reported that as of October 1997, the 13 teleradiology programs in the USA reported seeing an aggregate of 20,323 diagnostic cases/month, averaging 1,694 apiece (range 250-7, 200; median 575). The extrapolated total for 1997 is about 243,000 cases/year. The average program serviced 7.3 remote sites. Only four of the programs were University-based; the remainder were private practice and one VA Medical Center. (Oct 1997, pp. 24-25)
However, Ace Allan, editor of Telemedicine Today, explains why it is difficult to quantify teleradiology activity in the USA in any more detail:

- It is more difficult to track diagnostic teleradiology programs because they are more or less mainstream and don’t attract federal dollars, so there’s no mechanism for identifying them.
- Interim-read (nondiagnostic) teleradiology is quite widespread and is often deployed in small group practices...once again making identification and surveying difficult.
- Teleradiology vendors are reluctant to divulge sales figures, and VERY reluctant to give out names of clients.
- It is not always clear any more where a PACS ends and a teleradiology program begins.

(Oct 1997, p. 5)

**Market trends and drivers**

As discussed above, a major, potential driver of telemedicine is the legislation passed in Congress in July 1997, enabling remuneration for some telemedicine consultations. Whether this is a driver is challenged in a later chapter of this report.

Other major drivers in the USA are:

- ‘aged care’ telemedicine
- call centres
- ‘disaster’ telemedicine
- ‘battlefield’ telemedicine
- ‘correctional services’ telemedicine
- ‘mental health care’ telemedicine
- the move towards a ‘managed care’ framework in health care.

**Weaknesses of and barriers for USA telemedicine**

The report on telemedicine to Congress (February 1997) identified the following weaknesses in telemedicine in the USA: most of the projects to date are publicly funded; there is little public-private collaboration in telemedicine; there is a lack of strategic planning for Federal projects; and there are few cost benefit studies available. The report to Congress (February 1997) also identified the following barriers: legal, regulatory, financial, technical, cultural and skill.

**Summary**

The telemedicine industry in the USA has many mature aspects, such as industry associations and publications, healthy competition, strong manufacturing, active research and development, extensive Government and private investment and high levels of use in some instances. On the other hand, substantial obstacles still need to be overcome, before the industry takes off in a dynamic, enduring manner.
While Australia lags behind the USA in terms of manufacturing and industry associations, Australia is comparable with the USA in terms of telemedicine installations.
5. Telemedicine in Asia: Uneven developments

This chapter provides an overview of telemedicine activities in Asia and a later chapter addresses Australia’s opportunities for exporting to Asia.

The development of telemedicine in Asia is uneven and each country has progressed at different rates. Many have yet to begin, due to lack of resources.

Potential size of the market

The potential market for telemedicine in Asia is huge, if countries such as China, India and Pakistan are taken into account. In South East Asia, including Indonesia, Malaysia, Thailand and Vietnam, there are approximately 20,000 hospitals and 600-700,000 beds. In a 1993 study by the Commonwealth Department of Industry, Technology and Regional Development, the market for telemedicine in the whole of Asia was calculated at $3.2 billion, based on the installation of teleradiology, telepathology and videoconferencing equipment in 5% of hospitals - i.e. 6,200 hospitals.

The following South East Asian countries and Japan are known to have significant telemedicine plans, projects or networks in 1998: Malaysia; Hong Kong; Singapore; Thailand; and Indonesia.

Malaysia

Malaysia is attracting the interest of the international telemedicine industry in the way it is planning a comprehensive approach to telemedicine, including the development of new laws to pave its way.

Malaysia has 119 government hospitals with 33,478 beds and 197 private hospitals with 7,511 beds. The Government is hoping to stem the sharp increase in health care in Malaysia through the use of telemedicine.

Malaysia’s Multimedia Super Corridor (MSC) released a number of key documents on telemedicine on 25 July 1997:

- Malaysia’s Telemedicine Blueprint: Leading Healthcare into the Information Age. This overview statement indicates the future of the Malaysian healthcare system. The document claims that “Malaysia will develop one of the most advanced health systems in the world by harnessing the power of information and multimedia technologies to transform the delivery of healthcare and improve health outcomes.” It also claims that “telemedicine will dramatically reshape the delivery of healthcare. Information and other services will become more virtual, more distributed and more integrated, resulting in better, more timely and more efficient healthcare.”
Importantly, the document focuses primarily on the concepts of wellness and on prevention of ill health, and on reducing the dependency on hospitals. Technology is seen as an enabler to provide integrated healthcare.

- Telemedicine Standards. This document specifies the telemedicine standards required to implement telemedicine in the MSC to ensure compatibility of equipment, interoperability, interconnectivity, scalability, portability and sharing of data in real time.

- Teleconsultation. This is one of four areas to be developed by the MSC, together with a life time health plan, medical education and a mass customised/personalised health information and education. The definition provided of ‘teleconsultation’ is ‘a medical specialist from a tertiary hospital or a diagnostic centre providing remote consultation, diagnosis, therapeutic planning and patient education for patients in health centres or clinics through a medical officer or a paramedic.’

**Indonesia**

The population of Indonesia is expected to increase from 200m to 250m between the year 2000 and 2020. To establish the telecommunications infrastructure for this massive expansion, the Government of Indonesia is planning a project called Nusantara 21, which will connect the entire archipelago to an information highway, with the 27 provincial capitals provided with 155Mbps wideband transmission.

Under the Information Technology Agreement signed in March 1997 by trade superpowers and developing nations, tariffs for information technology products in Indonesia were eliminated, providing substantial saving for consumers. The tariffs will be cut by the year 2000 on items such as computers, telecommunications products, software and semiconductors.

Dr Ali Alkatiri, Head, Division of Planning and Evaluation, Directorate General of Medical Care, Ministry of Health, Indonesia explains:

> the development of telemedicine is inevitable. Indonesia’s 1,063 hospitals, supported by 7,000 health centres scattered on 17,508 islands, are waiting for the implementation of Telemedicine technology to support their referral network. (TeleMed Asia Conference, September 1997, Kuala Lumpur)

Two projects commenced in late 1997-early 1998: Dr Soetomo Hospital in Surabaya will link by videoconferencing to remote hospitals, mostly owned by oil companies and two teaching hospitals located in Bandund (West Java) and Ujung Pandang (South Sulawesi) will be equipped with both videoconferencing and teleradiology equipment. Interestingly, the funds to support the latter project are being provided by Vrije Universiteit, Belgium.

**Hong Kong**

The Faculties of Medicine and Engineering at The Chinese University in Hong Kong established the Telemedicine Taskforce in 1996, focusing on

- endoscopic surgery
• paediatric intensive care
• teleconsultations
• teledermatology
• tele-education.

As an example, one project involves the linking of a district general hospital with a tertiary neuro-surgery centre at Prince of Wales Hospital. To decide on whether a patient is transferred, the district hospital transmits radiological images of patients with head injuries and cardiovascular events to neurosurgeons at Prince of Wales Hospital for second opinions. As a result of trials, unnecessary transfers have been reduced by 21%, adverse effects during transfer have been reduced by 8% and the transfer time has been reduced by 10%.

The Chinese University of Hong Kong is exploring low-cost solutions for tele-education and teleconsultation with Shanghai Medical University and PLA General Hospital in Beijing. (K C Lun, TeleMed Asia Conference, September 1997, Kuala Lumpur)

**Singapore**

Mr. Tan Swee Hua, Director, Healthcare Cluster, National Computer Board, Singapore, at TeleMed Asia 97 in Kuala Lumpur, said that the key challenges in health care are the shortage of medical manpower, increasing demand for healthcare services, the aging population, controlling healthcare costs and regionalisation. Telemedicine was one of the strategies being used to address these challenges. The other strategies were information technology initiatives such as the longitudinal medical record and the electronic medical record, and information services.

This approach is similar to Malaysia’s. Mr. Hua described it as a ‘wellness model’ not an ‘illness model’. ‘Health One’ is part of this approach: using the broadband network Singapore One, it provides drug information, continuing medical information, medical image banks, a medical library, medical terms and information about common ailments. It is aimed at both the general public and health professionals. The National University of Singapore’s Cyberspace Hospital Development Team has developed the Cyberspace Hospital, which has been functioning since May 1995.

Singapore is actively developing remote diagnosis and monitoring services, involving call centres and vital signs telemetry, particularly in aged care situations.

The Ministry of Health has an extensive homepage, http://webtop.s-one.net.sg, providing information on areas such as cancer, dental health, nutrition, AIDS, blood pressure, exercise and smoking. The Homepage provides health education, information on various medical services available and preventative healthcare advice.

A number of international telemedicine activities are being conducted, mostly in the teleradiology field, one involving links to Johns Hopkins Hospital in the USA and another to the National Cancer Centre in Japan. Nationally, teleradiology links Singapore General Hospital with Geylang Polyclinic and AMK Community Hospital.
CASE STUDY: GOLDEN HEALTH PROJECT, CHINA

Except from China Daily, September 1997

The Golden Health Project is one of China’s eight “Golden” projects, which aim to promote digitalization or electronic technology application in the country.

The Golden Health Project started two years ago, aiming to link China’s hospitals by networks to share the resources and doctors’ experience for patients anywhere in the country.

The other golden projects, including Golden Bridge, Golden Card, Golden Customs, Golden Tax, Golden Information, Golden Enterprise and Golden Intelligence, aim to make the most use of information and networking technology.

"The Medical Information Network now has linked 20 hospitals in 15 cities," said Pei Hongyuan, president of Golden Health Medical Networking Company under the Ministry of Health, which sponsors construction of the golden health network.

The Ministry of Health began to establish the Golden Health project in 1995. The project consists of the Medical Information Network to link hospitals countrywide, Hospital Information System to manage hospitals, and Golden Health Cards for common people to record their medical information and account.

The Golden Health Network uses a special communications satellite channel to link the country and ground communication lines to connect hospitals. Beijing is planned to be the centre of the network, with Harbin as a backup station. It will first connect to each provincial capital city, then link to other cities and towns, and finally spread to remote townships.

Last winter the first Golden Health link between Beijing, Dalian and Guangzhou was established, Pei said. Early this year, the network began to link to big hospitals in Beijing, Shanghai, Nanjing and Harbin. Pei said the network is planning to connect more than 80 hospitals by the end of the year.

Thailand

Thailand’s national Telemedicine Initiative, managed by the Ministry of Public Health, includes a teleradiology, telepathology and telecardiology network. The objectives of the network are to increase efficiency of medical treatment; develop human resources; and develop a health data network. The network was established in 1994. The network allows 60 district hospitals to link to Bangkok hospitals, for medical consultation, distance learning and health information. ThaiCom 1 satellite provides the project backbone. The cost benefits of fibre optic versus satellite were examined in 1994 and the decision was taken to use satellite.
Japan

The sudden interest in telemedicine in Japan can be gauged by the number of journal publications on telemedicine in Japan: from one in 1993 to 60 in 1995 and 59 in 1996. Telemedicine activity in Japan is best summarised by the following table, which shows that telepathology and teleradiology account for 94 of the 153 projects. The table was developed by T. Takahashi (Dr K C Lun, Director, Medical Informatics Program, National University of Singapore, at TeleMed Asia 97).

Telemedicine projects in Japan by Prefecture: Source T. Takahashi (via Dr K C Lun)

<table>
<thead>
<tr>
<th>Specialty</th>
<th>Pathology</th>
<th>Radiology</th>
<th>Other Specialty</th>
<th>General Health care</th>
<th>Collaboration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hokkaido</td>
<td>1</td>
<td>13</td>
<td>2</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Tohoku</td>
<td>3</td>
<td>13</td>
<td>4</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>Kanto-Koshinetsu</td>
<td>7</td>
<td>20</td>
<td>2</td>
<td>4</td>
<td>11</td>
</tr>
<tr>
<td>Chubu-Hokuriku</td>
<td>2</td>
<td>11</td>
<td>3</td>
<td>4</td>
<td>2</td>
</tr>
<tr>
<td>Kinki</td>
<td>1</td>
<td>3</td>
<td>4</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Chugoku-Shikoku</td>
<td>4</td>
<td>7</td>
<td>3</td>
<td>2</td>
<td>1</td>
</tr>
<tr>
<td>Kyushu-Okinawa</td>
<td>2</td>
<td>7</td>
<td>1</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>74</td>
<td>8</td>
<td>23</td>
<td>21</td>
</tr>
</tbody>
</table>

Summary

Telemedicine development in Asia is uneven and activities in most countries are limited. However, plans for telemedicine in Malaysia and Indonesia are very extensive.

Many Asian countries are looking to fellow Asian countries to access telemedicine services or to supply services, hence reducing the market potential for Australia.

The issue of exporting Australian telemedicine services will be discussed in a later chapter of this report.
6. The Telemedicine Industry in Australia: Markets, Technologies and Stakeholders

The next two chapters provide a description and analysis of the telemedicine industry in Australia today. This chapter assesses the scale and extent of the existing and emerging opportunity in telemedicine, in terms of market size, growth and segments. It also notes the increasing numbers of technologies becoming available for telemedicine and questions how Australian companies can add value to these imports. Finally, the chapter identifies the groups of stakeholders involved in the industry.

As discussed earlier, an industry can be defined loosely by

- the types of technologies used
- the markets
- the stakeholders, including vendors, customers and users.

Following is a description of the telemedicine industry in Australia, based on these categories.

**Market size and growth**

![Diagram showing the intersection of technologies, markets, and stakeholders]

**World leader**

In relation to the number of telemedicine installations overseas, Togno, Ash and Mitchell (1996) claim that, on a per-capita basis, Australia is one of the world leaders in telemedicine:

Telemedicine activity in Australia is increasing rapidly. On a per-capita basis, the Australian deployment of telemedicine may rival that of Norway, which may be the most active in the world in terms of implementation per unit population. Numerous experiments are underway, using a wide variety of transmission technologies, to help tailor the technology to specific applications and local conditions. (Telemedicine Today Nov/Dec 1996, p. 43)
The geographical challenges in Australia are both a stimulus and a barrier to the spread of telemedicine:

Like the continent, Australian telemedicine is surprising, sprawling, and variegated. The geographic challenges of Australia rival those of anywhere on earth, with vast territories containing less than one human inhabitant per square mile. (Togno, Ash, Mitchell in Telemedicine Today, Nov/Dec 1996, p.42)

By late 1996, Australia had 28 different telemedicine projects using videoconferencing, compared to the USA’s 42 in 1995:

Among these projects, approximately 28 support interactive video mediated patient-physician consultations. This approximates the 42 projects in North America in 1995 (TT’s 3rd Annual Program Survey, vol. 4, no. 4), and is especially impressive in a land with less than 20 million people. (Togno, Ash, Mitchell in Telemedicine Today, Nov/Dec 1996, p.42)

While Australia lacks many of the sophisticated aspects of the telemedicine industry in the USA, such as professional and industry associations, journals, research bodies and technology expositions, Australia’s pace in installing new sites is in advance of the average world rate.

**Early projects and drivers**

The start of this heightened activity in telemedicine in Australia was around 1994: “In the past two years a host of telemedicine projects has sprung up throughout Australia”. (Togno, Ash, Mitchell in Telemedicine Today Nov/Dec 1996, p.42)

One of the key early drivers was the then-Commonwealth Government body, Health Communication Network, which funded a number of innovative projects, particularly the teleradiology network linking rural NSW towns with St Vincent’s in Sydney, and the telepsychiatry network of the South Australian Mental Health Service, linking Glenside Hospital in Adelaide with a number of country hospitals. The latter project built on the insights gained from trial links between the Royal Adelaide Hospital and Whyalla, 400kms from Adelaide, in 1992-93.

Several other telemedicine projects that commenced at that time have continued to make an impact on the field in Australia. The Renal Telemedicine Network of The Queen Elizabeth Hospital in South Australia, which is a national benchmark for telemedicine evaluation studies (Health On Line, p. 49), commenced operation in September 1994. The first of the Victorian telepsychiatry links also began in this period, resulting in over 36 installations by late 1997.

A major driver behind these early projects included the desire to provide equity and access to rural populations. Because of the lack of psychiatrists outside of capital cities, psychiatry was an understandable early adopter of telemedicine technology in Australia. Other drivers behind these initial projects were an interest in using technology to save on travel and other costs and an interest in providing improved quality of care.

Telemedicine projects multiplied quickly in 1995, particularly with New South Wales committing $2m to 12 separate projects, covering a range of clinical applications. The largest single addition of videoconferencing-based telemedicine sites occurred in 1996, when Queensland Health added 62 sites for clinical purposes and 30 sites for rural medical education.
**Numbers of sites and growth**

As at early 1998, there are around 250 functioning videoconferencing-based telemedicine sites in Australia, compared to approximately 30 sites in 1994. This estimate of 250 includes both the State based facilities and those owned by private health practitioners and hospitals. Teleradiology sites number approximately 150.

Queensland has the most videoconferencing-based sites, at around 100, when private practice sites are added to the Government’s 92 sites. Victoria and South Australia have around 40-50 sites each. A detailed list of sites has been prepared by the Australian Health Ministers’ Advisory Council (AHMAC) Telemedicine Sub-Committee and is appended.

The following breakdown of telemedicine sites and projects was presented by Professor Peter Yellowlees at TeleMed Asia 97, in Kuala Lumpur, in September 1997. A few minor changes have been made to update the list.

Queensland: Telemedicine Applications and Locations
- Intensive Care - 3 Hospitals
- Psychiatry - 30 Hospitals & 2 GP Practices
- Neonatology - 3 Hospitals
- Ophthalmology - 2 Hospitals & Private Specialist
- Dermatology - GP Practices & Private Specialist
- Paediatrics - 5 Hospitals
- Radiology - 3 Hospitals
- Judicial System - 2 Courts

New South Wales: Telemedicine Applications and Locations
- Obstetric Ultrasound - 2 Hospitals
- Ophthalmology - 2 Hospitals
- Psychiatry - 20 Hospitals
- Correctional - 2 Prisons
- Pathology - 4 Hospitals
- Radiology - 2 Hospitals
- Paediatrics - 3 Hospitals

South Australia: Telemedicine Applications and Locations
- Renal Dialysis - 4 Locations
- Psychiatry - 15 Hospitals
The above list will need constant updating as new networks are installed around Australia, particularly when the following plans bear fruit. Appendix 5 sets out the current summary of telemedicine activities collated by the Telehealth Sub-Committee of the Australian Health Ministers Advisory Committee.

**Current expansion and evaluation plans**

In early 1998, most State and Territory Governments of Australia are developing plans to expand telemedicine. Some notable examples are:

- the Northern Territory is developing a business plan in the first half of 1998, to provide a framework for expansion
- Tasmania is conducting a number of proof of concept trials in 1998, for evaluation, as a precursor to expansion
• Western Australia, South Australia and the Northern Territory are engaging a consultant to prepare a business plan for the possible introduction of a tri-State joint venture in telemedicine.

• Victoria is evaluating its significant telepsychiatry network.

**Dominant applications: teleradiology and telepsychiatry**

Two applications have dominated telemedicine in Australia since 1994: telepsychiatry and teleradiology.

The scale of teleradiology activity in Australia is difficult to quantify, for similar reasons cited in an earlier chapter by Allen (1997), particularly the fact that the information is commercially sensitive.

Teleradiology pervades the radiology industry in Australia. In South Australia, for instance, all three of the major radiology companies use teleradiology to link to all of their distributed sites, including Broken Hill in New South Wales, and Alice Springs and Darwin in the Northern Territory.

**Table 6.1 Summary of Teleradiology of Private Radiology Practices in South Australia**

<table>
<thead>
<tr>
<th>Radiology Practice</th>
<th>Brand of Teleradiology Equipment</th>
<th>Teleradiology Locations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Private Practice ABC</td>
<td>CDN</td>
<td>Alice Springs, Broken Hill, Berri</td>
</tr>
<tr>
<td>Private Practice DEF</td>
<td>EMED</td>
<td>Mt Gambier, Modbury, Elizabeth, Golden Grove, LMHS, Ashford, Modbury, Woodville; North Adelaide and Munno Para</td>
</tr>
<tr>
<td>Private Practice XYZ</td>
<td>Binary Image (now Integra)</td>
<td>Whyalla, Pt Augusta, Pt Pirie, Pt Lincoln, Darwin, Katherine, Memorial, Wakefield, Calvary</td>
</tr>
</tbody>
</table>

The reasons for teleradiology’s pervasiveness include the reliability of the technology, the quality of the images, the speed of decision making and the ability to have a specialist in one location provide advice to generalist staff at another site. The portability of the technology now enables radiologists to take home a PC with modem and to receive images from country or metropolitan hospitals. Teleradiology technology is also reducing significantly in price and its expansion is assured.

While teleradiology is a major telemedicine application overseas, telepsychiatry dominates the use of videoconferencing-based telemedicine in Australia, by a very significant margin. One industry commentator estimates that telepsychiatry represents 70% of real usage of videoconferencing systems in telemedicine in Australia:

> Australia is heavily skewed towards the practice of telepsychiatry (mostly due to the enthusiasm of key psychiatrists and also the manner in which Mental Health services are funded.) (Ash, PictureTel Telemedicine Update, p.1, August,1997)

Another reason for telepsychiatry’s dominance includes the point made earlier: that the vast majority of psychiatrists live in the capital cities of Australia, leaving the rural areas greatly under serviced. Research undertaken in Australia has also demonstrated that the available technology is considered suitable by most patients and clinicians.
Estimated sales revenue

It is difficult to precisely quantify the value of telemedicine sales of equipment and services, as the information is sometimes commercially confidential. Quantification is also made difficult by the issue which will continue to cause debate: what are the boundaries of telemedicine?

In the table following, an attempt is made to delineate the boundaries of telemedicine by referring only to videoconferencing-based activities, teleradiology, call centres and health-related CD ROM and Internet activities. The relationship of the Internet with telemedicine is not as easy to define, as some activities such as the provision of online medical information is seen by some as telemedicine and by others as part of the broader application of telecommunications and information to the health care system.

The figures in the following table were derived from consultations with industry representatives and indicate that sales of equipment and services in the telemedicine industry represented around $24 million in 1997.

Table 6.2 Estimates of Sales Revenue from Telemedicine Industry in Australia, 1997

<table>
<thead>
<tr>
<th>Category</th>
<th>Estimated Value of Sales</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>videoconferencing equipment (including service and maintenance)</td>
<td>$10m approx.</td>
<td>Based on industry estimate of videoconferencing industry as $40m, with health representing 25%</td>
</tr>
<tr>
<td>peripheral equipment for videoconferencing systems (e.g. document cameras, probe cameras)</td>
<td>$0.5m approx.</td>
<td>Based on average sales of $10,000 for each of 50 sites</td>
</tr>
<tr>
<td>room modification (e.g. lighting, acoustics)</td>
<td>$1m approx.</td>
<td>Amounts spent vary from nothing to $150,000 per site.</td>
</tr>
<tr>
<td>teleradiology (includes hardware, software, networking components). Does not include PACS.</td>
<td>$5m</td>
<td>Based on consultations with the teleradiology industry</td>
</tr>
<tr>
<td>call centres, for clinical health purposes</td>
<td>$3m</td>
<td>Based on advice from the call centre industry</td>
</tr>
<tr>
<td>Internet and CD ROM (e.g. Health Online Project in SA)</td>
<td>$0.5m</td>
<td>Guestimate</td>
</tr>
<tr>
<td>transmission (e.g. ISDN, satellite), including access and rental charges</td>
<td>$2m</td>
<td>Based on estimate of annual cost of $8,000 per site, per annum</td>
</tr>
<tr>
<td>fees for attending telemedicine education sessions</td>
<td>$0.05m</td>
<td>This is a new market</td>
</tr>
<tr>
<td>hire of videoconferencing facilities</td>
<td>$0.2 m</td>
<td>A number of networks are well organised for hiring out of facilities</td>
</tr>
<tr>
<td>fees for telehealth services</td>
<td>$0.5m</td>
<td>This is a conservative estimate only of the value of teleradiology services. When other telemedicine consultations are accepted as part of MBS, this source of funds should increase considerably.</td>
</tr>
<tr>
<td>consultation advice (e.g. IT engineering, project management, evaluation, Web design)</td>
<td>$1.25m</td>
<td>Based on average of 12.5% of project costs. Many consultancies are provided by internal staff.</td>
</tr>
<tr>
<td>TOTALS</td>
<td>$24m approx.</td>
<td></td>
</tr>
</tbody>
</table>

**Market growth and drivers**

Discussions with industry representatives reveal that the market is expected to grow considerably in 1998, and in the next few years, due to:

- the increasing popularity of a number of cheaper videoconferencing units, in the price bracket of $10-20,000, leading to the purchase of multiple codecs for the one hospital building or for the development of application-specific networks (e.g. a mental health network in South Australia, managed by the Women’s and Children’s Hospital)

- the wider availability of the new European style of ISDN through local, digital Telstra exchanges is expected to lead to many more ISDN connections to community health centres and small hospitals, in locations where ISDN was not previously available

- ISDN usage is expected to grow in proportion to the number of new videoconferencing units and because of a growing interest in the more expensive 384kbps transmission rate, compared to the lower costs for 128kbps

- desktop videoconferencing, operating over the plain old telephone service (POTS), is expected to become used more frequently for telemedicine to the home

- industry representatives expect the teleradiology market to grow by 50% to $7.5m in 1998.

Telemedicine can be expected to grow even more in coming years, for the following additional reasons:

- the possibility of telemedicine consultations becoming eligible under the Medicare Schedules Benefit, as recommended in Health On Line

- private health practitioners embracing this currently public-dominated arena

- equipment and transmission options becoming economical and more widespread.

Hence, estimates of the growth of the telemedicine industry in Australia, based on consultations for this study, are:

- 1997 $24m
• 1998  $36m
• 1999  $54m.

The full value of telemedicine cannot be gauged by these figures. As discussed later in the report, telemedicine needs to be seen as part of a new, flexible way to deliver health services. Telemedicine will also become increasingly enmeshed with the integrated application of other information and communication technologies. This integration will also add considerable value to the Australian economy and will change the delivery of health care permanently.

The implication of such changes inspired by information and communications technology are difficult to appreciate, but health care delivery in the 21st century will certainly apply such technology more effectively and, hopefully, less expensively. We will witness a significant change in the role of the tertiary teaching hospital, and increasingly empowered family practitioners with their better-informed patients will enforce a new role on the specialist practitioners. For better or for worse, communication in medicine will be different. (McKinnnon, Medical Journal of Australia, Dec 1997)

There were some surprising predictions about the potential size of the telemedicine industry from interviewees for this study. One commented:

In the longer term, telemedicine becomes part of medicine. As medicine is already a $40B industry and growing, one would expect that up to 10% of the activity would be conducted electronically. Therefore $4B is a ball park over the next ten years.

Another interviewee placed the emphasis in the long term on fees for service, not technology, in answering the question about the potential size of the market:

Several million dollars for equipment; many millions for telecommunications; very many millions for medical fees.

**Market Segments**

Mainstream videoconferencing-based telemedicine market segments in Australia include teleradiology, teleconsulting (particularly telepsychiatry) and telehealth education. Teleconsulting includes a range of applications: for example, tele-ophthalmology, tele-cardiology, tele-ophthalmology, tele-dermatology, tele-oncology and tele-paediatrics.

Emerging markets in telemedicine in Australia include:

• call centres. A case study of High Performance Healthcare follows.
• telemedicine to the home. A case study later in this report, on the University of New South Wales and the work of Professor Branko Celler, indicates that Australia has world-class expertise and potential in this field.
• telemedicine to aged care facilities
• correctional services telemedicine
• Aboriginal telemedicine
• Defence forces telemedicine
• ambulance telemedicine
emergency, outback telemedicine

combining digital communications at the GP’s desktop

telehealth information on the Web

export of telemedicine services to Asia (discussed in more detail in a later chapter of this report.)

CASE STUDY: CALL CENTRE – HIGH PERFORMANCE HEALTHCARE (HPH)

High Performance Healthcare, with headquarters in Sydney, is a wholly owned subsidiary of TeleTech, one of the world’s largest customer communication companies. TeleTech provides integrated customer care solutions for large companies internationally including Telstra, Westpac, AT&T and GTE.

High Performance Healthcare is a unique healthcare company which specialises in the delivery of telephone and Internet based programs for the health and welfare sector. These programs aim to deliver a number of services, but primarily include health and welfare information, care coordination, discharge planning, disease management, telephone based counseling and support for consumers; telephone advice, information and support to general practitioners.

Call centres are located in Sydney and Melbourne currently, with an Adelaide office to be established in 1998 and fifty five medically trained staff are available, on line.

HPH has fourteen major Australian health clients, including large health insurers MBF and HBF.

Some of the innovative programs conducted by HPH include:
• conducting program for GPs in northern Sydney in 1998, on disease management for areas such as cardiovascular medicine and vaccines
• conducting program for Department of Health and Family Services on Child Care Access, providing an information service, advice and coaching.

Services are delivered by consumer focused health, nursing and consumer service professionals, with highly attuned skills to meet the needs of the caller. Aside from relying on this expertise, the healthcare professionals access a range of software which enables them to quickly source information. This software is also complemented by written material and fact sheets which can be sent to the consumer. There is also the capacity to communicate electronically.

High Performance Healthcare’s clients come from the full spectrum of the health and welfare industry. They include health funds, the pharmaceutical industry and government departments. For each client, High Performance Healthcare operates seamlessly as part of the organisation. Virtually all of the programs operate in the name of the client, with High Performance Healthcare running the program on the client’s behalf. In fact, clients are encouraged to see High Performance Healthcare programs as a business unit of their organisation.

High Performance Healthcare, therefore, is a technology enabled healthcare customer communication centre that can provide a range of healthcare information from simple information and advice to care coordination of complex clinically ill patients. It has the capacity to triage and refer
patients to the most appropriate “on the ground” service or provide self care strategies.

High Performance Healthcare is a telehealth provider in the broader sense of the word, offering access through telephones, fax, letter, email as well as interacting with both providers and consumers. In the United States the parent company is piloting video kiosking technologies that will allow the linkage between video, voice and data signals using call centre technology.

Types of technologies used

The telemedicine industry can be defined, in part, by the technologies used.

A large range of technologies are used in telemedicine, in the following broad categories:

- videoconferencing
- teleradiology
- telepathology
- call centres
- Internet, intranet and CD ROM.

Telemedicine technologies are rolling off the research laboratory benches at a fast rate and it is increasingly difficult to categorise telemedicine equipment, as explained by Ace Allen, introducing Telemedicine Today’s survey of telemedicine equipment in the USA in 1997:

Keeping up with telemedicine technology is like climbing a sandpile, running fast just to stay in the same place. Some of the struggle is in figuring out how to categorize products. A single item, such as an electronic stethoscope, could be classified as a Medical Peripheral, a Telemonitoring Device, or under Medical Specialities (Cardiology). (Ace Allen, Telemedicine Today, 1997 Buyers’ Guide, p.5)

The House of Representatives Committee agreed with the findings of the United States Telemedicine Report to Congress that what is known about telehealth today “represents only an initial snapshot of a technology that is changing and expanding daily”. (Health On Line, 1997, p.29)
On the surface, Australia has little to offer to the international telemedicine community, given that most of the equipment is manufactured in the United States and Europe. The challenge for Australian industry is to take the raw technology and to add value. One example of this is Health OnLine, described in the following case study.

**CASE STUDY: HEALTH OnLINE**

Health OnLine was established by the South Australian Health Commission to research and develop new approaches to the delivery of health education into the 21st Century - to advance total health quality.

The Flinders University of South Australia, in recognising the potential of Health OnLine, has taken an equity position in the project.

Health OnLine believes that interactive computer technology is fast becoming an integral part of the study and practice of medicine and other health professions. These paperless education tools will be accessed via the Internet and intranet systems and supported by CD ROM.

Health Online designs and develops health education products that are intuitive, functional and user centered. Using leading edge multimedia technology, it combines graphics, text, video, animation and virtual reality into creative learning modules. Applications are written in the Java programming language.

Health OnLine has developed programs on Hepatitis C, Asthma and Diabetes. Current CD ROM titles in production include the Respiratory System and the GI System. The programs can be accessed online via broadband, on CD ROM or on a combination of CD ROM and the Internet. Their launch is expected in the next twelve months.

The Health OnLine Interactive Medical Curriculum Project was endorsed by the APEC Telecommunications forum in March 1997 and the project will form part of the test bed for the Asia Pacific Information Infrastructure.

**Categories of technology**

Telemedicine Today, a USA bi-monthly, produced a 1997 Buyers Guide and Directory for telemedicine and included were definitions of the major categories of telemedicine equipment. Data for the Buyer’s Guide and Directory was solicited directly from vendors and completed surveys were returned by 226 vendors. Telemedicine Today believes that these vendors “represent the core of the telemedicine business.” Given the findings from this scoping study, the telemedicine business in Australia, in terms of the companies that provide equipment, transmission, services and software, is estimated to be in the region of 60-80 Australian companies.

Telemedicine Today grouped telemedicine technology into the following 25 categories:

- Room systems/Rollabout Units
- Desktop Interactive Units
- Send - Receive: miscellaneous, e.g. videophones
- Multispeciality store and forward systems
• General Telemonitoring
• Blood pressure monitors
• Pulmonary Function Monitors
• Electronic Stethoscopes
• Specialty Applications, e.g. telecardiology-electrocardiograms
• Tele-Ophthalmology
• Telepathology Systems
• Teleradiology Systems
• Integrated Light and Video Camera Platforms
• Dermatology
• Dental Cameras
• Video Laryngoscope
• Video Otoscopes
• Presentation Equipment
• Graphics Stands
• Software
• Miscellaneous Services, Products, Associations
• Lighting, Furnishings, Room Design
• Optical Memory Cards
• Networks
• Telecommunication Service Providers.

The above list is reproduced in order to illustrate the number of different telemedicine technologies becoming available to the Australian telemedicine sector. Australian industry needs to add value to these raw materials, particularly through innovative applications and clever bundling of services.

Telemedicine and Telehealth Networks identifies the basic technology ‘building blocks’ and perceptively comments that the challenge is to pick the appropriate building blocks:

The technical building blocks for telemedicine networks encompass computer, video, and telecommunications technologies - each with its own role to play in the acquisition, transport, and display of medical information. The challenge for telemedicine implementers is identifying the right mix of systems that will meet their current and future need to share and integrate clinical data.

What essential components are required to provide telemedicine services? This is one of the most frequently asked questions by implementers. The answer will depend on installation...
A handful of Australian companies are rising to this challenge and are providing services for integrating the appropriate telemedicine technologies. 

Telemedicine and Telehealth Networks also provides the following useful framework of telemedicine technologies:

Telemedicine information, regardless of the medical specialty, can be managed as one of the following categories:

- Industry-standard analog video;
- Text entered via computer keyboard;
- Paper documents;
- Digital image data output from a radiographic scanner or medical image device; or
- Live, interactive videoconferencing.

A small number of Australian companies are clear about these different categories of telemedicine technologies and are positioning themselves to provide a suite of telemedicine services and products.

### Videoconferencing-Telemedicine Peripherals

The above list of 25 categories provided by Telemedicine Today provides a general snapshot of telemedicine technology. The next layer of detail is to clarify what is meant by any one of the categories.

Following is a list of scopes and accessories from one provider of telemedicine peripherals, for videoconferencing-based telemedicine, AMD. This company signed an agreement with Welch Allyn in late 1997, for the latter to distribute their products in Australia. AMD’s equipment falls within a small number of the 25 categories of telemedicine equipment, listed above, demonstrating the technological depth of this industry. AMD Video Scopes and Accessories for Telemedicine include a dermascope; ophthalmoscope; otoscope; ENT scope; laparoscope; nasopharyngoscope; head mounted cameras; intraoral scope, colposcope; proctoscope; sigmoidoscope; microscope - direct video; slit lamp; and fundus camera.

Currently almost all telemedicine peripherals are designed and manufactured overseas, again raising the issue of how Australian companies can create wealth by using others’ creations.

CASE STUDIES: VALUE ADDING TO TECHNOLOGY

Given that most telemedicine equipment is fully imported from the USA and Europe, some people could believe that there is no opportunity to develop new products and services.

One reseller of videoconferencing equipment to the health industry in Australia has demonstrated the ability of adding value to the existing technology. Integrated Vision, based in Adelaide, Sydney and Brisbane, has excelled in adding value in the area of specialist telemedicine room design. For instance, Integrated Vision designed the telemedicine room used by the Oncology Department at the Royal Adelaide Hospital. The room is...
used predominantly for links to Royal Darwin Hospital, for oncology case management. Features of the world-class facility include touch screen control of all equipment, from the one control device; specialist equipment for the display and transmission of x-rays; tiered seating, with a camera capable of panning to find each successive speaker; and a special, roof-mounted camera for displaying x-rays.

Integrated Vision represents a new way of thinking about telemedicine by vendors, perhaps forced on them by changes in the market. The high margins available to videoconferencing resellers in the early-mid 1990s have disappeared and the availability of lower cost units means there is little incentive in only selling equipment.

Future integration of technologies

Proving Allen’s (1997) earlier comment that telemedicine technologies are increasing in number, new store-and-forward technologies are now challenging the leading profile of videoconferencing technologies. Store-and-forward technologies that utilise PCs and the Internet are predicted to become central to telemedicine in the future:

‘Multimedia e-mail’ are current buzzwords in telemedicine. They refer to the development of store-and-forward electronic mail, allowing transmission of not just text, but also audio, still images and video. In the future we will have more sophisticated and affordable real-time videoconsultation, and the luxury of multimedia consultation, to be accessed when convenient. (McKinnon, Medical Journal of Australia, Dec 1/15 1997, p. 574)

McKinnon (1997) believes that, in future, telemedicine technologies will be more versatile and less expensive, that the Internet will become more common and that health care delivery will be changed significantly:

What of the future? Today's technologies will be further developed and refined, they will become cheaper, and new applications will be developed. Already we are witnessing the application of the personal computer and the Internet and other broadband mechanisms in "medical informatics" to transmit patient data in community-based care. Importantly, telemedicine will probably move from being used mostly in its current rural settings into more widespread use. By early in the next century, health care delivery will emphasise the importance of bringing care to patients rather than bringing patients to the health care system and tertiary hospitals, regardless of where patients live. (Medical Journal of Australia, Dec 1/15 1997, p. 574)

The newness of such store-and-forward technologies means that opportunities abound for Australian companies to provide the market with innovative, customised integration of the technologies.

Stakeholders

The telemedicine industry consists of three broad components: the markets, the technologies and the stakeholders.
General stakeholder groups

‘Stakeholders’ is the term used in this report to describe all the various parties involved in telemedicine, from clinician users to patients as end-users, from hospital administrators as customers, to equipment vendors.

General stakeholder groups in telemedicine can be classified as either health care related or other, as in the two circles of diagram 6.1 following:

Stakeholders at a project level

Within any one particular telemedicine project, the numbers of stakeholders significantly extend the general list above. For instance, the evaluation of the renal dialysis network in South Australia (Mitchell, B., Mitchell J. and Disney, APS, 1996), identified the following stakeholders:

- 12 categories of Renal Unit staff (surgeons, nephrologists, registrars, interns, pharmacist, dietitian, social workers, educators, clinical and registered nurses, ward clerk)
• patients
• metropolitan and rural hospital administrators
• Health Commission personnel
• politicians
• technology integration company
• videoconferencing supplier
• transmission provider.

**Collaboration between stakeholders**

It is obviously important that there be collaboration between the stakeholders in the industry. Yellowlees and Kennedy (1996) advocate that the clinical leaders in telemedicine need to work with other telemedicine players:

> It is vital that these clinical leaders work with both experts from the information technology field, as well as with government agencies and, of course, other potential users of the systems, be these patients, or other clinicians. (Yellowlees, P and Kennedy, C, MJA).

**CASE STUDY IN INDUSTRY COLLABORATION: VTEL**

VTEL is funding a PhD scholarship at the University of Queensland for the study of Telemedicine. The scholarship, the VTEL Telemedicine Scholarship, provides funding to a student to study the effectiveness of Telemedicine in Australia’s delivery of health care services to rural populations, with an emphasis on the clinical and cost effectiveness of this method of health care delivery.

In addition, VTEL has provided videoconferencing systems appropriate to the study, including installation, training and provision of on-going support. Several trial projects are either currently underway or in the planning stages in Queensland Health.

VTEL are enthusiastically providing videoconferencing equipment (which has included the HS2000 Health Station) along with technical and some consultative support for the projects, because it believes the Queensland initiatives will deliver practical outcomes for health care delivery and will also help to set realistic technical and procedural standards for effective delivery.

**Buyers**

Currently, the main customers in telemedicine in Australia are health administrators and senior clinicians. If it is to improve and excel, the telemedicine industry needs to develop increasingly sophisticated knowledge about what these buyers want, what benefits they are seeking and their reasons for buying. The following table is a useful aid in this process and sets out the benefits, potential clients (or customers) and reasons for buying telemedicine facilities. The table was prepared in 1993 and more client types could now be added to the list.
Table 6.3 Telemedicine Benefits, Clients and Reasons for Buying (from Steidl, P., 1993)

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Potential Client</th>
<th>Reason for Buying</th>
</tr>
</thead>
<tbody>
<tr>
<td>More services for Country-based Australians</td>
<td>State Health Bodies</td>
<td>Better Rural Health Service</td>
</tr>
<tr>
<td>Consolidating Public Hospital Services</td>
<td>State Health Bodies</td>
<td>Cost Reduction</td>
</tr>
<tr>
<td>Reduced Patient Travel Costs</td>
<td>State Health Bodies</td>
<td>Cost Reduction</td>
</tr>
<tr>
<td>Increased Profit/Better use of Specialists</td>
<td>Radiologists / Pathologists / Hospitals</td>
<td>Greater profit / Better client services</td>
</tr>
<tr>
<td>Reduced Specialist Travel Costs</td>
<td>Radiologists / Pathologists / Hospitals</td>
<td>Greater profit / Cost savings</td>
</tr>
<tr>
<td>Stronger Communication skills within a major hospital</td>
<td>Major Hospital</td>
<td>Cost savings / Better service</td>
</tr>
<tr>
<td>Exporting Australian Health Services</td>
<td>Health Specialists / Federal Government</td>
<td>Profit, export earning</td>
</tr>
<tr>
<td>Training / Education</td>
<td>Hospitals / State Health Bodies / Education Bodies / Large numbers of the private and public sector organisations</td>
<td>Improved training / Cost saving</td>
</tr>
</tbody>
</table>

New and emerging types of telemedicine buyers or customers in Australia, not covered in the above table, include:

- general practitioners
- aged care administrators
- defence administrators
- indigenous communities
- correctional services administrators
- ambulance services administrators
- indigenous community leaders
- emergency services.

**Suppliers, potential entrants and substitutes**

An indication of the number and types of suppliers of telemedicine products and services in Australia is provided in the contact list in Appendix 3. These suppliers include videoconferencing vendors, peripheral equipment vendors, technology integrators, teleradiology suppliers, call centre operators, transmission providers, Internet designers and consultants. A range of these companies are profiled in the case studies throughout this report.

Potential entrants to the telemedicine industry in Australia are many and varied. Many of them will come from other fields currently active within the health care industry, such as information technology companies that will add telemedicine to a long list of
other services they currently provide. Other new entrants will invent services that do not currently exist, by adding value to new and future technologies.

Substitute companies will provide services with new technologies, making some existing services obsolete. For example, companies that can provide services that operate over the plain old telephone service will erode the markets of companies currently providing technology that is dependent on ISDN. Other companies will integrate at the desktop, separate applications that currently operate separately.

New directions

As flagged earlier by McKinnon, the power balance within telemedicine may change in the future, when consumers become more influential:

While Telehealth will continue to be a tool used primarily by the health care professional, the Committee believes that it is inevitable that Telehealth and Health Informatics will, in the future, also be driven by the Health consumer. As indicated earlier, the predictions are that the traditional compact between the patient and the physician will change, and that such change will be consumer driven.” (Health On Line, 1997, p.125)
7. The Telemedicine Industry in Australia: Barriers and Competition

The previous chapter provided a summary of the opportunities available in the telemedicine market. It also highlighted the challenges facing an industry where most of the technology is currently imported.

This chapter provides insights into the barriers facing the development of the telemedicine industry in Australia.

The chapter also summarises the competitive factors in the industry and describes the nature of the industry in terms of standard business measures.

Barriers to growth

A wide-ranging examination of the barriers to the development of telemedicine in Australia was undertaken by the House of Representatives Standing Committee, for the report Health On Line (1997). The report highlighted in particular the lack of remuneration for general practitioners as a barrier to their adoption of telemedicine:

Lack of remuneration for GPs was identified as a major barrier to the use of Telehealth because the Medicare Benefits Schedule applies only to face to face consultations. Under the current provisions of the Health Insurance Act, there is a requirement for the personal attendance of the medical practitioner for a consultation to be considered a professional service. In order to encourage the medical profession to computerise, it is necessary to remove barriers which act as disincentives. The Committee has therefore recommended the recognition of Telehealth consultations as an item in the Medicare Benefits Schedule. (Health On Line, 1997, p. xiii-xiv)

Recent developments in the USA, as discussed below, suggest that simply providing a remuneration system for tele-consulting will not be a panacea.

Health On Line (1997) was very critical of the wastage of money on many projects that did not disseminate their findings:

The Committee considers that the money spent on telemedicine pilots in Australia has been wasted in many cases, ‘as the information and knowledge gained from them was never disseminated.’ (1997, p. xiii)

The report noted that medico-legal issues were a potential hazard:

medico-legal issues could become an issue very soon in Australia, when telemedicine moved from being a predominantly public health system activity. The Committee advocated the ‘establishment of appropriate legal regimes’ by the Commonwealth Attorney General, together with State and Territory representatives. (Health On Line, 1997, p. xiv)

The question of the medical registration of health care professionals was also discussed by the Committee and a recommendation was made that “the Australian Medical Council negotiate with registration bodies in the various States and Territories to introduce a national framework of mutual recognition.” (Health On Line, 1997, p. xiv)
The issues related to access to telecommunications infrastructure were investigated by the Committee and the following matters were underlined:

- unreliable telephone and ISDN services in sections of Australia
- the rollout of broadband services to only a section of suburban Australia
- the high cost of satellite services.

Other barriers to the extension of telemedicine investigated for Health On Line (1997) included privacy, confidentiality and the security of information.

The Committee summarised the main barriers discouraging GPs from participating in a move to computerise health care activities. Research for this study suggests that these same barriers are affecting the adoption of telemedicine by GPs:

- large initial cost outlays for technologies, including recurring telecommunication charges and upgrading of systems
- lack of recognition in the Medicare Benefits Schedule
- belief that trends are being driven by a self-interested technology industry
- limited demonstrable evidence of benefits
- lack of technological standards
- lack of Government policies and a national strategic outlook;
- inability to consult in other jurisdictions without national registration thereby minimising the use to which Telehealth can be applied;
- medico-legal concerns; and
- computer illiteracy and lack of training and support, as well as lack of time to undertake training. (Health On Line, 1997, p. 100)

The report, Telehealth in Rural and Remote Australia, 1997, took the view that the adoption of telehealth needs to be seen as part of a wider move to encourage rural health professionals to adopt ‘IT&T’:

Access, training and participation with regard to Telehealth need to be within a national policy and regulatory framework which will facilitate adoption of IT&T. (p.13)

The list of barriers cited by the report is very similar to that identified by Health On Line (1997). The length of the list is a further reminder that there are many rows of hurdles in front of telemedicine in Australia:

At present there are several barriers with regard to the use of IT&T:

* reimbursement for Telehealth consultations;
* licensing;
* legal liability;
* privacy and security;
* regulations regarding sharing of medical information;
* standards for information management;
* standards of technology;
* State, Territory and regional/district policies and practices regarding health and IT&T and funding arrangements. (p. 13)
**Real barriers and ‘straw men’**

It is interesting that both the Health On Line (1997) and Telehealth in Rural and Remote Australia (1997) emphasised the lack of reimbursement for doctors in telehealth as a fundamental barrier. In California, where some teleconsultations have been refundable since late 1996, surprisingly there was not a significant increase in services in 1997. Lapolla and Millis in Telemedicine Today, in an article entitled, ‘Is telemedicine reimbursement a real barrier or a convenient straw man?’, commented that

> We believe that the reimbursement issue may have been overstated as a barrier to telemedicine deployment, and wonder if other barriers are ‘straw men’ also. (December, 1997, p.5)

Lapolla and Mills urge their readers to

> figure out what are the real problems and not blame the ‘government’ or ‘reimbursement’ for problems that may, in fact, come from within ourselves and our healthcare practice environment. (Telemedicine Today, December 1997, p.5)

This study of telemedicine in Australia suggests that some of the major barriers to telemedicine adoption relate to the nature of the industry, including the immaturity of the industry, the limited telecommunications infrastructure, the lack of appropriate dialogue between vendors and buyers about solutions required and the lack of partnerships in the industry. Remuneration is only one barrier. There are, of course, other substantial organisational, financial and attitudinal barriers to telemedicine adoption.

**AHMAC and Legislation**

The Australian Health Minister’s Advisory Committee Telemedicine Sub-committee prepared a range of papers on the following topics, for consideration by Ministers in March 1998:

- Funding Arrangements and Financing Options
- Legislation and Legal Frameworks
- Standards
- Data Definitions and a National Minimum Data Set
- Strategic Evaluation Research Agenda.

The observation of Lapolla and Millis (1997) that changes in legislation on their own are not enough to simply stimulate telemedicine is a reminder that despite all the above efforts by the AHMAC Telemedicine Sub-Committee, by Health On Line (1997) and by Telehealth in Rural and Remote Australia (1997), even more needs to be done to ensure that each telemedicine initiative is successful. Too much reliance on government direction and financial support will distract stakeholders from undertaking a breadth of actions needed to ensure the successful implementation of telemedicine. The topic of the role of government is discussed in more detail later in this report.
Criticisms of vendors and customers

In the interviews for this study, vendors sometimes saw customers as a barrier to the development of the telemedicine industry, and vice versa. For example, criticisms of videoconferencing-based vendors by telemedicine customers included:

• ‘they just sold us an expensive black box and, once the sale was completed, dumped it on us and left us to work it out’
• ‘they should offer us free advice about integrating the equipment into our specific context’
• ‘the service and maintenance costs (usually of 7.5-10% of capital cost) are too high’
• ‘the rollabout videoconferencing systems are still far too expensive’
• ‘they can’t offer us advice about the peripheral equipment’.

Vendors need to address these common complaints, if the industry is to progress.

Criticisms of telemedicine customers by vendors included:

• ‘the buyers are mostly Government, and the protracted tender process adds expense and time to the sales cycle’
• ‘buyers say that they want value added services, not just the products, then they invariably accept the lowest priced offer’
• ‘each State Government Health Department has a different approach to telemedicine and it is not clear which Commonwealth Government Department is coordinating telemedicine nationally: Health and Family Services; Communication and Arts; Industry, Science and Tourism’.
• ‘the high cost of establishing an Australian-wide network of sales and service, in a thinly populated market, creates pressure for vendors – a pressure not understood by our customers’
• ‘Government should establish technical standards and specifications at a national level, so that quality is assured’.

These types of criticisms are often the result of inadequate communication between the relevant parties. Much could be gained by more open dialogue about the difficulties customers experience and the difficulties vendors face. The widespread occurrence of these criticisms suggests that the development of national collaborative forums would be beneficial. This topic of national forums is discussed in more detail in later chapters.

Competitive factors

Telemedicine in Australia would benefit from healthy competition between suppliers of similar products and services. In some sections of the telemedicine market, such as the provision of videoconferencing and of related peripheral equipment, the market is dominated by a few suppliers. Interviews for this study revealed that even these companies would prefer a more vibrant, competitive environment.
Reasons why the competition is lacking in some sections of the telemedicine arena, relate to entry barriers, rivalry factors, supplier power, buyer power and substitution threats. A number of these are discussed below, to illustrate the factors affecting competition in telemedicine in Australia.

New companies in the Australian telemedicine market face significant entry barriers, such as

- economies of scale: it is very expensive to market products in every quarter of the telemedicine market around Australia
- brand identity: it is difficult to establish brand recognition for new products in such a distributed, thinly populated market.

Rivalry determinants in the telemedicine industry include:

- product differences: interviews for this study indicated that customers often complain that there are too few differences between the products offered by major brands, particularly in the videoconferencing arena. ‘It’s like choosing between a Commodore or a Falcon, and I want something very different to suit my context’, is the common complaint. Customers would like a wider range of choices, but Australia is too small a market to sustain a range of different brands and products.
- diversity of competitors: a number of the companies involved since the early 1990s in telemedicine in Australia evolved from the audio-visual and computing vendor backgrounds. A more recent type of entrant to the industry has software and networking expertise, and these new participants promise to enrich the field.

There are dangers in only ‘drawing a map’ of the industry, argue Hamel and Prahalad (1989). Business strategists need to take the next step and find new space on the industry map:

Armed with concepts like segmentation, the value chain, competitor benchmarking, strategic groups, and mobility barriers, many managers have become better and better at drawing industry maps. But while they have been busy map making, their competitors have been moving entire continents. The strategist’s goal is not to find a niche within the existing industry space but to create new space that is uniquely suited to the company’s own strength, space that is off the map. (Hamel, G and Prahalad, C.K., 1989, pp.63-76)

Following is a case study of an Australian telemedicine company that is thinking strategically about new spaces off the current industry map.

**CASE STUDY: GLOBAL DIAGNOSTICS LIMITED**

Global Diagnostics Limited was incorporated in Perth, Western Australia in 1996, to compete in the highly competitive teleradiology arena. The founders identified an opportunity to commercialise into the export market the teleradiology business being performed within the founders’ radiology operations. Similar to the domestic market, they identified a demand for high-quality healthcare and diagnostic medical services on a cost effective basis without regard to geographical boundaries.

Global Diagnostics is committed to providing the global market with "Telemedicine Solutions" through the marriage of complementary
technologies and their introduction to specialist medical services. Whereas many technology providers only market turnkey hardware systems that "enable" teleradiology, Global Diagnostics provides an "integrated" solution that considers the patient from initial presentation until treatment is concluded. This "Total Diagnostic Solution" philosophy is a new concept in an otherwise compartmentalised industry.

The Telemedicine market potential is extensive and there are currently three recognised approaches to transferring information via Telemedicine technologies: store and forward; interactive real time data exchange; and information dissemination.

Global Diagnostics’ operations and in-house developed systems can be utilised across all three delivery approaches. The commercial success experienced so far has come through the store and forward applications which are used to facilitate medical diagnosis and case management on a cost effective basis that replicates the interactions between attending physicians managing cases at the primary level and the diagnostic and/or clinical specialists.

Global Diagnostics’ store and forward systems were designed to work within the infrastructure constraints that the Company faced in its initial market, remote and rural areas of the Southwest and Northwest of Western Australia. In those areas, high capacity (high bandwidth) transmission lines are generally not available, so Global Diagnostics Telemedicine System was designed to operate on standard telephone lines. The store and forward approach is used in this application due to the relatively low capacity lines (narrow bandwidth) that provides the means of transmission.

Global Diagnostics believes that there are a number of significant opportunities in Telemedicine and they are: to link providers in one country with each other to create a domestic network; to link country networks in various countries to create an international network; and to import electronically to various countries subspecialist expertise available only in a limited number of centres of excellence in the world.

The engagement of radiology Centres of Excellence has commenced with commitments from Stanford University Medical Centre and The Mayo Clinic.
8. Telemedicine in Australia: Costs and Benefits

This chapter discusses issues related to the costs and benefits of telemedicine to Australia, in terms of economic activity and social impacts.

The chapter also discusses whether telemedicine can provide a vehicle to improve the excellence and cost effectiveness of medical education and training and health services, in urban, rural and remote communities.

Lack of data

It is impossible to provide a comprehensive statement regarding the costs and benefits of telemedicine to Australia, as necessary data does not exist. Health On Line (1997) comments that a thorough evaluation of benefits and costs in telemedicine has not been undertaken and recommends the development of a model:

It is widely acknowledged that Telehealth and Health Informatics will improve the delivery of health services. Despite the lack of data, it is generally perceived that the full deployment and use of technologies in health will be cost neutral. However, a thorough evaluation of the benefits and costs of these processes has not been conducted either in Australia or in other countries and using these methods. The Committee has therefore recommended the development of a model designed to evaluate the costs and benefits of deploying Telehealth and Health Informatics within the Australian health system to allow a more accurate assessment to be made. (1997, pp. xii-xiii)

Australia is not the only country with a lack of data. McIntosh and Cairns (1997) argue that, internationally, there is only limited data regarding the cost effectiveness of telemedicine:

The introduction of new technologies has generally been accompanied by claims of efficacy and cost-effectiveness. To date, however, there are only limited data concerning the costs and cost-effectiveness of telemedicine systems. Many technological advances have, in fact, increased the cost of medical care. Any decision to commit resources to telemedicine projects implies that other potential projects that could have been funded with the same resources will have to be either abandoned or delayed. These are the forgone benefits or opportunity costs of the implementation of telemedicine. Any decision to introduce telemedicine must ensure that the opportunity costs are less than the benefits accrued from the allocation of resources to telemedicine. (Journal of Telemedicine and Telecare, no 3, 1997, pp. 138-139)

In Australia, the AHMAC Telemedicine Sub-Committee is addressing the issue in part, through a discussion paper on the topic for Ministers. However, the general lack of data from current telemedicine activities means that much effort will be needed in future to redress the matter.

Regarding the call by Health On Line (1997) for the development of a model for evaluating the costs and benefits of telemedicine, the basis of a model is already available from the work by McIntosh and Cairns (1997), Lobley (1997) and many of the writings of Grigsby (e.g. Grigsby J. et al, Analysis of expansion of access to care through the use of telemedicine and mobile health services, Denver: Centre for Health Policy Research, 1994) and Bashshur (e.g. Base evaluation on access and quality as well
as cost. Telemedicine, 12,8). One would hope that any commissioned study would not only include a literature review, but would encourage those involved to not try to re-invent what is already available.

Economic activity

From a national point of view, the scale of economic activity in telemedicine is currently small, compared to the national health expenditure, but there is significant scope for increased activity. In Chapter 6, the dollar value of sales of telemedicine equipment and services is estimated to be $24m in 1997. It is estimated that this will increase by a factor of about 50% in each of the next few years, to around $54m in the calendar year 1999. If telemedicine reimbursement legislation is passed in the next two years, then fees for telemedicine consultations could become a significant factor in telemedicine economic activity in the long term.

It is argued in Chapter 6 that the full, dollar value to the economy of telemedicine will be much higher than $24m p.a., given the benefits to health and well being. The economic value of telemedicine is also greater than $24m, given the ‘multiplier’ effect of one new activity or project or job in the telemedicine industry creating work opportunities for a number of others in the economy.

It is also suggested in Chapter 6 that telemedicine needs to be seen as part of a new, flexible way to deliver health services. Telemedicine integration with other information and communication technologies will also add considerable value to the Australian economy and could permanently change aspects of the delivery of health care.

There is a possibility that expenditure on telemedicine facilities may replace some traditional expenditure. The trials undertaken in California in 1997 by Kaiser Permanente suggest that more expenditure could be made on ‘telemedicine-to-the-home’ technology with a resultant reduction in expenditure on nurses making house calls, travelling by car. Telemedicine-to-the-home also has the potential to enable patients to become well sooner, and to reduce hospital stays.

Evaluating economic activity in telemedicine is a complex activity, as a number of variables are not static or uniform, such as the technology and the size of the sample. McIntosh and Cairns (1997) summarise the main challenges associated with the economic evaluation of telemedicine:

- evaluation of constantly changing technology;
- inadequate sample sizes;
- limitations of the methodologies available for evaluation;
- establishing an observable and empirical link between telemedicine and improved patient outcome;
- inappropriateness of the conventional techniques of economic evaluation;
- valuation of benefits, including non-health benefits, such as improvements in the process of care;
- the short-term effects on infrastructure and organization may differ from the long-term effects.

(Journal of Telemedicine and Telecare, 1997, No.3, p. 138)
Types of savings and benefits

The types of savings made possible by the use of telemedicine vary from reduced costs for patient admissions to reductions in the cost of expensive, specialist staff travelling to remote sites. Lobley (1997) believes the range of savings might include:

1. Reductions in the costs of patient movement, including the costs of ambulances, aircraft and so on - such savings are likely to depend on the distance between the patient and the specialist and the mode of transport;
2. Reductions in the costs of moving staff, including direct costs of travel, accommodation and subsistence for specialist staff;
3. Reductions of the opportunity costs of the time spent by specialist staff in travelling, which would be more effectively spent working in their profession;
4. Savings through not undertaking laboratory tests which might be deemed unnecessary as a result of a telemedicine consultation;
5. Savings from the increased use of highly skilled medical staff at a specialist centre;
6. Savings due to better scheduling of patient diagnosis and treatment;
7. Savings due to patients receiving more effective treatments and recovering more quickly as a consequence;
8. Reduced costs of travel for patients, including the direct costs and the opportunity costs of time spent travelling. (p. 123)

Lobley (1997) accepts that many of the benefits of telemedicine are not easy to quantify, but still need to be valued:

They include qualitative improvements in patient care through improved treatment, faster and more accurate diagnosis, reduced need for patient referral due to remote consultation, improvements in patient referral through better knowledge and preparation, improved training and education, reduced disruption to patients through reduced travel, improved training due to knowledge transfer from the specialist consultation as a result of knowledge transfer, and more interesting and high-quality referrals for specialist consultants, leading to greater opportunities to undertake research. (p. 123)

Costs and consequences

McIntosh and Cairns (1997, p.134) suggest that a ‘balance sheet’ approach to costs and consequences in telemedicine is useful, because it is often difficult to measure all the costs and consequences in the same units (e.g. in dollar terms). Hence, the possible costs (and savings) of telemedicine would include:

- hardware,
- software,
- consultants' time,
- travel costs,
- running costs (e.g. telephone line and rental charges),
- administrative changes,
- staff changes,
- number of referrals,
- treatment costs. (p.134)
The consequences (positive and negative) may be directly related to health or not. The health benefits would include:

- effect of bringing treatment forward in time (e.g. changes in patient management),
- clinical confirmation (e.g. second opinions). (McIntosh and Cairns, 1997, p.134)

Non-health benefits would include:

- improved quality of service,
- transfer of skills,
- speed of service,
- education,
- reassurance. (McIntosh and Cairns, 1997, p. 134)

**Controversy about social impact and cost effectiveness**

There are a number of contentious issues in the Australian telemedicine community regarding the cost benefits of telemedicine. Firstly, there is disagreement that a major benefit of telemedicine is that it will address the significant lack of services in rural areas. Secondly, there is debate about whether telemedicine is cost effective.

Regarding the social impact of telemedicine, the most common set of needs usually cited as incentives for the development of telemedicine are related to health in the rural and remote areas of Australia. The report, Telehealth in Rural and Remote Australia (1997), provides a succinct summary of the deficiencies in rural health service provision and why these deficiencies exist:

*Significant gaps in the health care of rural and remote communities in Australia have been well documented over the past 20 years. The key issue has been the lack of access of the populations of rural and remote communities to the same level of health services enjoyed by urban communities. This lack of access has been created by a number of factors, including a shortage of health providers prepared to work in these areas, distance from the location of health services and inadequate provision of resources. For those health providers who do choose to work in rural and remote communities there is lack of access to education, training and ongoing support for their roles, as well as lack of peer support. This results in problems with recruitment and retention of staff. (p. 12)*

The report Health On Line (1997) challenges the assumption that telemedicine will automatically improve the delivery of health care to rural and remote communities:

*The Committee cannot endorse the observations that rural and remote communities will increase their access to health services because of Telehealth. A cost effectiveness analysis of Telehealth by itself may not be sufficient:*

*because it fails to account for all the changes that would occur as a result of telemedicine...‘we remain in the dark’ on the issue of cost effectiveness, as there is little hard data and only projections available. (Health On Line, p. 53)*

In its submissions to the House of Representatives Committee, the Department of Health and Family Services accepted that telehealth would improve access to rural and remote communities, but was not prepared to say that telehealth is absolutely cost effective:

*In all of its implementations and all of its guises (telehealth) is absolutely cost effective and the only way to go. We are being quite cautious about that. That is because the underlying infrastructure costs of some of these technologies are very high and frequently they are not*
brought to the table when you are actually looking at a particular thing. (Health On Line, 1997, p. 51)

In its submission to the same Committee, the South Australian Health Commission pointed out that equipment is only one cost component and that while telehealth could facilitate access to health services, it could result in a corresponding increase in costs:

because as you increase access to services you tend to increase the volume of services and there tends to be a net additional cost at the end of the day that has to be borne by someone, somewhere, within the health system. (Health On Line, 1997, p. 52)

Health On Line (1977) indicated that consumer organisations were also cautious and concerned about the cost effectiveness of telehealth:

From the point of view of the Consumers’ Health Forum of Australia (CHF) Telehealth is in its “honeymoon period”. While people see many of the benefits “there is some caution and concern” in relation to cost effectiveness and privacy matters. Because of a lack of evaluation and dissemination of information, there is also general confusion amongst community groups and consumers generally about the possibilities offered by health technologies. (p.122)

CASE STUDY: BENEFITS OF RENAL TELEMEDICINE NETWORK

A range of benefits for staff, particularly doctors and for patients, were identified in the report Establishing Renal Clinical Telemedicine (Mitchell J. and Mitchell, B., 1995) on the renal telemedicine network at The Queen Elizabeth Hospital in South Australia. The network includes three metropolitan and one rural location (Port Augusta, 300km from Adelaide).

Less obvious savings and benefits of the telemedicine network, for staff, are:
• meetings can be held more easily and more often
• staff at satellite centres can be informed of patient transfers and introduced to the patient
• numerous staff development, training and education uses are made possible, e.g. the pharmacist can educate staff about new drugs
• staff in Port Augusta undertaking the renal nursing course can be better supported
• videotapes of live training sessions can be made available to staff
• Unit cohesion and morale is enhanced
• decisions can be made quicker.

There are particular savings and benefits from the doctors’ use of telemedicine:
• doctors can intervene earlier when a patient’s condition is deteriorating
• doctors can, on occasion, determine whether a patient needs to be transported to TQEH
• doctors can manage behavioural problems that occur in satellite centres
• doctors can involve other specialists to examine renal patients suffering from non-renal complaints.

Savings and benefits for patients are:
• patient emergencies can be managed immediately, as has happened during the project, e.g. when a patient fainted during a telemedicine session
• patients in satellite centres can have their outpatient consultation via telemedicine, saving the cost and time involved in travelling to TQEH
• patients can be more easily persuaded to move from TQEH to satellite centres, where no doctors are resident, knowing that they can have
access to doctors, pharmacists, dietitians and social workers, via telemedicine

- patients in satellite centres feel they can access a range of medical and allied health staff, if a need arises
- Aboriginal patients who need to move to TQEH Woodville from Port Augusta can remain in contact with other patients and family in Port Augusta
- because many patients are using telemedicine for their outpatient consultations, the doctors can spend more time with the less well patients during outpatients’ sessions.

Improving service delivery

Telehealth provides a vehicle to improve medical education and training and health services in urban, rural and remote communities, but there is ongoing debate about its cost effectiveness, as noted above. There is also a problem of increasing expectations, when the telecommunications infrastructure in many parts of rural Australia cannot provide a reliable telephone service.

The report Telehealth in Rural and Remote Australia (1997) provides a brief summary of the potential benefits of telehealth technology:

IT&T can have a significant impact in the rural and remote areas of Australia. It is the particular application of these technologies to health - Telehealth - that offers exciting potential to penetrate the barriers of distance, cost, poor distribution of services and lack of support for health providers that at present restrict the access of rural and remote communities to the level of health services enjoyed by most Australians. (p.12)

The report Health On Line (1997) also summarises the benefits:

Telehealth is valuable in solving many challenges created by underserviced rural communities. Telehealth consultations can reduce unnecessary travel for both the patient and doctor and enable a GP in a rural practice or in a remote Aboriginal community to consult with a specialist in a major teaching hospital anywhere in Australia, or in any country in the world. A bush nurse in a remote clinic can be assisted in the care of a patient through telehealth consultations with a doctor, who may be located in the nearest town or a capital city. (p.xiii)

CASE STUDY: DARWIN-ADELAIDE TELEMEDICINE SERVICES

Darwin, particularly the Royal Darwin Hospital (RDH), is an outstanding user of telemedicine. Three separate institutions in Adelaide regularly videoconference to RDH:

- the Royal Adelaide Hospital regularly links to RDH for oncology case management
- The Queen Elizabeth Hospital links almost every Tuesday morning to the RDH for renal transplant meetings
- Flinders University is commencing in 1998 a program to provide undergraduate medical training at RDH, which includes the use of links to Adelaide by videoconferencing.

Psychiatrists attached to the Glenside Hospital in Adelaide have linked to Darwin for supervision of psychiatrist registrars.

Additionally, the Child and Adolescent Mental Health Service from the Women’s and Children’s Hospital in Adelaide has a two-year RHSET grant to
provide services to mental health staff in Darwin, using videoconferencing predominantly.
The radiology company based in Darwin regularly transmits electronic, teleradiology images to its parent company in Adelaide.
RDH links not only to Adelaide: it can link to other capitals such as Brisbane and Sydney, depending on the need. For a professional development activity in 1997, it linked to Oxford University in the UK.

Health On Line (1997) was unequivocal in asserting that Aboriginal communities could benefit from telehealth:

> A significant benefit of Telehealth to Aboriginal communities is that it provides opportunities for distance learning in health care delivery settings for both health professionals and members of the community. In addition, Telehealth can provide improved access to health care in medically underserved areas and urges those committed to improving Aboriginal health care not to dismiss the capabilities of Telehealth outright.” (Health On Line, 1997, p. 57)

The report Telehealth in Rural and Remote Australia (1997) points out that the technologies are available for exploitation:

> The convergence of IT&T over the past few years has created a technical environment where there are rapid developments in interactive technologies. These technologies combine the high speed communications made possible by digital technology with sophisticated computer-based programs and applications. Developing interactive applications have high levels of functionality, at increasingly affordable prices. (p.12)

The report notes the high expectations of rural and remote areas for IT&T. Research undertaken for that project showed that rural and remote health providers already have high expectations of the imminent introduction of IT&T technologies:

> There is demand for technologies that health providers anticipate will overcome significant problems such as professional isolation, access to information and service delivery. (Telehealth in Rural and Remote Australia, 1997, p. 12)

The report is cautious about building up expectations about whether these new technologies will be applied, given the lack of telecommunications infrastructure. The report notes that access to reliable and adequate telecommunications services, particularly the telephone network, in most rural and remote areas, is limited and needs to be upgraded:

> first, it is necessary to enable voice, fax and data communications adequate for Internet access; second, the service needs to be upgraded to ISDN standard; and, third, in the longer term ISDN services need to upgrade to broadband services as they become available and affordable. (Telehealth in Rural and Remote Australia, 1997, p.12)

In summary, it is easy to be carried away by the potential of the new technologies to deliver new services to rural and remote areas in particular. Concrete, tried and proven case studies are needed to demonstrate the issues involved and to assist in the embedding of the services into the mainstream of health care delivery. Additionally, the telecommunications infrastructure needs to be put in place, to enable the services to be delivered.
Telemedicine for rural and remote Australia has captured the attention of most commentators on telemedicine. There are niche applications of telemedicine in suburban areas deserving of note.

The North Western Adelaide Health Service comprising the Queen Elizabeth Hospital (TQEH) and the Lyell McEwin Health Service (LMHS) is an active practitioner of urban telemedicine.

The distance between the two metropolitan campuses is about 25km, through the heaviest traffic of Adelaide. It is often impractical for specialists to jump in a car for the minimum of one hour round trip. Telemedicine links between the two campuses have been used extensively since 1995, for a range of purposes including

- multi-disciplinary breast endocrine clinics
- tele-neurology clinics
- surgeons forums and physicians’ workshops
- seminars for medical students.

TQEH also has three renal dialysis centres in metropolitan Adelaide, linked by videoconferencing. The network enables specialist staff such as nephrologists, dietitians and pharmacists to provide services at remote sites, without wasting consulting time by travelling in a car between centres.
This chapter comments on the potential to create a new medical information technology industry in Australia, in relation to telemedicine.

The chapter also addresses the extent to which telemedicine export operations from Australia would be commercially viable.

Finally, there is a discussion of the opportunities to foster industry collaboration between public and private hospitals and Australian companies with appropriate expertise for the development and export of new medical products and services.

New industry

While there has been constant speculation over the last few years that Australia could export telemedicine expertise to Asia, as will be discussed later in this chapter, little discussion has occurred about how Australia could develop a strong, local telemedicine industry. Most of the attention in Australia has been on developing a variety of telemedicine applications, not on developing a new industry. (The definition of an industry used in this report is of interlocking markets, stakeholders and technologies.)

It is theoretically possible to create a comparative advantage for a minor world power such as Australia in small industries such as telemedicine:

Comparative advantage within the information economy is something that is, and can be, created. Relatively small scale economies like Ireland, Israel and Malaysia - all of which are subject to similar constraints as Australia - are working hard to create such comparative advantage. (A national policy framework for structural adjustment within the new “Commonwealth of Information, 1997, p. 10)

Steidl (1993) argues that Australian companies could develop a comparative advantage in telemedicine by adding value through the bundling of services:

Telemedicine does not only provide an opportunity to export clinical advisory services - it can also be used to deliver a wide range of education and training programs in medical, paramedical and nursing disciplines, management programs for health administration, etcetera. These programs will be developed as distributed education programs. Some of them will be fully delivered using Telemedicine infrastructure while with others, the Telemedicine infrastructure will be just a value-added component, used for tutorials and discussion sessions. (‘Exporting Medical Services to Asia Pacific: The Potential of Telemedicine’, p. 34)

CASE STUDY: CSIRO

The CSIRO has maintained a watching brief on the subject of telemedicine for many years (with particular emphasis on teleradiology), given its skills in interfacing technology and medicine, and its depth of skills in
telecommunications. It has discussed developments with various clinical collaborators, and with researchers and industry groups such as ACCI, Binary Image, St Vincent’s Hospital, DH&FS and the TARDIS team at the Royal Brisbane Hospital.

It has also followed developments through participation in professional organisations such as the Health Informatics Society of Australia and the Society for Computer Assisted Radiology.

CSIRO has recently initiated research on the transmission of live ultrasound over limited bandwidth links for real-time Teleultrasound. It is also planning a project aimed at developing products and services for home telemedicine for chronically ill and elderly patients.

For their research into real time tele-ultrasound, CSIRO has set up a simple prototype system in the laboratory, transmitting live video images between two computers. This has a user-selectable region-of-interest which has higher resolution (or a higher frame rate) than the remainder of the image. The next step will be to acquire representative ultrasound video and do a more realistic concept demonstrator. CSIRO has held discussions with a number of the major ultrasound manufacturing and ultrasound PACS/telemedicine companies, as well as local distributors, and they have all expressed interest in the project.

A recent study has shown that a lack of an entrepreneurial orientation is often the obstacle to the development of creative new ventures:

many of Australia’s indigenous companies appear to lack a strong international outlook, and an entrepreneurial orientation. Many small and start-up enterprises limit themselves through their discomfort with the realities that, to create significant wealth, ownership must be shared with venture funders and with professionals who can enhance managerial competencies. Too much of Australian innovation is undercapitalised and undermanaged. (A national policy framework for structural adjustment within the new “Commonwealth of Information, 1997, p. 6)

A concrete barrier for many initiatives in the field of information technology, including telemedicine, is the lack of investor funds. The ‘Goldsworthy Report’ notes this problem and suggests the use of a Queensland model to stimulate development:

It is clear that many ventures are not investor ready. Many lack sufficient management skills and a convincing business or marketing plan. Australia must achieve a rise in the number and quality of venture capital proposals. There are many ways to do this, but one of the most promising initiatives we have seen is Queensland’s Financing IT&T Growth (FIG) Program, which provides practical skills in business planning, entrepreneurship, business structures, intellectual property, project management and export marketing, and encourages start-up businesses to participate in business networks and business training and awareness programs. It is early days, but the FIG Program provides one possible model for national action and could be used in combination with a range of other business improvement programs. (‘The Global Information Economy: The Way Ahead’ pp. 35-36)

The following case study illustrates how important investment funds are to the growth of new companies.
CASE STUDY: JAM SOFTWARE

Jam Software Pty Limited, established in 1984 in Sydney’s inner western suburbs, is an innovative Australian company specialising in medical and time management technology. The company employs a team of Australian programmers, engineers, technicians and support staff whose primary aim is to increase productivity on the medical desktop.

JAM software has enjoyed international success with award winning products which are used by over 50,000 people in over 40 countries around the world. Over 46% of MacWorld readers in the US voted its product Best Software every year for eight years.

JAM Software has specialised in developing software that provides for the needs of the health care community in a manner that, rather than restrict styles of practice by the demands of computer or traditional database technology, encompasses and facilitates the notoriously idiosyncratic practice styles of health care professionals by allowing them to modify and customise their systems “on the fly” in real-time use.

This flexibility and the ability to provide easy end user customisation is a very necessary feature for international success. The development of modular, customisable components has enabled their products to be used by over 90 medical sites internationally, including the software’s translation to the Japanese Kanji.

Examples of their customised products in Australia include:

• Castlemaine project. This project involved installation of a software system into a number of the local rural practices in Castlemaine Victoria and the local hospital where the GPs in the area are rostered. They use modems to communicate from the local hospital to their surgeries, to log in and directly access patient information when they present in casualty.

• Picton project. A group of 5 GPs with 3 practices located in and near Picton, NSW, using modem communication, access patient files when they present at one site but their records are at another. With the use of scanning technology they also convert paper consultant reports to text which is then stored electronically. This site is very close to being paperless.

• Brisbane project. JAM software has provided the software for a specialist in Brisbane to integrate his electronic patient records with videoconferencing, for linking with his Townsville surgery.

JAM Software has over $2m invested in research and development to maintain JAM’s position at the leading edge of technology. The company believes that it would be enormously helpful and productive if financial and other resources were made available to the Australian software industry, to facilitate further expansion and the timely exploitation of the huge marketing opportunities in this area.

The report, ‘A national policy framework for structural adjustment within the new Commonwealth of Information’ (1997) provides a list of weaknesses affecting Australia’s participation in the Information Economy. Research for this study suggests that these weaknesses could be applied to the telemedicine industry:
1. Undeveloped capital markets - and associated support - for technology based enterprises
2. The tyranny of distance (a country still too far away)
3. Lack of domestic scale
4. Insularity of business base
5. Lack of “distant independent” communications and cheap network bandwidth
6. Lack of depth in skills and management
7. Poor access to global distribution channels
8. Poor brand recognition of Australia online
9. Inadequate international linkages at government, business and academic levels
10. Lack of focus on business innovation and entrepreneurialism. (1997, p. 23)

CASE STUDY: UNIVERSITY OF NSW: WORLD CLASS R&D

The following excerpts from an ‘Application for Collaborative Grant Support in 1997’ by a University of New South Wales team, led by Professor Branko Celler, demonstrates the world class expertise available in telemedicine in Australia.

The project includes the development of a device capable of recording a range of clinical measurements, for use in both the doctor’s clinic and during home visits and the development of a similar, though simplified (lower cost, easier to use) device for physiological monitoring in the home.

In Australia, telemedicine has concentrated on those services which take advantage of broadband communications technology, for example ‘teleradiology’ and ‘telepathology’ (Alexander, 1995). Little work has been undertaken in the clinical measurement area despite widespread interest in the application of information and communications systems in medicine.

This project is based on the vision that improvements in healthcare services and reductions in healthcare costs can be effected by establishing a continuum of patient care. Traditional diagnosis and patient management will be extended beyond the doctor’s clinic into the everyday living environment, using home monitoring techniques and a telemedicine infrastructure.

The chief investigators, in a project led by Prof. Celler, have recently completed a major research program in collaboration with British Telecom, which has resulted in the development of an extensive suite of software for the remote management and assessment of functional health status of the elderly in the home or in an ambulatory day care setting via a remote telemedicine server. It has also resulted in sophisticated instrumentation for the remote monitoring in the home of parameters of daily living sensitive to changes in health status.

Through the links with Community Medicine, many of the important ethical and legal issues involved with remote home monitoring via telemedicine have been examined and addressed. This exciting project has received extensive international coverage.

Clear synergies exist between the activities of the academic group and the objectives of Telstra Multimedia in the adaptation and creation of applications suitable for implementation on the PSTN network, the digital mobile network and the fibre optic broadband network.
This research is conceptually at the forefront of developments in Health Information and Communications Systems underway in the UK, the EEC and the USA. A number of pilot telemonitoring projects have been carried out in the USA and Europe. While these projects have demonstrated the feasibility of a concept, they have not focused on how an integrated system could be used to provide a continuum of patient care.

The proposed research represents a major innovation in the integration of advanced mobile biomedical instrumentation with information and communications technology as applied to medicine. No projects have attempted to integrate clinical measurements taken during the consultation with physiological measurements recorded during daily living.

The University of NSW is at the leading edge of this research because it has the capacity to adapt existing technology and to design new technology to meet the necessary requirements.

Interviewees for this study were invited to name clinical research and technology in Australia that could be commercialised. A range were mentioned including:

- a ‘tele-ECG’ development by a Brisbane company
- teleradiology software developed by a Sydney company
- a hospital information system developed by a Perth company
- a ‘scalable medical image server’ developed by a Melbourne company
- videoconferencing hardware and software from a Melbourne company.

For reasons of commercial confidentiality, the names of the companies involved cannot be divulged. However, the above list illustrates the breadth of technological inventions in the Australian telemedicine industry.

CASE STUDY: CENTRAL DATA NETWORKS (CDN)

The Central group of companies was originally founded in 1980. Central Data Network’s (CDN) main activities include computer data cabling, computer customisation and communications products, including teleradiology. Central has spent many R&D dollars in the strategic development of specialised imaging connectivity for the medical industry. Central Data Network’s intention is to become the major supplier in the medical industry of electronic communications and related services.

Using computers for medical imaging usually requires a lot of effort and expertise. One has to master a complex software package with many features and one often has to work with a user interface designed for computer wizards, not for doctors.

The CDN RadLink (formerly ScreenLink) product line of medical imaging applications from Central Data Networks P/L addresses that. One can
now work on a PC in the familiar Windows 95 environment whilst viewing and reporting digital images from various diagnostic imaging modalities. Most of its features are self explanatory. Experience with multiple installations all over Australia shows that radiologists and other medical professionals can operate the software after a short familiarisation and training process.

The CDN RadLink software is one of the most open imaging systems available. With adherence to database communication and network standards, it can be seamlessly integrated into almost any multi-vendor environment or hospital network. The modular software enables stand-alone use (even at home), departmental use, or wide area network use.

Export opportunities

The opportunity to export telemedicine services to Asia has tantalised the industry since 1992, when a study carried out on behalf of the South Australian Economic Development Authority by the consultancy firm PPK estimated the total Asia Pacific market for telemedicine hardware and software at approximately $2.9 billion.

In addition to hardware and software sales, annual Asia Pacific market revenues are also available from consulting and maintenance fees which were estimated to be $349 million, resulting in a total Asia Pacific market estimate of over $3.2 billion in 1993 dollar terms. (Steidl, 1993, p. 5)

The PPK study identified the primary market for telemedicine goods and services as ‘Wealthy Asia Pacific’ which the World Bank defines as around 5% of the Asia Pacific population. (Steidl, 1993, p. 43)

Five years later, Health On Line (1997) was less ebullient and felt that Australia needed to develop leadership in telemedicine before exporting services and recommended that export must be confined to health education:

It was widely acknowledged that Australia’s medical knowledge and expertise has the significant potential to provide a niche market in health education by way of teleconference links with universities and teaching hospitals with countries in Asia. It was stressed, however, that Australia could not be considered a leader in the field of Telehealth and Health Informatics because these processes have not yet been sufficiently developed domestically. (p. 150).

On the other hand, Health On Line (1997) questioned whether any country was ready to export telemedicine services:

standards must be harmonised, medico legal issues addressed and privacy and confidentiality questions resolved, before Australia, or any other member of the international community, is able to become a successful player in the international market place.” (p. 150)

This cautious approach contrasts with the urgent tone of the ‘Goldsworthy Report’ (1997) which advocates the development of an ‘Australian Inc’ export culture for information industries through the establishment of an export working group under the auspices of the Information Industries Council:

As a matter of priority, the Export Working Group would oversee the development of an industry driven export strategy targeting key markets, harnessing government resources and leadership whilst recognising the different export characteristics of sub-sectors in the industries and of different technologies. There needs to be a strategic focus on opportunities and strategies to pursue virtual exports using information and communication technologies to

provide services, software and content. (‘The Global Information Economy: The Way Ahead’ pp. 54-55).

In seeking sound platforms for export, Health On Line (1997) identified health education as a possible lever for increased export activity:

The Committee believes there is real potential for Australia to build on its reputation of excellence in education, particularly in health, in the Asia/Pacific Region. The similar time zone Australia shares with its neighbours provides an advantage over countries in Europe and North America. The Committee therefore recommends that the National Office for the Information Economy develop a program in consultation with the universities and teaching hospitals to stimulate the export of health education to countries in the Asia/Pacific Region. (p.xxix)

Health On Line (1997) also believed that there is potential for the delivery of Australian aid, including humanitarian aid, via telehealth:

This is especially important for its neighbours in South-East Asia and countries in the Pacific. The Committee recommends that the Australian Government:

(a) through AusAid, investigates the delivery of Australian aid, such as education and training, including follow-up training of health care professionals through distance learning methods; and

(b) pursue the delivery of humanitarian aid to developing countries in the Asia Pacific region such as teleconsultations via Telehealth. (p.xxix)

In summary, Australia does not seem to have progressed from the position outlined in the 1993 ‘SWOT’ (Strengths, Weaknesses, Opportunities and Threats) analysis (Steidl), which suggested that Australia:

- has a competitive ‘product’ as well as a natural geographic advantage in terms of location in relation to developing Asia Pacific markets;
- has failed to develop and implement a well-focussed Telemedicine marketing strategy, particularly in terms of building relationships with overseas specialists and institutions;
- has a fragmented approach to the export of medical services; and
- may again end up as a follower, rather than a leader, with Singapore (and possibly others) establishing and operating a domestic and export orientated Telemedicine network before Australia. (‘Exporting Medical Services to Asia Pacific: The Potential of Telemedicine’ 1993, p. 4)

The report concludes that there are a number of perceived barriers which need to be addressed before telemedicine becomes a viable export product:

- the current lack of co-operation and co-ordination between states and individual institutions and specialists involved in Telemedicine applications: if this issue is not addressed, it will result in a fragmented domestic Telemedicine infrastructure, causing inefficiencies and providing a rather weak platform for export activities;
- there needs to be consensus between all relevant government agencies if Australia wants to participate in the application of Telemedicine projects in developing countries alongside Canada, the USA and others;
- Telemedicine has to be considered as a national challenge, not an opportunity by any particular state to ‘outdo’ other states;
- Telemedicine benefits need to be considered in their total impact on health costs, not in terms of narrow measures, such as capacity utilisation; and
- if Australia is serious about the concept of the ‘Clever Country’ we need to get out and do something clever, rather than just talking about it. There is a window of opportunity in the establishment of a Telemedicine infrastructure in the Asia Pacific region. History shows
Australia usually follows rather than leads. This is not particularly clever. The time has come to get up and realise our vision….('Exporting Medical Services to Asia Pacific: The Potential of Telemedicine', pp. 6-7)

A variety of opinions were expressed by interviewees for this study, about export potential for telemedicine. The views included:

- a belief that State Governments ought not be trying to export services in competition with the private sector; instead, they should be promoting the private sector’s export initiatives
- a belief that Australia is missing out on using a number of competitive advantages in health care, such as the excellent links clinicians have with Asia through conducting periodic clinics in Asia, and through the personnel from Asia who have studied in Australia
- concern that the health industry in Australia was trailing the education industry, perhaps by five years, in learning how to market services in Asia.

**CASE STUDY: HEALTH CONNECTIONS AUSTRALIA PTY LTD**

Health Connections Australia Pty Ltd was winner of the Australian Health Industry Inc. 1997 Award for Development of Strategic Alliances between Australian and Foreign SMEs to promote Australia’s Products and Services Internationally.

Health Connections Australia assists companies wishing to enter and export to Asian or Australian markets by preparing feasibility studies and market surveys as well as providing in-country support and advice.

Dr Jennifer Bowers is Managing Director of Perdana Healthcare International and Director of Perdana Health Connections Sdn Bhd. She established Health Connections Australia in 1995 to provide consulting and advisory services for the health industry and to match Australian health care expertise, products or services to the requirements of Asian clients.

Perdana Healthcare International is a specialist, innovative organisation involved in the development of a range of healthcare facilities and services in Asia. All facilities currently being designed or planned will be developed with appropriate and up-to-date information technology systems such as financial, management and clinical information systems, telemedicine consulting and teaching capabilities such as tele-radiology and other specialties, Internet access including on-line health and wellness information and data bases.

The scope of facilities under development include: 50-100 bed medical centres; day surgery centres; specialist polyclinics; corporate polyclinics; residential aged care facilities and services; and health farms and resorts.

The scope of services and related areas of activity include:
- Education and Training - Medical, Nursing and Allied Health supported by Flinders University of South Australia and Flinders Medical Centre;
- Telemedicine - specialist imaging and consultations; teaching; continuing medical education (CME) available for all staff via Intrahospital, Interstate and International links.
Borneo Specialist Medical Centre is the registered name of the planned 100 bed medical centre to be constructed in Kota Kinabala. It is the first of a planned chain of similar Medical Centres in the Philippines, Indonesia and India. The design, construction, management and clinical care will be based, where ever possible, on Australian standards.

To meet these standards emphasis will be placed on:

- the training of staff using a range of technologies including on-line and video linkages with resources in South Australia; and
- management and clinical information systems compatible with those in affiliated services e.g. Flinders Medical Centre.

**Collaborative strategies**

Collaboration between different parties is not a major feature of telemedicine in Australia. However there are some exceptions including the TARDIS (Telemedical Application for Remote Distributed Interactive Systems) project in Queensland, linking Royal Brisbane Hospital’s intensive care unit to similar units in two country centres. Partners in the project with RBH include Telstra and Ipex.

Other examples of collaboration have been cited in the various case studies in this report, including VTEL’s sponsorship of a telemedicine scholarship at the University of Queensland and Telstra’s proposed collaboration with the University of New South Wales on research and development in telemonitoring. There are many examples in Australia of one-off sponsorship, such as PictureTel’s partial sponsorship of the professional quality telemedicine videotapes made by the Renal Unit at The Queen Elizabeth Hospital.

According to the ‘Goldsworthy Report’, the low level of collaboration and sponsorship among companies in the IT&T field is alarming, given the need for both producers and users to cooperate:

> To prosper in the 21st century Australia must be a leading user and producer of information and communication technologies. Experience suggests that leading edge producers and leading edge users form mutually reinforcing relationships. Rarely does one exist in isolation from the other. (‘The Global Information Economy: The Way Ahead’, 1997, p. 3)

State Governments are demonstrating the value of high level collaboration with key suppliers in the provision of infrastructure. For example, the Queensland Government’s awarding of the Connect Ed project to Telstra, a project primarily to provide at least 64kbps transmission services to over 1,000 schools in Queensland, has led to the availability of ISDN in new locations, that can now be used for telemedicine purposes. Health On Line (1997) commented on this trend:

> many States are investigating and promoting the option of attracting higher level services through joint ventures and collaboration between groups, communities and organisations. The Department of Communications and the Arts has advised that this approach is being supported by the Commonwealth, through the RTIF, and through advice presented to the Government by the Information Policy Advisory Council, in its recent report on regional and rural online services development (p. 21)

Optus is proposing to trial ‘telecentres’ or ‘centres for Telemedicine’, or a combination of several other facilities at a fixed point using satellite technology. Optus submitted that
“there is not one square inch of Australia that the Optus Satellites do not cover”. Satellite technology can link back into other types of infrastructure and is therefore in a position to provide a number of solutions. Cost and affordability are an issue, “but that is largely driven by the consumer base.” (Health On Line, 1997, p.22)

The Health Department of Western Australia believes, that in order to lessen the duplication of telecommunication facilities and reduce costs, aggregation is the answer. Dr Jan Marshall of the Health Department explained:

it means that if you start getting communities involved in it and, therefore, it becomes an ownership thing: they can start seeing that it is good for their whole community. (Health On Line, 1997, p. 22)

CASE STUDY: HEALTH COMMUNICATION NETWORK (HCN)

Health Communication Network Limited (HCN) was established as a telecommunication-based network dedicated to the health sector and giving health professionals access to the right information at the right time. HCN’s intent is to exploit the convergences of communications, health and information technologies.

HCN believes that it is possible for Australia to provide leadership in the use of Internet services, as Australia has a considerable asset in its own health information which is very saleable via the Internet.

Information provision of health information via the Internet is an area of telemedicine which is often overlooked. The proliferation of health knowledge, the increasing ability to access that knowledge by consumers, the increased level of specialisation amongst health practitioners, increasing use of the Internet for information sharing, and HCN’s position in the health sector, have all lead HCN into supplying and developing appropriate market offerings to meet this need.

HCN has its own state of the art server computer and is now providing information via the Internet including Medline Pro: A collection of five abstract databases from the United States National Library of Medicine and other databases including an Australian index of other Australian Health journals not covered under Medline and others to suit particular specialties. HCN also provides the innovative ‘Health Monitor’, a daily summary of news items in the Australian press, delivered promptly each morning via email.

HCN is working with Australia’s leading Internet service providers to provide Australian health practitioners with the ability to access the Internet and communicate with fellow practitioners or anyone else, whether they are across the world or in the next consulting room.

Current projects include:

• collaborating with the Central Bayside Division of GPs to provide Internet workstations for GPs workstations
• working with over 200 hospitals in the NSW Department of Health.

For its PC rental scheme for GPs, HCN has developed strategic alliances with leading IT companies.
10. Telemedicine in Australia: National Coordination

This chapter provides a summary of current arguments regarding the value of national coordination in telemedicine and identifies a number of models for coordination.

The chapter also illustrates that there are divergent opinions about the purpose and functions of proposed national bodies in telemedicine in Australia.

The need for national coordination

Interviewees for this study confirmed the view summarised in Health On Line (1997):

There was an overwhelming view that without a national strategic approach involving the relevant stakeholders, the opportunity for improving health care through the use of communications technology would be lost. (Health On Line, 1997, p.3)

without a national cooperative approach across all interests to inform planning in Australia, Telehealth and Health Informatics are unlikely to be deployed systematically and the potential of these processes will be lost to the Australian community. (Health On Line, 1997, p. 170)

After extensive consultations in 1996-97, the House of Representatives Committee investigating telehealth was concerned about the lack of a coordinated approach:

The Australian health system is highly fragmented. As a result, a great deal of work already being undertaken in the areas of Telehealth and Health Informatics have not been widely shared due to the lack of a coordinated national approach. If the potential of Telehealth and Health Informatics is to be realised, a national approach is essential. (Health On Line, 1997, p. xix)

To counter fragmentation, the Committee recommended the development of a model to evaluate the costs and benefits of deploying telehealth. The Committee also recommended that the Department of Health and Family Services:

(b) consolidate and disseminate results of all trials conducted to date;
(c) ensure that any future pilot projects should satisfy a strategic plan which includes a thorough costs and benefits analysis and the wide dissemination of all outcomes; and
(d) that a defined aim of each pilot should be that upon successful completion, it becomes incorporated as a fully operational program. (Health On Line, 1997, p. xxii)

Prior to the formation of the Commonwealth/States Health IT and Electronic Commerce Committee, the House of Representatives Committee concluded that the new National Office for the Information Economy was the appropriate body to coordinate and monitor trends in this area.

The Office should establish a National Working Group on Telehealth and Health Informatics which includes representation from all State and Territory governments, the public and private health sectors, health professional associations, consumer groups, academics and the telecommunications and technology industry to implement or monitor the recommendations made in this Report.” (Health On Line, 1997, p. xix)

The Committee also recommended that the National Office for the Information Economy establish a National Working Group on Telehealth and Health Informatics.
The Working Group should remain standing for the three year life span of the Office and include representation from all State and Territory governments, the public and private health sectors, health professional associations, consumer groups, academics, and the telecommunications and technology industry to develop, implement and monitor the recommendations made in this Report. (Health On Line, 1997, p. xxx)

The lack of dissemination of information was raised continually by Health On Line (1997) as a result of the lack of national coordination in telehealth:

This Inquiry raised the problem of the fragmented and *ad hoc* approach which has characterised approaches to Telehealth and Health Informatics. The point was made that while a great deal of work has been undertaken in these two areas, such as a number of successful pilot trials, the lack of a national approach has prevented the wide dissemination of information resulting from these trials. Therefore, little is known about how far Telehealth and Health Informatics had progressed within Australia’s health system (p. 165)

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**CASE STUDY: PICTURETEL’S TELEMEDICINE UPDATE**

Leading videoconferencing supplier to the health industry, PictureTel Australia, has developed a periodic four-page newsletter, Telemedicine Update. The only publication of its kind in Australia, it is very popular in the industry, with over 10,000 copies of each of the last two editions being produced.

The newsletter provides a mix of articles on latest technologies, current applications, outstanding case studies, tips on usage and information about global trends.

The newsletter is an opportunity for a major vendor to communicate directly with buyers and users. It also partly addresses the problem highlighted by various Government reports that information about telemedicine initiatives are not sufficiently disseminated in the industry.

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**Alternative mechanisms for coordination**

The interviewees for this study were flexible in their views about how the Commonwealth Government could provide national coordination in telemedicine. They were less concerned about which Department provided leadership and they were more concerned about the following:

- that if one Department was given carriage of telemedicine, that it embrace it passionately and be supported by other Departments
- that the selected Department provide leadership in pulling together interest groups from a range of areas, such as telecommunications, computing, software and, of course, health
- that the Department champion the hastening of legislative changes recommended in the report, Health On Line (1997)
- that any representative committee have a majority of private sector members
- that funding be provided for research and development and for commercialising new products.
There was little enthusiasm among interviewees for the strategy of asking the AHMAC Sub-Committee on Telemedicine to admit other industry players into its committee, as there was concern that public servants would dominate proceedings.

Interviewees for this study were also interested in the formation of a partly Government funded body in telemedicine which could provide a range of support services, such as maintenance of a database of providers, information on global and national trends and developments in telemedicine, advice on equipment standards, direction on medico-legal issues in telemedicine and advice on exporting services.

The report Health On Line (1997) recommended:

- a network of major teaching hospitals should be established as Centres of Excellence in telemedicine
- a national body with inter-sectoral representation formulate a national strategic framework to inform directions.

Centres of excellence are also a strategy proposed by the “Goldsworthy Committee”:

Create centres of excellence - we need a few high quality centres of excellence around Australia, focused on a particular field and recognised around the world as leaders in that field for education and for research. (‘The Global Information Economy: The Way Ahead’ pp. 79-80)

While strategies such as centres of excellence are attractive, a number of stumbling blocks lie in the way of such strategic mechanisms. For instance, the Department of Health and Family Services pointed out that

There are currently no mechanisms for making national advances in health IT. Not only are health areas within states moving along independent paths, state-wide IT developments are to some extent dictating directions for state health. National co-ordination would thus need to extend beyond the health portfolio for resolution of some issues.

In addition, the Department pointed out in its Submission that there is a multiplicity of government layers, their agencies, private sector and community interests within Australia and from overseas endeavouring to influence individual components health information management. (Health On Line, 1997, p.169)

The Committee acknowledged the work being undertaken by AHMAC committees, but believed that the issues which require resolution need an expanded organisation which should include a variety of stakeholders from both the public and the private sector. (Health On Line, 1997, p. 169)

**Access to reliable IT&T infrastructure**

One possible component of a national, coordinated approach is the development of a telecommunications infrastructure. The report Telehealth in Rural and Remote Australia (1997) proposed that

A telecommunications infrastructure needs to be developed for rural and remote Telehealth, enabling health providers’ access to adequate bandwidth to meet their particular service, education and training needs. The infrastructure should be established on a national basis with specific reference to the needs of rural and remote Australia. Concomitantly, the infrastructure should allow access to such a national network by service, education and training providers. The infrastructure developed must ensure interoperability and gateways between all service systems. (p. 13)
While such an aim is laudable, the recommendation flies in the face of several realities, including:

- individual States and Departments within States designing their own networks
- the work of the Regional Telecommunications Infrastructure Framework, in allocating $250m to regional initiatives
- the freedom of the transmission providers in a deregulated market to negotiate individual arrangements with each State.

**Promotion and training**

A second, tangible area where national coordination could occur relates to training. The report Telehealth in Rural and Remote Australia (1997) detected four areas of concern with regard to education and training:

1. The lack of awareness on the part of health providers regarding the technologies available and their applications to Telehealth;
2. The need for training in the operation of the technologies for Telehealth applications;
3. The need for training in the ways in which the technologies can best be used for the continuing education of health providers; and
4. The need for training in the ways in which the technologies can best be applied to clinical health services. (p. 13)

National coordination in these generic, training areas would meet with wholehearted support from the majority of people interviewed for this study.

**Coordination of strategic directions**

A third area for national coordination, proposed by the report Telehealth in Rural and Remote Australia (1997), concerns strategic coordination by governments and other groups.

A consequence of Federal, State and regional authorities pursuing individual strategic plans and implementation policies for IT&T is likely to be fragmentation of services and practice. This may result in restriction of access by health providers in rural and remote communities to information resources. A cooperative approach across governments and other workforce groups/stakeholders should create a focus for communication service providers to improve the level of infrastructures by providing a more viable commercial base on which to develop and expand infrastructure. (p. 13)

While this has recommendation has commonsense on its side, the difficulty of coordinating not only all Governments but all transmission providers would seem to be impossible.

**Focus of a national centre of excellence**

As noted above, centres of excellence have been recommended by two recent Government reports, Health On Line (1997) and the ‘Goldsworthy Report’ (1997). Health On Line (1997) advocated the establishment of a series of Centres of Excellence for telehealth. The Centres would be set up in each State and Territory; would be strategically located; would promote Australia expertise in the Asia-Pacific region and
beyond; and would deliver education and would provide teleconsultations within the local region.

The Health On Line Centres would be quite different from the national centres of excellence advocated by the ‘Goldsworthy Report’ (1997), which identified the work that could be undertaken by these centres:

Creating a Software Engineering / Software Quality Network - a network of centres of expertise in specific areas of software engineering, with at least one node in each capital city. These centres would:

- provide a first point of contact for local industry to obtain help from any node in the network;
- provide training and consultancy services in specific areas of expertise on a fee for service basis;
- perform collaborative, contract and applied research;
- perform basic research using existing ARC and similar funding; and
- provide an interface with international software engineering activities in specific areas of expertise, including reporting on and participating in standards activities. (The Global Information Economy: The Way Ahead p. 94)

The ‘Goldsworthy Report’ model is similar to the model proposed by Steidl (1993) with expertise in Telemedicine, which is not marketing its own equipment and thus offering unbiased advice. The Health Communications Network may play such an ongoing role. The Australian Telemedicine Centre could provide a planning service to those health units (or state agencies) exploring the use of Telemedicine in Australia or overseas. This service should include carrying out a feasibility study, identifying applications which would benefit most from Telemedicine, providing cash-flow forecasts showing the impact of Telemedicine, based on similar situations encountered elsewhere, outlining technical solutions and recommending the most appropriate solution, identifying revenue opportunities (if relevant) and identifying other health units in the Telemedicine network which have similar interests, or offer complementary service usage or delivery systems. (pp. 46-47)

Steidl (1993) also recommended an information coordination role for the national group:

Related to the planning service is a co-ordinate service. The Australian Telemedicine Centre could keep track of Telemedicine applications, projects, services offered, health units with Telemedicine facilities and the specifications of these facilities, et cetera. It could provide a co-ordination service with respect to joint programs involving a large number of health units (e.g. high profile lectures by visiting specialists) as well education and training programs. (p. 47)

Finally, Steidl (1993) recommended that the national body focus on marketing:

The Australian Telemedicine Centre’s role could be to increase the number of overseas health units installing Telemedicine units and to market the range of Australian medical services, made available by Australian health units and specialists with access to Telemedicine units. (p.47)

While there was encouragement from the interviews for this study, for a national coordinating organisation in telemedicine, there is little agreement about whether it be focused on technology matters, such as the availability of infrastructure or standards; strategic planning; policy development; promotion; evaluation; marketing; or other issues. It may be unwise to burden any one organisation with too many functions,
particularly if there could be conflict within the organisation between commercial and Government agendas.

It is interesting to note that in the USA there are a number of tiers of telemedicine organisations, with few parallels in Australia:

- a number of bodies advise the Federal Government
- the American Telemedicine Association (ATA) provides a forum mostly for clinicians
- the Telemedicine Information Exchange provides extensive information online
- the Telemedicine Research Centre conducts research into key issues within the industry
- the Centre for Telemedicine Law examines medico-legal matters raised by telemedicine
- the Association of Telemedicine Service Providers (ATSP) provides member services for organisations providing telemedicine products and services.

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**CASE STUDY: AMERICAN TELEMEDICINE INDUSTRY ASSOCIATION**

The Association of Telemedicine Service Providers (ATSP) was created to meet the special information, management, and policy needs of hospitals, clinics, long and short-term care facilities, health care systems, managed care organizations, corporate telemedicine service providers, home health care providers, and individual practitioner offices that are, or expect to be, providers of telemedicine services. The Association’s long-term goal is to make telemedicine live up to its potential as a valuable and economically viable way of providing health care services.

Member surveys are designed to help Association planners determine when, where, and how the Association should take action on issues ranging from licensure and liability to reimbursement and communication protocols.

Association members may qualify for special rates on items ranging from communications hardware to software and bandwidth.

Association advocacy programs are designed to bring rationale and context to the State, Federal and industry level regulatory, legislative, and policy decisions that may impact on an organization’s ability to sustain and deliver health care services remotely.

The ATSP works closely with the nonprofit Telemedicine Research Center to perform proprietary research.

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**Summary**

Research for this scoping study showed that there is agreement that national coordination in telemedicine is wise, but there are differences of opinion about the
purpose and functions and membership of any national coordination body. Various options include:

- imitating various USA models, such as the ATA or ASTP
- expanding the AHMAC Sub-Committee to include private companies
- using the Commonwealth/States Health IT and Electronic Commerce Committee as a forum for discussion and a platform for planning
- creating an information clearinghouse and broker, on a partially government funded, partially self-funding basis
- creating a new body.
11. Telemedicine in Australia: industry development

This chapter extends the discussion started in earlier chapters about industry development by advocating roles for government, industry and consumers in relation to the telemedicine industry.

The development of a vibrant telemedicine industry will encourage multinationals to collaborate with Australian companies and to manufacture equipment in Australia.

Throughout this report, it has been recommended that telemedicine be seen as part of the larger information and communications arena. Hence a number of related reports, such as the 'Goldsworthy Report' (The Global Information Economy: The Way Ahead, 1997) and the Information Policy Advisory Council (IPAC) report (A national policy framework for structural adjustment within the new Commonwealth of Information, 1997) have been used as key reference frameworks for the telemedicine industry. The industry development frameworks from these two reports will be discussed in this chapter.

Building business, not regulating

The ‘Goldsworthy Report’ (1997) argued that Australia’s graduation to being a leading user and producer of information and communication technologies will be signaled by a move towards equivalent world import and export market shares. The ‘Goldsworthy Report’ (1997) also recommended that Government should establish an information and communication technology development fund to enable Australia to explore and be in a position to seize development opportunities as they arisen (p. 21). The urgency to create this fund stems from two findings:

- there is strong international competition for investment capital and Australia is uncompetitive at attracting global investment in the information industries;
- a competitive business environment is a necessary, but not sufficient condition for investment and success in the information industries. (p. 6)

Practical mechanisms for building strategic alliances and export-based partnerships between local and multinational companies in the information industries already exist in the Partnership for Development and Fixed Term Arrangement programs and Carrier Industry Development Plans:

For many information industries SMEs (small to medium sized enterprises) these partnerships have facilitated access to the international distribution and supply networks of multinational companies and to technical, quality and marketing support. Government outsourcing offers new opportunities in this regard. (The Global Information Economy: The Way Ahead’ p. 59)

The ‘Goldsworthy Report’ (1997) advocated the following key policy principles which could easily be applied to telemedicine planning:

- strategic - Australia’s vision and goals have to be for the long-term, not the short term;
a policy partnership - proactive government leadership supporting industry initiatives. (p.ii)

The ‘Goldsworthy Report’ (1997) suggested that Australia needs a business-focused industry policy - the focus must be on building business, not regulating or restructuring industries. It argued that:

- Government needs to back business, not pick winners - providing supportive infrastructure and reducing obstacles to a minimum;
- Government needs to instill confidence in the business community through a sense of policy continuity and permanence;
- pragmatic - the playing field is as it is, not as textbook orthodoxy would have it;
- reciprocity - not giving away advantage without getting something in return. Reciprocity in the sense of negotiating and trading advantages in multi or bilateral fora, and having regard to the pace of change elsewhere;
- building businesses and seizing opportunities in a global context:
  - investment facilitation - winning information industry investments for Australia
  - export orientation - maximising exports, and by so doing minimising the net information technology trade imbalance;
  - building wealth and income by the creation of intellectual property through focused research and development-based businesses and seizing opportunities in a global context;
  - developing the right skills at every level to maximise growth of the information industries and their widespread use; and
  - leveraging industry development through government purchasing and outsourcing
- act as a nation, not as competing States, particularly in the global marketplace (Europe has demonstrated how to do this with enormously diverse interests). (pp. ii-iii)

The telemedicine industry would benefit greatly by being part of this national approach to industry development. Of particular note is the call for Government to provide infrastructure, reduce obstacles, facilitate investment and build wealth through research and development.

Roles for Government

Government can play either a constructive and facilitating role or an obstructionist role, in the shaping of the new information economy. The Information Policy Advisory Council (IPAC) believes it is as important for Government to identify what it should not do, as it is to recognise those areas where Government can add value in the interests of the community. (A national policy framework for structural adjustment within the new Commonwealth of Information, 1997, p.14)

IPAC suggests seven roles for Government which are easily applied to the telemedicine context:

- National leadership
- Regulatory functions
- Catalyst for national activity
- Exemplar as key market participant
- Information resource manager
- Information and content asset owner
Government as user and purchaser of services. (A national policy framework for structural adjustment within the new Commonwealth of Information, 1997, p. 14)

These actions coincide with many of the ideas of the interviewees for this study. The major roles that interviewees want Government to take are leadership, a regulatory approach in terms of ensuring a consistent approach across Government portfolios, providing forums for dialogue and laying off government intellectual property rights to the private sector willing to assume commercialisation risks.

Roles for industry

IPAC believes that a purposeful but limited role for Government depends upon industry and business playing their part. Real collaboration and joint effort is required, comprising a partnership between government, industry and community groups. The five roles for industry (associations and market leaders) include:

- Leadership
- Self-regulation
- Promotion
- Industry development
- Exemplar. (A national policy framework for structural adjustment within the new Commonwealth of Information, 1997, p. 16)

The interviewees for this study accepted that industry needed to provide leadership by nurturing consumer confidence and comfort with new systems; and providing self-regulation by developing collaborative relationships with consumers.

The telemedicine business world in Australia, being so fragmented, will find it difficult to meet IPAC’s challenges regarding industry development, viz:

- Industry associations to promote world’s best practice and encourage innovation;
- Prepare case studies of balance sheet implications of going online: quantity benefits;
- Implement industry training and skills development programmes to create digitally literate managers and personnel;
- Target attraction of specialised skills from offshore. (A national policy framework for structural adjustment within the new Commonwealth of Information, 1997, p. 16)

Government facilitation will be needed to provide the telemedicine industry with sufficient cohesion to undertake these activities.

Roles for consumers

IPAC uses the term ‘online’ which can be taken to mean any industry which uses the new information technologies, such as telemedicine. IPAC believes that both consumer associations and community groups have an important role in shaping Australia’s online future. Established businesses need to recognise that consumers and “virtual communities” with commercial value and power will play new and different roles in the business systems of new online systems. Ironically, the breaking down of national boundaries is likely to result in the erection of higher borders around local communities and groups. For each to be successful in benefiting from new networked applications, users and producers need to develop new relationships. (A national
policy framework for structural adjustment within the new Commonwealth of Information, 1997, p.17)

The five roles for consumer and community stakeholders include

- Leadership
- Advocacy
- Exemplar
- Community Development
- Market regulation (A national policy framework for structural adjustment within the new Commonwealth of Information, 1997, p. 17)

Based on the interviews for this report, the consumer groups within telemedicine will need education programs to understand the industry and their role within it. Many existing consumer groups within the health care industry will want to develop a position on telemedicine, to ensure that their constituents are protected and properly served.

It will be interesting to see whether the current grants to regional groups by the Regional Telecommunications Infrastructure Framework will help local consumer groups to develop a more formal understanding of telemedicine.

**Priorities for industry and businesses**

IPAC considers that industry associations and business have a major leadership role to play in creating the user environment for electronic commerce and electronic transactions, and the best possible commercial settings for Australia’s participation in this new world of information. (A national policy framework for structural adjustment within the new Commonwealth of Information, 1997, p. 27)

IPAC believes that early priorities for industry and business attention include:

Leadership and promotion, for instance:

- Promoting business take-up and innovation, including the education of Australia’s boardrooms to the opportunities and threats of the information economy;
- Promoting and supporting a much greater focus on entrepreneurialism and innovation within Australia’s business community;

market regulation, for instance:

- Playing a leadership role in establishing robust industry codes of practice, promoting quality standards for service delivery, and enforcing codes of practice.
- Establishing productive and collaborative relationships with consumers and user organisations to develop an operating environment of trust and confidence;

and industry development, for instance, through

- Peak industry bodies surveying their constituencies with regard to:
  - the rate of adoption of information and communication technology platforms within firms
  - deployment of electronic services and transactions
  - skills development and strategies for managing the “intellectual capital” of the firm;
  - competitiveness against global market leaders;
  - factors affecting a firm’s ability to grow global market share;
and regularly reviewing areas of bottleneck of market failure requiring collaborative industry and government attention.

(A national policy framework for structural adjustment within the new Commonwealth of Information, 1997, pp. 27-28).

**Integrating with national developments in IT and healthcare**

The ‘Goldsworthy Report’ (1997), the Information Policy Advisory Council (IPAC) report (1997) and this scoping study provide a national, industry development framework into which telemedicine can be meshed.

Telemedicine is currently a fragmented, immature industry in Australia. If it is to develop and to influence the delivery of health care services in Australia, and to live up to its potential, it will need to be integrated with mainstream IT in health care. To achieve this integration, actions are required by all parties, including Government, businesses and consumers. A number of immediate actions are recommended in the following section.
12. Recommendations

Based on the research conducted for this study, it is recommended that:

1. **National workshops involving the full range of stakeholders in the telemedicine industry be conducted.** The workshops would involve the full range of stakeholders identified in this report and would consider the findings of this scoping study and recommend further actions. The workshop participants would debate in which directions the boundaries of telemedicine are moving, as the integration of telemedicine with other information and communication technologies proceeds relentlessly.

2. **An industry association for telemedicine be formed.** The association would represent the full range of telemedicine stakeholders and would focus on major issues such as industry development, national coordination, technology development and infrastructure needs. The association would focus on the following tasks and issues:
   - identification of the major environmental trends that may have an impact on the industry over the next three years
   - an examination of the industry’s internal strengths and weaknesses and external opportunities and threats
   - identification of barriers to entering the market
   - the needs of various segments of the market
   - the availability of core and peripheral equipment
   - identification of barriers to entering the market
   - the needs of various segments of the market
   - the availability of core and peripheral equipment
   - the quality of systems integration
   - an understanding of customer motivations and unmet needs
   - the opportunity to offer value-added aspects of products and services
   - barriers to customer adoption.

3. **A comprehensive database of the stakeholders in the telemedicine industry be developed.** The database would identify the wide range of telemedicine products and services available.

4. **Statistics regarding the economic size and impact of the telemedicine industry be collected and maintained.** The statistics would cover the full range of costs and benefits of telemedicine.

5. **The telemedicine scoping study report, ‘The Telemedicine Industry in Australia: from fragmentation to integration’ be presented at the Commonwealth/States Health Information Technology and Electronic Commerce Forum.** This forum represents the key information technology decision makers in each Government in Australia, and ensures that telemedicine will be incorporated in the mainstream of information technology enhancements to health delivery.
Appendices
Appendix 1: Scoping Study Brief

Department of Industry, Science and Tourism Scoping Study for the Telemedicine Industry

1. BACKGROUND

The Department of Industry, Science and Tourism (DIST) requires the development of a comprehensive information product covering industry development activities in Telemedicine in Australia. The Department has recently undertaken extensive consultation with key industry players and has concluded that what was needed was a concise scoping study to identify and bring together information on the increasing number of organisations interested in developing the industry. It is also necessary to assess the scale and extent of the existing and emerging opportunity and serve as a basis for a future industry development strategy. The scoping study will serve as the base document for a national workshop involving industry stakeholders and subsequently a capabilities publication for the industry to be used by all active and potential national business and government players.

DIST’s view is that the industry comprises hardware/software/systems, the various forms of carriage services required by telemedicine and the telemedicine content generated by providers and the user community.

2. FUNCTIONAL REQUIREMENTS

The consultant will collect, collate and provide information necessary to develop a Telemedicine industry scoping study of national, state and local information in a form suitable for publication and presentation at national workshops on the subject.

The scope of the study is defined by the following Terms of Reference:

_ Describe the status for the Telemedicine technology and industry nationally and internationally and the market basis for development of the industry in Australia. Market assessment will include descriptions of major sites of activity and relevant studies worldwide.

_ The present and potential size of the market for telemedicine products and services.

_ Detail of an industry development program including but not limited to:
  - import replacement
  - export opportunities
  - clinical and technology research and commercialisation
  - current impediments which need to be addressed

_ Assess the scale and extent of the existing and emerging opportunity and serve as a basis for a future strategy.
Identify key issues facing Australian industry in using telemedicine and potential for its use.

Identify and where possible quantify both the costs and benefits to Australia in terms of economic activity and social impacts.

Address the extent to which telemedicine operations from Australia would be commercially viable.

Australian potential to create a new medical information technology industry in Australia.

Opportunities to foster industry collaboration with public/private hospitals and Australian companies with appropriate expertise for the development and export of new medical products and services.

A brief summary of how Telemedicine provides a vehicle to improve the excellence and cost effectiveness of medical education and training, and health services in urban, rural and remote communities.

Industry development and investment focus designed to encourage multinational medical equipment and IT vendors to collaborate with Australian industry.

Identify measures to encourage multinationals to consider manufacturing telemedicine equipment in Australia.
Appendix 2: Interview and Survey Questions

The Department of Industry, Technology and Science (DIST) is undertaking a scoping study on telemedicine to collect information on the increasing number of organisations interested in developing the industry.

The scoping study will serve as the base document for national workshops involving industry stakeholders and subsequently a capabilities publication for the industry to be used by all active and potential national business and government players.

Your assistance in completing this survey is appreciated and will help in the national development of the industry.

Responder’s Details

Name:

Organisation:

Position:

Address:

Are you willing for your comments to be placed on the DIST web site for this project?

Are you happy for your comments to be attributed to you in the Report? (If not, the quotes will be used anonymously.)

Questions

1. Could you please describe your involvement in and/or knowledge of the telemedicine industry.

2. What major Australian telemedicine activities are you aware of?

3. Which studies of telemedicine, either Australian or international, can you recommend?

4. The telemedicine industry consists of many players, such as equipment vendors, software developers and transmission providers as well as end users, such as clinicians and patients. Who do you think are the main groups who make up the telemedicine industry in Australia?

5. What do you see as the strengths and weaknesses of telemedicine in Australia at the moment?

6. How would you describe the condition of the telemedicine industry

a) internationally, and

b) in Australia.

For example, vibrant, growing, immature, about to take off, fragmented?
7. Telemedicine *products* include customised equipment for clinical settings, such as dermascopes for use with videoconferencing. Telemedicine *services* include advice about technology selection. What telemedicine products and services are you aware of and what potential is there for growth?

8. What do you think are the drivers behind the development of the telemedicine industry in Australia?

9. What do you think are the impediments to developing the telemedicine industry in Australia?

10. What do you think needs to be done to further develop the telemedicine market in Australia? For example, government funding; incentives for users; promotion of telemedicine.

11. If equipment importers could be encouraged to contribute to research in telemedicine, what areas could be funded?

12. Could you describe any clinical and technology research in Australian telemedicine that could be commercialised?

13. What do you think are the costs and benefits of telemedicine for Australia?

14. To what extent could telemedicine operations from Australia be commercially viable?

15. What opportunities are you aware of, for fostering industry collaboration with public/private hospitals and Australian companies, for the development and export of telemedicine products and services?

16. How can telemedicine provide a vehicle to improve the excellence and cost effectiveness of medical education and teaching?

17. To what extent can telemedicine provide a vehicle to improve the excellence and cost effectiveness of health services in urban, rural and remote communities?

18. How can multinational medical equipment and IT vendors be encouraged to collaborate with Australian industry in developing telemedicine?

19. How can multinationals be encouraged to consider manufacturing telemedicine equipment in Australia?

20. What do you think is the potential scale of the telemedicine industry in Australia?

21. What strategies would you recommend to develop opportunities for the telemedicine industry?

Please e-mail your responses to DIST’s consultant, John Mitchell, from John Mitchell & Associates at: johnm@jma.com.au A copy of your responses will be sent by John Mitchell to Bozica Knezev from DIST.
Appendix 3: List of Representatives of the Telemedicine and Related Industries in Australia, consulted by DIST Officers Bozica Knezev and Georgia Moudakis and by the DIST Consultant, John Mitchell, in 1997-98

NSW

Alister Simington, Product Manager, Retail Products & Marketing, Global Development, Telstra
Andrew G. Parkinson, Director, M.J.H. Nightingale & Co. Limited
Andrew Greatbatch, Marketing Manager, Quality Semiconductor Australia
Andrew Jolly, Marketing Manager, WelchAllyn
Angus M. Robinson, General Manager, The Warren Centre for Advanced Engineering
Ashley Roach, Regional Sales Manager, VTEL Australia Pty. Ltd.
B. Norman, Industry Development Manager, Dept. of State and Regional Development
Bernie Seth, General Manager, UTILUX Pty. Ltd.
Brian Davis, Managing Director, Nortel Australia Pty. Ltd.
Bruce A. Jones, Technical Director, Alcatel Australia
Bruce Cooper, AWA Limited
Charles Mooney, Management Accounting Manager, Vodafone Pty. Ltd.
Chris Dalton, Regulatory Policy Manager, Vodafone Pty. Ltd.
Christopher Janssen, Managing Director, General Power Controls Pty. Ltd.
David N. Barnes, Government Relations Manager, Consulting for ISSC Australia Ltd., IBM Australia Ltd.
David Veal, Director, ALLCO IT Finance Limited
David W. Oliver, Executive General Manager, Grants & Loans, Australian Trade Commission
Deborah Oong, Manager, Contracts and Service Implementation and Telemedicine, Department of Health
Dee Wilkes-Bowes, Assistant Director - Rural Affairs, NSW Farmers’ Association
Desmond H. Randall, Managing Director, AT&T Australia Limited
Diana Sharpe, Gillett Sharpe International Lawyers
Dr Andrew Wilson, Joint Managing Director, High Performance Healthcare Pty. Ltd.
Dr David Moore, Health Industry Specialist, IBM Consulting Group
Dr George R. Lewkovitz, Ear, Nose & Throat Surgeon, Facial Plastic Surgery
Dr John Falconer, Faculty of Medicine, University of Newcastle
Dr Maurice Barton, Manager R&D Business Office, Graduate School of Engineering, University of Sydney
Elias Bampos, Manager - Sydney, Parsons Galloway Foundation Pty. Ltd.
Elizabeth Parsons, Managing Director, Parsons Galloway Foundation Pty. Ltd.
Ezio Belfiglio, Executive Director, Jtec Pty. Ltd.
Gareth R. Thomas, Managing Sales Director, General DataComm
Gary Doherty, CSIRO
Gordon Makryllos, Managing Director, PictureTel Australia Pty Ltd
Graeme K. Holm, Senior Project Manager, Vodafone Pty. Ltd.
Greg Blunden, Business Network Manager, Australian Information Industry Association
Hugh Kelly, Managing Director, Australian Electronic Manufacturing Services Pty. Ltd.
Ian Guy, Assistant Director, Dept. of Industry, Technology & Regional Development
James Waldron, Product Manager - Professional Audio and Video Conferencing, Broadcast & Professional Division, Sony Australia Limited
Janice Cherubini, Department Head, Education, The New Children’s Hospital
Jeremy Simpson, Director, Parsons Galloway Foundation Pty. Ltd.
Jill Lister, Manager Corporate Affairs, International Business Unit, Telstra
Jim Hoggett, General Manager, Corporate Affairs, Australis Media Limited
Jimmy Hafesjee, Business Development Manager, SBS Television
Joanna Maratos, Regional Manager - Europe, Africa & Middle East, International Relations, Optus Communications
John Bishop, Managing Director, Vodac Pty. Ltd.
John Cameron, Manager, Customer Service, CSC Australia
John J.T. Fries, Financial Director, Vodafone Pty. Ltd.
John Rohan, Managing Director, Vodafone Pty. Ltd.
Keith Chapman, Project Manager, Industry Development Services, Dept. of Business and Regional Development
Ken Wright, Senior Technical Consultant, Central Technical Support Group, CSC Australia
M.A. Zahra-Newman, Managing Director, Jam Software Pty. Ltd.
Marie R. Bashir A.O., Clinical Professor of Psychiatry, University of Sydney, Aboriginal Health Unit, Director of Mental Health Services
Mark C.M. Thorpe, Commercial Manager, Interscan International Limited
Mark Nicholson, Industry Development Manager, Dept. of State Development
Matthew Henderson, General Manager, ANAM Technology Pty. Ltd.
Maurice Howe, Managing Director, Corporate Network Limited
Melinda Fonda, Conference Manager, AIC Conferences Pty. Ltd.
Merl de Silva, Director, Department of Medical Imaging, The New Children’s Hospital
Michael G. Kerr, General Manager, ALCATEL AUSTRALIA
Michael Lamb, Managing Director, ERG Telecommunications
Mike Gilbert, Manager - Telemedicine, Network Vision Systems
Mike Gregg, Chief Executive, Health Communication Network
Peter Janssen, Group Managing Director, UTILUX Pty. Ltd.
Phillip G. Cargill, Assistant General Manager, Strategic Planning & Marketing Division, NEC Australia Pty. Ltd.
Professor Branko Celler, School of Electrical Engineering, University of New South Wales
Professor Trevor Cole, The Warren Centre for Advanced Engineering
Rafik Razzouk, Director of Technology, PictureTel Australia Pty. Ltd.
Ralph Tobias, Corporate Advisor, ANAM Semiconductor & Technology Co.
Robert Frizza, Central Data Networks
Robert Sakker, Contracts Manager, Vodafone Pty. Ltd.
Robert Zanier, Central Data Networks
Roger Allen, Roger Allen & Associates
Ross Halgren, Manager - Multimedia Products, AWA Limited
Sally Hudson, Corporate Affairs and Strategy Director, AT&T Australia Limited
Scott Woodward, Managing Director, Network Vision Systems
Sandra Prerost, Managing Director, Globalink Comm.
Ted Donnelly, Consultant, Donnelly & Associates
Ted Whitgob, Consultant, Special Projects, SBS Television
Terry Halard, Product Manager, Media & Satellite, Optus Communications
Tony Cooper, Marketing Manager, AWA MicroElectronics Pty. Ltd.
Tony Mulry, Principal Consultant, Computer Power Pty. Ltd.
Tony Zahra-Newman, Co-Director R&D, Jam Software Pty. Ltd.
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Don Kordick, Manager, Technology and Conferencing Operations, Telstra Multimedia
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Jillian Barrie, National Marketing Services Manager, Yellow Pages Australia
Jim Walker, Director, KPMG Management Consulting
Joan Edgcombe, Executive Officer, Health Informatics Society Australia (HISA)
John Baker, Managing Director, Binary Image Pty. Ltd.
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Lyndon Seys, IT and I Strategy Unit, Department of Human Services
Mark Arandale, Executive Advisor, Strategy & Industry Development, Nortel Australia Pty. Ltd.
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Peter Allen, Managing Director, Intercel Pty. Ltd.
Peter Lewis, National Manager - Communications, Australian Trade Commission
Peter Moon, Managing Director, Baltech Pty. Ltd.
Peter Natoli, Manager - Spectrum Planning, Telstra
Peter Osborne, Project Manager, Acute Health Services Department of Health
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Steve Leach, General Manager, Insight Informatics
Trevor Buchanan, Account Manager, Videoconference Services, Corporate Television, CITEC
Warren Hampton, Manager, International Business Consultant and Trade Facilitator, Renger International
Yvonne Packbier, Manager, CHIC (Collaborative Health Informatics Centre)

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Dr Jack Sparrow, Chief Medical Officer, Department of Community and Health Services
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Lee Tipping, Office Manager, Human Solutions
Michael Rochford, Director, Human Solutions Pty. Ltd.
Rod Smith, Senior Manager, Small Business Service, Development Division, Department of Development and Resources
NORTHERN TERRITORY

Belinda Fluder, Manager, Export Development, Territory Health Services
Gary Russell, Director, Information Technology Services, Territory Health Services
Jo Bryson, Director, Department of Communications and Advanced Technology
Kathy Byrne, General Manager, Darwin Private Hospital
Len Notaros, Medical Superintendent, Royal Darwin Hospital
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Appendix 5: List of Current Telemedicine Projects in Australia, compiled by AHMAC Telemedicine Sub-Committee

From: Australian Telehealth Services Issues Paper,

South Australian Health Commission, October 1996

(project list revised Feb 1998)