

From Mines to Minds:

Western Australia in the

Global Information Economy

February 1998



**WESTERN AUSTRALIAN
TECHNOLOGY & INDUSTRY ADVISORY COUNCIL**

**From Mines to Minds:
Western Australia in the Global Information Economy**

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Background

The Western Australian Technology & Industry Advisory Council (TIAC) has conducted a number of studies relating to the various aspects of the State's Information & Communications Sector. The last two reports titled *Towards an Information Infrastructure Policy for Western Australia - The Business Aspect* and *Telecommunications Deregulation: Is Western Australia Prepared?*, contributed to the State Government's decision to establish the Office of Information and Communications Policy Advisory Council (ICPAC) within the Department of Commerce and Trade which reports to the Cabinet Standing Committee for Information and Communications Issues.

The Minister requested TIAC to participate in the Information and Communications Policy Advisory Council (ICPAC) and TIAC commissioned this report as part of its contribution to that process. The report presents a series of options for the development in Western Australia of a strong, sustainable, globally-oriented indigenous information industry which has been leveraged off the State's world class minerals & energy sector and includes recommendations on the action required to achieve these options.

For the purposes of this report, the term "information industries" covers a wide range of activities, including electronics manufacturing, computing and telecommunications platforms, office equipment, consumer electronics and information and entertainment services.

The preparation of the report and associated consultation with industry has taken place over the past nine months. During that time there has been a number of substantial initiatives undertaken by the State Government in this area, and several of the projects outlined in this report have already been, or are in the process of being, implemented.

Vision

To build an enterprising online culture in Western Australia as the foundation for an integrated and sustainable indigenous network of globally-oriented Information Industries

About the Title - From Mines to Minds

The document argues that the mining and resource industries are already very heavy gatherers and users of information, at the same time being vital sectors within the State's economy. It is logical to use resource industry participants, as many companies already have, as the basis for global expansion of the State's Information Industries. Furthermore it is not intended to suggest that mining and resource applications should be the limit of this vision since the opportunity exists for generic technologies and techniques developed by going through "From Mines to Minds" are able to be applied elsewhere.

Executive Summary

1 Global Issues

Developed economies are moving into the fastest growing sectors - information and knowledge-based industries and Elaborately Transformed Manufactures (ETM).

Globalisation is driving increasing levels of competition in all markets.

Information and Communication Technologies (ICT) are significantly changing the relationships between regions; between centralisation and decentralisation.

The global information economy will be made up of big winners and big losers.

Management is becoming significantly more challenging as the "steady state" era ends and is replaced by far greater volatility.

These changes can be seen as a shift from the economics of transformation (epitomised by mass production) to the economics of transaction.

2 National Issues

Multi National Corporations (MNCs) dominate Australia's Information Industries.

Australia is a heavy consumer of (predominantly imported) Information and Communication Technologies (ICTs) which it does not use very productively. It has a massive trade imbalance in ICTs without always generating the productivity returns.

Australia has an extremely low level of Information Industry exports.

3 Western Australian Issues

Western Australia has a narrow economic base dependent on commodities. Its resources sector performs very strongly.

The value of resource commodities has been falling over time and continues to fall.

Western Australia is a significant exporter of highly skilled talent.

Western Australia has a good track record of innovation...

...as with the rest of the country, it has an appalling record in commercialisation.

The State Government accounts for 40 per cent of Western Australia's ICT consumption.

The Western Australian Information Industry is 0.1 per cent of the global industry.

4 Western Australia's Strengths

The State's resource sector operates at world's best practice and is globally oriented.

The Western Australian ICT companies have a (relatively) strong export performance earning more than twice the national average from overseas.

Distance and isolation create domestic imperative to seize opportunities enabled by ICTs.

Strong technical base, with a well educated, English-speaking workforce.

Time Zone precisely eight hours from the UK and from the west coast of North America.

Strongest growing State economy, although exports are dominated by resources.

Attractive physical environment.

5 Driving Forces

To achieve the State's potential will require transitions on a number of fronts. These can be summarised under the following headings:

Social and Economic: The transition from a provincial to a global perspective on the part of the business community and government.

Technological: To reconceptualise the Resource Industries as heavy users of information and that this can become the foundation of a business(es) in its own right.

Environmental: Addressing the impact of ICT's on the State's physical isolation, in particular in relation to:

- the effect on various industries' value chain, and;
- building online relationships for social and global business development.

Political: Encourage the Federal Government to reframe its Taxation and Industry Policies to take account of the Global Information Economy.

Recommendations

As has been mentioned, work on this report has taken place over the past nine months. During that time there have been a number of substantial initiatives undertaken by the State Government. It has been gratifying that several of the projects outlined in this report have already been, or are in the process of being, implemented.

The Federal Government has also been active during this time. It is not the intention of this report to suggest there should be any duplication between State and Federal initiatives but that they continue to cooperate in this area. To provide a framework the recommendations have been organised under major headings: Awareness and Demonstration Projects, Support, Education and Training, Infrastructure, Networks and Alliances, Data and Information, and Lobbying Initiatives.

1 Awareness and Demonstration Projects

It is recommended that:

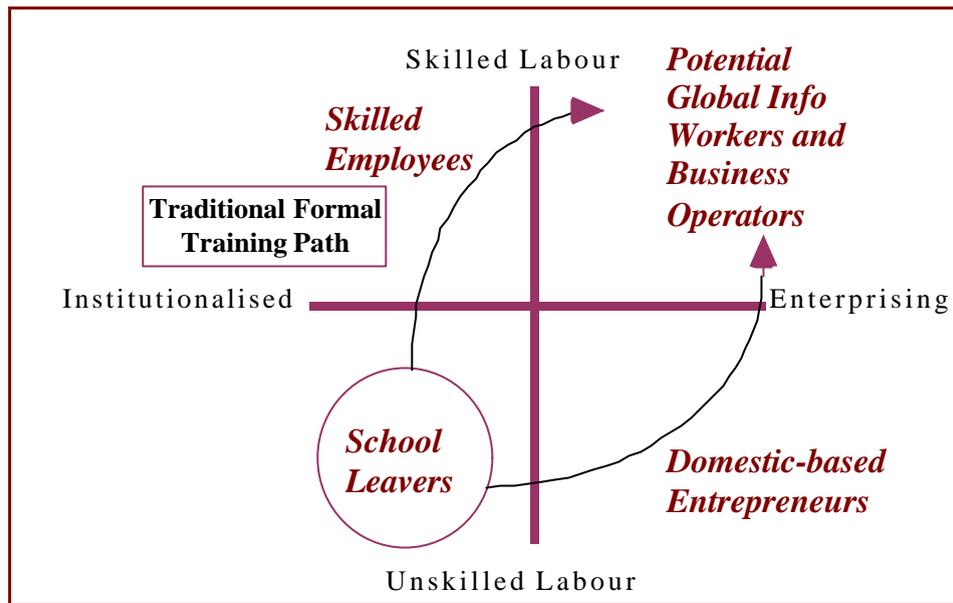
- a) The State Government fund a *Western Australia Online 2000* program to:
 - raise education and awareness;
 - get businesses online, and;
 - develop industry by industry online cases studies.
- b) The State Government establish an "Investment Ready" Program for small to medium sized Information Industry companies.
- c) The State Government initiate a Public Sector Distributed Management Project.
- d) The State Government should work with the Local Government sector to encourage it to act as a facilitator and lead user within its community of ICTs and information services.
- e) In conjunction with office developers the State Government encourage the development of High Bandwidth Serviced Offices - aggregating the telecommunications needs of small information companies to one location to overcome telco pricing strategies to enable them to access high bandwidth telecommunications at competitive prices.
- f) The State Government facilitate the establishment of Information Industry Business Incubators - as above (High Bandwidth Serviced Offices) with the addition of online business advise and support.

2 Support

- a) The State Government facilitate and encourage the marketing and use of Information Brokers¹ by its agencies and appropriate Western Australian firms.
- b) The State Government implement a program for Online Process Reengineering - an AusIndustry-like program in which firms are subsidised to have consultants review their operations and recommend online alternatives which will increase their efficiency.
- c) The establishment of an Online Business Division within the Small Business Development Corporation to provide advice to aspiring online companies and existing firms interested in developing an online presence. This Division should have at its disposal personnel capable of giving advice on global and national markets.
- d) The State Government should investigate short comings in Western Australia's seed funding market and examine potential strategies to overcome these difficulties eg.:
 - support the establishment of a Western Australian branch of a national Venture Capital firm, and/or;
 - establish a Western Australian branch to a foreign investment bank(s) and/or VC.

3 Education and Training

- a) The State Government establish an organisation to coordinate and support research, education and training in the Information Economy generally and in distributed work technologies and techniques in particular.
- b) Global Information and Knowledge Industry Entrepreneurship Training be introduced for High School, TAFE and University level students.
- c) The State Government work urgently with Western Australia's educational institutions (at all levels) to develop a strategy to address the Skills/Enterprise Gap.



4 Infrastructure

- a) The State Government undertake a feasibility study of the potential costs and benefits of attracting a Semiconductor Fabrication Plant to the State.

While this study is undertaken a strategy to provide services to the Semiconductor Fabrication industry be developed (possibly through TimeShift and other distributed work techniques) to:

- gain greater knowledge of the industry's dynamics;
 - to generate short-term revenue;
 - to better position Western Australia for subsequent negotiations for a plant in the future, and;
 - as part of a wider campaign to encourage graduates to stay while continuing to develop their skills and to attract emigres back to Western Australia.
- b) The State Government undertake a feasibility study of the potential costs and benefits of attracting a Short-run, Contract Manufacturing Plant to the State to assist in the development of Elaborately Transformed Manufacturing (ETM) companies.
- c) The State Government oversee the development of a Narrow Bandwidth WWW Standard. This would allow for World Wide Web pages to be efficiently transmitted over narrow bandwidth links.

Government Agencies would be required to conform to this standard to service regional and rural users.

5 Networks and Alliances

- a) The State Government facilitate Western Australian Information Industry exchanges to enhance links between the Western Australian telecommunications, computing and content industries.
- b) The State Government implement a Western Australian Prodigal Sons and Daughters project. This would include developing a database of expatriate Western Australia Information workers and develop strategies to attract them back to the State.
- c) For those who cannot be induced to return home, strategies need to be developed to incorporate them into Western Australian information networks for indigenous firms to use their knowledge.
- d) The State Government should initiate a "Know Who" project which encourages the involvement of knowledgeable new arrivals (to Western Australia) into local industry networks.
- e) The State Government should initiate a study into the best means of developing and maintaining globally dispersed Feed-back Loops. This study must acknowledge the difficulties distance and isolation pose for the State's Information Industry firms in remaining abreast of market intelligence in a fast-moving global industry and develop strategies to address these limitations.
- f) The State Government should facilitate Global Partnering: encourage the partnering of Western Australian Information Industry firms with complementary organisations overseas to enhance information flows.

6 Data and Information

- a) The State Government should identify opportunities for import replacement by Western Australian Information companies.
- b) The State Government should “map” the Western Australian Information Industries to identify clusters. This database must also be maintained.
- c) The State Government should benchmark Western Australia’s online progress in comparison with other states and comparable overseas regions in terms of:
 - online primary, high school and tertiary education programs;
 - telecommunications services and costs;
 - public sector online initiatives;
 - number of online business start-ups and their longevity, and;
 - management understanding of online threats and opportunities.

From Mines to Minds:

WA in the Global Information Economy

- d) The State Government should identify the Western Australian industries most vulnerable to the Global Economy and develop strategic approaches for them to counter this threat.
- e) The State Government should identify Western Australia's Skills Surpluses
- f) The State Government should identify service industry clusters for most suited to TimeShift distributed work.

7 Lobbying Initiatives

- a) Lobby the federal government and industry groups for reform of:
 - the existing capital gains tax legislation to support the establishment and development of fast growth Information Industry companies, and;
 - the current sales tax regime (in light of the general acceptance of developing world acceptance of the Internet as a tax free zone).

¹ These firms do currently exist in WA but appear to be used in a limited way. This seems to be through a combination of limited marketing by the mainly small, home-based brokerage firms and lack of awareness of them by WA companies.

1 The Current Context: Driving Forces of the Global Information Economy

...new winners and losers will emerge over a period of five to ten years at most. We do not have the luxury of the 50 to 80 year period of adjustment experienced in the transitions to steam or electricity. ... Government and business leaders must understand this urgency and grasp the challenge. Australia's future employment, growth and prosperity depend upon it¹

The Goldsworthy Report

This paper is concerned with the development of Information and Communication Technology-based organisations in Western Australia and the optimal utilisation of these technologies through the state's economy and wider community. Included under this term are applications of hardware, software and content in the Information Technology and Telecommunications industries.

The massive changes predicted in these sectors over past decades are becoming increasingly obvious. Our economic and social lives are being driven by two primary forces: technological advances and international deregulation. These two shifts are in turn driving globalisation and a variety of other effects.

This chapter outlines some of the technological and political changes which have brought us to this critical point, presents some of the theories as to what the trends might be in the future and points to some early indicators of change.

1.1 Technology

A 1975 mainframe computer could carry out 10 million instructions per second and cost about \$10 million. By 1995 the ordinary desktop computer could compute nearly 70 million instructions per second and cost only \$3,000. In cost/performance terms, the capital cost of performing one million instructions had dropped from \$1 million in 1975 to \$45 in 1995.

The Goldsworthy Report

1.1.1 Technology explosion

Computing technologies have spread widely over the past twenty years. Their impact on the processing, manipulation and storage of information has been significant. But it is the linking of this capacity to make the distribution of information far easier and cheaper which is beginning to have a substantial impact.

Linked with this convergence of computing and communications technology is the conversion of an increasing amount of content into digital format. The plunging cost of rapidly increased computer power has been the first wave of this revolution.

Connecting these machines through networks moves us from simply mechanising existing processes to reshaping organisations and industry structures through the transfer of many processes online. We are on the crest of this change today. Where the past decade has seen organisations reduce their general workforce through wide adoption of technology the next wave of technology implementation is likely to be as significant, if not more so, in some sectors.

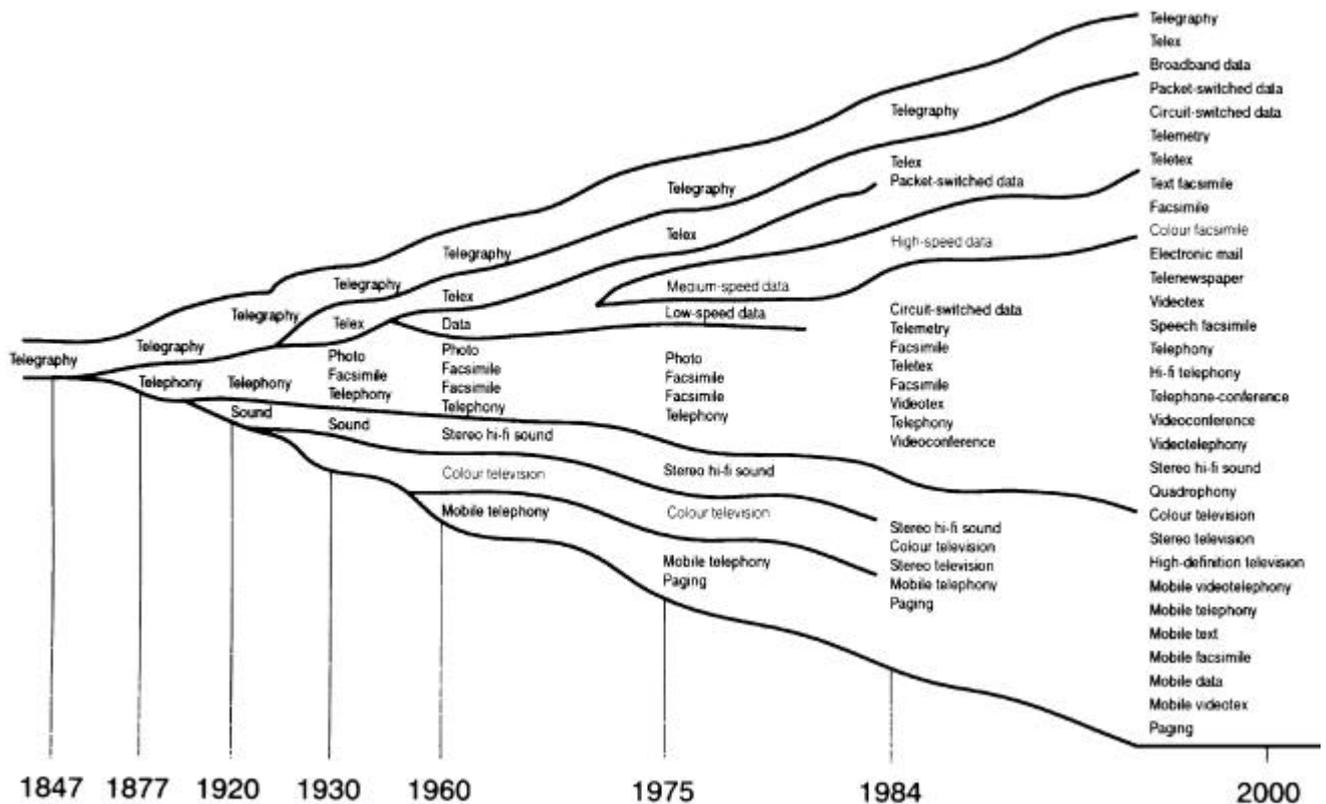
The number of technologies and their spread throughout the world into a vast range of sectors has been extraordinary (see Figure 1.1 below).

1.1.2 Processing Power

Underpinning this explosion in the use of information technologies has been the development of the microprocessor. The microprocessor has been described as “the most productivity-enhancing, life changing technological revolution since the harnessing of steam power in the 18th century or, in the 19th, of electricity itself”.²

Soon after the first microprocessor was mass produced by Intel in the early 1970s Gordon Moore, one of the company’s founders, predicted these chips would double in power and halve in cost every 18 months. Moore’s Law, as it has become known, has proven accurate ever since. It has been said that if the automobile industry had achieved the same cost/performance ratio improvements it would now be cheaper to abandon your car than to pay to park it.

Figure 1.1 - The Technology Explosion



1.1.3 Telecommunications Trends

Telecommunications is an area where the two primary drivers of the move to the global information economy - deregulation and advances in technology - are both crucial.

(a) Deregulation

Having been regarded as a natural monopoly by policy makers in virtually every country through the industry's early history, telecommunications services have tended to be provided by a single operator. In most cases telecommunications services have been provided by a public monopoly and in a few others, such as the United States, by a privately owned monopoly.

This assumption that telecommunications was a natural monopoly began to change in the early 1980's. In 1982 following a protracted court case AT&T - the giant US monopoly - was ordered to divest itself of some of its operations. It split off its local business (as opposed to its long distance domestic and international) operations into seven Regional Bell Operating Companies (RBOCs), each of which maintained a regional monopoly for local services. In the same year the British government allowed a second carrier into its market to compete with British Telecom and in 1985 the Japanese began to liberalise their telecommunications market. The Australian Government's sale of a third of Telstra and the admission of competitors places it mid-range in terms of policy settings and the timing of these changes amongst developed economies.

(b) Technology

A range of technologies, including the ubiquitous microchip, has significantly changed the design and operation of telecommunications networks which has in turn changed the economics of installing and operating these networks. The improvements in technologies fall into two broad categories: switching and transmission technologies.

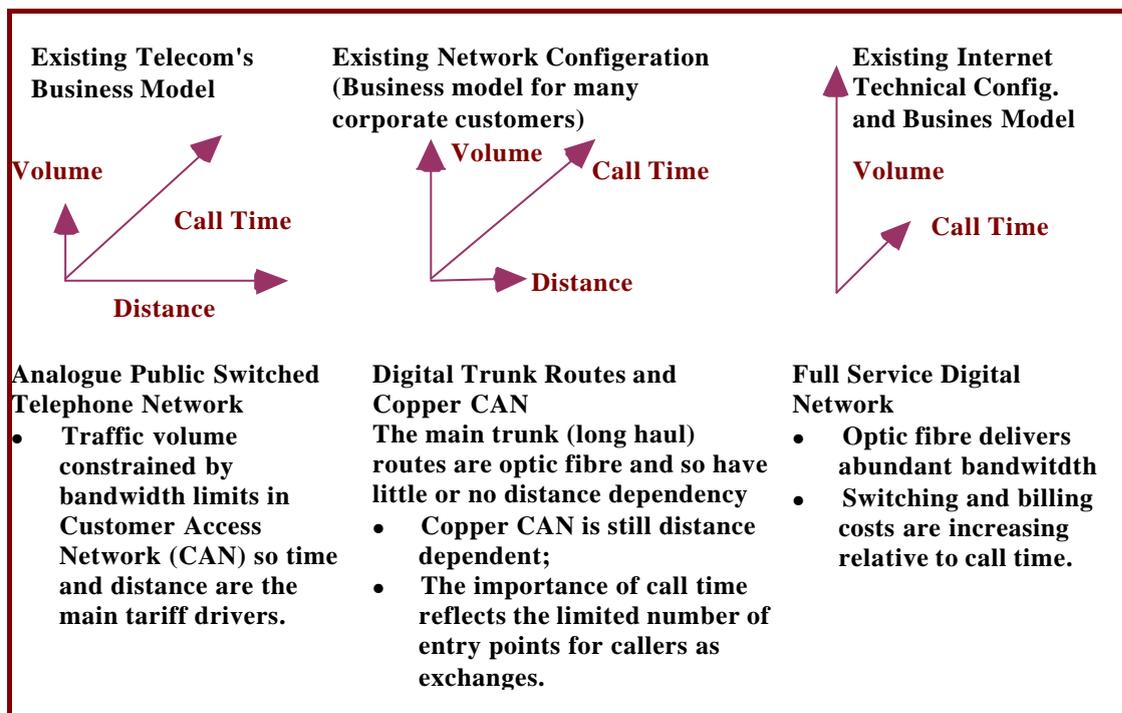
Microchips and their related technologies have enabled significant changes to be made to the way in which network designers can configure their networks and how managers operate and maintain them. As with computing technology, network switching is now far more efficient and can handle more traffic at significantly lower prices. Staffing levels in the telecommunications industry have also fallen, with the consequent cost savings, because the new digital technology can very often be diagnosed and repaired remotely. This has allowed telephone companies to dramatically reduce the number of workers they need in the field. (Rural and regional users in Australia have expressed strong reservations about the practical implications of this capacity. Their misgivings are driving resistance to further moves to liberalising the local industry.)

Probably the most important change in transmission technology has been the move from copper cable to optical fibre. It has brought a significant shift in the cost/performance for transmission. While this is important for any network operator making the transition from traditional telephone network (POTS - Plain Old Telephone Services) to the Online era another important factor is the network's bandwidth, or carrying capacity, and the cost of that capacity. Where POTS bandwidth may be adequate for a conversation or sending a fax, it cannot adequately cope with video conferencing or many of the other higher order applications which are crucial technologies for the Information Economy³.

Improvements in wireless and satellite technologies have also been significant in offering alternatives to telecommunications planners in designing their networks. Aside from driving down the operating costs of existing operators their potential impact is probably greater in enabling competitors to enter markets dominated by an incumbent carrier far more easily, both in terms of cost and the time required to roll-out a network.⁴

The changes in technologies used in telecommunications networks and the uses to which these networks are now being put are leading to significant rethinking by carriers as to how best to position their organisations. The move from dependence on voice traffic for the vast majority of their business to increased data traffic has profound implications for them. The combination of these changes has led some commentators to predict that distance will, in the next few years, become a largely irrelevant factor in determining the cost of a phone call. As is shown in Figure 1.2 below, distance will ultimately disappear as the costs of trunk route links become incidental and the duration of the call will decline in importance. Volume will be the major determinate for charging.

**Figure 1.2 - The Evolving Business Model for the Telecommunications Industry
(diagrams are indicative only)**



Source: Adapted from: "Rural Australia: Electronic information systems for building enterprises and community beyond the cities"⁵

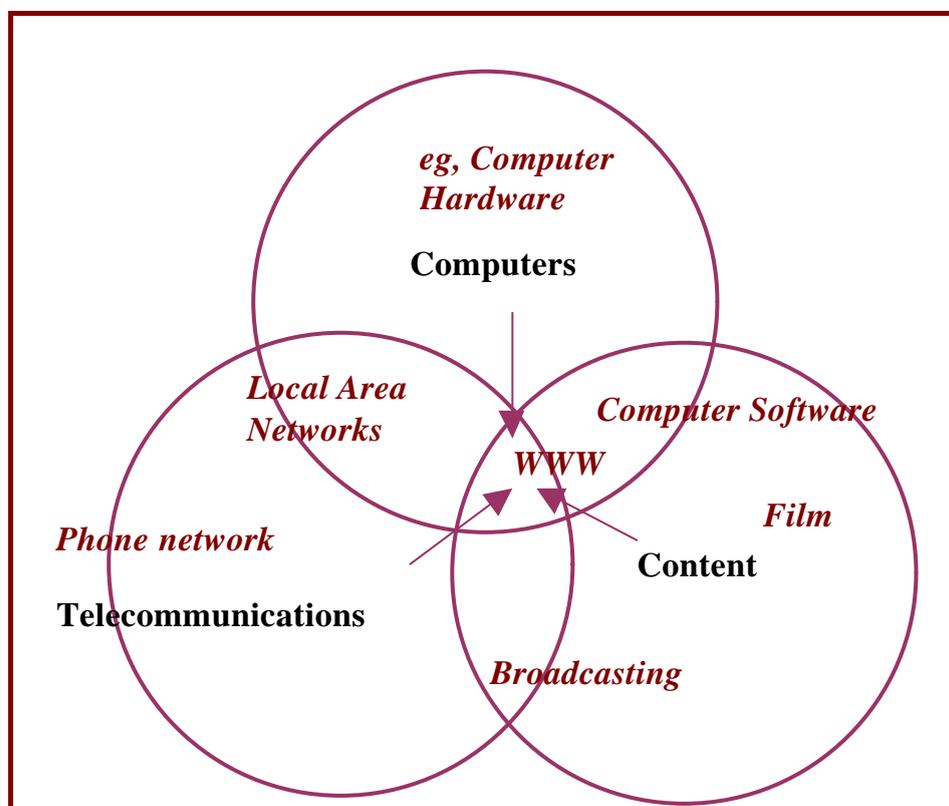
1.1.4 Digital Convergence

Digital Convergence is sometimes interchangeable with the terms the “digital” or the “online revolution”. It refers to the increasingly common move to digitising more and more information (audio, text and images) which is generated, stored and manipulated on computers and then easily, quickly and cheaply distributed over a digital communications network.

Companies involved in content generation, storage and manipulation (publishing, broadcasting and film) have been using computer technology over the past decade or two in production, but the merging of computers with telecommunications has been relatively recent. The most significant application of this has been the rise of the Internet, a trend which has really only moved into the wider public arena in the past three years.

Convergence has been well illustrated and widely popularised by Nicholas Negroponte’s⁶ use of three circles, representing the formerly independent worlds of computers, content and telecommunications (Figure 1.3). His argument is that these three areas are beginning to converge and in time will be indistinguishable from one another. Digitisation has been the crucial technical enabler for this change. The phenomenally rapid acceptance of the World Wide Web (WWW) over the Internet is a clear practical example of this scenario. Text, still images, audio and video can all be found on various WWW sites and down-loaded globally (the speed of delivery and quality of the product, particularly for audio and video, is still problematic but these can be expected to improve quickly).

Figure 1.3 – Digital Convergence (with examples of core and cross-over technologies)



1.1.5 Convergence's Impact

The digital revolution has been largely confined to using the technologies' processing power within existing work processes and organisational structures up until now. The current transition is significantly different in that it is about networking and coordination. Although the economies delivered by computers' processing power have brought significant changes to the operations of various industries they have tended to be confined to changing particular functions, or eliminating them, while the basic organisational structure remains largely in place.

Comparing the changes which occurred in the banking industry in the ten years before 1995 with more recent changes illustrates this point well. Pre-1995 various technologies had massive effects on the back-office functions of banks with the introduction of mainframe computers to mechanise operations. Today networking, combined with the deregulation of the banking industry, is radically altering the entire business model for banks with many of their established sources of revenue being seriously challenged.

This change is affecting all industries, not just those concerned with computers, content and telecommunications. These technologies are changing the way the resource sector and agriculture operate through sophisticated data gathering and manipulation. In manufacturing, particularly the more sophisticated forms, Information and Communication Technologies (ICTs) are now an essential component at all stages of production. It is this growing area of convergence which is the focus of this paper. The term Information and Communication Technologies (ICTs) is the generic term which will be used throughout to describe this new combination of technologies.

1.2 Global Deregulation

A learning economy must adapt well to competitive challenges. Trade liberalisation is placing enormous competitive pressures on national economies. ...In many ways entire national innovation systems are now being brought into competition with each other.

The High Road or the Low Road? Alternatives for Australia's Future⁷

Running in parallel with the changes in technology outlined above has been a significant philosophical shift to deregulation and the liberalisation of markets in most western economies. Changes by governments domestically, followed by changes in international agreements, have effectively created an environment in which smaller countries are obliged to follow this trend, at least to some extent. As a significant commodity exporter Australia is certainly in this category, with little option. These changes include the liberalisation of capital markets; reduction of trade barriers; and deregulation of markets for a variety of goods, services and financial flows.

President Nixon's decision in 1971 to remove the link between the US dollar and gold was the first step in deconstructing many of the controls and international agreements which had been put in place through the middle of the century, largely in response to the Great Depression and WWII. By 1980 Britain had joined the US in dismantling many of the controls which had been in place over their financial markets. In Europe these changes, along with the move to a single market, encouraged many countries to follow suit through the 1980s, although the push to market liberalisation has not been as strong as in Anglo-Saxon countries.

Between 1980 and 1992 the proportion of the United State's GDP generated from currency trading on financial markets increased ten-fold. Several other countries (Germany, France, Italy, UK and Canada) experienced similar changes.⁸ This has created a massive amount of mobile capital, moving continuously around the world in search of opportunities to maximise returns. This change in the financial markets is clearly very important, particularly in reducing options open to governments. Any policies which are not approved of by the markets will risk a rapid flight of capital.

1.3 Globalisation

A global economy is an economy with the capacity to work as a unit in real time on a planetary scale. ... it is only in the late twentieth century that the world economy was able to become truly global on the basis of the new infrastructure provided by the information and communication technologies. This globality concerns the core processes and elements of the economic system.

Manuel Castells, *The Rise of the Networked Society*

Improvements in technology and the loosening of regulations governing trading on capital markets have combined to bring currencies and economies closer than ever before and to create a massive and dynamic global financial market. This fluidity of capital has inevitably had a significant impact in employment patterns and in the relationship between rates of pay for various skills.

Box 1.1 - Features of Globalisation

- Simultaneous competition in each market between numerous new competitors from all countries. This new competition demands, in numerous areas, extremely rapid structural adjustments;
- Internationalisation of production: multinational origin of components, products, services and capital;
- Growing interdependence of the various levels of globalisation (trade, direct investment flows, technology transfers, capital movements etc.);
- High degree of cross-border activity by many organisations;

- The structure of international trade is becoming increasingly intra-industry or intra-product in nature;
- Inter-nation economic activities are far more tightly integrated than the "at a distance" mode most trading relationships have;
- Foreign direct investment has become a crucial factor in the worldwide process of industrial restructuring and the development of genuinely global industries;
- National comparative advantages increasingly correspond to advantages of location which vary according to corporate strategies;
- The financial sector is even more tightly entwined with the industrial sector;
- Emergence of specific regional and cultural factors in response to globalisation, and;
- Multiplication of regional free trade agreements.⁹

Governments have been driven by increasingly liberal multilateral trade agreements which have in turn encouraged - sometimes forced - further liberalisation within their own jurisdiction. In advanced western economies these globalising forces have been blamed for continuing high levels of unemployment, particularly amongst unskilled and semi-skilled older males. Many of these workers have seen their jobs "exported" under the demands of globalisation to countries with lower wage costs. This has in turn led to the development of the "hourglass society" in which the rich are getting richer, the poor poorer and the middle contracting.

1.4 Information and Knowledge Economies

...all the most promising technologies making their debut now are due chiefly to communication between computers - that is, to connections rather than to computations. And since communication is the basis of our culture, fiddling at this level is indeed momentous."

Kevin Kelly, "New Rules for the New Economy", Wired, September, 1997

Our traditional economic perspectives can make understanding the economics of information difficult. We have little difficulty in understanding the value of a piece of wood, a sack of oats or a motor car. Value-adding is used to describe turning wood into anything from wood chips to fine furniture; this kind of refinement we can understand but trying to see it as adding information is more difficult. It is not part of the conceptual framework of those of us raised through the latter stages of the Industrial era.

Case Study 1.1 - Quaker Oats

At the beginning of this century oats were seen as an unpalatable food fit only for livestock. By packaging and marketing them appropriately, as a desirable food for humans, the Quaker Oats brand established itself as the first mass market breakfast cereal. The brand, the packaging and the other elements which changed the public perception of this food are all pieces of information. The value-adding is substantial, far more than any physical or industrial process.

In countless other product and service industries the level of knowledge or information contained in their output has steadily increased. For Quaker Oats it was the brand which was the missing element and converted stock feed into a desirable meal, and with it a substantial increase in price which could be charged and cheerfully paid. By the 1980s the majority of workers in western economies were information workers adding value through information rather than physical processing.¹⁰

(a) The Knowledge Economy

Another useful perspective on this shift is the Knowledge Economy. This term emphasises some of the most important elements of the Information Economy, in particular the increased knowledge *intensity* (as well as the quantity) in the creation, production and distribution of goods and services. The term Knowledge Economy also highlights the importance of high level expertise, not just the increasing role of information. Whether this is a matter of fashion or substance is still not clear. Debate continues as to whether the extraordinary performance of many high technology and information stocks are an aberration or part of a significant new trend. Even the venerable head of the US Federal Reserve, Alan Greenspan has said, "our nation has been experiencing a higher growth rate of productivity - output per hour - worked in recent years. The dramatic improvements in computing power and communication and information technology appear to have been a major force behind this beneficial trend."¹¹

Emphasising knowledge also underlines the central role of education, at all levels, to any society with aspirations to succeed in this new world. Those countries with a clear and coherent vision of their future in a global information economy have ensured the support and promotion of their education sectors is one of their highest priorities.

(b) Information Companies

The last decade has seen the rise of what might be termed "pure information" companies. These are companies which, using traditional methods of valuation, appear to be little more than medium-large sized firms but are valued as being worth billions of dollars. The most striking example of this is the giant software developer, Microsoft and a number of Internet companies including Yahoo!, Excite and Amazon Company. All of these have been valued by quite different parameters than stocks in other sectors. The recent stock market falls in the United States have affected these companies to varying degrees.

1.5 Network Economics

Networked industry structures have been a by-product of the Information Economy. The formation of alliances and partnerships, outsourcing and contracting out, are becoming increasingly common. These more obvious manifestations are, according to some writers, triggering another wave of change leading to suggestions of a new, or network, economy.

Box 1.2 - Twelve New Rules for the New Economy

by Kevin Kelly - from *Wired*, September, 1997

1. The Law of Connection: embrace dumb power;
2. The Law of Plentitude: more gives more;
3. The Law of Exponential Value: success is non linear;
4. The Law of Tipping Points: significance precedes momentum;
5. The Law of Increasing Returns: make virtuous circles;
6. The Law of Inverse Pricing: anticipate the cheap;
7. The Law of Generosity: follow the free;
8. The Law of Allegiance: feed the web first;
9. The Law of Devolution: let go at the top;
10. The Law of Displacement: the Net wins;
11. The Law of Churn: seek sustainable disequilibrium;
12. The Law of Inefficiencies: don't solve problems.

A summary of the Twelve New Rules of the New Economy is at Appendix D

Franchising networks are a tight, codified example of these structures where a level of autonomy, albeit a highly specified form, is vested in units on the periphery of the organisation. Companies such as the shoe maker Nike are another form of this trend. Nike maintains the design, marketing and distribution relationships in-house but contract out the mass production of its products. Motor vehicle manufacturers around the world have, over the past decade or more, moved substantially away from the tightly vertically integrated model of production to contracting the supply of numerous components to independent small and medium scale manufacturing companies. Coordinating this complex web of contacts and ensuring all the necessary elements arrive at the assembly line in time is only possible, or at least practical, with ICTs.

Box 1.3 - Markets and Hierarchies in a Network Economy

Williamson¹² observed that firms have tended to forgo the opportunity of going to external markets for their inputs even though the market should provide them more cheaply due to the high costs of coordination, or interaction. They have preferred to retain these tasks within their organisational hierarchy to avoid the heavy coordination costs. This led to the development of the vertically integrated firm and accounts for the dominant power of conglomerates over the larger part of this century. As coordination (interaction) costs drop, it makes far greater sense for organisations to get the best of both worlds and out source more and more activities and reap the savings the market brings - a trend we are seeing increasingly.

Malone and Rochart¹³ have added a third type of organisation to Williamson's model - the organisation using Online coordination mechanisms - to starkly illustrate the next inevitable wave of organisational systems, one in which both Production and Coordination costs are low.

Relative Costs of Market Transactions & Internal Hierarchical Coordination

Coordination Mechanism	Production Costs	Coordination Costs
Markets	Low	High
Hierarchy	High	Low
<i>Online</i>	<i>Low</i>	<i>Low</i>

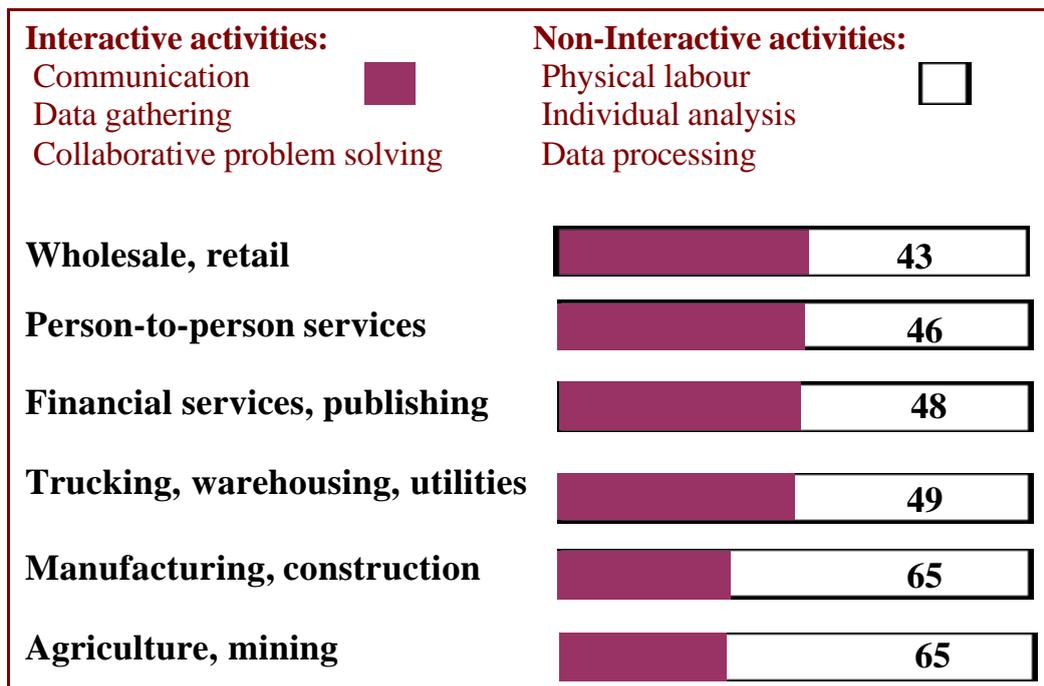
Not all of these relationships are dependent on advanced communications networks, although the relationships are certainly far closer when they exist. Communications networks are enabling this trend in our economy and, in the process, significantly altering the shape and style of business relationships.

1.5.1 Transaction Costs and Friction-Free Markets

The capacity of communication networks to extend networking practices and structures further and deeper into industries is important because it makes interactions between dispersed partners far more practical than they have been in the past. They have also led to significant reductions in transaction costs - the costs in searching, coordinating and monitoring - when we exchange goods, services or ideas. This has led some to suggest that we are entering an era where we will see the steady disintermediation (the removal of the middleman¹⁴) of industries and the development of friction free markets. (Others have argued that the increase in new participants in many markets will make brokers even more important in establishing virtual marketplaces or by sifting through this mass of information on behalf of buyers).

Following on from Malone's work, McKinsey and Company estimate that these interaction costs account for more than half the labour costs in the US economy, the equivalent of more than a third of GDP. They say these figures are similar in other developed nations¹⁵. According to McKinsey's, the current and anticipated network technologies will enhance our capacity to interact by a factor of two to five times, depending on the industry. The significance of this change is heightened by their belief that these changes in interaction patterns and costs will take effect over the next two to five years. If these predictions are carried through to the workplace the impact on employment levels will clearly be severe and swift.

Figure 1.4 - Share of Interactive Activities by Industry Type, Percentage of Labour Costs, United States, 1994



The McKinsey authors have attempted to apply this theory to practical industry situations and estimate the proportion of interactive activities by industry (Figure 1.4). It suggests that in the United States Interactive Activities account for 51 per cent of labour costs, 46 per cent in Germany and 36 per cent in India. Although this analysis mainly draws on US statistics it serves as a useful indication of the impact the move to increased networking may have in all developed economies.

1.6 Electronic Markets

Anyone who overestimated how quickly Electronic Commerce would grow should be comforted by the fact that nobody got it right.

Industry Briefing - Electronic Commerce
The Red Herring, February, 1998

Predictions as to the scale and the speed with which Electronic Commerce will develop have proven to be remarkably varied and unreliable. This has been added to by definitional problems. Electronic Commerce has been defined as narrowly as only retail purchases conducted over the Internet to far broader boundaries encompassing any transactions which have any electronic device anywhere in their chain (telephone sales, home television shopping etc.) and including all levels of business (business-to-business as well as retail) as well as electronic trading on financial markets.

Retail, Internet-based Electronic Commerce has proven to be the area where there has been most enthusiasm but, with a few notable exceptions, greatest disappointment. At the beginning of 1997 the IT consulting firm International Data Corporation (IDC) predicted E-Commerce would increase to just under \$50 billion during the year. The generally accepted figure is about \$10 billion. Notwithstanding the reservations about IDC's earlier predictions Table 1.1 below sets out the actual value of trading on the Internet for the past three years and the company's estimates of future growth for both retail and business.

Table 1.1 - Worldwide Internet Commerce by Segment

	1995	1996	1997	1998	1999	2000	2001
World Wide Web Users	15.3	27.8	50.2	71.3	96.6	129.2	174.6
WWW Buyers (mill.)	3.5	7.1	13.9	21.8	32.2	46.9	68.4
Revenues (\$US bn.)	0.3	2.6	10.6	28.9	62.5	123.3	223.1

Source: International Data Corporation

Online industry analysts are predicting retail Internet transactions will be in the \$4-10 billion range by 2000¹⁶. The estimates for business-to-business are for it to be 20 times this amount in the same period.

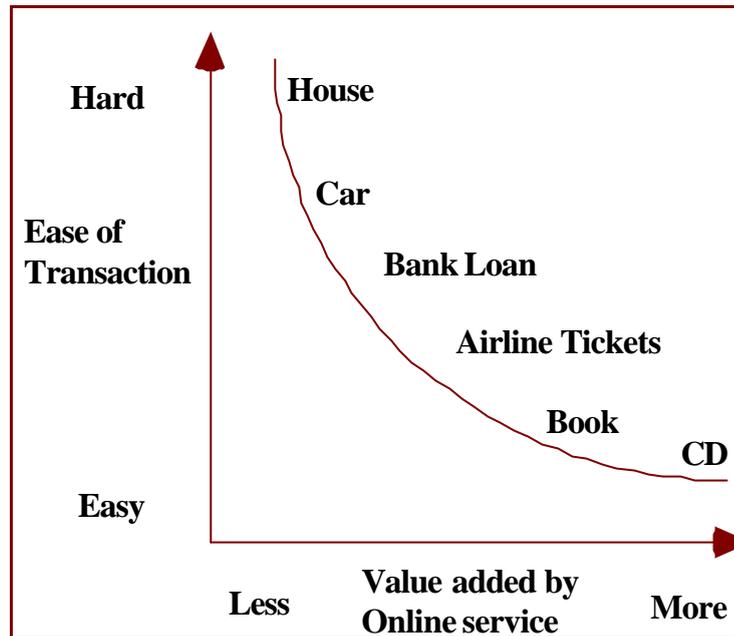
1.6.1 World Trade Organisation

A recent report from the World Trade Organisation (WTO) is even more bullish estimating the value of electronic transactions at \$US300 billion by 2000. It has also raised questions for its members on the implications of this change on international trade regulations. The Organisation says this shift presents some fundamental issues about the differences between goods and services; books versus the text for a book, for instance¹⁷. Both the European Community and the US Government have proposals before the WTO arguing that the Internet should be free of tariffs, a move challenged by many developing countries fearful of the impact of such a decision. (See Appendix E)

1.6.2 Retail E-Commerce

Despite continuing concerns in some quarters about payment security on the Internet a number of products are building up substantial electronic sales. Not surprisingly, computer software and hardware has sold well over the Internet. Books and CDs have also been sold very successfully. It is generally accepted that markets in which the selection or range, information (particularly timely information) and price are critical, are the most suited to electronic selling. Being able to easily describe the product is also important.

Figure 1.5 - Online Sellers



Source: Microsoft and *The Economist*

How prepared people will be to undertake more complex, and more expensive transactions, such as for a house or a car over the Internet is not clear. Many real estate agents and motor vehicle manufacturers certainly see the Internet as a potentially powerful, and cost effective, marketing medium although the number of actual sales managed electronically is reportedly very small.

It is very likely that higher levels of connectivity amongst consumers, greater acceptance of online transactions, technology improvements which are able to provide more information and improved online marketing will significantly extend the scope and scale of electronic commerce.

1.6.3 Business-to-Business Electronic Commerce

As the figures quoted above show, industry expectations are that E-Commerce which links businesses has considerable potential and a faster growth curve than targeting retail customers, certainly in the short term.

The Internet has enabled alternatives to the mainframe-based, proprietary networks which have been a feature of Electronic Data Interchange (EDI) systems. Many companies have moved these older-style systems to the Internet and the lower costs have encouraged many smaller companies to also convert much of their purchasing to electronic format.

Box 1.4 - Business to Business E-Commerce in the US

The number of US businesses with an online presence continues to grow. According to Computer Intelligence, the number of small businesses using the Web roughly doubled in 1997. The latest from Internet researcher Cyberdialogue shows 2.6 million US small businesses (37%) now conduct business online. Another 1 million are expected to come online this year - at which time 50% of US small businesses will be on the Web. Among those with Web sites now, more than a quarter credit their online presence with boosting sales. And half report improved customer service.

ZdNet News Service, 30 March, 1998¹⁸

The impact of the savings which can come from EDI and other transaction cost reduction technologies is well illustrated by Wal-Mart, the giant US discount retailer. The company has revolutionised retailing in rural areas through its use of ICTs. It has significantly lowered the minimum market size capable of supporting one of its department stores by closely monitoring supplies at each of its outlets and through its distribution channels, lowering inventory costs. Not only has it been able to successfully establish and sustain stores in regions which had been regarded as unviable or marginal, but it has also operated as a discount retailer, often placing other retailers in these areas under impossible pricing pressures.¹⁹ Wal-Mart can be considered a portent of what the business environment will look like generally as these technologies improve and become even more widely applied.

A significant number of software companies are working on building systems which will streamline business-to-business transactions further. The US Department of Commerce has invested \$US5 million in a consortium called CommerceNet to develop a procurement services standard, a move which is likely to speed this technology's implementation further.

While the potential savings these technologies offer to companies will attract them to it, this shift also has major implications for dealing with distant suppliers such as those in Western Australia. The reduction in the costs of managing supply chains will be even more significant over distance. They are likely to open up opportunities for commercial relationships which would have been impractical in the past (see Microtrading at 4.3.4). As to whether the outcome of these changes will be positive or negative; the answer is likely to be both. Organisations which make the correct moves quickly and whose core business is in a sector suited to online trading (see Figure 1.5 above) are likely to do well. It is certain that those which make no adjustment will either wither or be consumed.

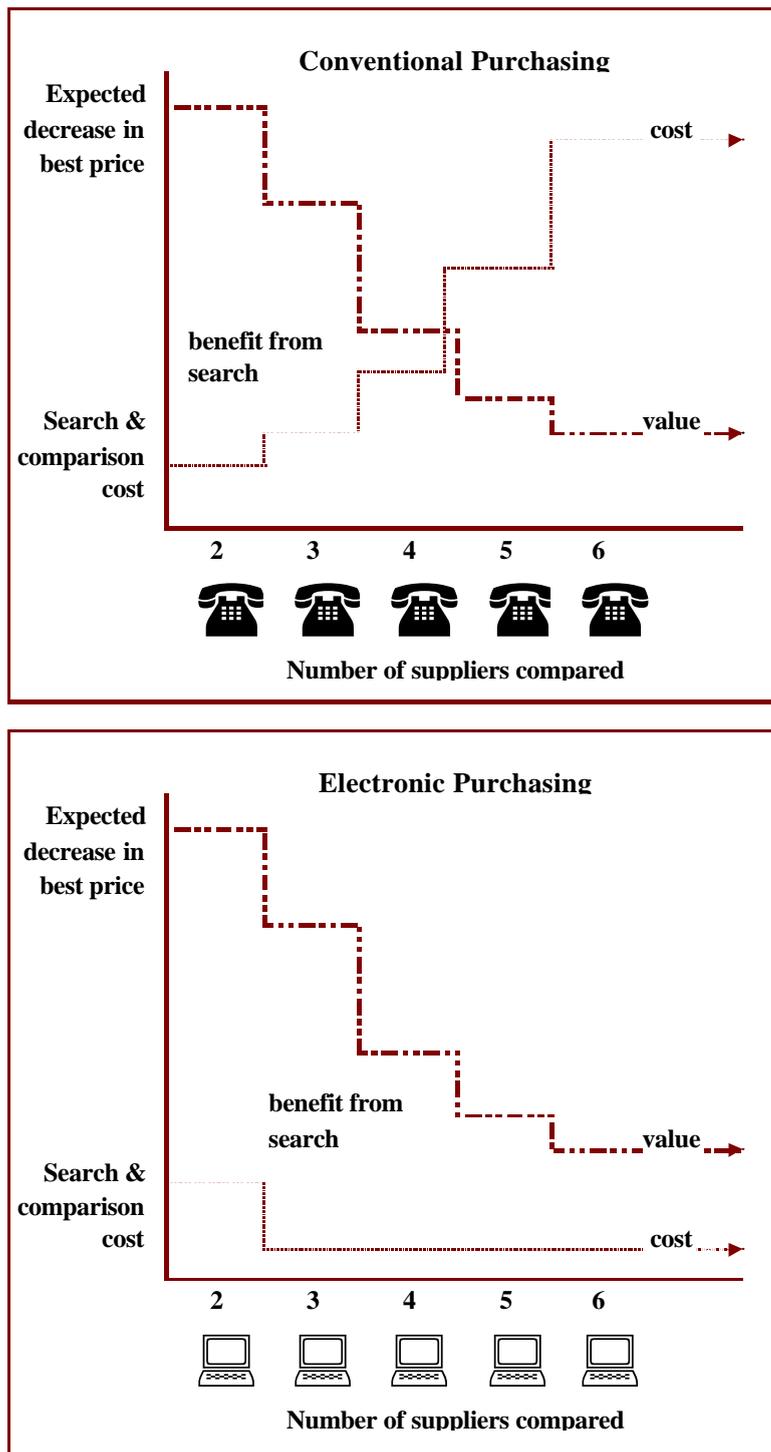
1.6.4 Electronic Tendering

A feature of online markets, which is not easily available in the physical world is the capacity for customers to very easily (and cheaply) compare products from a wide range of suppliers. Vendors have become expert in masking the similarities between products to discourage comparison. Some online sites have built barriers to prevent automated software agents getting prices from them. Both these tactics must be seen as temporary responses to an environment in which it will be possible for

consumers to effectively conduct an online tender for the provision of goods and services they wish to buy.

If this becomes widespread practice it will place enormous cost pressures on all sections of the production chain but probably none more than retailers who can be easily by-passed or swamped by electronic superstores. This is likely to be the feature which will encourage the widespread adoption of Electronic Commerce, not just consumers' commitment to the social or entertainment attraction of in-person shopping. Figure 1.6 illustrates the likely impact this process will have in cost effectively enabling purchasers to easily (and cheaply) reap marginal cost savings.

Figure 1.6 - Conventional Purchasing and Electronic Purchasing



1.7 The New Economy

Evidence has been growing in the United States, in particular, that the economy is beginning to take on a significantly different shape. This has led some economists to suggest that we are moving into an era in which the usual limits to the speed an economy can grow, without suffering ill-effects, are now significantly higher. They say the cycle linking rapid growth and inflation followed by recession and higher unemployment need no longer be seen as inevitable. They say 'computers and globalisation have brought faster productivity growth that permits rising profits, rising wages and falling inflation, all at the same time'. The venerable head of the United States' Federal Reserve Board, Alan Greenspan, appears to have accepted something quite different is happening.²⁰ But as can be expected of economists there are those who argue little has changed and the current strong growth is just that and no more, certainly not a new paradigm.²¹

On the consumer side spending in the US on "new economy" products; PCs, financial services etc. - is significantly up while demand for old economy products; cars, food, appliances - is flat or barely rising. This has been driven by a six per cent increase in personal income during 1997 and consumer confidence at historical highs.

In the past that would have sent Americans scurrying into car showrooms.

Instead, Americans are choosing to put the extra money in their pay packets into computers. The number of personal computers bought at computer stores jumped by 54 per cent in the year to January 1998.²²

Also interesting has been the significant increase in consumption of products and services delivered by information and communication technologies. Amongst these are a number of formerly industry-only products which are now, through reductions in the cost of ICTs, more widely available to retail consumers. Home owners are reportedly hunting down better rates and refinancing more often as lenders can process the applications faster and more cheaply.

Table 1.2 - A Comparison of Consumer Spending for "Old" and "New Economy" Products (Year to January, 1998)

Old Economy	Per Cent Increase	New Economy	Per Cent Increase
Motor vehicles	0.3	Home phone services	8.8
Food	0.6	Entertainment and recreation services	12.4
Major appliances	1.1	Cable TV	13.4
Clothing	2.3	Brokerage, financial services	15.6
AVERAGE	0.9	Home Computers	18.1
		AVERAGE	12.5

Source: Business Week, US Department of Commerce

1.8 Product Cycle Times

The increasing competition from globalisation is increasing pressure in terms of the time companies take to get a new product or service to market. Taking products and services through research and development and into production quickly and economically is no longer a competitive luxury, it is an essential capacity for success.

Table 1.3 - Product Development Cycle Time Trends in Various Industries

Industry	Company	Announcement
Aircraft	Boeing	Cut building time of new plane from 12 months to 6
Apparel	Berghaus	Cut delivery time from 6 to 12 weeks in 1980 to 1 week by early 1990s
Automobiles	Chrysler/Ford	Reduced time for new model from 5 years to 3
Computers	Compaq	Introduced notebook computers in 8 months
Construction Equipment	Caterpillar	Since late 1980s, reduced time to build new tractor from 25 days to 6
Electric Equipment	ABB	Reduced time-to-market for high voltage transmitters/switching gears by 21 percent
Office Products	Rubbermaid	Cut time to enter new market from 18 to 12 months.
Pharmaceuticals	Zeneca	Reduced time from drug synthesis to first testing on human volunteers from 30 months to 14
Semi Conductor	Texas Instruments	Cut time to market from 24 to 36 months to 12 to 18
Telecommunications	AT&T	Reduced design-to-delivery time for custom power supplies from 53 days to 5

SOURCE Institute for the Future, *The Future of America's Research Intensive Industries*, Report R-97 (Menlo Park, CA Institute for the Future, May 1995), p 50

1.9 From Optimisation to Innovation

Under economies of scale optimisation is the logical approach: the large-scale retooling required to introduce new innovations is an extremely costly exercise. The costs of entry mean the dominant players in any industry had/have the ability and need to manage the rate at which innovations are introduced to market. At the demand end users, in an industrial economy, are less likely to be prepared to alter their own processes for a marginal improvement. As more industries are drawn further into the information economy this approach is no longer feasible. Retooling for an information-concentrated product is far more simple because more generic and adaptable machines tend to be used, rather than the highly specialised tools of the industrial age. The other important and related issue is that when retooling can be done comparatively easily by one company, the same applies for others, quickly increasing the level of competition. When components are being manufactured externally, as is increasingly common through outsourcing, much of the cost of retooling is passed onto the supplier. If they cannot adjust there are likely to be others willing to take over the contract. The speed of this change is made even greater by the relative ease with which companies in other industries can move horizontally or start-up companies can enter the market. The well documented rise of Small to Medium-sized Enterprises (SMEs) in developed economies is a manifestation of this process.

1.10 The Changing Shape of Distance: Centralisation vs Decentralisation

IT (telecommunications) will alter, in ways that are only dimly imaginable, decisions about where people live and work; concepts of national borders; patterns of international trade.

Survey of Telecommunications,
The Economist, September 1995

The potential for telecommunications to alter the way we think about time and the way we see space has been written and spoken of regularly. Past generations of communications technology have had a major impact on the means with which organisations can coordinate and control their operations²³ and there are certainly even greater effects likely to flow from this generation of technology. The telegraph, telephone, telex and fax machines cut response times from months, to weeks, days and minutes; the networked computer has pushed this trend to fractions of a second.

For Western Australia, with its huge distances and widely dispersed population (and its capital city regularly dubbed the most isolated city in the western world) these effects are a part of life. Any technologies which "compress" distance further are certain to have an even greater impact in Western Australia than for other communities. The State has managed to prosper despite (or possibly because of) these great distances. In a future in which the impact of distance will be changed considerably it is in our self interest to understand these dynamics well if we are to preempt, or at least respond with some understanding, to these changes.

1.10.1 Global cities

Beginning in the 1980s, coinciding with the deregulation of markets in many industrialised countries and the first wave of change in the telecommunications industry, the relationships and balance of power between various cities began to change. The new technologies were predicted to be the catalyst for decentralisation, encouraging a mass migration from the congestion and high office rents of central cities. But this has not been the case. There are certainly examples of companies moving some functions, most commonly low value, "back office" functions out of the CBD. The more important trend is illustrated by a select group of cities - New York, Tokyo and London are the leading examples - which have experienced periods of strong growth coinciding with these techno-economic changes with companies expanding or moving their operations in.²⁴ They have gained even greater dominance of international finance as well as in those areas of consulting and business services with international scope.

"These three centers together cover the spectrum of time zones for the purpose of financial trading and work largely as a unit in the same system of endless transactions. But other centers are important and even more preeminent in some specific segments of trade, for example Chicago and Singapore in futures' contracts. Hong Kong, Osaka, Frankfurt, Zurich, Paris, Los Angeles, San Francisco, Amsterdam and Milan are also major centers in both finance and international business services."²⁵

In the Australian context, Sydney can be added to this list as one of the sub-regional control centres of the global economy.

Rather than using these technologies to distribute information to regional bases of operation, located in cheaper or more physically pleasant locations, the opposite has happened. “The higher-level functions, in terms of both power and skill, have been concentrated in some major metropolitan centres.”²⁶ Information has been sucked into the centre and contributed to building the headquarter operations. Closer to home, we have seen precisely this pattern with regard to regional areas with the gradual diminution of services available.

Taken from a global (or even national) perspective, Perth and Western Australia are no more than distant regions within the global economy. As many country towns are discovering, they have to show considerable resourcefulness and determination to survive, let alone prosper, against these forces. The value chains of industries are being altered and with them the location of economic power.

Confronting this reality is the most crucial economic question facing the State in an increasingly globalised economy.

1.10.2 The New Industrial Space

Just as deregulation and technological developments have changed the pattern of flows between cities they have also significantly affected locational decisions for manufacturers. The most obvious of these over the past two decades has been the moving of millions of manufacturing jobs from western countries to the developing world. (In fact Fairchild semiconductors are credited with being the first IT company to take this step, moving its manufacturing operations to Hong Kong in 1962.) This pattern has continued to the point that it is now generally assumed that all but the most specialist manufacturing will be undertaken off-shore from developed nations. Once again, this trend has been facilitated by deregulation and enabled by advanced ICTs. Operating under global competitive pressures, which exist in most industries, it is increasingly difficult for firms to behave in any other way.

Focussing on the production of ICTs, although this hierarchy would be repeated in the structure of most elaborately transformed manufactures (ETM) sectors, four distinct phases can be identified, each with a particular locational imperative:

- R&D, innovation and prototype fabrication are concentrated in highly innovative industrial centres in core areas, generally with a good quality of life.
- Skilled fabrication in branch plants, generally in newly industrialised areas in the home country.
- Semi-skilled, large-scale assembly and testing that from the beginning was largely located off-shore, particularly in SE Asia, with Singapore and Malaysia pioneering the movement specifically targeting US electronics companies.
- Customisation of devices and after sales maintenance and technical support, which has been organised in regional centers throughout the globe.²⁷

The second and third of these phases have largely become the province of the developing economies. Australia (and Western Australia) has a presence in some limited areas of the "Research and Development, innovation and prototype fabrication" phase but it is mainly confined to the last phase - "customisation".

1.10.3 Distributed Work

Just as predictions about the end of cities have been over-stated, the shift to teleworking has also been grossly over-estimated. Various proponents of teleworking painted a picture of the future in which virtually every information worker will be connected via broadband cable to his/her home and spend their working days there - most often located in some idyllic rural setting. While examples of this type of working arrangement do exist, in Western Australia and elsewhere, it is certainly not commonplace. The general failure of this vision to catch on is blamed on everything from reactionary management, occupational health and safety concerns to lack of suitable infrastructure.

As mentioned above in relation to electronic commerce, definitional problems have also plagued this area. 'Distributed work' is used in this paper as a more generalised term which covers a wider range of work styles and patterns.

Electronic Home Working is the most common image of distributed work. But research suggests that while there are increasing numbers of part-time electronic home workers, full-time electronic home work is rare and generally unappealing for both employer and employee due to the lack of face-to-face contact.

	Definition
Electronic Home Working	Working from home, sometimes exclusively from home, sometimes mixed with work in a central office. The work relationship varies between employee & contractor, although the latter is more common.
Telecentres & Neighbourhood Centres	Working with others from an equipped centre, usually in a suburb or country town.
Mobile or 'Nomadic' working	Workers who spend a substantial proportion of their time away from their office but are still linked.
Group or Team Telework	Using information and communication technologies for groups to "virtually" work together, in much the same way as if they were collocated.
Call Centres and Remote Offices	Various types of information work often carried out in a region distant from the client or company headquarters but linked with sophisticated ICTs.

Many Telecentres in Western Australia are undergoing a realignment from being primarily concerned with acting as the delivery point for training to playing a more direct economic role. Those centres which have made this change have mainly provided services for their immediate communities rather than clients elsewhere. In other parts of the world Telecentres, or Telecottages as they are sometimes known, and Neighbourhood Centres make significant use of telecommunications to import and export work.

Mobile or 'Nomadic' working has enjoyed significant growth recently. The widespread adoption of laptop computers and mobile phones has enabled this style of work to become widespread, particularly amongst sales people and other client liaison workers.

Group or Team Telework is already being used extensively by some companies nationally and internationally. Most of the working examples are for unskilled and semi-skilled work. There are three common forms:

- Call Centres where operators field phone inquiries, often aided by sophisticated computer support.
- Back Office functions transferred from high cost CBD locations to suburban or country areas.
- Business Process Outsourcing Centres which may combine both services above on a contract basis.

The term "virtual alien", used to refer to a worker employed directly by a US company but located in another country, has come into general use. Although conclusive statistics are not available it is estimated the number of virtual aliens employed by US firms is now about 4 million, connected only through electronic telecommunications networks. More than 100 US software firms out source their "code cutting"²⁸ to sites in India²⁹, where the work is completed and returned overnight by programmers working at only a fraction of the cost of employing local workers.³⁰

1.11 Change, Young People and the 30 Year Rule

Ted Saffo of the Institute of the Future says in adopting and adapting to change societies work on a 30 year rule. The decade between our 15th and 25th birthdays are the most intellectually influential, he says. Most of our values and fundamental ideas are shaped through this time. It then takes us another 30 years, when we are 45-55, to rise to positions of sufficient influence that we can put these ideas into operation: hence the 30 year rule in terms of the implementation of new ideas.

The aptitude of many young people with these new technologies is well known to us. Regular anecdotes are heard about those senior managers and politicians who do *really* understand these changes being introduced to them through their teenage sons or daughters.³¹

A great opportunity exists for the society which maintains an openness and offers support to those of its young people who show the aptitude and interest in Information Industries to break the 30 year rule and in the process leap well ahead. This is the positive perspective on this issue. Given the pace of change and the speed with which new industry structures are being put in place it could also be argued that unless such an approach is taken then numerous doors will be closed to us.

1.12 Conclusion

Massive changes in technology, principally the development and improvement of semiconductors, combined with an international push to market deregulation are the primary drivers of a substantial change in our economic and social patterns. These forces are altering the dynamics of markets, placing new pressures on countries and firms to be increasingly innovative, as well as on workplace organisations and significantly increasing competition and changing the relationships between regions around the world.

For an isolated region such as Western Australia, with its physical and human attributes, these changes are particularly significant, both for their potentially positive and negative impacts.

¹ The Global Information Economy, The Way Ahead,
<http://www.dist.gov.au/itt/golds/html/execsumm.html>

² “That astonishing microchip”, *The Economist*, 23 March 1996

³ An important proviso to this statement is the impressive advances which are being made with compression technology. This enables information to be processed and the files reduced in size - so that it requires far less bandwidth - and is then reconstituted at the receiving end. ADSL, for instance, is a technology which it is hoped will enable full video to be transmitted along conventional domestic size copper cables.

⁴ An excellent example of this is Wireless Local Loop (WLL) technology. The cost of the local loop - the industry's term for the cable from the exchange to the customer - has accounted for about half the total cost of the network. WLL replaces the exchange to consumer cable with a wireless link at a fraction of the cost. Where the cost of installing a cable local loop was prohibitive and likely to dissuade most new companies from competing in this aspect of the market WLL is beginning to open new possibilities.

⁵ Buckeridge, Roger, "Rural Australia: Electronic information systems for building enterprises and community beyond the cities", Rural Industry Research and Development Corporation, Canberra, 1996

⁶ Nicholas Negroponte is Director of the Media Lab at the Massachusetts Institute of Technology and author of *Being Digital*.

⁷ The High Road or the Low Road? Alternatives for Australia's Future, A report on Australia's Industrial Structure for the Australian Business Foundation, Marceau, Jane, Manley, Jane and Sicklen, Derek, Australian Business Foundation, Sydney, 1997

⁸ Castells, Manuel, *The Rise of the Network Society*, Blackwell, London 1996

⁹ Hatzichronoglou, T., “Globalisation and Competiveness: Relevant Indicators”, STI Working Paper No. 1996/5, OECD, Paris 1996

¹⁰ see, amongst many, Daniel Bell’s “Post-Industrial Society” and Barry Jones’ “Sleepers, Wake!”

¹¹ "Monetary Policy Testimony to the Congress", Testimony of Alan Greenspan, Chairman, federal reserve Board, February 28, 1998. <http://www.bog.frb.fed.us/boarddocs/HH/>

¹² Williamson, O.E., *Markets and Hierarchies*, Free Press, New York, 1975

¹³ Malone, Thomas and Rockart, John F., "How will IT Reshape Organisations? Computers as Coordination Technology" in *Global Technology and Competition*, ed by Bradley, Stephen, Hausman, Jerry and Nolan, Richard, Harvard Business School, 1993, p. 37

¹⁴ As networks increase the connections between individuals and organisations the role played by agents, brokers or retailers becomes less important as the value of their knowledge and contacts falls as the networks spread.

¹⁵ Butler, Patrick, Hall, Ted E., Hanna, Alistair M., Mendonca, Lenny, Auguste, Byron, Manyika, James and Sahay, Anupam; "A Revolution in Interaction", *The McKinsey Quarterly*, 1997, No. 1, pp.4-23,

¹⁶ Forrester Research, the Yankee Group, Cowies/SIMBA and Jupiter as quoted in *The Economist's Survey of Electronic Commerce*, 10 May, 1997

¹⁷ "WTO seeks to rule the web", by Fred Brenchley, *Australian Financial Review*, Friday, March 20, 1998

¹⁸ http://www.zdnet.com/anchordesk/story/story_1941.html

¹⁹ Parker, Edwin and Hudson, Heather, *Electronic Byways: state policies for rural development through telecommunications*, The Aspen Institute, second edition, Washington, 1995

²⁰ "Old Dangers Lurk for US New Economy", *The Economist*, reprinted in *The Australian*, 18 September, 1997

²¹ "How fast can the US Economy Grow?" by Klugman, Paul, *Harvard Business Review*, July-August, 1997 and "Why America's 'new economy' isn't new at all", *The Washington Post*, reprinted in the *Australian Financial Review*, 28 November 1997

²² "Forget the car, I'll take the PC", by Michael Mandel, *Business Week*, reproduced from *The Australian Financial Review*, Friday March 20, 1998.

²³ For the definitive discussion of these changes see James Beniger's "The Control Revolution: Technological and economic origins of the Information Society", Harvard University Press, 1986, Cambridge, Massachusetts

²⁴ Sassen, Sakia, *Cities in a World Economy*, Pine Forge Press; Thousand Oaks, London and New Delhi, 1994

²⁵ Castells, Manuel, *ibid*

²⁶ Castells, Manuel, *ibid*

²⁷ adapted from Castells

²⁸ the industry expression for the more routine programming work involved in writing software

²⁹ see in particular "Bangalore", by Richard Rapaport, *Wired*, February 1996

³⁰ Neef, Dale, "The Knowledge Economy", Butterworth-Heinemann, Boston, 1998

³¹ During a national debate over censoring the Internet some years ago it was seriously suggested that the reason the NSWs government was taking the most conservative position of all the states and the federal government was because neither the Premier, Bob Carr, nor the state Attorney General, Geoff Shaw, had children.

2 Australia's Position in the Information Economy and the State of its Information Industries

No one doubts that it is necessary to pursue micro-economic reform and reduce barrier protection in the drive towards international competitiveness. The unanswered questions are: is this sufficient to ensure the future prosperity of Australia; is it working and will it work in the future; and is there something else we should be doing in the interests of employment, productivity and growth?

John Houghton and Philip Flaherty¹

Over the past 18 months various agencies within the Federal Government and a number of industry bodies have produced substantial reports on aspects of the global information economy². This chapter draws on a number of these reports to examine some of the effects the forces outlined above have had on the Australian economy generally and the Information Industries in particular. An analysis of the elements which make up the Australian and Western Australian Information Industries follows. It concludes with some discussion of two relevant Federal Government reports: Innovation for Growth and Towards an Australian Strategy for the Information Economy.

2.1 Australia's Economic Profile and the Information Economy

As in all advanced economies there has been a steady decline in Australia's manufacturing sector and a growth in services over the past three decades. In fact our manufacturing has declined faster than that of any OECD country. Within this trend has been a tendency in OECD countries for manufacturing sectors which make greater use of R&D to be growing, both in terms of employment and revenue. This has not occurred in Australia. Our manufacturing tends to have lower R&D intensity being concentrated in the food and metal industries and resource related manufacturing sectors.³ The Australian economy is overweighted with manufacturing companies which are classified as low tech. Our low levels of private sector R&D are partly caused by the high proportion of small firms in the manufacturing sector and the disproportionately high representation of multinationals amongst larger firms, which conduct their R&D in their 'home' country.

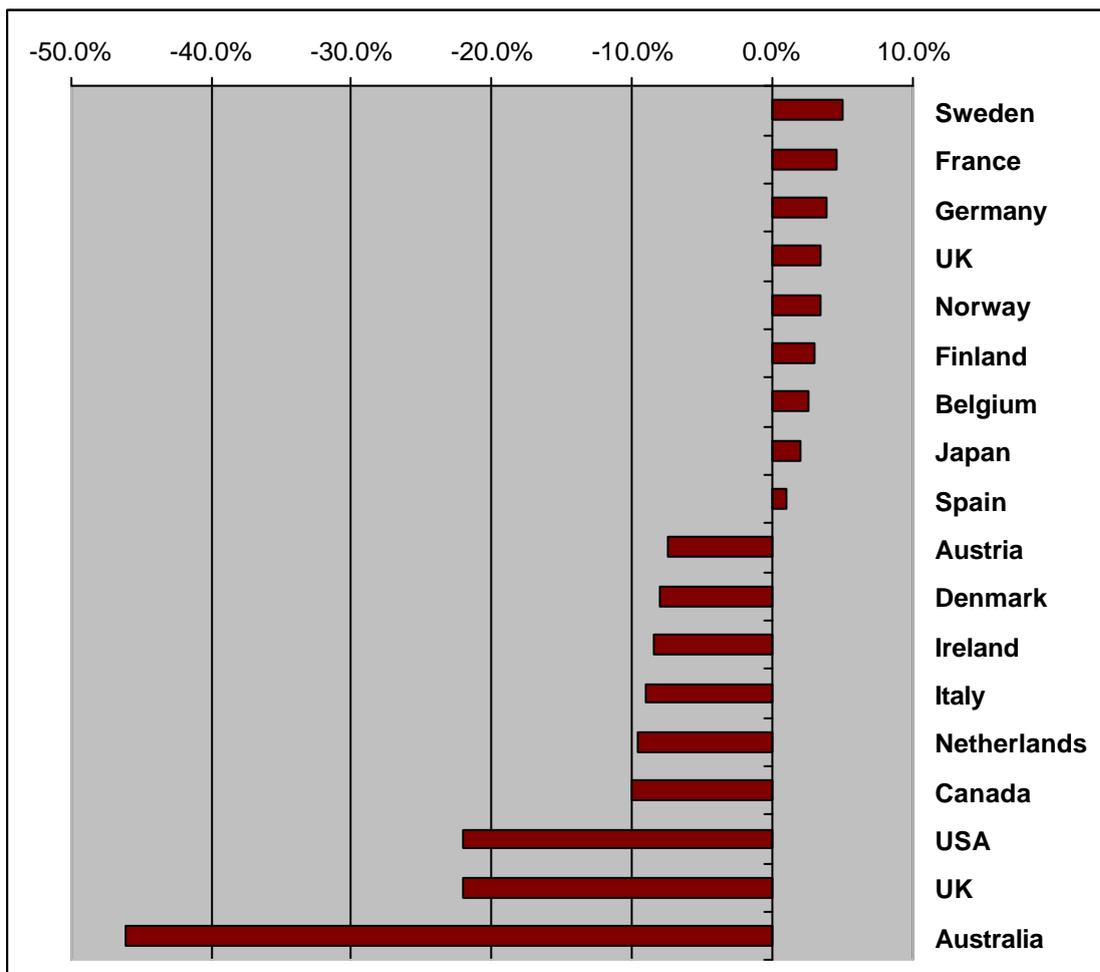
Australian corporate R&D expenditure is very highly concentrated with just two corporations accounting for 12 per cent of the total and the top ten firms accounting for 30 per cent. This suggests a degree of national vulnerability, in this important area of innovation, to the decisions of a small number of firms.⁴

But this pattern has been developing for some time:

One of the notable trends in world trade is the long term decline in the share of natural resource-based products vis-a-vis engineered products. Elaborately transformed manufactures (ETMs) including such things as consumer electronics, information and communication equipment have been the major source of growth in world trade for the past 50 years. And yet commodities still dominate Australia's exports. This means that our exports are not providing us with the same level of growth opportunities that ETM exports are providing to other countries and would provide to Australia if it were a significant exporter of ETMs....

Moreover, prices fetched in world markets for natural resource-based products are falling vis-a-vis those fetched by ETMs. As a result the things Australia is exporting are earning less and less on world markets, while the things we are importing are costing us more and more. **Compared to the mid 1960s Australia now has to export 50 per cent more commodities (by volume) to be able to afford the same volume of manufactures⁵** (emphasis added).

Figure 2.1 - Australia's Terms of Trade 1964 – 1992



Source: AEEMA (1997) Submission to the Information Industries Taskforce, Australian Electronic Equipment Manufacturers Association, Canberra p.14

In "What Game are We In?" Houghton and Flaherty say, "such a decline in terms of trade affects the standards of living of all Australians. It cannot be dismissed as an economic phenomenon which will be compensated for by exchange rate adjustments". It is a change which has seen Australia's wealth, measured in terms of per capita income, from being the most affluent country in the world late last century, fall to 10th place in 1970 and by 1990 down to 18th.

"...because goods purchased in Australia are priced in Australian dollars, Australian consumers are often unaware of the practical consequences of slipping down the 'income ladder', particularly the erosion of living standards and consumer choice. In fact the consequences are quite profound and can be measured in various ways. For example: 20 years ago there were about 385 Japanese yen to the Australian dollar; today there are about 85 yen to the dollar⁶. The effect is that a Japanese car which today costs \$30,000 could be purchased for \$6,000 if we had the 1973 exchange rate."⁷

Examples such as these, the authors say, are a clear indication that Australia is in a long term decline, "which has considerable momentum". In a world where capital is increasingly mobile and the pressure on managers and investors to maximise their returns grows ever greater there is less interest in making longer-term investments generally, and certainly not investments which are not based on substantive financial grounds.

History shows us, if common sense fails to, that those countries with strength in dynamic sectors will drive prosperity. Unfortunately, Australia has been enjoying the fruits of its resource riches without acting to balance off the impact the decades long decline in their underpinning price structure is having on the broader economy. It has done little to drive the growth of those sectors which are the growth industries in the global economy.

...at any given moment particular industries are economically strategic... The mastery of steam engines altered the application of energy to manufacturing throughout Europe. Its use in rail transport altered economic and social distances. The emergence of modern chemical industries created new products and altered old ones. The expansion of the automobile industry has had similar effects. ...those countries solidly based in these strategic industries which symbolise the transition and which have a web of sectoral interconnections that permit the industries that are driving the technological advance to influence more traditional industries are better situated for sustained expansion.⁸

It seems that having realised the implications of our recent economic history Australian business and successive Governments have responded by working ever harder to contain costs and where innovation is implemented it is process innovation⁹ or optimisation. We have adopted a policy of "steady as she goes" incrementalism, the economic manifestation of "she'll be right mate". This has in turn put us on a downward spiral.

Among high growth industries, the information industries stand out, both in terms of their own inherent performance but also, in terms of their transformative capacity for other industries.

2.2 Australia in a High-Tech World

In their insightful study of Australia's industrial structure for the Australian Business Foundation, *The High Road or the Low Road: Alternatives for Australia's Future*, Marceau et al¹⁰ discuss the necessary elements in a learning or knowledge economy and Australia's strengths and weaknesses in this regard. Amongst our positive attributes are:

- the willingness of Australia's service sector to engage in R&D;
- the substantial relative increase in the level of investment by the private sector in R&D over the past 15 years; electronics, shipbuilding and metals industries are all high by world standards;
- Australia's gross exports of ETMs have increased substantially in the past 15 years;
- more firms are experimenting with cooperative business linkages;
- training appears to have increased this decade, and;
- there appears to have been an increase in productivity growth rates this decade.

On the negative side:

- Australia is operating substantial and growing trade deficits in more knowledge and information intensive industries;
- the structure of our employment growth is toward lower paying industries and lower skilled jobs ("This is the response to increased competition which the literature would predict as being characteristic of a lower tech, lower innovation economy, which can only react to such competition using wages and exchange rates rather than increase in knowledge intensity"¹¹);
- Australia's trade structure has a number of negative attributes including:
 - deteriorating terms of trade (see 2.1 above);
 - a tendency to increased unemployment (and so depressed wages);
 - expansion of low wage jobs and industries;
 - a propensity for reduced R&D;
 - the growing risk of environmental shocks, and;
 - the short term cost (through the trade account's impact on GDP growth) of boosting productivity through substantial increases in equipment, which must most often be imported.

- relatively poor industrial R&D performance leading to a relatively low-tech manufacturing sector;
- the apparent low quality of Australian investment by world standards, typified particularly by the low propensity to export, a poor record in commercialising innovation and the low priority given to human resources development program;
- the "hollowing out" of industrial capacity;
- increasing concentration of industrial capacity within conglomerates, making the position of small to medium sized enterprises (SMEs) more precarious;
- public infrastructure appears to be declining by OECD standards;
- Australia's trade performance has not improved for the past 40 years;
- the tax system is biased against knowledge-embodying equipment investment as compared to property investment, and;
- access to capital appears to be a major impediment to innovative activity.

(a) Longer Term Views

The Allen Report also commented on a number of these issues, in particular the lack of aspirations by senior executives and their boards to export or globalise operations.¹² It also observed a lack of future orientation and practices in relation to information management. The Report quoted some disturbing results from academic research following a survey of 200 firms between March and June 1996:

If the responses to these interview questions can be taken as indicative, Australian commercial organisations are at present not very future oriented in their practices generally and not at all sophisticated in either their information management (IM) practices or their awareness of the potential of IM as a means of promoting their capacity to cope with the future. The most significant impediments to change in these organisations seem to be aspects of organisational culture, of attitudes and of individual knowledge and mind-sets, rather than the absence of hardware, software or technical systems or the presence of other 'practical' problems. Since the organisations whose senior managers responded to this survey range between 'middle-of-the-road' and 'leading edge' they represent the average to the best in Australian commercial organisations at present. The best seem to be very like the average and the average seems to be located considerable distance from the cutting edge.¹³

2.3 Government and Industry Body Reports

Although the reports from the Federal Government and industry bodies (detailed at footnote 2 above) have been commissioned by a range of different organisations and had differing terms of reference, there is surprising unanimity on the seriousness of Australia's problem and the scale of the challenge. There was greater variation as to the most suitable solutions.

Virtually all the reports agreed on a number of central points:

- the shift to a global information-based economy is occurring and gathering pace;
- the level of awareness of this change and its implications are very poorly understood by Australian government(s), much of the public sector and within business;
- Australia's combination of well-educated, innovative workforce with its pleasant physical environment make it ideally suited to this new environment, and so the opportunities before us are significant;
- Australia lacks a clear vision or commitment on the part of its decision-makers to direct the country into this new era, and;
- Australia's frequently commented upon lack of investment capital and other support for knowledge-based and high-tech, high-growth, innovative companies will prove particularly damaging to Australia realising its significant potential into the new millennium.

A recent survey of Australian-based managers of multi-national firms has shown them to be highly critical of Federal Government policy in attracting information industries. The survey¹⁴ confirmed the greatest impediment is outside Canberra's control - the small size of the domestic market - but after that the next two issues were all Federal Government concerns:

- high local taxes (75 per cent);
- little government incentive (72), and;
- uncertain outlook for industry policy (68), followed by;
- distance to markets.

The survey quoted one CEO as saying:

"...we've worked hard bringing our operation up to global standards and in terms of competitiveness or productivity we can match most of the other locations in Asia. But at the end of the day the pitch made by the EDB (in Singapore) and Malaysia Industry Development Authority was just so much better than anything we could arrange here that our case for Australia faltered."

In its rundown of the current investment environment the Allen Report cited high Capital Gains Tax as another disincentive to investment saying: "Australia's capital gains tax is *entirely* uncompetitive and prevents overseas development capital funding Australian enterprises". As a result it goes on to say: "investment in Australia is vigorous, due to domestic Australian market growth - but it is scaled to Australia and New Zealand, not regional demand (eg. Australia and New Zealand plus ASEAN Free Trade Area could dramatically change Multi-National Corporation's perspective)" ¹⁵ In broad terms MNCs categorise their overseas operations investments into two categories: close to market (therefore USA or Europe) or low labour/high incentives (therefore Asian Tigers). Australia falls between these two categories and so needs to work more strategically to achieve a place on any list of potential investment locations.

The following section summarises further aspects of the reports under subject headings.

2.3.1 Awareness and Leadership

Given its present approach to the information economy Australia is destined, in the words of one of the reports, to remain a spectator rather than a serious player in this new economy due to the lack of awareness and commitment to these changes by our government, corporate and community leaders. There is a need for this to change rapidly and for their active involvement to work cross-sectorally in building leading edge information economy models.

Several of the reports also point to the rapid pace of technological developments and the short decision-making time frames involved in realising market opportunities. These features need to be factored in by government in making policy changes.

2.3.2 Strategic Options

While there is unanimity over Australia's strengths (well-educated, innovative workforce, a stable political and economic environment, an attractive physical environment etc.) the reality of our wider position in the global economy raises significant challenges:

- the size of Australia's information industry as a proportion of the world's information industry is very small (about two per cent);
- our export capacity of information products and services is currently very small;
- we have a growing and significant information industry trade deficit, and;
- many Australian information companies maintain a focus on the domestic rather than export markets (a little over five per cent of the industry's revenue comes from exports).

The global information industry is dominated by a relatively small number of multi-national corporations which can and will site their operations in the most cost-effective locations. The competition from many of these potential sites (countries) is opening up significant opportunities to play them off against each other.¹⁶

2.3.3 The Leading Edge Application of New Products and Services

The process of “creative destruction”¹⁷ has not begun in any serious way yet. Australian companies and institutions are not moving quickly enough to reinvent themselves to enable successful and effective participation in the emerging information economy.

Initiatives that provide incentives for encouraging and motivating developments, particularly applications innovation on the demand side of the industry, are of great importance. As the benefits from many of these projects are often difficult for any one organisation to capture, encouraging them is likely to require government support as a catalyst. This is particularly true in Western Australia with its large number of smaller local firms.

2.3.4 Venture Capital and Innovation

The gap between Australia's strong history as a nation of inventors and its continuing failure to exploit these innovations has been reported and commented upon continually over the past decades. The lack of capital markets to invest in and support new ventures is critical to this. In the context of the current global economic shifts (see 2.1 above) this continuing indifference to the structural and cultural impediments to commercialising innovation will become even more costly.

As other countries recognise the vital strategic importance of knowledge intensive industries and “tune” their policies to accommodate them, the gap between practice here and overseas is widening. That gap will encourage Australians and Australian firms to seriously consider moving off-shore while acting as a disincentive for global companies to base little more than their sales operations here, as is the current trend.

Australia is not attractive to venture capitalists. It is not attractive in encouraging the establishment of local firms because of taxation policies, in particular capital gains tax, and a general lack of attractive R&D incentives. There is also a need for strong R&D collaboration particularly between both the supply and the demand side of the industries.

This issue of building a balance between the supply and demand side was raised by a number of the reports and deserves further emphasis. Because so much of Australia's R&D spending has been undertaken by public institutions (the CSIRO and Universities in particular) much Australian innovation has tended to be supply push. In many other developed countries, where the private sector is more heavily involved in R&D, the emphasis is demand pull or more market driven. Furthermore, many of the taxation incentives to industry and investors to invest in R&D (what frequently passes for demand pull in Australia) have been based on tax minimisation schemes rather than being embedded in the tax system's wider structure. As a result they tend to be tax law and accounting rather than technology, business and market driven. There was a consensus amongst the reports, once again, that initiatives which encourage Australian venture capital companies to invest in all stages of the commercialisation of local technology and applications are an urgent priority. But, as has been mentioned, the urgency of addressing this has been stated repeatedly for at least a decade.

A number of recent initiatives have been announced which may address some of these shortcomings. The Australian Stock Exchange has announced the establishment of its Enterprise market, a market designed for smaller, more speculative and unlisted ventures. The market operates exclusively on the Internet. The ASX is also discussing with NASDAQ, the New York-based market specialising in high technology stocks, partnering arrangements which will facilitate trade in scrip listed on each exchange by the other.

The Federal Treasurer has also announced changes to the Corporations' Law which, he says, will relax requirements for companies seeking less than \$5 million capital. The Department of Industry Science and Tourism (DIST) has called for expressions of interest from organisations intending to establish alternative equity markets, particularly for SMEs.

2.3.5 Telecommunications

Having access to world class telecommunications infrastructure at the most competitive prices possible is an essential precondition for building effective information industries. While there is little question over the technical quality of the network in Australia, the continuing uncertainty over the various industry performance indicators conceals the actual position, particularly in terms of price, the roll-out of new technologies and their availability in regions outside the major east coast capital cities. More than five years after liberalisation of the industry began, the benefits which have been delivered outside the corporate sector and beyond Sydney and Melbourne in terms of price reductions and new services are limited, in some cases negative.

2.3.6 Skills development

Education and training are clearly at the heart of maintaining Australia's existing competitive edge in having a highly skilled workforce. Some of the reports proposed greater involvement from industry to ensure this advantage is maintained, others argued for the reinstatement and increase, of funding to universities and other training institutions. Whichever option they supported there is agreement that support for education and training in this environment must be a priority.

2.4 The Australian Information Industry

The Australian Information Industry accounts for only two per cent of the world's information industry. It generates about \$50 billion across all its sectors.¹⁸ As Table 2.1 below clearly shows, the industry is highly centralised with the vast bulk of this activity in NSW and Victoria - more than 70 per cent of employees and almost three quarters of the industry's revenues¹⁹.

The Allen Report observed:

... the reality is that the multinational firms have overwhelmingly located their activities in Sydney and Melbourne due to factors such as the presence of agglomeration economies and the size of their markets. Nevertheless, both the New South Wales and Victorian governments have provided assistance to attract investments where they are seen to be strategically significant (ie. providing a good fit with the state's areas of competitive advantage) and where they provide net benefits. In 1995 the New South Wales government assisted American Express to locate its Asia Pacific regional operations centre in Sydney and the Victorian government assisted the Oracle Corporation to locate an Asia Pacific centre in Melbourne.

The other States and Territories have actively used purchasing leverage and financial incentives to attract multinational firms to locate all or part of their activities in their jurisdictions. The actions of the South Australian government in 1994 to provide incentives to get Motorola to locate their Software Centre Australia in Adelaide and in 1995 to attract EDS to locate its Asia Pacific Resource Centre in Adelaide by outsourcing its computer services are examples. Other States have sought to use purchasing leverage to get the multinational firms to locate some parts of their operations with them eg., training centres.

The States and Territories have also sought to create conditions in which locally owned information industries and firms can grow. This tends to be the main focus of the States other than New South Wales and Victoria.

Some of the States and Territories have also tended to assist particular elements of the information industries in which they have or can develop a competitive advantage. Victoria's multimedia vision is one example, South Australia's focus on defence industry electronics is another.²⁰

NSW's dominance of the industry is spread relatively evenly over the sectors although it does have a stranglehold over the relatively small amount of manufacturing undertaken in Australia, accounting for more than half the national jobs in this national segment. Western Australia's relative strength in Telecommunications Services is likely to have changed since deregulation of the industry 12 months after the survey period. Between them, the three east coast states account for more than 80 per cent of the industry's jobs.

Table 2.1 - Information Industry Employment by State & by Sector: 1995-96²¹

Industry	NSW	VIC	Qld	SA	WA	TAS	NT	ACT	Australia
<i>Manufacturing</i>	9,979	4,450	898	858	842	23	-	246	17,295
% of Aust total	57.70	25.73	5.19	4.96	4.87	0.13	-	1.42	
% of state total	11.57	7.23	3.73	7.80	6.74	1.06	-	5.89	
<i>Wholesale trade</i>	17,597	13,151	3,686	1,604	1,944	300	168	179	39,629
% of Aust total	44.40	33.19	9.30	4.05	4.91	0.76	0.42	0.45	
% of state total	20.40	21.38	15.33	14.57	15.55	13.87	17.02	4.28	
<i>Telecom's Services</i>	33,180	27,184	14,777	6,108	6,660	1,569	697	1,525	91,701
% of Aust total	36.18	29.64	16.11	6.66	7.26	1.71	0.76	1.66	
% of state total	38.46	44.20	61.46	55.49	53.28	72.54	70.62	36.50	
<i>Computer Services</i>	25,509	16,724	4,682	2,437	3,054	271	122	2,228	55,028
% of Aust total	46.36	30.39	8.51	4.43	5.55	0.49	0.22	4.05	
% of state total	29.57	27.19	19.47	22.14	24.43	12.53	12.36	53.33	
TOTAL	86,265	61,509	24,043	11,007	12,500	2,163	987	4,178	203,653
% of Aust total	42.36	30.20	11.81	5.40	6.14	1.06	0.48	2.05	

Source: Australian Bureau of Statistics; Information Technology, Australia 1995-96

While virtually all our Asian neighbours have been actively developing export oriented Information Industries Australia's performance has improved only slightly and from a very low base.

Table 2.2: Comparison of Selected Countries ICT Industries

	Export Revenues (A. \$bn.)		Percentage of Exports		Percentage of GDP	
	1993	1995	1993	1995	1993	1995
Australia	1.3	2.1	1.9	3.0	0.3	0.7
Hong Kong	11.0	13.2	26.0	31.7	6.5	6.6
Indonesia	2.7	2.5	5.2	n/a	1.2	1.0
Japan	150.4	184.3	28.3	29.9	2.4	2.6
Malaysia	31.4	54.2	46.4	54.6	33.2	46.4
Philippines	4.3	9.0	25.4	37.8	5.3	8.8
Singapore	41.7	56.0	75.0	79.4	49.6	56.7
South Korea	39.9	36.9	33.5	39.0	8.2	10.6
Taiwan	15.0	22.5	12.0	14.6	4.6	6.2
Thailand	4.0	7.7	9.9	9.9	2.6	3.4

Source: "Spectator or Serious Player?" (The Allen Report)

2.5 The Western Australian Information Industry

Although a small section of a very global sector, the Western Australian industry has developed a number of strong niche areas of expertise. In 1995-96 the local industry had revenues of just over \$2.8 billion, more than half of this from telecommunications services.²² There are approximately 400 IT and multimedia firms in the state. Two of these, ERG and Intellect, were rated amongst Australia's top fifty information industry exporters in 1995-96.²³ ERG was ranked tenth with \$91 million in exports and Intellect twentieth earning \$5 million from overseas sales. Curtin University was the other Western Australian organisation included in this group, listed thirty-first with \$36 million generated from the sale of educational services. A striking feature of the export results is the large number of subsidiaries of foreign-owned companies represented: only three of the top ten - Telstra, Pacific Dunlop Cables and ERG - are significantly Australian owned.

The 400 IT and multimedia firms in Western Australia include multinational and local companies involved in the manufacture, development or wholesaling of equipment, software or services in which the primary product is the delivery of information processing, multimedia or communications. Of these about two thirds are locally owned, the remainder are either owned by overseas or east coast interests. Despite this, the bulk of the revenue earned by the industry (52 per cent) was earned by non-Western Australia firms.²⁴

Table 2.3 - Turnover and Employees per Firm in the Western Australian Information Industry: 1992-93

	% of firms	% of sales	Turnover per firm \$mill. (1992-93)		Employees per Firm (Dec. 1993)	
			Mean	High	Mean	High
WA Owned	64	48	2	14	18	200
Non-WA	36	52	6	55	30	300

Source: Information Technology Industry and Market Survey - Western Australia, EIIC, 1995

As the table above shows, non-Western Australian firms tend to have significantly more employees than the locally owned companies. But the discrepancy in mean turnover is even greater by a factor of three to one.

Table 2.4 - Revenue by sector in the Western Australian Information Industry: 1992-93

	Sales - \$mill.	% Total	Staffing (excluding admin.)	% Total	Revenue/ employee - \$'000s
Manufacture of IT equipment	69	21	400	23	172.5
Prod'n of software	40	12	560	32	71.4
Distribution of IT products	116	36	270	15	429
Provision of IT services	97	29	520	30	186
Provision of services through IT	7	2	not known	-	-
TOTAL	329		1750		188

Source: Information Technology Industry and Market Survey - Western Australia, EIIC, 1995

Government accounts for 40 per cent of the local industry's revenue. Resource, environment, land management (including mining, petroleum and mapping) and software development is by far the dominant activity, followed by finance, banking and insurance applications with telecommunications and utilities a close third. Compared to other Australian ICT companies the Western Australian firms tend to be more export oriented. The MNCs tend to do little exporting from Australia and that which is done is managed from either Sydney or Melbourne. Twelve per cent of the state industry's revenues come from overseas sales, while the national figure was only 5.6 per cent.²⁵

At the time of writing there was no current data available to identify major clusters within the local industry. However it is clear that the state has strong existing companies and research organisations working in imaging (for a variety of applications) and in aspects of communications, particularly wireless and broadband telecommunications. Research undertaken in 1994-95 identified imaging, advanced communications and multimedia as areas of greatest interest to the Western Australian industry.²⁶ Much of the work being done in each of these areas within the state is globally significant with commercial and research links overseas. Other firms are recognised global players in smart cards and EFTPOS technologies, RF systems, security, phone traffic management, intelligent home systems and various other technologies. Further work needs to be undertaken, and maintained on a continuing basis, to track these industry clusters.

2.6 Investing for Growth

The Federal Government's *Investing for Growth*²⁷ identifies three areas worthy of particular attention; innovation, investment and exports. The programs announced to meet these needs are:

- **innovation:** R&D Start series of programs, scaled to support R&D for various firm sizes; extend the Innovation Investment Fund; expand technology diffusion initiatives and international science and technology collaboration.

From Mines to Minds:

WA in the Global Information Economy

- **investment:** establish Invest Australia to promote Australia as a location for investment, work with State and Territory governments to streamline approvals for major projects.
- **export:** program to harmonise customs, standards and conformance within APEC and promote industry collaboration; extend the Export Market Development Grant scheme.

The government also announced the establishment of the Information Industries Action Agenda. This embraces a number of initiatives including:

- a national network of software quality centres to provide firms with access to leading edge software engineering technology;
- access to appropriate test bed facilities;
- removal of tariffs on inputs to manufacture of information industries equipment;
- assisting industry development through procurement and outsourcing, and;
- facilitating the licensing of rights for intellectual property developed within Government contracts to Australian-based firms for commercialisation.

Investing for Growth also includes a number of programs to raise knowledge and awareness of information products and services. A number of related publications have been released by the Federal Government during the first half of this year which add to issues raised in *Investing for Growth*. They are *Getting Business Online*, the *Information Industries Action Agenda*²⁸ (both from the Department of Industry, Science and Tourism) and *Building the Information Economy: a progress report on the enabling legal and regulatory framework*²⁹ (from the National Office for the Information Economy).

2.7 Towards an Australian Strategy for the Information Economy

The preparation of this preliminary statement from the National Office for the Information Economy (NOIE) on behalf of the Ministerial Council for the Information Economy has coincided with the work undertaken for *Mines to Minds*. It sets out four guiding principles for the Federal Government's approach to the Information Economy, they are that:

- all Australians should have access to the technology, skills and knowledge required to participate in the Information Economy;
- Government should be a lead user, supplier and purchaser of electronic services and provide the appropriate regulatory framework;
- Government encourages industry self-regulation to encourage the private sector to take the lead, and;

- as the Information Economy crosses national boundaries Australia's regulatory regime conform with those set by other countries.

The document then spells out ten strategic priorities. These cover some of the issues raised in this paper such as awareness raising, training, infrastructure, programs to encourage adoption by business and strategies for developing indigenous Information Industries. It also raises two additional issues which are outside the Western Australian domain but crucial nonetheless: Australian national legal and regulatory frameworks and Australia's role in influencing international fora on these issues. NOIE have also set "ensuring the integrity and growth of Australian culture in the Information Economy" as another of their strategic priorities.

As has been mentioned, the focus of the NOIE report sits very well with the direction set out here in *Mines to Minds*. But there is one area of substantial and important difference and that is over NOIE's view on the impact these technologies will have on distance. In a short section headed "The End of the Tyranny of Distance" it perpetuates the notion that this change is intrinsically positive for peripheral areas - "Participation in the information economy allows us to overcome the isolation of Australians in remote and rural areas and the disadvantages of national isolation from world markets".

Earlier communication technologies and the trends flowing from this generation show this to be false. Continuing to promote this superficially logical assumption is likely to lead to seriously misguided policy and strategy decisions on the part of governments and the private sector. These technologies certainly *can* offer a country such as Australia, with its vast distances, massive opportunities but the potential dangers should also be factored in.

2.8 Conclusion

There is little doubt (nor argument amongst industry analysts) that Australia has some significant weaknesses, without down-playing its substantial strengths. The overriding conclusion one reaches having reviewed these reports of the history and current position is that successive governments and business believe that either these shortcomings have been overstated or that the industry and global trends are not likely to continue. Their view appears to be that with the refinement of a few policies and processes adequate growth will continue. The attitude appears to be the same at both the leadership and senior management levels as it is on the shop floor: optimisation rather than innovation is the best approach to these changing times.

¹ In, *What Game Are We In? Framing Policy Options for the Information Industries* prepared for the Information Industries Taskforce (the Goldsworthy Report) and is attachment 1 to that report. It is also available at <http://www.dist.go.au/itt/golds/html/attach1.htm>

² “Australia.com: Australia’s future online”, Australian Coalition of Service Industries, February 1997;

“Spectator or Serious Player? Australia’s Competitiveness in the Information Industries”, Allen Consulting Ltd and Allen and Buckeridge Ltd., March 1997;

“Priority Matters: A report to the Minister for Science and Technology on the arrangements for Commonwealth Science and Technology”, (The Stocker Report), Department of Industry Science and Tourism, June, 1997;

“Going for Growth: Business Programs for Investment, Innovation and Export”, (The Mortimer Report), Department of Industry, Science and Tourism, June 1997;

“The Global Information Economy: the way ahead”, (The Goldsworthy Report), report of the Information Industries Taskforce, July, 1997;

“Make or Break: Seven steps to make Australia rich again”, by the Economist Intelligence Unit for the Metal Trades Industry Association, August 1997

“A National Policy Framework for Structural Adjustment within the new Commonwealth of Information”, produced by the Information Policy Advisory Council for the (then) Minister for Communication and the Arts, August 1997;

“Putting Australia on the New Silk Road: The role of Trade Policy in advancing Electronic Commerce”, Department of Foreign Affairs and Trade, Canberra, 1997

“The High Road or the Low Road? Alternatives for Australia’s future”, Jane Marceau, Karen Manley and Derek Sicklen for the Australian Business Foundation, September, 1997;

“Winning Companies and Jobs”, Allen Consulting Group for the Australian Business Foundation, September 1997; and

“Working for the Future”, Australian Academy of Technological Sciences and Engineering, November 1997

³ Marceau, Jane, Manley, Karen and Sicklen, Derek, “The High Road or the Low Road? Alternatives for Australia’s future”, Australian Business Foundation, August, 1997, Overview Report, p.14

⁴ *ibid*, p.19

⁵ AEEMA, Submission to the review of business programs: Mortimer Review, AEEMA, March 1997, author's emphasis

⁶ As of 1 September 1998 the rate had dropped to about 81 yen to the \$Aus.

⁷ BCA, *Australia 2010: Creating the Future for Australia*, Business Council of Australia, 1993, quoted in Houghton and Flaherty

⁸ Cohen, S.S. and Zysman, J., *Manufacturing Matters: the myth of the post-industrial economy*, Basic Books, 1997

⁹ In innovation theory a distinction is made between product innovation, broadly speaking the invention, and process innovation, the fine-tuning of the product. "During the formative period of a new product technology, the processes used to produce it are usually crude, inefficient and based on a mixture of skilled labour and general purpose machinery and tools..."

But product innovation and process innovation are interdependent; as the rate of product innovation decreases, it is common to observe a growing rate of process innovation."

From Utterback, James M., *Mastering the Dynamics of Innovation*, Harvard Business School Press, Boston, 1994

¹⁰ "The High Road or the Low Road? Alternatives for Australia's future", Jane Marceau, Karen Manley and Derek Sicklen for the Australian Business Foundation, September, 1997.

¹¹ *ibid*

¹² "Spectator or Serious Player?", the Allen Report

¹³ Oh, Denise, "Australian Commercial Organisations: Their general level of future orientedness and their degree of sophistication in respect to information management", RMIT Department of Information and Management and Library Studies, January 1997 - to be published, quoted in "Spectator or Serious Player?", the Allen Report.

¹⁴ In "Australia's Foreign Investment Challenge: The Harsh Reality", EIU Australia, survey responses from the information industry CEOs.

¹⁵ "Spectator or Serious Player?", the Allen Report

¹⁶ see also the Industry Commission's report: "State, Territory and Local Government Assistance for Industry" (Industry Commission Report No. 55, AGPS, Canberra, October 1996), the overview document is available at <http://www.indcom.gov.au/inquiry/stateass/final/index.html>

¹⁷This refers to companies radically restructuring their operations whilst they are performing strongly but before the effects of an anticipated, but hard to perceive, change occurs.

¹⁸ Senator Richard Alston, Speaking at the opening of Alcatel's optic fibre plant at Botany Bay, 10 December, 1997

¹⁹ Information technology - Australia 1995-96, ABS, Catalogue No. 8126.0

²⁰ At <http://www.dist.gov.au/itt/tskforce/allen/appendc.html>

²¹ At the time of writing the release of industry statistics for 1996-97 is imminent.

²² ABS, *ibid*

²³ "Spectator or Serious Player?", the Allen Report

²⁴ "Information Technology Industry and Market Survey - Western Australia", by Deakin Consulting, published by Electronic and Information Industry Chamber (WA), January 1995

²⁵ "Information and Communications Technology Industry: Regional Capabilities and Advantages", Department of Commerce and Industry, March, 1997

²⁶ "Information Technology Industry and Market Survey - Western Australia", by Deakin Consulting, published by Electronic and Information Industry Chamber (WA), January 1995

²⁷ The main report can be found at <http://www.dist.gov.au/growth/index.html>, the section dealing with Information Technology at <http://www.dist.gov.au/growth/html/it.html>

²⁸ Available at <http://www.dist.gov.au>

²⁹ Available at <http://www.noie.gov.au>

3 Options for Western Australia's Information Industries

The issues that will define life in the future have already arrived here [in Silicon Valley]: a new economy based on knowledge work, a hyper-diverse population, and a huge tolerance for change, ambiguity and failure.

Tom Hayes, Fast Company, October-November, 1997

As the most global industry in a rapidly globalising world economy, any substantial and sustainable development of vigorous local Information Industries must have an international outlook. As the figures in the previous chapter indicated, the Western Australian Information Industry already has more than twice its revenue coming from exports compared with the national average, albeit from an extremely small base.¹ (The strong export performance of two of the State's leading ICT companies - ERG and Intellect - most likely "skews" these figures.)

Australia's share of the global Information Industries is about two per cent and as Western Australia accounts for five per cent of the Australian industry this leaves the State with 0.1 per cent of the world Information business. Highlighting Western Australia's tiny share of the global industry is not intended as a disincentive for action but to emphasise the necessity of tightly focussing the State's efforts in a realistic way. Numerous segments and niches within the global Information Industry are open to well-focussed participants with a long-term strategic vision.

The options canvassed here are unashamedly geared toward creating the necessary environment which will build and expand locally-based, globally oriented, information industries. Taken at face value this goal appears entirely non-controversial and one which would be universally endorsed. But it is possible to view the industry as having two quite separate segments, each with very different agendas. On one side are the distributors, dominated by the branch offices of the MNCs and nationally owned companies, on the other the locally-owned producers and developers. There are also a substantial number of firms which fit between these two; locally owned agents and systems integrators, to name two categories.

A difficulty for government in setting policy is that representatives from the distributors group tend to be the most consistent attendees at industry briefings and are more often in close contact with government. Their priority at these occasions are usually questions associated with government buying practices. Their organisations are unlikely to be conducting export drives from Western Australia. For this reason they are of less concern in the context of this study. Nonetheless this is not an attempt to vilify these companies. They can be, and have been in the past, essential players in the development of the local industry. Aside from the services they provide the Western Australian economy and society generally many have formed partnerships with local companies which have assisted them in expanding into other markets. In this role they can be of invaluable service to achieving the goals outlined above.

3.1 Western Australia's Competitive Advantages in an Information Economy

Perth could be one of the most attractive suburbs in the Global village.

Frank Blount, Telstra CEO,
addressing the Into Asia Conference, Perth, 1993

Western Australia's competitive advantages as an attractive location for industry have been noted in a variety of government reports². Its advantages for Information Industries are slightly different. Western Australia:

- is the closest Australian State to the developing economies of Asia;
- shares the same time zone as many of the major centres in the region;
- has a time zone which is precisely eight hours (one working day) ahead of the United Kingdom and 16 hours ahead of the west coast of the United States;
- has been Australia's fastest growing State economy for many years, with a strong export culture;
- has good telecommunications and transport infrastructure with regular interstate and international air services;
- has a highly skilled, innovative, predominantly English-speaking workforce³, with skills surpluses⁴ in many information-based professions⁵;
- has world-class education and health systems;
- has a very stable, western political and economic system, and;
- has an attractive physical environment.

3.2 Western Australia's Limitations

The arrival of a new generation of communication technologies has been predicted to overcome distance, and with it, isolation (see Section 1.10). Yet the experience of many heavy users of these technologies is that they are travelling physically further and more often than ever. It seems to be the case that the technologies can sustain relationships for longer over distance but they need to be regularly reinvigorated with face-to-face meetings. These technologies have, in some cases, brought about significantly more centralisation in some sectors - contrary to many predictions. Rather than causing the death of distance and making location irrelevant these Information and Communication Technologies (ICTs) appear to have consolidated the importance of distance and location in many cases. The massive centralisation of control of the finance industries to New York, London and Tokyo is a prime example of this and a pattern which can be expected to be followed in other sectors.

These technologies do offer Western Australia the potential to participate more actively but they can also marginalise the State. The force of these changes make it crucial we comprehend them to maximise the positives and minimise the negatives.

3.2.1 Travel and Distance

As the world communicates more easily, competitive Western Australian businesses are likely to have to travel more to keep pace, but the rewards for this contact will be potentially greater. The distance to major markets will continue to be a challenge but once bridged the new technologies mean it will be easier to keep the lines of communication open.

3.2.2 Isolation and Size

The State's isolation and its relatively small market size cannot be overlooked. As mentioned earlier, Australia accounts for a mere two per cent of the world's information industry and Western Australia five per cent of this - meaning about 0.1 per cent globally. A major advantage of the information industries are that many of them are comparatively location independent and size is not as critical as it is in the industrial economy. It *does* mean that niches have to be very clearly identified and systematically pursued.

Isolation and small market size do mean many sectors within the information industries do not have "critical mass" in terms of support services. Skilled workers, for instance, can be difficult to attract and many employers report that it is often unusual to receive applications from high quality east coast personnel for nationally advertised jobs.

The issue of isolation and information industry size can create difficulties in:

- accessing major investors (who tend to be Sydney/Melbourne-based);
- keeping abreast of Federal Government industry support and export programs, particularly their finer nuances and shifting agendas;
- the challenge to retain many talented young graduates (anecdotal evidence suggests the state loses 40 per cent of its electrical engineering graduates);
- encouraging an introspective and domestically-focussed orientation on the part of some companies which can fuel a higher level of intra-industry jealousy than is the case elsewhere, and;
- the difficulty in building company scale to a sufficient size to support a push into global markets.

3.2.3 Western Australia's Disappearing Middle (Management)

The staff cuts in many companies during the recession of the late 1980's resulted in many Western Australian branches also being downgraded and losing a good deal of their decision-making power. This rationalisation, combined with better communication technologies, has meant that within many east coast controlled organisations more control has returned to head office.

Reductions in the public sector - both state and federal - are also contributing to a situation where many early and mid-career workers cannot expect to gain the range of experience or opportunities their predecessors enjoyed in Western Australia.

3.2.4 Cultural Life

Perth and Western Australia's broader cultural and intellectual life need to be kept in mind as significant issues in the development of an innovative information industry in the State. The information economy, with its priority in building knowledge-based companies, requires top flight creative individuals, particularly in the creation of content. For many of these people a vibrant cultural community is a major factor in choosing where to live.

3.2.5 "Don't Work Too Hard"

The State's comfortable physical lifestyle, which is widely accessible, encourages a more relaxed approach to creative endeavour. While this is clearly a very highly valued feature of Western Australian life, for more ambitious and driven individuals it can be a limitation. It is not suggested here that anything should or can be done about this, aside from acknowledging this paradox. The negative aspect to this is that it can lead many with ambition and ability to move - the challenge is to find reasons which encourage them to stay, or even better, to return.

3.2.6 Narrow Economic Base

The Western Australian economy is quite narrowly based around the resource industries, agriculture and the state public sector. Its strength has been closely entwined with the strength of our major trading partners in Asia, in particular Japan. In March of this year the Western Australian Treasury summed up the current position in the following terms:

The East Asian economies remain unstable, despite International Monetary Fund intervention, and speculation continues on how this will affect economic activity in other regions.

Although Western Australia appears to be relatively heavily exposed to events in Asia because of the increasing value of exports directed to the region in recent years it remains well placed to withstand the downturn. Fortunately, Western Australia's trade with the region comprises a diverse range of commodities, which is largely used in the production process for Asia's exports...⁶

By June Treasury was expressing a more confident tone, largely based on the drop in the value of the Australian dollar and the capacity this has provided for exporters to move into other, more robust markets.

...the vast majority of Western Australia's exports are primary commodities, which are not only relatively homogeneous, but also crucial inputs to basic industrial production processes across the globe. This has meant that, as the East Asian markets have wilted, the commodities have been readily redirected to the much stronger economies of North America and Europe.

In addition, the depreciation of the Australian dollar against the currencies of North America and Europe has meant that Australian manufactured and services exports are much cheaper in those markets. This improved competitiveness has stimulated demand significantly.

As a result, Western Australian exports remain robust overall.

Domestic demand is also continuing to grow at a faster pace than the national average, sustained by strong business investment and healthy growth in private consumption expenditure and dwelling investment underpinned by low interest rates. Treasury estimates economic growth in Western Australia for the 1997-98 financial year at around 6.5%. This is a stronger rate of growth than the average over the past decade and higher than expected for any other State.⁷

The State's narrow revenue base, both sectorally and in terms of markets, is a point of vulnerability.

As in any regional economy, the Western Australian Information Industry is made up of a mixture of branch offices of national companies and MNCs and locally-owned firms. As we have seen (Table 2.3) almost two thirds of the companies are Western Australian-owned although more than half the local industry turnover goes to non-Western Australian owned companies.

This feature is worth repeating here, not to argue against the presence or activities of the organisations owned outside the State, but to highlight the different broad motivations of these two groups. The task of this report is to identify policy settings to assist in the growth of a local industry. If we can assume that it is unlikely the MNCs will use Perth as an export base (not impossible, but unlikely) then the emphasis should be on local firms. The important qualification to this is the role the branches of MNCs and national companies can and have played in partnering local groups to take products and services into national and global markets.

3.3 An Information Industry and the Resource Sector

For Western Australia, with its fortuitous time zone, and the other advantages mentioned above, improvements in ICTs and the move further toward the Information Economy present some exciting opportunities. Clearly, as a small regional economy, Western Australia cannot hope to mimic many of the better known success stories and expect to build firms across a wide range of Information Industry sectors. It has to pick its mark. Many of the State's existing Information Industry companies (see Box 3.1) have established themselves primarily through servicing resource companies. This has not only sustained them and allowed them to grow financially but also funded substantial development programs within some organisations. Much of the local Information Industry's world-class expertise in various forms of imaging and mapping technologies, remote and mobile communications can be traced back to on-going contracts from resource companies.

Box 3.1 - Selection of WA, Resource industry-based Information Companies

Barrett Communications, design and manufacture radio equipment;
Cadgraphics, CAD bureau services for oil, gas and mineral exploration;
Datamine Australia, technical geological and mine planning software developers;
Earth Resource Mapping, developed and markets advanced image processing system;
Focus Engineering, conveyor belt monitoring and plant reporting systems;
Micromine, exploration & mining data processing;
Specterra Systems, data collection, image processing and interpretation;
Terravision, software and electronics developers for real time information systems; and
Transcom, development and sale of electronic control systems and mobile data transfer

The opportunity exists to build on Western Australia's global competitive advantages in resource and resource service industries to create a range of information and knowledge-based companies and industries. The State's resources and agricultural sectors are the only substantial sectors within the Western Australian economy with a strong global position. While innovations occur regularly in agriculture these are not as frequent nor as widely transferable as those developed in and around the resource sector.⁸ This desegregation of the agricultural industry also makes it difficult to harness many of these innovations.

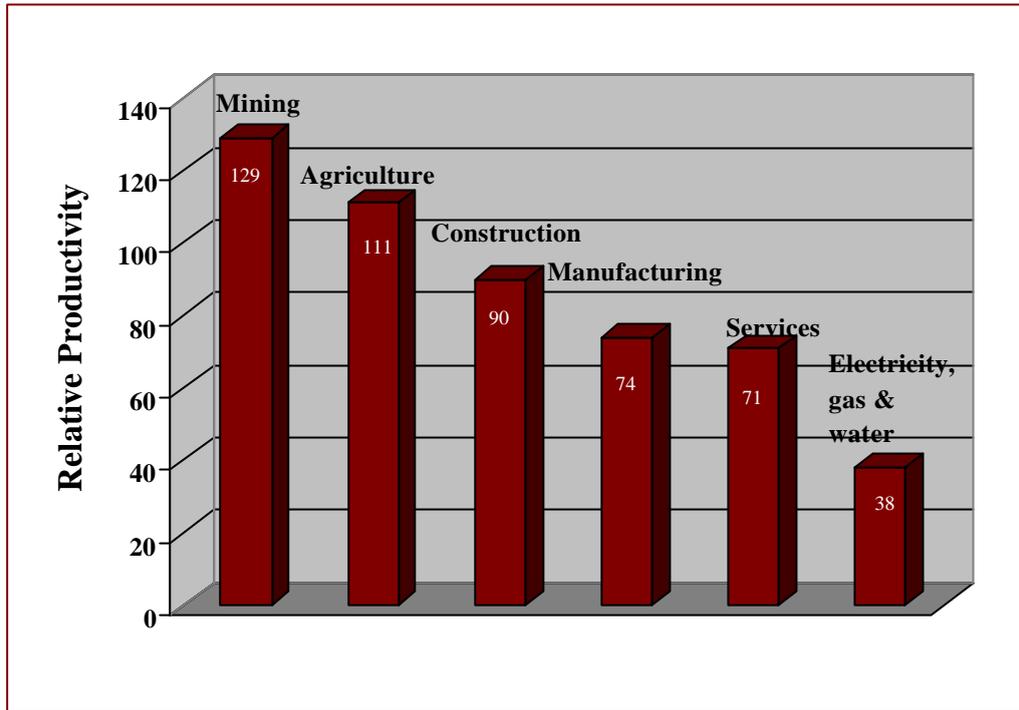
The strategy outlined below seeks to leverage the potential offered by the global strength of Western Australia's resource sector, enhance the position of the existing organisations, build new applications and then to extend them out into other sectors which exploit the State's other comparative advantages.

It is not conceived as a resource industry-only strategy.

3.3.1 The Resource Sector as a Global Industry

Both the resource companies and the service companies which have grown up around them have a proven record of world-class innovation and development. Achieving this record has required the continued development of efficient operational methods. According to McKinsey and Company the Australian mining sector - of which the Western Australia industry accounts for a disproportionately large amount - has by far the highest relative productivity of any sector in the national economy. Measured in terms of value added per employed person mining recorded 129 against the Australian national all-industry average of 75. The US all-industry average is 100.⁹

Figure 3.1 - Value Added/Employed Person for Selected Australian Industries (index all US industries = 100)



Source: McKinsey and Company¹⁰

This combination of high productivity and global orientation make the resource industries and existing information industries servicing the sector the logical starting point on which to focus the state's strategies in developing a strong indigenous Information Industry. Existing areas of expertise in Imaging, Spatial Analysis, 3D Modelling, Process Control, Global Positioning Satellite (GPS) applications, Wireless communications, specialised areas of Robotics and consulting services offer an impressive series of starting points.¹¹ While mining, oil and gas companies themselves are an integral part of this strategy its primary focus is on the locally-owned Small to Medium-sized Enterprises (SMEs) in the Information Industries, some of which are already servicing these larger resource companies. Others have built substantial niches quite independent of the resources sector. In both cases the strategy proposes two interrelated goals:

- That existing companies be assisted to expand, within their existing market niches as well as vertically and horizontally, through the innovative use of ICTs.
- That the skills acquired through this expansion, particularly in dispersed project management, be leveraged into developing other knowledge-based industry opportunities for WA, beyond the resources sector.

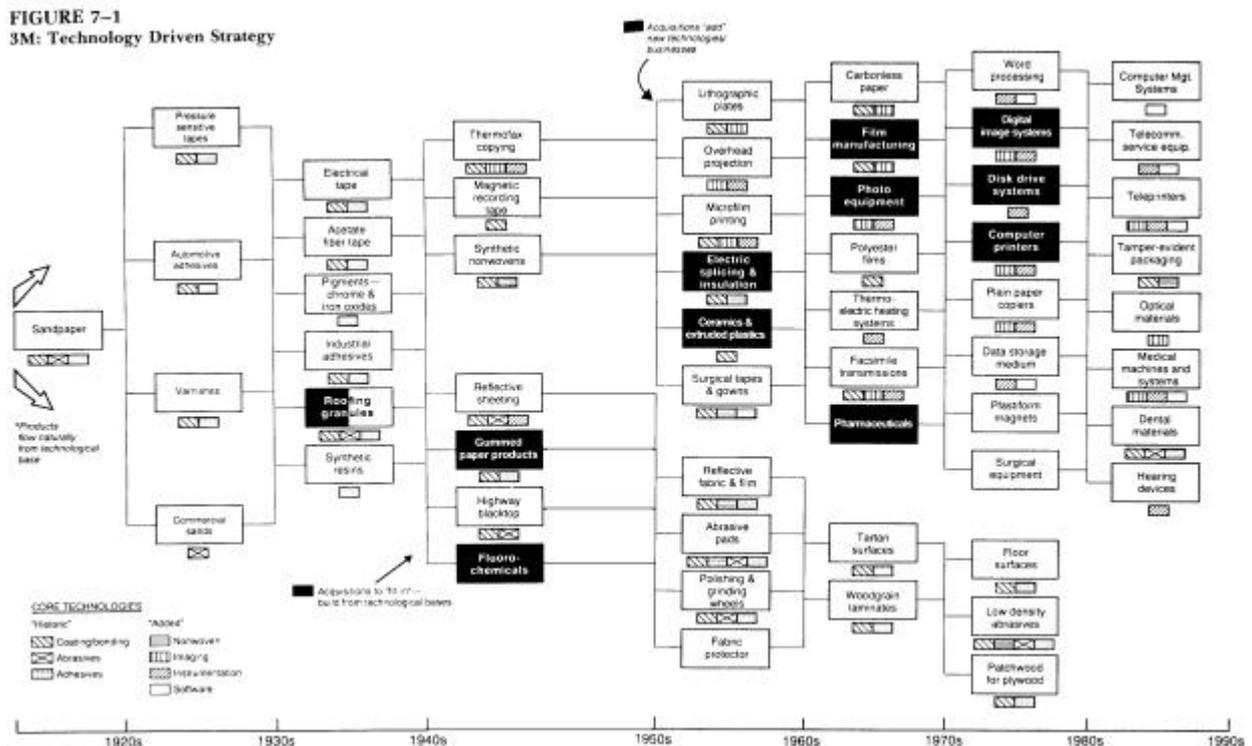
Despite the resource industry's profound impact on the Western Australian economy there are only a limited number of examples where these strengths have been applied to other sectors or where "spin-offs" have been created.

3.3.2 Spin-off Strategy

There are a growing number of examples of regions and major corporations which have shrewdly leveraged their core competitive advantages in one area and built on those to expand strongly into other markets. Honda began with expertise in small engines which it extended from lawn mowers to boat engines, motorcycles and, in the last few decades, motor cars, to establish itself as one of the leading manufacturers in the industry. Similarly, Canon began manufacturing cameras before leveraging its expertise in optics, electronics and miniaturisation in addition to its strong distribution system to expand first into X-ray cameras and then electronic calculators. From there Canon entered the copier market (electronics and optics), fax machines and as a major supplier of componentry in computer printers. From its background in cameras came computerised cameras and home video cameras.

This technology-driven strategic expansion is illustrated very well in the case of the 3M Company which has grown from very humble beginnings more than 60 years ago. The Minnesota Mining Manufacturing Company, as it was originally known, began with a knowledge of sandpaper production and the core technologies associated with that - coating/bonding, abrasives and adhesives - to expand through the development of various skills and strategic acquisitions into a multinational corporation renowned for consistent innovation and quality over a vast range of industry sectors¹².

Figure 3.2 - The 3M Company's Technology "Family Tree"



3.4 The Shape of Information Industries

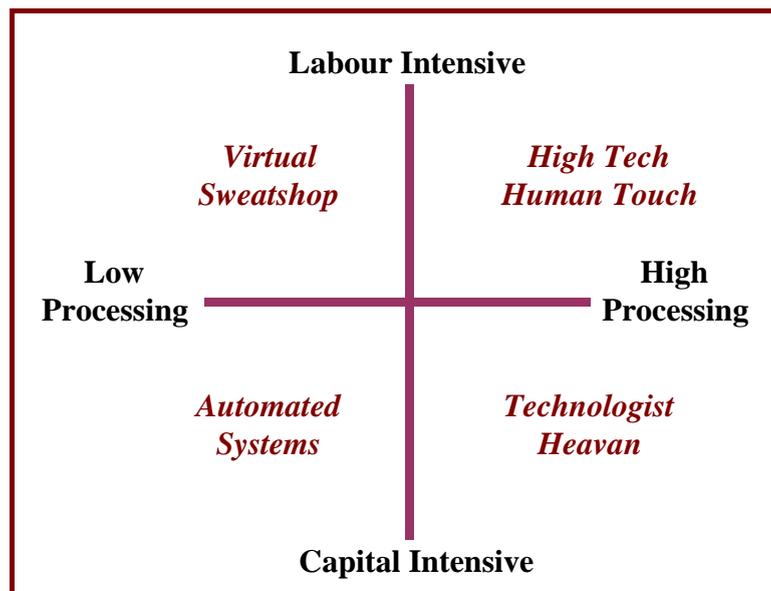
It is already possible to draft the early stages of a Western Australia version of this diagram showing various types of Information Industry expertise - particularly in imaging and remote communications, as mentioned above - having been developed by companies working with the resources sector. In proposing ways in which this can be built on it is useful to examine some of the general options, to help determine the most useful direction. One way of looking at the Information Industries is by placing various industry segments on a matrix with Labour and Capital Intensity on one axis and Low versus High Processing on the other.

Capital vs Labour Intensity distinguishes between the traditional factors of production, capital and labour. In broad terms this axis marks the path of mechanisation or industrialisation.

From an investment point-of-view the potential for Western Australia to attract extremely Capital Intensive Information Industries - notwithstanding the state's success in this quadrant with capital intensive resource projects - is limited. The lack of a sufficiently large existing industry and market in most sectors means this type of investment would be hard to justify by most companies. The Federal Government's policies are particularly important as far as the State's prospects of attracting these investments are concerned. The reliance on Canberra to attract this type of investment is another disincentive to relying too heavily on this form of industry development.

Low or High Processing defines the complexity of a task in either human or machine terms. A worker assembling components for a computer is doing low processing work as opposed to a developer designing the next generation of the machine. From a technology perspective photocopying a document requires far less processing power than scanning it into a computer or transforming the words on that document into digitised voice.

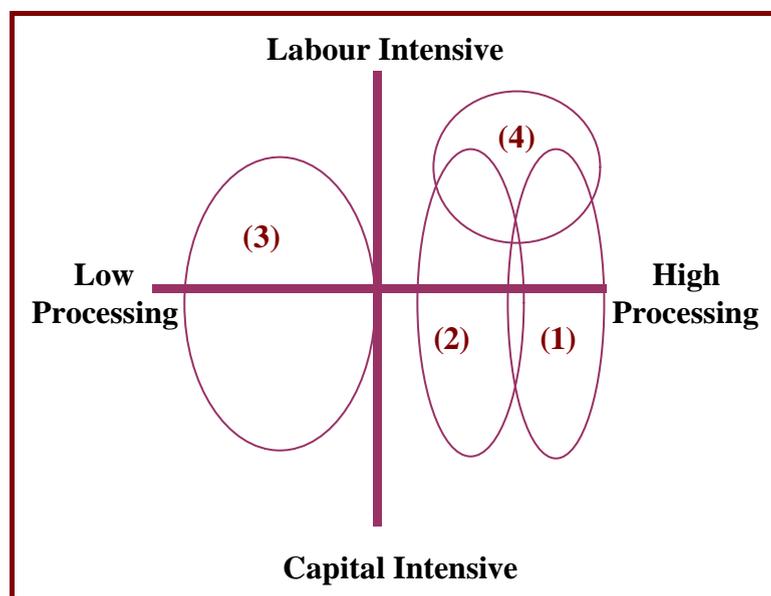
Figure 3.2 - Categorising the Information Industries



Information Industry projects which require low processing skills are more likely to be mobile, particularly if they are also labour intensive, and highly cost sensitive. They are often referred to as "footloose" industries which can and will move their operations quickly when they find another location with lower cost structures. As their employees are largely unskilled or semi-skilled they are relatively easy to replace. This should not discourage the inclusion of projects from this quadrant as they can be invaluable in providing employment for workers most vulnerable to being marginalised in this new economy. But having said this any business development or attraction strategy in this area should be developed with potential unique linkages to the State to reduce the degree of "foot looseness".

Superimposing Castell's breakdown of the locational trends for various stages in the development of information products above (Section 1.10.2) it is possible to locate each of them on the matrix.

Figure 3.3 - Locational Patterns for Information Product Manufacturers



- (1) R&D, innovation and prototype fabrication**
- (2) Skilled fabrication in branch plants**
- (3) Semi-skilled, large scale assembly**
- (4) Customisation of services**

The following section discusses the characteristics of each of the quadrants, the policy inputs each require to be realised and some examples.

3.4.1 Automated Systems: Capital Intensive-Low Processing

Features: The mass production of mass market electronic products is a classic example of activities in this quadrant, certainly at its farthest limits. Moving closer to the centre of the matrix (particularly to the right) introduces greater skills required in specialist manufacturing. This is often associated with short-run, niche products, an area of significant potential for Western Australia.

Some more specialised types of call centre work could spill into this quadrant, generally toward the centre, as the skill level tends to rise.

Example: Taking this route has been almost the standard path for the Asian Tigers as they have evolved into developed economies.

Policy Inputs:

- Taxation and other financial incentives to attract manufacturing contracts.
- Minimisation of tariff regime to reduce the cost of production inputs.
- Assistance in gaining planning and environmental impact approval to enable the rapid and trouble-free construction of plants.
- The implementation of appropriate strategies to minimise the costs of plant construction.
- Labour relations policies to minimise wage costs.

(Applied more generally to the global economy this is the quadrant that the core of Western Australia's resource industry and many of its value-adding components fit into.)

3.4.2 Virtual Sweatshop: Low Processing- Labour Intensive

Features: in the Information Industries this quadrant covers activities such as Call Centres and Data Entry contractors. The work assumes a basic level of technical infrastructure but is more often driven by the savings which can be delivered by moving work from one location to another - usually because of wage, rent or other cost differentials. Obviously, to make these arrangements the cost and efficiency of communications services must be excellent.

As the adoption of these approaches become more common other factors beyond simply cost are coming into play. Some locations' staff offer a quality of service that has given them a competitive advantage¹³ although these services will continue to be highly price sensitive and relatively mobile.

Examples: Ireland, some parts of New Brunswick, Omaha (Nebraska) and the Philippines.

Policy Inputs:

- Advanced, low cost telecommunications services.
- Low wage and employment costs (eg. payroll tax) structure.
- Grants and/or concessional loans to assist in the establishment of operations.

3.4.3 High Tech, Human Touch: High Processing-Labour Intensive

Features: The bulk of the "intelligent industries" fall into this quadrant, that is those which demand large numbers of highly skilled information workers. While some commentary on the changes we are going through characterise the shift to an information economy as one in which jobs are being shed this is not entirely true. Jobs *are* undoubtedly being lost from particular sectors and while these losses are affecting some groups particularly heavily (unskilled and semi-skilled older males, for instance) many thousands of new jobs are being created. One of the most significant challenges facing high growth companies is finding sufficient numbers of skilled workers, particularly in the upper right sections of the matrix. This is an area in which Australia, and Western Australia, have substantial existing strengths.

The pressure to fill these skilled positions¹⁴ has led many companies to allocate significant resources to distributed work programs to source skilled workers off-shore at competitive prices. As mentioned above, the Indian city of Bangalore has become renowned in the computer software world for its thousands of "virtual aliens": software writers employed by US companies to produce programs working from their home country.

Due to the relatively high wages paid to engineering draftsmen in Australia there are increasing examples of this work being electronically transferred to the Philippines where it is completed and sent back here.

Policy Inputs:

- The maintenance and continued upgrading of information industry educational and training programs.
- Development of global enterprise programs for existing and aspiring business owners and managers.
- Implement a "Boomerang" program.
- Develop sophisticated global industry information propagation programs.

3.4.4 Technologists' Heaven: Capital Intensive-High Processing

Features: This quadrant is at the upper end of the information industry "food chain", certainly as far as hardware developments are concerned. The highly specialised and complex R&D required to drive this segment of the industry would be located in this quadrant. This work requires both state-of-the-art development technology, leading-edge technical skills and state-of-the-art investment, business and marketing acumen.

Much of the technical research work funded by government in universities and companies would fall into this category with regard to the first section of this chain. Clustering¹⁵ of these activities has tended to occur although it is not absolutely essential. The Finnish company Nokia's success in carving out a strong niche for itself in mobile telephony is a good regional example of challenging this trend.

Example: Pockets of activity and particular organisations in Silicon Valley, Route 128 outside Boston, Cambridge (UK), Sophia Antipolis in the south of France.

Policy inputs:

- Substantial R&D investment, most probably from the public sector, as a "pump primer".
- Substantial industry attraction funding¹⁶.
- Boosting of funding to university scientific and technical research.
- Expanding the teaching of technically-based subjects at all levels of the education system.
- Encouraging the formation of long-term and "tight" partnership(s) with well chosen industry leader(s).
- Concessional tax regime, tax credits.

3.5 Conclusion

This chapter focused on the particular strengths and weaknesses of Western Australia in a global information economy. The size of the local market, the dominant position of the State public sector and Western Australia's distance from other markets are crucial factors in proposing strategic options to develop the local Information Industries. The size, strength and global orientation of the resources sector make this a logical starting point for the Information Industries, as many companies have already determined.

It then sets out a framework in which various types of Information Industries can be located as a means of helping determine desirable and appropriate sectors into which the State might aspire to. The next chapter builds on this to propose a series of policy initiatives.

¹ This compares with Israel where almost three quarters of its revenue from technology companies comes from exports.

“Stockdale urges investment break”, *The Australian*, 10 March, 1998

² Also see Australia's positives and negatives in the Information Economy at section 2.2

³ While English speakers offer an advantage in many Information Industry jobs the State's non-English speakers are also an important asset in a global economy.

⁴ Skills surpluses exist in a region when the local demand for particular skills does not exist or is low. If these skills are information-based skills then it is often possible, using ICTs to move the skills, rather than the individual and market these skills on other markets. The upsurge in virtual aliens in the US is an example of this.

⁵ This refers to those professions whose output can be entirely or predominantly converted into digital form.

⁶ "Economic Developments in East Asia: implications for the Western Australian economy", a discussion paper, Treasury Department, Government of Western Australia, March, 1998

⁷ "Western Australian Economic Summary, June Quarter 1998", Treasury Department, Government of Western Australia, June, 1998

⁸ The strength of expertise amongst WA information companies working on projects to market to agriculture should not be overlooked, as demonstrated by several companies success in the recent National Farm Software competition, "Software contest yields bumper crop", *The Australian*, 10 March 1998.

⁹ from "Growth Platforms for a Competitive Australia: Incentives, Aspirations, Innovations", McKinsey and Co. Australia with the McKinsey Global Institute, 1995, p. 22

¹⁰ From "Growth Platforms for a Competitive Australia: Incentives, aspirations and innovation", McKinsey and Company Australia and the McKinsey Global Institute, Sydney, 1995

¹¹ To this list of companies operating in these fields should be added a significant number of research institutions.

¹² reproduced from *The Intelligent Enterprise: A New Paradigm*, by James Brian Quinn, p. 218, The Free Press, New York, 1992

¹³ An example is Ansett Airlines experience with its Launceston call centre. Although data showed the number of callers handled by its Tasmanian operators was less than their city-based mainland colleagues they consistently generate more sales. This has been attributed to their lower levels of stress and so friendlier phone manner, according to the company.

¹⁴ A substantial lobbying campaign has reportedly begun in the US to lift, or even eliminate, the restriction on the number of visas issued to foreign professionals. Microsoft, IBM and Oracle have banded together to have the number lifted from 65,000 a year. The industry believes 14,000 of the visas go to high tech workers - *Wired*, April 1998

¹⁵ Clustering refers to the tendency of related businesses - sometimes in competition with each other - to congregate together and create mutually supportive linkages. This phenomenon appears to be even more pronounced in the high tech industries.

¹⁶ Although Silicon Valley and other USA high technology regions have not had industry funding from Government in the forms we would recognise, the USA Government's role through its Defence Department cannot be disregarded. Massive development contracts from the Pentagon, along with generous technology transfer agreements to the private sector, have been crucial in the development of many of these companies and regions.

4 Building from Mines to Minds: Western Australia Information Industry Strategy Components

This strategy's goal is to develop a broad Information Industry which functions in selected niche markets across a wide range of sectors. It will encompass both products and services, hardware and software, tangibles and intangible information products. The strategy flows directly from the convergence of these industries to leverage these synergies to establish a strong, mutually reinforcing set of organisations targeting well chosen niches.

By working outwards from the global strengths of the Western Australian resources sector and its support services their global perspective can be extended into other Western Australian industries - as illustrated in the Honda, Canon and 3M examples above. This is not a strategy based exclusively around the resources sector. It argues that the significant use resource companies make of ICTs, the sector's strength in the State's economy and globally makes it a logical starting point, from that starting point other exciting opportunities will flow. On the intangible, or service side, this largely revolves around building expertise in distributed global work and distributed project management.

The strategy also proposes separate, but inter-related approaches to developing technology manufacturing companies (ETMs). The priority in the first instance, in both sectors, is to build companies (and encourage individuals) capable of:

- operating globally;
- expanding Western Australia's strengths in the resource and related industries;
- developing "spin-off" services and products drawn from the resource industry and other information industry companies which can be marketed to other industries, and;
- identifying world-class existing technologies, both "hard" and "soft", which can be applied to other industries.

Achieving these goals will require intervention in both Perth *and* regional Western Australia to:

- raise the awareness and information levels amongst politicians, public servants, industry leaders and the community generally of the global, online environment;
- highlight existing innovative demonstration sites and encourage their creation in a range of sectors;
- support the establishment of innovative online projects, primarily through the provision of appropriate support services;

- offer support through skill development and business opportunities to potential global workers and to global, information/knowledge-based company-builders;
- identify gaps in accessing infrastructure at a world competitive price and identify policies to remedy these;
- facilitate interaction between participants in the various information industries - telecommunications, information technology and content developers, both locally and globally;
- encourage the establishment of alliances with organisations nationally and internationally which offer synergies for Western Australian organisations, and;
- enhance the existing data on the industry to enable bench marking and the further refinement of the State's Information Industry strategy.

The lack of clear and current information about the Western Australian information industry is also a significant impediment to formulating viable policy options and is a gap which urgently needs to be filled.

4.1 Strategic Projects and Policy Initiatives

4.1.1 Awareness and Information

The dynamics of the world's business systems are undergoing profound changes extremely quickly and on a bewildering number of fronts. These changes are altering, and will continue to change, the way in which businesses and industries function. For many managers and business owners these new dynamics are largely alien.

Having flourished over the past few decades, despite the disadvantages of isolation, the Western Australian economy has far greater self-interest in understanding the dynamics of these technologies and the changes they will bring because of their impact on radically altering the affects of distance.

It is imperative that local businesses quickly come to grips with these changes so they can apply them to their particular position and be prepared to protect themselves from the new, global competition these changes are to bring - at the very least - or preferably to begin thinking beyond Western Australia of ways they may be able to broaden the scope of their operations.

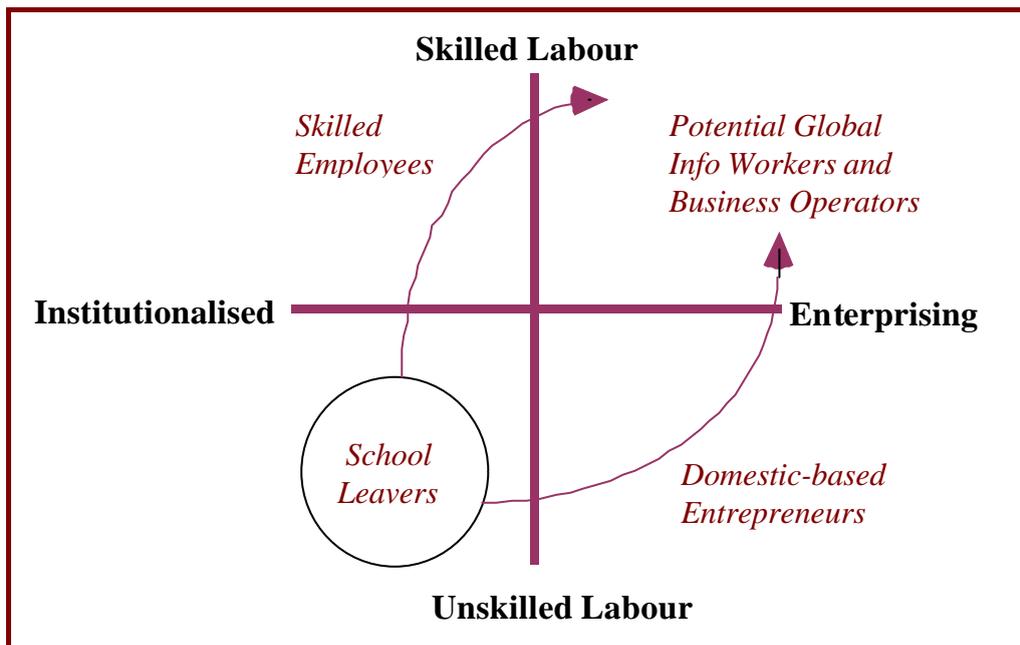
This is not simply a matter of demonstrating new technologies to executives; it involves a far more fundamental shift in the conceptual framework through which they see their operation. It marks a shift from "steady state" management - managing in an environment where next year's business decisions can be based on previous years - to far more volatile conditions in which globalisation, creative destruction, risk assessment and constant innovation are by-words of day-to-day operations.

4.1.2 Education and Training

The needs of aspiring global information industry workers or business operators are very different from those which most educational or training institutions are passing on. The move from optimisation to innovation in products and processes, far greater levels of uncertainty, learning to value intangibles, the limits of zero sum economic thinking, the need for almost constant risk assessment and the need to think globally in terms of potential markets and competition are all features of this new environment. Our education and training tradition, and our workplace have often placed a divide between the most highly educated and skilled workers and those with entrepreneurial skills, resulting in a relatively low level of enterprise skills (see Figure 3.4). Australian graduates, for instance, are far more likely to seek employment in a public or private sector institution through which they build a career.

Whilst these individuals are often very highly skilled, and their work experience helps them to build these skills, a form of low level institutionalisation occurs as the direct link between task and payment is broken and because the task of sourcing funds/revenue is most often delegated to others. Over time this means enterprise skills are under utilised and remain undeveloped, a situation which can be very hard to reverse.

Figure 4.1 - The Skills/Enterprise Gap



The other common path in the Australian workforce is the early school leaver for whom traditional education and training had little attraction. The archetype of this group goes into establishing a business, sometimes through an apprenticeship but often without. This experience often gives them excellent enterprise skills (often through the school of "hard knocks") but the limits of their education and training tend to confine the scope of their business to the domestic market.

Figure 4.1 illustrates this pattern. It is not intended to suggest here that there is anything inherently wrong with being vocationally located in either the upper left or lower right quadrants - although there are some vulnerabilities in both - but to highlight the national implications of our relative lack of representation in the upper right quadrant. We have a significant Skills/Enterprise Gap. Means have to be found to break down the apparent barriers which exist preventing those Domestic-based Entrepreneurs who wish to gain the skills to begin operating globally and for the Skilled Employees to understand global enterprise sufficiently well. (A common response by this latter group has been to undertake post-graduate study, most commonly an MBA, to address this issue. While commendable the institutionalised, "steady state" view of business perpetuated by virtually all of these courses make them largely irrelevant and potentially counter-productive to the needs of this new business environment.)

4.1.3 Global Information and Knowledge Industry Entrepreneurship Training

Knowledge Industries and Network Economies (see Appendix D) have very different dynamics to the industry and economic patterns we are accustomed to. The educational goal of this series of courses would be to convey in far greater detail the dynamics of the new economy while also having a strong information component in which participants can be exposed to relevant sources of information and receive up-to-date information on trends and shifting alliances, dynamics, global risk assessment and other factors likely to influence the Global Information and Knowledge Industries.

The program would target working managers and business managers, company directors as well as those aspiring to build global information businesses. While the central goal of this program would be to lift the awareness and knowledge base of those people in businesses or other organisations, a secondary goal would be raising the awareness of consumers.

4.1.4 Tertiary Education in the Global Information Economy

As mentioned above, the active and appropriate participation of Western Australia's Universities and TAFE sector is absolutely critical to the State's success in this new environment. There is a need for these institutions to work together, with support from government, to develop appropriate programs that will provide the skills and knowledge levels required.

4.1.5 Western Australian Information Industry exchanges

As an isolated region attempting to build a stronger presence in a global industry global networking is a necessity. In addition to travelling support programs (which are useful but open to abuse and vulnerable to political attack) creative and appropriate application of technologies to building and maintaining these links are also essential.¹ This goal ties in well with the distributed work project outlined below. Industry relationships managed, at least partially, through ICTs are essential skills to maintain contact at a distance or this application as well as for others.

An important issue in travel programs such as these, which may be supported by public funds, is the requirement that successful applicants are bound to return to Western Australia for a certain period after travelling. This is especially important in an industry such as this where global demand for able and talented people is so high.

4.1.6 Lobbying Initiatives

As has been noted elsewhere in this paper, many policy issues, including several of most concern to prospective foreign investors (see section 2.3) are outside the control of the state government. The tax regime (in particular Capital Gains Tax rates and other policies which deter the development of fast growth companies), the lack of incentives and uncertainty over industrial policy were all issues of significant concern to the local managers of MNCs and which are all the domain of the Federal Government.

It is appropriate and necessary for the State Government to increase its level of activities in these areas and to give serious consideration to any initiatives which would assist the involvement of Western Australian Information Industry groups to participate in pursuing national lobbying campaigns.

4.1.7 Youth Online

The capacity of young people to comprehend these technologies and their implications and applications quickly and easily has been regularly commented upon. Harnessing this capacity offers terrific opportunities for the individuals concerned and for the community as a whole: to a significant extent in the short-term but potentially massively important in the longer-term.

This program could include, but not be confined to:

- online and information industry training programs in schools;
- specialist training in selected schools;
- strategic marketing and online business advice for aspiring information business operators;
- the development of an online enterprise culture;
- facilitation of special interest groups;
- development of program of recognition of achievements by young people;
- commissioning of young people to produce products targeted at their age group, and;
- conducting a series of master classes for young people (high school and university age) in both information industry technologies and global information industry business practices.

4.1.8 Investment Ready Program

While the Australian investment community, and the regulations governing it, have come in for consistent criticism in their failure to properly support high growth, high tech companies the companies themselves have also been lacking. Many investors report that companies with strong, promising technologies which are seeking investment are not well prepared. "Investment Ready" programs have been established in other states to assist high tech companies prepare proposals which will address the requirements of prospective investors.

The program should also cater for start-up companies seeking investment as well as the issue of small to medium-sized, privately owned firms wishing to list on the stock exchange. For SMEs the inability to access the funds which listing could provide often prevents them growing to the next plateau. Aside from the employment and revenue growth opportunities forgone it can mean the company does not have the resources to enter or contest foreign markets.

4.2 Support

4.2.1 Information Brokers

Information Brokers are expert information trackers. In the Industrial Economy this function was largely filled by librarians. The profession still has a great deal to offer in this area, particularly those who are familiar with online searching and some of the more anarchic information structures which are developing.

As information makes up an ever increasing proportion of virtually all businesses facilitating the training, particularly the commercial training, of these professionals and the establishment of information brokerage businesses will be a vital part of the infrastructure to develop the wider industry. A whole range of the policy initiatives outlined in this section assume ready access to up-to-date and accurate information on market conditions and opportunities in a wide variety of sectors across the world. For Western Australian businesses, operating from a tiny market and under the constraint of isolation, the need for detailed and timely information becomes even more important.

4.2.2 Online Process Reengineering

It has been said that the real impact of information technologies is only being felt now as the number of computers linked to each other begins to reach critical mass. As long as the majority of computers operate as stand-alone machines traditional processes will only be mechanised and the patterns of operation of most industries will remain the same. Very often this maintenance of the same practices is a function of tradition and/or an inability to innovate in such a way as to exploit the full potential of these technologies.

Demonstration projects, dispersed as widely as possible through as many industries as possible are invaluable catalysts for encouraging individuals to reexamine their work processes and to see how they could be improved.

To enable these changes to take place support structures need to be put in place. Some Internet evangelists have talked about the creation of a new profession, that of "Internet Plumbers"; individuals expert in networking technology capable of assisting individuals and organisations to realise the technologies' full potential.

Just as AusIndustry supports firms, on a partially subsidised basis, to improve their business planning and other aspects of their operation, a program which analyses a company's operation and then partially supports it to implement appropriate technological solutions would provide a significant productivity enhancement. This program would not only reap rewards in the short-term through the introduction of efficiencies but also holds the promise of being able to undertake this reengineering on the client company's terms. It is certain that these changes will take place over the coming five to ten years anyway. The shape of the newly reengineered structure will have great significance as to the balance of power and the returns earned by various parties in the supply chain. By being the initiator of these changes Western Australian organisations will have far greater potential influence over their outcome.

4.2.3 Online Business Division, SBDC

This section within the Small Business Development Corporation would serve two groups:

- Start-up online information companies or existing companies launching substantial online, revenue generating projects.
- "Conventional" companies looking to alter their structures to take advantage of online technology.

This group would form an important part of the network of information and support to the Western Australian small business sector. (See also High Bandwidth Serviced Offices - section 4.3.5 - and Online Business Incubators - section 4.3.6) It would also provide a valuable service in alerting other advisers in the SBDC of the issues involved with the evolving online business environment.

4.2.4 Venture Capital

To assist the development and growth of high growth global information industry companies there is an urgent need for the establishment of appropriate sources of investment (see discussion above at 2.3.4).

This in turn requires that Government revisit and update past investigations into the short comings in Western Australia's seed funding market and examine potential strategies to overcome these difficulties, eg.:

- Support the establishment of a Western Australian branch of a national Venture Capital firm.
- Establish a Western Australian branch to a foreign investment bank(s) and/or Venture Capital firm.

The second of these two options may require a structure in which the ultimate ownership and equity of the VC and its shareholders is located off-shore in an arrangement similar to that used by many MNCs operating in Australia. This structure would be used to capitalise on the substantial funds available in other countries, particularly the US, actively seeking high technology investments².

4.3 Projects and Demonstration Sites

4.3.1 Synergies between Geological Analysis and Telehealth for Imaging

Western Australia has a substantial core of world class companies and expertise in various aspects of geological imaging. It has also developed significant expertise in Telehealth. At present there appears to be very limited interaction between these two sectors but considerable potential for synergies, particularly with regard to the gathering, storing, manipulation and communication of highly complex and detailed digital images.

This coincidence of applications is an excellent example of the potential to build "generic clusters" around various technologies which can then be further developed and applied in other areas as well as the resource industries and medicine. In addition to the gathering and storing of images interest is growing in techniques to manipulate and analyse them across a wide range of areas. As the amount of data systems are capable of gathering and handling continues to increase many users are examining the potential of presenting data visually as the most effective way to present information and have it understood quickly and accurately. With the addition of up-to-date, reliable global market intelligence, other business opportunities to apply these technologies in other sectors may be identified.

...and Communication

Another example of an extremely exciting and promising area of technological development in which Western Australia has strengths and in which synergies between these two sectors exist is thin client broadband³ communications networks. For resource companies and for the efficient delivery of Telehealth services there is clearly a need for broadband capacity to move large files. Developing a network to achieve this in Western Australia with its vast distances and thinly distributed population places considerable pressures on its viability. Solving this problem in the Western Australian environment opens significant opportunities for application around the world.

4.3.2 Public Sector Distributed Management Project

As with geological and Telehealth imaging, distributed management is an area in which Western Australia has a clear incentive to develop appropriate technologies and techniques which can then be exploited elsewhere.

Where advanced ICTs have been touted as bringing about the death of distance and making it possible to work from any location anywhere in the world the reality has been very different (see section 1.11). It is clear that even with access to some spectacular technologies there remain considerable human barriers to their application to changing the way in which we work. For Western Australia, understanding these dynamics offers the potential to significantly improve the delivery of services (by both the public and private sectors) to clients/customers across the State. Potentially more important is the opportunity it presents to seriously challenge the "tyranny of distance" through a more measured and innovative application of these technologies. It opens up the possibility for the State's information workers to more fully engage with colleagues internationally and for business alliances and partnerships to be built.

The public sector provides an ideal test bed for many of these opportunities. While its agencies have varying degrees of responsibility for direct client liaison all have a substantial information component in their work. Making greater use of distributed work technology offers significant opportunities for the public sector to improve its level of service delivery cost effectively, particularly its delivery of services to regional and rural Western Australia.

If this process is conducted under a distributed work management program invaluable lessons about the dynamics of these work relationships could be gathered for application in other sectors and for marketing elsewhere. A range of issues covering distributed project design, team selection, management protocols, multi-cultural issues, managing different values across distance, accountability in a distributed work environment through to building trust all need to be understood.

The short-term goal for the State would be improved delivery of public services and the opportunity to decentralise some operations. But longer term, and potentially of far greater significance, are the opportunities which could flow from understanding these dynamics to exploit our time zone and other advantages, opening up a global market for information work for Western Australians.

4.3.3 TimeShift

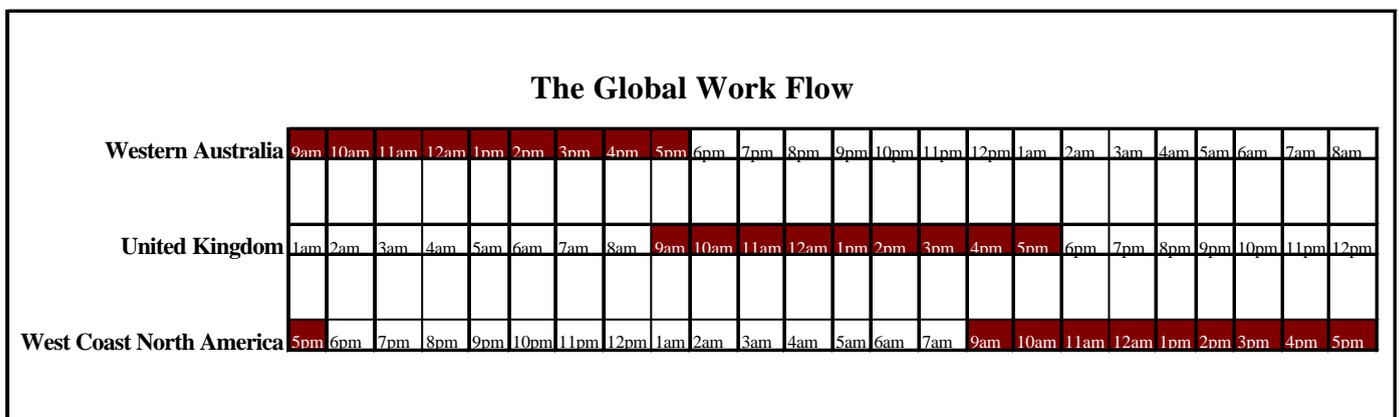
TimeShift is the working title for a form of global distributed work linking with centres in Europe and North America to create a three shift, 24 hour work day. By capitalising on Western Australia's position in the "third time zone" it has become possible to propose the State as a base for global work flows. This would be done to offer a rapid "overnight" service to clients or to capitalise on wage differentials or skills surpluses between various markets.

TimeShift is a form of global distributed work which exploits:

- the low and declining cost of telecommunications services;
- ubiquitous business computing power;
- an increase in the availability and adoption of team working software;

- the drop in price, growing performance and availability of desktop video conference software and hardware;
- a shift in management culture in some sectors to a greater acceptance of contract and remote working;
- Australia's time zone being opposed to Western Europe's and the west coast of North America;
- the high educational levels of the Australian workforce;
- Australia's multicultural workforce, and;
- Australia's comparatively low pay rates for skilled workers in many industries.

Figure 4.2 – TimeShift



While the organisation of the work may differ between industries and tasks in most cases the workers would be employed at a central location. For them the work environment would be similar to an existing office. That the work is being done for a client in Europe or North America would be largely invisible. For other, more specialised tasks it may be appropriate to have the job completed at the worker's home, in much the same way as many teleworkers operate now.

Systems similar to TimeShift have operated for some years moving unskilled or semi-skilled work such as data processing from high to low wage countries or those with more favourable tax regimes. Data processing undertaken for US insurance companies in Ireland and Jamaica is an example of this. A number of computer companies also move work around the world, between their offices, to improve the service offered to their customers. If a fault has not been rectified by the end of the day at the service centre closest to the client it is moved onto an office of the company in the next time zone and so on. In theory, by the time the client reappears for work the next morning an additional 16 hours work has been done toward solving his problem.

TimeShift would operate in a similar way. It would involve the importation of work from the United Kingdom, the United States and/or Canada (in the first instance) and continue while the client is asleep. For some applications this would mean work which would normally take a day can be completed "instantly", from the client's perspective. For longer projects it would enable the compression of the task by up to half, more if a series of work sites are developed across time zones.

By building on the experience gained from existing teleworking projects and exploiting Australia's time zone it would be possible to systematically develop techniques, management structures and marketing strategies to build this mode of work to the point where it could be a significant employer and revenue generator.

Case Study 4.1: Singapore's New Straits Times

To reduce its operating costs Singapore's *New Straits Times* newspaper has established an office in Sydney from which twelve sub-editors work to assist with the production of each edition of the paper.

The Singapore paper has had a long tradition of employing Australian journalists, particularly as sub-editors, but high staff turnover and the costs of relocating them to Singapore made the opening of the Sydney office an attractive and cost-efficient option. Reports indicate the newspaper has cut its total employment costs for these workers by almost half. The Sydney and Singapore offices are directly linked with high capacity lines which are capable of carrying raw newspaper copy in one direction and edited stories in the other.

TimeShift would involve a central sales and management group responsible for marketing the service and administering the flow of work. A second essential feature would be account executives stationed in each of the overseas markets to liaise with clients and to see the smooth dispatch and return of work.

Industries would be ranked in terms of their attractiveness as prospects for TimeShift according to how they relate to various criteria. The most attractive possibilities appear to be in cases where:

- there is a skills surplus in Australia and/or good retraining prospects;
- there is a significant wage differential between Australia and the client's country;
- the work is computer-based;
- the work is time sensitive, and;
- the work can be handled in discrete parts.

The advantages and opportunities for clients and for Western Australia can be summarised as follows:

CLIENTS	AUSTRALIA/AUSTRALIAN BUSINESS AND EMPLOYEES
Compresses project time	Expands employment opportunities
Offers employment flexibility	Higher wage rates in sectors with skills surpluses
Provides access to hard to obtain skills	Greater flexibility of location for business and employees
Cheaper employment costs (in select industries)	Presents the opportunity to address endemic regional unemployment, with appropriate (re)training Globalisation of workforce skills, further enhancement of global perspective of business and employees

4.3.4 MicroTrading

MicroTrading integrates advanced searching technologies with ICTs and Electronic Data Interchange (EDI) to significantly reduce the entry cost for small and medium-sized businesses to establish and maintain trading relationships with overseas companies. It confronts the traditional barrier requiring significant scale before a company can consider exporting.

While much interest in doing business on the Internet has focussed on direct contact between producer, wholesaler or retailer with the customer MicroTrading recognises that in many industries this is not yet - and may never be - a feasible business model. By building a link to the retailer rather than the end-user MicroTrading minimises concerns over security, payment systems and the number of customers willingly make purchases over the Internet.⁴

Case Study 4.2 - Hypothetical Fine Cheese Maker and MicroTrading

To launch their export campaign the cheese maker conducts a search of demographic databases - probably with the assistance of an information broker - for suburbs in overseas cities in the target countries with a high concentration of people known to be heavy and/or adventurous cheese consumers. S/he can then search out and contact a suitably located delicatessen and negotiate a supplier-retailer relationship. This would most likely be mediated in the first instance through the Internet. There are obviously likely to be health, legal and customs regulations along with credit and financial arrangements which have to be dealt with through this stage. (Even access to this information and complying with the regulations is becoming increasingly network-based.) Once the appropriate EDI software is installed subsequent orders and payment information will pass along the same channel. Delivery would be handled either through shipping or air freight, depending on the distances, shelf life of the cheese, margins available and the client's needs.

MicroTrading follows the conventional trade development process of product categorisation, market identification, establishing a relationship with the importing organisation and then servicing that company. Where these steps have traditionally been undertaken face-to-face and so involved considerable time and resources MicroTrading makes heavy use of ICT for each of these stages, significantly reducing cost. While personal contact is likely to be necessary it is intended, as far as possible, to establish a procedure which minimises this and the heavy costs it entails⁵.

With an agreement in place, the Internet would serve as the vehicle for EDI-based ordering and supply information to quickly, simply and cheaply pass between the two businesses.

Using MicroTrading producers, and in particular smaller firms, would be capable of establishing an export base at an early stage of their development and building their export business at a rate which they can more easily control.

4.3.5 High Bandwidth Serviced Offices

The current pricing structure for telecommunications services discriminates particularly heavily against small start-up firms in the information industry. Advanced telecommunications services are, by and large, priced and marketed with the corporate sector in mind. By bringing a number of these users together in one location it is possible to aggregate their demand and by sharing the cost of the connection make the services they require affordable.

This project aims to address this short-coming of the market by establishing serviced offices specifically targeted at small companies working in the information industries or with heavy information needs. In addition to the usual facilities available in serviced offices this building will also be equipped with high bandwidth telecommunications links, delivered to each desktop.

4.3.6 Information Industry Business Incubator

This project will serve as a catalyst for the development of new information industry businesses and the encouragement of those already operating in this sector in Western Australia. It will also serve as an important demonstration project to encourage existing businesses to look at the application of ICTs to their enterprises.

The needs of businesses in the information sector differ significantly from those working in more traditional industries. Aside from requiring a different range of industry-specific services (see High Bandwidth Offices above) the level and type of business support required is also likely to be different. It is likely that many of the start-up companies attracted to this incubator will be operated by relatively inexperienced business people. The nature of the information industries - rapidly changing and structurally under-developed - presents further challenges for new business operators. It could be expected that the level of support would be greater than in traditional incubators.

In addition to management support and advice the incubator will also provide its tenant companies with a range of other services specifically designed for information industry businesses, including:

- competitively priced telecommunications services; including "conventional" (STD, IDD and mobile services) and advanced (in particular constantly connected broadband) services ;
- access to professional-level server technology;
- data back-up services;
- technical assistance;
- information industry market intelligence, and;
- information industry business planning assistance.

4.4 Infrastructure Strategies

4.4.1 Semiconductor Fabrication Plant

Semiconductors are the foundation stones of information products and their application in thousands of other manufactured products grows by the day. Their commercial importance is also rising rapidly: in 1990 they accounted for less than 11 per cent of the value of all electronics, by 1995 this had risen to 19 per cent and is expected to account for almost 26 per cent of their value by 2000.⁶ The semiconductor industry is the fastest growing of all manufacturing industries. Global sales increased by 20 per cent compounded from 1990 to 1995 and industry researcher Dataquest predicts this rate of growth will continue at more than 13 per cent to the end of the century.

Table 4.1 - Semiconductor Plant Development Construction Plans

First production in:	1997	1998	1999	2000	Total
China	5	2	0	1	8
Japan	17	6	1	0	24
Korea	4	2	0	0	6
Malaysia	1	1	0	0	2
Singapore	1	3	1	0	5
Taiwan	11	3	0	2	16
Thailand	1	0	0	0	1
Total Asia	40	17	2	3	62
France	1	3	0	0	4
Germany	1	0	1	0	2
Italy	1	1	0	0	2
United Kingdom	3	0	1	0	4
Total Europe	6	4	2	0	12
USA	13	10	5	0	28
TOTAL	59	31	9	3	102

Source: Dataquest

The largest consumers of semiconductors - the computer, telecommunications and consumer electronics industries - are migrating to the Asia-Pacific. By 2000 nearly 70 per cent by value of all consumer electronics, 52 per cent of computer hardware and 36 per cent of telecom equipment will come from the region. To meet this demand semiconductor fabrication plants - or "Fabs" - are also moving. By 2000 there are expected to be 926 wafer fabrication plants operating, 37 per cent in the Americas, 18 per cent in Europe, 31 per cent in Japan and 14 per cent elsewhere in Asia. Almost two thirds of the plants under construction or announced will be in Asia (this estimate was made before the Asian economic crisis).

Developments in semiconductor technology are driving the cost of plants rapidly upwards. In 1990 a plant could be constructed for \$US13 billion, in 1995 for \$US38 billion and they are expected to cost \$US76 billion by 2000. The industry has tended to cluster fab plants around design, packaging and other services. There are 35 sites around the world which have clusters of five or more fab plants. According to Stuart,

the near-term economic benefits of attracting a world-class fab project include construction (over \$US250 mill, excluding equipment), employment (1-2,000 jobs), output (over \$US500 million per year) and exports (most of the output). Additional investment and jobs can be expected to follow, as construction of an initial fab has usually attracted subsequent fabs, as well as design centres, supporting industries, professional services, and a major expansion of technical education.

Table 4.2 - Sales of Leading Semiconductor Manufacturers (\$US Mill.)

Manufacturer	Sales 1993	Sales 1994	Sales 1995	Growth 94-95 (%)	Sales 1996	Growth 95-96 (%)	Share 1996 (%)	No. of Fabs*
Intel Corp	7.97	10.1	13.17	30.4	16.94	29	12	18
NEC	6.14	7.96	11.31	42.1	10.58	-6	7.5	27
Motorola, Inc.	5.96	7.24	8.73	20.6	8.44	-3	6.0	
Hitachi	5.01	6.64	9.13	37.5	8.06	-12	5.7	21
Toshiba Ltd	5.72	7.56	10.08	33.4	7.98	-21	5.7	27
Texas Inst.	4.08	5.55	7.83	41.1	7.09	-9	5.0	36
Samsung	3.04	4.83	8.33	72.4	6.2	-26	4.4	13
Fujitsu	2.99	3.87	5.54	43.1	4.51	-19	3.0	24
Mitsubishi	2.83	3.77	5.27	39.8	4.2	-20	3.4	18
Hyundai	0.85	1.52	4.13	171.7	n/a	n/a	n/a	10
Combined share	50.9%	52.5%	54.6%		140.69			

* operating, under construction or announced, including joint ventures.

The pivotal importance of Fab Plants and their potential as a catalyst for other industries have encouraged governments to offer substantial inducements to attract them. In their recent discussions with the Australian government representatives of industry leaders, Intel, reportedly asked for a rebate of about 40 per cent of the construction cost.⁷ There is little doubt that any move to attract a fab plant will require considerable, consistent involvement from the federal and state governments. The cost of the plants and the competition for them is growing.⁸

The mounting costs of these plants would seem to make an early move into the industry desirable. On the other hand a more prudent approach, although possibly slower, may be to develop a supportive environment, in terms of support services, for a Fab Plant. While this would not eliminate the need to provide incentives it is likely to keep the size of incentives to a minimum.

Case Study 4.3 - Attracting Intel to Ireland (from the Allen Report¹)

- The Ireland Development Authority first contacted Intel in 1980, team visited in 1983.
- Intel opted for Israel, the IDA had difficulty selling Ireland's people advantage
- As a result of this experience a number of initiatives were put in place, including:
 - Irish Network - recruited 300+ Irish graduates working in Silicon Valley;
 - Skills Pool- tracked other Irish graduates working overseas.
- A second site selection team visited Ireland in the mid 1980s, as well as Scotland, Wales, Austria, Spain, France, Germany and the Netherlands.
- The team decided an English speaking location was essential to facilitate technology transfer.

- Independent cost evaluation positive towards Ireland.
- Positive exposure to Irish workers, “the people factor won Intel, not financial incentives”.
- Other positives for Intel:
 - Member of the European Union;
 - Excellent, English-speaking workforce;
 - Developed infrastructure;
 - Outstanding support, IDA and local government level;
 - Financial incentives, 10 per cent corporate tax to 2010, capital grants towards fixed cost base; and
 - Competitive cost base.

The economic difficulties in Asia present both opportunities and challenges in this regard. Some of the proposed fab plant developments in the region may not look as viable today as they did six months ago.

Although there are significant differences of opinion as to the wisdom of industry attraction on the scale likely to be necessary to attract a semiconductor plant⁹ ignoring this option will have substantial implications for Australia’s claims to being an advanced economy into the next century. One of the interviewees for *The Allen Report* said failure to attract a semiconductor plant would condemn us to technological orphan status forever. In his overview of the industry Stuart concluded:

Australia faces a choice between alternative visions of its future: either it maintains its ineffective approach to strengthening the microelectronics industry, forfeits the chance of establishing a semiconductor cluster location, and forgoes the economic benefits that would flow from it; or adopts a new, focussed and proactive approach, to foster a cluster of semiconductor design centres and fab plants, to assume the technological basis for its future competitiveness in the information industries.

Western Australia can assist its case to attract a Fab Plant (or any major MNC investment) through building its human networks (see Prodigal Sons/Daughters and Know-Who) and its information base. A transitional strategy, which will position Western Australia well in the future while creating jobs and generating revenue in the short term, would be to build an alliance with one of the manufacturers to establish a chip design studio in WA. This would make use of skills, retain them, generate revenue, show casing skills, building a foothold and local knowledge of the industry.

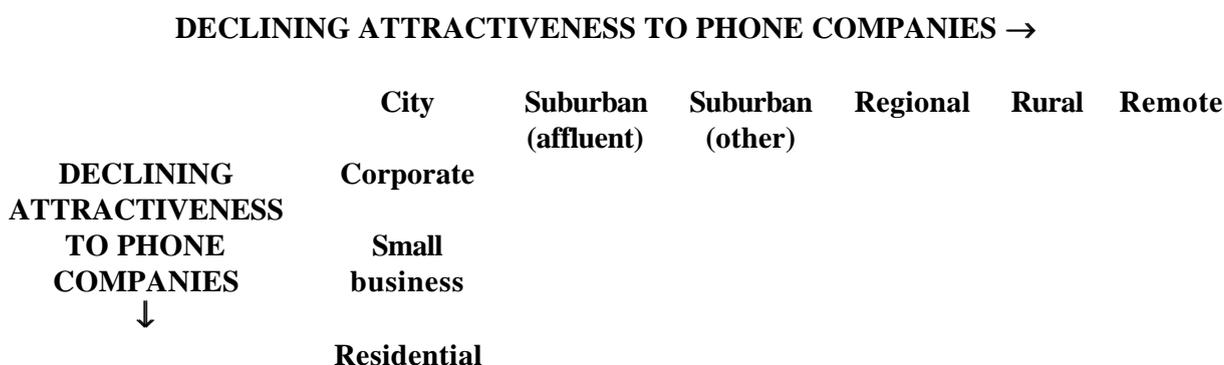
4.4.2 Regional Telephone Companies

What is communications but value-added electricity?

US Electricity Utility Vice-Chairman,
Upside, February, 1998

The benefits of competition in telecommunications markets as they have been deregulated have flowed in a consistent pattern. The priority markets for telephone companies in offering access to more advanced services and reduced prices can be summarised in the figure below; the least attractive markets are toward the bottom and the right.

Figure 4.3 - Priority Markets for Telecom's Companies



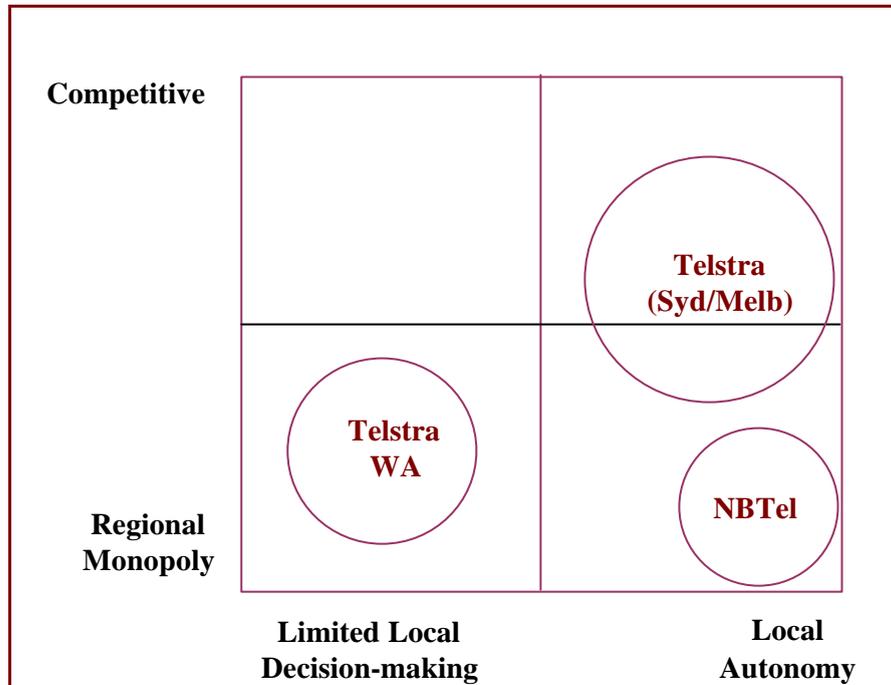
The major new players in the Australian telecommunications market have minimal presence in Western Australia beyond the mobile telephone, Internet service provision and the corporate markets. A number have made an impact on international and long distance telephone markets beyond the corporate sector offering cheaper rates, largely through affiliation marketing.¹⁰ In terms of the wider telecommunications market these sectors are “soft targets” which deliver limited value to the State as a whole. The positive impact of competition in regional Western Australia is even more difficult to identify.

The crucial issues are having access to advanced telecommunications services at a world competitive price. While reducing the cost of international and long distance calls is an important issue it is at the margins of any strategy to encourage the development of a viable Information Industry. The development of the industry, particularly the service or intangible portion of it, is heavily dependent on being able to access cheap, advanced telecommunications services.

The downgrading of Telstra’s management ranks, particularly in Western Australia and other “outer states” over the past few years¹¹, has a further impact on the potential to drive change in this crucial sector. The figure below illustrates Western Australia’s, and several other regions’, predicament under the current telecommunications policy regime. Competition exists only in some limited markets, as mentioned above, while corporate decision-making within Telstra is becoming increasingly centralised to Sydney and Melbourne. Western Australia importance within the political decision-making declines. The State is experiencing the worst of both worlds.

Contrast this with the position in the Canadian province of New Brunswick (spelt out in greater detail at section 5.5 below). Its telephone company, New Brunswick Telecommunications (NBTel), enjoys an effective monopoly but has invested heavily in its infrastructure to build a broadband communications network and formed a partnership with the provincial government to use its technology as a means to deal with some of the region's endemic economic problems.

Figure 4.4 - Competition and Control in Telecommunications Companies



4.4.3 Strategies to Address the Lack of Telecommunications Competition

In the apparent absence of interest amongst existing “second tier” telecommunications organisations in the Western Australia market and the lack of substantial private investors wishing to establish a regional telephone company other options need to be investigated.

There is a steadily increasing role being played by electricity utilities around Australia and the world looking at the potential for them to extend their operations into the provision of telecommunications services. It has been reported that as many as 40 per cent of US electricity utilities also offer telecommunications services to their customers. Their existing strengths as dominant participants in their local markets which offers access to (virtually) every household, having a well established billing structure and the increasing role telecommunications services have in managing their own operations. Energex, the Brisbane electricity utility, Energy Australia in Sydney and Citipower, which serves Melbourne have joined forces to establish Down Town Utilities, specifically for this purpose. As this report was being completed both Western Power and Alinta Gas announced their intention to follow this strategy.

Case Study 4.4 - The ACT's Electricity Company goes into Telecoms

The ACT's power and water utility, ACTEW, is well advanced in the first phase of its roll-out of an optic fibre broadband network. Once completed it will serve all 120,000 households in Canberra.¹² ACTEW expects to have the infrastructure for a 1,000 home technical trial completed by June/July this year. Assuming this performs satisfactorily the full roll-out will commence and be completed by mid-2000. Where the first generation of broadband telecommunications infrastructure targeted to consumers was heavily oriented to the needs of Pay-TV the TRANSACT (the ACTEW subsidiary responsible for the telecommunications network) network has been conceived as a communications network, ie equal capacity in both directions.

Although Optus have a presence in the Territory it is largely confined to working with the Federal Government. In addition to providing another option to its customers ACTEW saw the opportunity of "colonising" its market while the major players were concentrating on Sydney and Melbourne.¹³

Market research undertaken by the company shows that 70 per cent of Canberra households have PCs and 30 per cent have modems. They assume that Internet access will be a major drawcard. TRANSACT sees itself as remaining in "the wire business" and, although it is currently installing a switch (automated exchange), it is looking for partners to offer telecommunications services. According to Jane Taylor, TRANSACT's Project manager, "the more companies that come in the better". In addition to Internet access they have had a lot of interest in advanced teleworking: "it (the network) will handle those sort of applications very easily", according to Ms Taylor. Both the Territory's Universities are planning to run courses over the network also.

(a) Value-adding Partners

The possibilities opened by taking the initiative in this market become even more attractive if an appropriately "synergistic" partner can be identified. Companies such as BT (British Telecom) and Pacific Telesis (the Regional Bell Operating Company serving California, Oregon and Washington) both have considerable expertise in distributed work and would form ideal partners for the establishment, development and marketing of TimeShift (see section 4.3.3). Similarly, on a smaller scale, Equant, the specialist telecommunications service provider to the mining industry may serve as an invaluable partner in pursuing some of the resource sector possibilities outlined here.

4.4.4 Short-run, Contract Manufacturing Plant

Amongst the hyperbole surrounding the rise of the Information Industries and the decline in some manufacturing sectors it is easy to assume that manufacturing as a whole is in decline. As we have seen above (section 2.1) a new generation of goods, generically described as Elaborately Transformed Manufactures (ETMs) are an area of significant growth accounting for an ever increasing proportion of world trade. Where the more traditional forms of manufacturing can be categorised as Low Processing-Labour Intensive or, on occasions Low Processing-Capital Intensive, (see section 3.4 above) ETMs fall on the other side of the line as High Processing-Labour Intensive or High Processing-Capital Intensive.

This places ETMs solidly in the region of our greatest competitive advantages and the area where we should logically aim to locate as much economic activity as possible. These products tend to have shorter production runs than many manufactured items.

For electronic product developers and designers in Western Australia making the step from the work bench and prototype stage into production, even for limited production runs, often requires them going interstate or off-shore. At a time when the project's cash flow is likely to be at or near its most stressed this can prove a substantial hurdle. The development of a short-run, manufacturing plant in Western Australia would act as a significant incentive for this group of designers and developers and a vital piece of infrastructure for the further development of niche electronic manufacturers in particular and the State's ETM capacity generally. The level of activity in this area is reportedly almost at the point to sustain a short-run, manufacturing plant. An operator of this type of plant on the east coast has considered investing in the State but, for the present, decided against it.

4.4.5 Regional Western Australia

(a) Narrow Bandwidth WWW Standard

The phenomenal growth of the World Wide Web over the past three years, both in terms of users and the total number of WWW sites, has placed heavy bandwidth demands on the Internet. Another trend has been the growth in the size of WWW pages through a combination of increased use of authoring programs,¹⁴ the perceived need to include more graphics to make the site more attractive and the rising use of "plug-ins".¹⁵

All these developments make ever increasing demands on the network to be able to deliver these substantial files to the user. While users in metropolitan areas with links to the Internet through a conventional telephone line may bemoan the slow speed at which these pages download, this trend makes much of the same information effectively inaccessible for users outside Perth. Narrower connections over longer, often poorer quality lines, slow the process significantly. In many cases the connection will be lost before the page has been completely downloaded requiring the user to reconnect and begin again.

While this problem is exasperating for country users it is also a problem for many city users. In some cases sites offer users with slower links the option of selecting a "text only" version, a poor compromise. The problem of bloated WWW sites also extends to many State government sites.¹⁶

This project would examine the myriad of factors which affect the transmission speed of WWW pages (web page size, server capacity, type of compression used, design principles etc.) and develop a set of standards for WWW page efficiency. Those Web site developers who conform with the standard would be entitled to carry an endorsement to that effect.

4.5 Alliances

4.5.1 The Western Australian Information Industry

At present the three major sections of the Information Industry - telecommunications, computer and content sectors - have little to do with each other. Each has its own industry group which have existed, and provided a useful service to their respective constituents, well before the idea of digital convergence came into being.

For a viable Information Industry to be created in Western Australia there is a need for these barriers to be broken down.

4.5.2 Western Australian Prodigal Sons and Daughters

Western Australia, like many regions, is a substantial exporter of talent. Each year thousands of highly skilled and able - mainly young - people travel interstate and overseas either to broaden their horizons or because there is little suitable work for them in the State. According to one senior academic about 40 per cent of the State's Electrical Engineering graduates leave for positions elsewhere¹⁷. Although many of them return for family reasons, or because of the lure of the Western Australian lifestyle, many more remain away.

Aside from the loss of the skills these people acquired during their education in Western Australia many of them have built on this and developed strong networks within particular industries around the world. These skills, their understanding of the industry and contacts are invaluable assets. Arguably they are even more valuable for a nascent industry such as that in Western Australia working to overcome the impediments of distance. Several other countries (Ireland and Israel) and states (Victoria) have begun programs which aggressively seek out those who have emigrated and work at developing packages to induce them to return. Examples such as Gary Millard's (below) demonstrate the frequently undervalued importance of solid international experience in acting as a catalyst for new and exciting innovations. In Mr Millard's case it could be argued that he has been a crucial element in what could be the rebirth of an Australian car industry tailored to the limits and opportunities of the 21st century. An interesting feature of this case is the importance of his family ties to Australia and the high value he placed on seeing his children grow up as Australians. This same attribute must apply to thousands of talented Western Australians currently dotted around the world. The right environment needs to be created to encourage them to forgo the opportunities they are enjoying in their current (temporary) homes and enable them to pursue them here.

Case Study 4.5 - Gary Millard, Millard Design Group

In 1971 having finished body design engineering training at General Motors Holden Gary Millard set off for Europe for the traditional working holiday. Travelling through the German state of Bavaria Mr Millard inquired with AUDI about the possibility of work with the firm. He was offered a position as Body Engineer and spent eight years there developing his skills as an automotive engineer and gaining an excellent insight into the industry.

In 1981 he left to establish his own automotive design firm in Munich servicing a range of clients both in Germany and in other countries. By 1987 Mr Millard's children had reached high school age. He was confronted with the decision of whether he wanted them to grow up as Germans or Australians. The decision was made to sell the business and to move back to Victoria.

After a year living in semi-retirement outside Melbourne Mr Millard decided to resume his career and to establish himself in business again. Millard Design opened its doors in 1989 offering automotive design services to the local industry. Over the following years the company's client list has extended, particularly to Asian manufacturers, many of whom had employed engineers and design staff from the Bavarian companies.

In the nine years since Millard Design established itself in Australia the firm has grown to 200 staff with a client base around the world. Millard Design was one of the instigators of the aXcess concept car to provide a showcase for Australian design and manufacturing expertise. As well as attracting international attention the car is also credited with being instrumental in gaining the recently announced package of support from the Federal Government for the industry.

4.5.3 Know Who

Just as the program outlined above seeks to recapture some of the value of Western Australians presently living outside the State many more have been attracted here from elsewhere. It is not always easy for some of these individuals to find their way into local networks. Many more of them have come here to retire or are working part-time with colleagues interstate or overseas and have no incentive to attempt to "break into" the local networks.

The former chief executive of British Telecom has retired to Perth, for instance. Many senior executives from various international resource companies in particular have decided to retire, or semi-retire, to Perth and Western Australia. These individuals - and no doubt many more - have global contacts which very few native Western Australians could hope to match. In an increasingly global economy methods have to be developed to provide well-placed new residents with the opportunity to contribute to assisting local organisations and their managers.

4.5.4 Feed-back Loops

Where innovation theory used to suggest that products were developed and brought to market through a systematic sequence of events (the Linear Theory of Innovation) it is now well accepted that the process is far more anarchic and involves feedback and complex intertwining of individuals and processes. The idea of feedback loops is central to this as the innovation is refined and developed to ensure it has the best chance of success when launched onto the market and that it can maintain its position through further refinement as more information comes back.

In terms of Western Australia's size and isolation the difficulty it presents in maintaining strong, reliable and timely feedback loops is probably the area of major challenge. Without having access to excellent information local developers could be misallocating resources.

4.5.5 Wagon Wheel Bar and Grill

In his analysis of the reasons for Silicon Valley's success in becoming a centre for Information Industries Manuel Castells (see section 5.4) attributes much of this to the part played by Walker's Wagon Wheel Bar and Grill. He says:

...while large, established companies in the East were too rigid (and too arrogant) to constantly retool themselves towards new technological frontiers, Silicon Valley kept churning out new firms, and practising cross-fertilisation and knowledge diffusion by job-hopping and spin-offs. Late evening conversations at the Walker's Wagon Wheel Bar and Grill in Mountain View did more for the diffusion of technological innovation than most seminars in Stanford.

Proposing a policy initiative which seeks to recreate the kind of social ambience around which the camaraderie and capacity for cross-fertilisation Castells talks of here seems foolish. Even so the importance and power of these gathering places cannot be ignored, particularly for a relatively isolated industry such as Western Australia's. Recent interest amongst the various Information Industry associations to "converge" some of their activities may well be a starting point in helping build a Western Australian version of the Wagon Wheel Bar and Grill.

4.5.6 Global Partnering

An invaluable way to address the need for information outlined in this section is through partnering with organisations which provide complementary skills and networks. Not only can this address some of the questions of accessing reliable market intelligence but can also assist in sharing of human and technical resources.

Local organisations interested in imaging are already working with the CAD Centre in Cambridge and Silicon Graphics in this way to build on the existing strengths and help maintain their positions in this global industry.

An alliance with British Telecom, Pacific Telesis (the telephone company serving California and Nevada), US West (the carrier for Oregon, Washington state through to the Great Lakes) or other operators in those regions could be desirable in furthering the dual goals of introducing competition into the Western Australian telecommunications market and pursuing TimeShift.

4.6 Data

As has been mentioned above, recent, detailed information on the Western Australian Information Industries is not available. To identify the optimal policies to support the industry this is essential. It is also important that it continue on an on-going basis to enable trends to be identified. Industry clustering is well recognised as providing the basis on which competitive advantage can be built. Anecdotal evidence suggests the State has strengths in various sectors but there is no clear picture of the depth and width of these strengths. More detail would pinpoint gaps and weaknesses or opportunities for further expansion.

4.6.1 Bench marking

Comparing the State's position and performance with other regions is an important way of ensuring we maintain pace in this rapidly changing area. A number of sectors are particularly important to monitor and compare, including:

- Education.
- Public sector.
- Information industry costs to sector firms.
- Monitoring information issues, awareness in industry and the community, etc

4.6.2 Western Australian Skills Surpluses

A skills surplus exists where the local economy is structured so that the skills which exist within the workforce are either not used at all or are under utilised. This can obviously lead to significant differences in the wages and salaries paid to workers with particular skills. (There are clearly other factors at work in determining rates of pay than simply supply and demand.) These surpluses become very important in a Global Information Economy as it becomes increasingly easy for information work to be moved from region to region.

As a generalisation Australia's professionals are less well paid than many of their colleagues overseas. For instance, the average wage for Australian engineers is lower than in Japan, the US, Canada, Germany, Hong Kong and Taiwan.¹⁸ This opens up significant opportunities for trade in services and is the central idea behind TimeShift.

To identify these opportunities (and potential threats to some areas of work in the future) an audit needs to be undertaken to identify Western Australia's Skills Surpluses and the skills in which there is a significant differential in rates of pay with comparable markets. With reference to TimeShift the priority for these wage and salary comparisons should be the United Kingdom and the west coast of North America.

4.7 Conclusion

This chapter has set out a series of strategic approaches to take to build strong, sustainable Information Industries. The priorities to achieve this are based on developing policy approaches which will:

- assist companies and/or individuals capable of operating globally;
- expand Western Australia's strengths in the resource and related industries to establish Perth as a global resource industry services centre;
- develop "spin-off" services and products drawn from the resource industry and other information industry companies which can be marketed to other industries, and;
- identify world-class existing technologies, both "hard" and "soft", which can be applied to other industries.

Achieving these goals will require intervention in both Perth *and* regional Western Australia to:

- raise the awareness and information levels amongst politicians, public servants, industry leaders and the community generally of the global, online environment;
- highlight existing innovative demonstration sites and encourage their creation in a range of sectors;
- support the establishment of innovative online projects, primarily through the provision of appropriate support services;
- offer support through skill development and business opportunities to potential global workers and to global, information/knowledge-based company-builders;
- identify gaps in accessing infrastructure at a world competitive price and identify policies to remedy these;
- facilitate interaction between participants in the various information industries - telecommunications, information technology and content developers, both locally and globally;
- encourage the establishment of alliances with organisations nationally and internationally which offer synergies for Western Australian organisations, and;
- enhance the existing data on the industry to enable bench marking and the further refinement of the State's Information Industry strategy.

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WA in the Global Information Economy

The other crucial factor is distance and the impact ICTs will have on its economic impact. Understanding these effects has obvious importance to Western Australia for a range of issues:

- gathering market intelligence;
- building and maintaining partnerships, and;
- participating in cross-border joint-ventures.

Understanding and solving these questions are also central for global distributed work, an area of massive potential opportunity for Western Australia and Australia generally.

¹ A specialist medical group has been examining the possibility of building a link with a leading US-based research institute dealing with the same illness. One strategy the group has been examining is the possibility of sponsoring a sabbatical of a US researcher to WA to work with colleagues here and to use as a means of building the local profession's contacts with this institution. The links would be further enhanced through the use of advanced telecommunications to run video conferences and other, more regular interactions.

² see "How to Finance Anything", by Jill Andresky Fraser, p. 34, *Inc.* magazine, February, 1998

³ This refers to a network which is called upon to deliver large amounts of data, so a broadband connection is required, but the number of clients using the line is small - hence thin client.

⁴ Clearly this number is rising and will continue to rise rapidly. A question mark remains over whether products with a high "touch and feel" component will be marketable directly using electronic networks, for these products MicroTrading may continue to be the optimal approach. See section 1.7.1 and 1.7.2 above.

⁵ With traditional export programs producers are obliged to establish substantial inventories and marketing resources before making a move off-shore. AusTrade has estimated the minimum cost of mounting an export drive at \$5 million. A full sales office in Europe or Asia is \$1-2 million a year and \$2-3 million in the US.

⁶ "The Economic Significance of the Semiconductor Industry", by Alex F.H. Stuart, appendix to "Spectator or Serious Player: Competitiveness of Australia's Information Industries" which formed part of the Goldsworthy Report, "The Global Information Economy: the way ahead". Stuart's article is at <http://www.dist.gov.au/itt/tskforce/allen/appendf.html>

⁷ "Intel deal not cheap as chips", by David Crowe, *Financial Review*, April 4-5, 1998.

⁸ "Semiconductors: Industry Briefing", by Andrew P. Madden, *Red Herring*, May 1997.

⁹ "Howard's \$2bn pitch to Intel", by Stephen Lewis, *Financial Review*, 28 November, 1997

¹⁰ This refers to marketing strategies based around agreements with special interest groups to provide services to the groups' membership with a portion being repaid back to the association.

¹¹ Restructuring of management within the company over the past 18 months have resulted in the removal of 14 of the 17 most senior positions in the state. One senior manager reported that WA was obliged to gain approval from Sydney/Melbourne for promotional spending over \$5,000.

The announcement earlier this year that rationalisation of network operations would mean the transfer/loss of 120 technical positions from the state is another example of this trend.

¹² <http://www.actew.com.au/transactinte.htm>

¹³ conversation with Jane Taylor, project manager for TRANSACT, 23 and 30 March, 1998

¹⁴ These programs assist users to develop WWW pages quickly and without the need to know HTML (the programming "language" of the WWW). A feature of the pages produced by these authoring programs is that they tend to be very large, the program does little to economise on the space they take.

¹⁵ Plug-ins is the generic term for additional features which can be added to a WWW browser software to enable the user to receive audio, animation or video from a site. All of these applications are very heavy users of bandwidth.

¹⁶ A leading developer commented that many departments and their site development teams seem to have entered into a competition to see whose site can contain the most features.

¹⁷ Private communication with Professor John Hullett, Curtin University.

¹⁸ The Allen Report

5 National (and State) Policy Approaches

5.1 National Information Industry Policy Strategies

The summaries of Information Industry development policies which follow provide both an indication of strategic approaches and the level of competition facing Western Australia. As more and more regions recognise the strategic importance of these technologies, on all aspects of their economies, the competition for investment grows. In the main, national government examples have been avoided as their approaches inevitably focus heavily on taxation and other financial incentives - an option which has limited possibilities for any state within the Commonwealth.

The Federal Government has recently released a report by the Industry Commission¹ examining the issue of incentives offered by state governments to attract industry. It estimated that the states and territories spent \$2.5 billion in 1994-95 in payroll taxes forgone. In general the report was highly critical of these strategies saying they were often secretive and discretionary, sometimes leading to conflicts of interest.

Gains from providing selective assistance at the State level are largely an illusion... Most selective assistance has little or no positive effect on the welfare of Australians. Rivalry between jurisdictions for development and jobs at best shuffles jobs between regions and at worst reduces overall activity.

The Commission recommends that the states agree amongst themselves to limit offering incentives and where incentives are offered make the process more transparent.

5.2 Information Industry Policy Case Studies

Notwithstanding this a case study examining the significant recent success of Ireland has been included. Its history as a small country with a very narrow economic base, geographically located in the shadow of several major economies which has managed to establish itself very quickly as a strong global niche player provides some useful insights. It has been dubbed the Celtic tiger (possibly not that complimentary today) and has the fastest growing economy in Western Europe. In the past two years its economy has expanded over 20 per cent. Since 1980, 40 per cent of all North American high-technology investment in the European Community has gone to Ireland.

In particular, given the current interest in Australia in attracting a semiconductor fabrication plant, Ireland's experience in courting Intel may be useful.²

The selection of Silicon Valley in this chapter would come as no surprise. It is useful to reflect on some of the thinking behind this region's phenomenal success, particularly as a region in which the public sector's intervention has been far more covert than in the other examples.

It could be argued that both the Canadian Province of New Brunswick and Tasmania are the Provincial/State equivalents of Ireland. Both have endured years of being regarded as economic “basket cases”. This dubious title has come about largely through the decline in the narrow industry sectors which have traditionally provided their economic drive. Their decline has seen both regions suffer unemployment levels well above their respective countries’ national averages for extended periods and the steady aging of their populations due to the unrelenting exodus of their young people. The respective governments are following broadly similar paths; New Brunswick is eight years into implementing its plan, Tasmania began one year ago.

But for the robust good health of Western Australia’s resources sector this state has a similar profile in terms of the narrowness of its economy.

5.3 Ireland³

5.3.1 Introduction

From an economy traditionally reliant on agriculture, Ireland has emerged as the world's second largest exporter of software, and is aggressively competing for foreign direct investment in other information industries such as semiconductors, computer hardware and financial services. At the same time, a vibrant indigenous software and multimedia sector is beginning to emerge, capitalising on the advanced infrastructure that has developed to serve multinational investors.

Since 1980, 40% of all US new inward investment in European electronics has come to Ireland. Over 300 companies are currently engaged in the development, manufacture and marketing of a wide range of leading edge products and services. They are involved in a wide range of sectors across the value chain - from wafer design and fabrication, systems components and peripherals to communications, networks and software.

These industries play a central role in Ireland's economy, which is consistently growing at levels amongst the highest in the OECD. Almost a third of all PCs sold in Europe are sourced from companies that are based in Ireland, and exports from the broader electronics sector account for more than a third of Ireland's total exports.

5.3.2. Government Strategy

In order to address structural weaknesses in Ireland's economy, successive governments moved to secure inward investment opportunities, particularly from the United States. In order to maximise returns to the economy, the Irish Industrial Development Agency (IDA) targeted a number of high growth industries that would build on Ireland’s competitive advantages - a young, well-educated and technically competent workforce. It also reasoned that such industries would not be easily displaced because of a dependence on highly skilled labour, rather than capital.

The Irish Government received considerable European Community funding for training and infrastructure development. This aid was used to establish an education system tailored to the requirements of the high technology industry, an advanced telecommunications network, and support industries offering turnkey solutions in manufacturing, teleservicing and distribution. Despite the success of the investment attraction program engineered by the IDA, the Government moved to dedicate more resources to the development of native enterprises.

5.3.3 Direct foreign investment in Ireland

As a small economy on the fringe of the European market, Ireland has typically turned to foreign investment to stimulate economic growth. In working with the IDA, the Irish Government pioneered a broad range of grants and incentives to entice inward investment, a model that has since been followed by Scotland, Portugal and Spain. These initiatives include the following:

(a) Taxation Incentives

A 10% rate of corporation tax guaranteed until 2010 applying to profits earned on the sale of goods manufactured in Ireland, regardless of whether those products are exported by the company. Computer service firms also qualify for the reduced rate.

(b) Cash Grants

The rate of awards is not fixed with the IDA determining a cash grant per job, calculated as a percentage of fixed assets invested. Grants are non-depreciable and non-taxable and may not exceed the amount of equity participation. Funding is available for site cost and development as well as for new equipment. Grants are generally set at 45% but are negotiable up to 60% in designated areas. Funding for industrial expansion cannot exceed 25% of the value of the total fixed investment.

(c) Research and Development Grants

Investors may obtain a 50% grant for preapproved expenditures on research and development. Capital grants are also available to establish permanent research facilities or pilot plants.

(d) Training Grants

The Government will supply grants to cover as much as 100% of the costs of an accepted training program.

(e) Loan Guarantees and Interest Subsidies

The IDA has developed a system of loan guarantees and subsidies for interest payments. Loan guarantees may not exceed 80% of the original sum. The agency may take an equity stake in selected projects.

(f) Physical Incentives

The IDA operates a number of fully equipped industrial sites. Firms may lease or buy premises and obtain cash subsidies for rentals. Arrangements can also be made for the construction of custom-built facilities for individual companies.

5.3.4 Incentives for Service Industries

Incentives in the form of employment grants exist for service sectors including engineering, computer software, data processing, commercial testing and media production. Qualifying companies must either operate internationally or bring in experience not generally available in Ireland.

In addition to these financial and other non-fiduciary inducements, Ireland's membership of the European Union has encouraged site location by many overseas firms in order to establish a processing, service or manufacturing base to effectively access other European markets.

Almost 90 foreign IT&T companies with a range of diverse products and services are operating in Ireland. Companies including Microsoft, Lotus and Novell have established localisation facilities to serve the wider European market for desktop software. Service firms such as EDS and Andersen Consulting are developing customised IT solutions. IBM maintains a development office that contributes to global projects and Corel has established a telephone technical support centre. AT&T, Motorola and Ericsson hire local programmers and engineers to produce telecommunications products and Intel and Philips design integrated circuits at Irish facilities.

Ireland's indigenous IT firms owe much to the decisions of the foreign multinational corporations that established manufacturing bases there in the 1970s and early 1980s. The regional headquarters of these international companies based in Ireland were modest in comparison with plants in their home countries and required innovative solutions to support smaller operations. A number of entrepreneurial Irish developers reconfigured these custom solutions as packaged products which were then adopted by the multinationals as they established operations in other locations. As a result, these companies began to generate export income from their products from an early stage, with the industry continuing to grow through the creation of a large number of start-up firms. Exports now represent 50% of total revenue for indigenous firms within Ireland's information industries.

The digital age represents a threat to Ireland, but it is also a major opportunity. The country has rich technological resources and is recognised as a creative centre for music, literature and, more recently, film and video production. As a result, an Irish multimedia industry is slowly emerging with some 50 firms who claim their core business is the development of multimedia systems. Nearly all of these companies are small and cash starved.

5.3.5 Domestic Information Industries

The Irish government has demonstrated significant support for domestic IT industries. In the case of software production for example, the reduced 10% rate of taxation available to overseas firms is also available to indigenous exporters. Forbairt⁴ has also targeted a number of initiatives at the software sector through venture capital funding and development programs.

5.3.6 Critical Constraints

Despite low rates of corporate taxation being a critical factor in securing an expanding information industry for Ireland, the majority of revenue generated by the multinationals is repatriated elsewhere. All the revenue earned by indigenous companies remains in Ireland, however most firms have annual revenue under US\$500,000 and will find it increasingly difficult to remain competitive in the maturing global information sector. These firms face critical constraints that challenge their ability to grow.

With a population of less than 4 million inhabitants, the potential for growth in focussing on the domestic market alone is limited. In order to survive, Irish firms must consider export markets at an early stage in their development, despite the managerial and financial impediments associated with establishing international distribution channels. Domestic firms are also limited by the conservative nature of Ireland's financial community, as banks and financial institutions have been slow to invest in projects perceived to be high risk. Currently, no software companies are listed on Dublin's Stock Exchange, and Irish and British equity markets remain generally unsupportive of high technology enterprises.

5.3.7 Conclusions

The expansion of Ireland's information industries demonstrate how a commitment to free trade, government incentives and a supportive academic community can attract direct foreign investment and foster a rapidly expanding, export orientated indigenous sector.

Ireland has few natural resources, and a limited domestic market means that it cannot offer the economies of scale of larger nations. However, the country has established a comparative advantage through financial incentives as well as strategic investment in infrastructure and education. The growth of vibrant indigenous firms will be restricted by a number of factors including a shortage of capital funding and difficulties in competing with the multinationals for scarce development talent.

5.4 State and Regional Strategies - Silicon Valley

Silicon Valley is located south of San Francisco around the cities of Palo Alto and San Jose. The Valley's spectacular reputation as a hot-bed of innovation and enterprise is well justified: it was the birthplace of the integrated circuit, the microprocessor and the microcomputer, the technological building blocks of the information economy. Even though the world's largest software producer, Microsoft, is based in Seattle, the largest manufacturer of PCs, Compaq, operates from Texas and IBM's headquarters are in New Jersey, Silicon Valley has a significant proportion of the next tier of players across a wide range of technologies⁵. Over four decades it has grown to now having more than one million information technology industry workers, a population of two million⁶ and an estimated Gross Region Product of \$US65 billion, about twice that of Western Australia.⁷ Its reputation for innovation and enterprise has also given it a substantial boost into the race online with many of the new companies in this sector, including leading World Wide Web browse developer Netscape, establishing themselves in Silicon Valley.

The generally accepted explanation for Silicon Valley's success is that the combination of a significant population of engineers and technologists, attracted to the area by universities and defence research institutes, coupled with the leadership of Stanford University in establishing one of the world's first technology parks to incubate small start-ups were crucial. The University was also responsible for another shrewd move, hiring William Shockley the inventor of the transistor, in 1956.

His decision to leave the east coast and move west came after attempting to commercialise his historic invention. The disappointment at being turned down by a number of major companies encouraged his move home to Palo Alto. Staff from the company Shockley's established went on to found Fairchild Semiconductors, the group credited with the invention of integrated circuits. The critical importance of this "seeding" process can be seen by the fact that half of the 85 largest semiconductor firms in the United States, including the largest Intel, can trace their antecedents back to Fairchild.⁸

This pattern of growing companies constantly spawning small start-ups has been a significant feature of Silicon Valley's history and an important reason for its success. According to Annalee Saxenian in *Regional Advantage*⁹ - her comparison of Silicon Valley and Massachusetts' Route 128¹⁰ - the crucial difference was the social and industrial organisation of companies in fostering or frustrating innovation.

"...while large, established companies in the East were too rigid (and too arrogant) to constantly retool themselves towards new technological frontiers, Silicon Valley kept churning out new firms, and practising cross-fertilisation and knowledge diffusion by job-hopping and spin-offs. Late evening conversations at the Walker's Wagon Wheel Bar and Grill in Mountain View did more for the diffusion of technological innovation than most seminars in Stanford."¹¹

This difference also had significant impacts in the 1980s when many of the United States' high tech industries suffered downturns. Saxenian says the big east coast companies were large, single products firms and while the Silicon Valley companies were also too dependent on one product -

semiconductors - they were more decentralised and so more able to spin off other companies and adjust to the changed conditions.

Although the Silicon Valley success appears at face value to be a massive triumph for the free market (there is little doubt it *is* a triumph for entrepreneurialism) these descriptions can overlook the crucial role played by the US Government, particularly by the Defence Department. Between the 1940s and 1960s, as part of its Cold War planning, the Pentagon funded billions of dollars worth of research by private companies and universities. Much of the non-militarily sensitive outcomes of this research were placed into the public domain. (For instance, DARPA the Defence Department's research agency was responsible for DARPA Net, the first manifestation of what we now know as the Internet.) Silicon Valley companies, as well as those in many other areas of the US, were significant direct beneficiaries of these contracts, as well as being well placed to capitalise on the intellectual property which "spun out" of other groups' research.

The results today of these combined forces are a vast array of rapidly growing companies (one in five publicly listed companies in Silicon Valley have grown at 20 per cent or faster each year for the past four years (across the rest of the US the figure is one in 35); very strong and consistent job growth (between December 1992 and 1996 the number of jobs went from a little over 1 million to 1.15 million); and expanding salaries (average pay rose 5 per cent against an average for the US as a whole of one per cent).

Inevitable pressures are arising with some companies choosing Austin, Texas and Seattle as lower cost options to establish themselves. But the growing trend of overseas high technology companies to open branch offices in Silicon Valley as the best option to keep their fingers on the rapid pulse of the industry is testimony to the region's continuing status.

Box 5.1: Some explanations for the "Silicon Valley Success Story"¹²

- A tolerance of failure; where bankruptcy is seen in many other countries as a sign of serious failure through incapacity, shoddy business practice or possible illegal activity, in the world of high tech start-ups it is often seen as a rite of passage;
- A tolerance of treachery; people (and with them ideas) move freely from company to company;
- Risk seeking; the venture capital culture seeks out risky propositions, balancing their portfolios with a range of investments varying in risk. The lower risk investments are expected to be more likely to return their investment, although that return is not expected to be great while those high risk investments which do succeed are expected to produce super profits;
- Reinvest in the community: successful companies and individuals have tended to invest in others starting up;
- Enthusiasm for change: everyone understands the technology enough to understand that unless changes are made quickly and decisively then others will overtake them;

- Promotion on merit;
- Obsession with product: the culture of Silicon Valley is heavily influenced by engineers and technologists who have a great respect for a “cool idea”;
- Collaboration;
- Variety: researchers at Stanford University say the driving forces behind companies vary dramatically from those driven mainly by financial gain, innovation-centric and technology focussed. This variety provides considerable flexibility in the face of down-turns - if one type of company does not make it another might, and;
- Anybody can play: migrants into the Valley report an overwhelming sense of optimism and very little negativity, the overriding sense is that if the idea is good enough, the opportunity is there, the people are up to it and the timing is right, anyone can make it.

5.5 New Brunswick¹³

5.5.1 Background

New Brunswick is a rural, remote and relatively sparsely populated province with a population of just over 750,000, three per cent of Canada’s population. The economy is largely driven by exports, especially food, energy, minerals, and forest products. The vast bulk of workers are employed by small business. The largest cities - Saint John and Moncton - each have a population of around 100,000, the capital Fredericton has 70,000. One third of the population are French-speaking. In winter temperatures can get to -30 Celsius and the Province can be snow covered for eight months.

Until the late 1980s New Brunswick faced significant challenges:

- One in seven of the Province’s population lived below the poverty line.
- Ten per cent received social security.
- Two thirds of the heads of households on social security had less than a grade ten education.
- A high proportion of 15-24 year olds were unemployed.
- The Province had the second highest unemployment rate in Canada.
- CAN Rail (the national train operator) closed in 1988 laying off thousands, including 2,200 in Moncton.
- New Brunswick had a credit rating seventh of all the Canadian Provinces.

- It had net debt in 1988 of \$C2.92 billion.
- 13.3 per cent of the operating budget went to pay interest on this debt.

5.5.2 Provincial Government-Regional Telco Alliance

Soon after the election of a new Provincial government late in 1987 a series of plans were put in place to reduce debt, unemployment and attract new businesses.

Telecommunications was seen as being crucial to this both in improving the efficiency of delivering government services (health and education were its largest areas of outlays) and in attracting new business. The local telephone company, NBTel, is a locally owned, regional monopoly. It had independently begun a process of massive investment to upgrade its own network and to implement new servicing practices to improve efficiency and service delivery. NBTel had also expressed its willingness to work with the Provincial government in overcoming some of the region's endemic problems.

Five objectives were identified:

- Make the government a model user of new technology.
- Increase awareness amongst the population of IT.
- Increase the size of the IT industry in New Brunswick, as well as getting traditional industry to make greater use of IT.
- Attract industry investment.
- Active involvement in the development of federal regulatory policy in order to ensure consistency with the New Brunswick position.

Significant administrative changes were instituted in the health (52 hospital boards were reduced to eight) and education (from 42 school boards to eight) sectors to ease the implementation of telehealth and tele education initiatives.

5.5.3 Call Centres

One of the main targets under this strategy was to leverage NBTel's modern telecommunications infrastructure, the Province's time zone (it is an hour ahead of the Toronto-Montreal-Boston-New York-Washington conurbation) and its relatively low cost structure¹⁴ to establish itself as a centre for call centre operators. It now has as call centre clients Nortel, IBM, Percolator, Xerox, Federal Express, Royal Bank, Unisys and UPS, along with approximately 30 others.

In the City of Moncton 27 call centres have been established in the past six years employing 4,000 people. Across the Province over the past two years 40 new companies have been established, mostly in the telecommunications services sector, and created 3,200 new jobs. The Provincial government has recognised that these jobs are "footloose" and could disappear if New Brunswick

loses its cost competitiveness or in the wake of a new generation of technology. As a result it has begun to invest heavily in education and training facilities, attracting Hispanic and other non-English speaking background migrants, actively pursuing other IT-based industries as well as continuing its low tax policies.

(An important technical aspect of the approach taken by NBTel is that in the substantial upgrading of its network to handle broadband traffic they have built what CEO Gerry Pond describes as a communications rather than a broadcast network. Mr Pond describes a communications network as one in which all the users have access to the same capacity rather than in a broadcast network where the central “controller” has greater bandwidth than those in the “out stations”. This has particular significance for Australia where a number of infrastructure providers are built on this asymmetric broadcast model - particular products from both Telstra and Optus operate this way. While it may seem logical to have greater capacity for the outward journey Mr Pond sees this as a short-sighted approach which is likely to eliminate many options for users in the future.)

Since New Brunswick has adopted this telecoms-based strategy:

- telecommunications and telecommunications services as a portion of the Gross Provincial Product have risen 71 per cent over the past ten years;
- the Province’s credit rating is now third amongst the Provinces;
- it has the lowest workers’ compensation rate in Canada, and;
- computer literacy is a requirement for graduation from high school.

5.6 Tasmania

Like New Brunswick, Tasmania has developed an unenviable position at the bottom of the economic comparisons amongst the Australian states. The population is in decline and according to Access Economics, Tasmania is in recession. Growth has been negative or flat since mid 1996 while the rest of Australia has, generally, enjoyed solid growth. In April 1998, there were fewer people employed than a year ago and its unemployment rate was twice that of Western Australia's. The economy has been shrinking one per cent a quarter for the past year. This compares with Western Australia's growth of one per cent a quarter.¹⁵

In April, 1997 the then Tasmanian Premier, Tony Rundle, announced that his government would be making a major push into the knowledge-based industries through:

...information technology, advanced telecommunications and the clever businesses whose advantage in the marketplace is their intellectual capital. Tasmania needs to be part of this but we need a new kind of public infrastructure to support it one where the Government's investment is in education, training, information and the most modern telecommunications.

And that's where we will be taking Tasmania ... creating an entirely new framework for growth. I want to say to you that merely taking an incremental approach will not be

enough to pull us out of our difficulties. We need to break through ... and unless we do Tasmania will quietly stagnate into a forgotten backwater with an ageing population and our young people leaving to find work interstate.

My vision is a Tasmania that's a small but full partner in the 21st century world ... with a growing economy which provides an expanding range of interesting jobs for our young people. And that's where the program I'm announcing today is designed to take us.

Let me make it clear that I don't know every single one of the steps along the road. But I do know that Tasmania has to make a start down that road.

The government also announced the sale of portions of its Hydro Electricity Commission (HEC) to fund some of the initiatives behind its Networking Tasmania strategy. It has proposed selling HEC's transmission and distribution arms but retaining ownership of the generating function. This plan has encountered some opposition. A proposal from the Greens to lease rather than sell these two sections of the utility is currently being examined by consultants. If the sale proceeds it is expected to raise between \$1-1.3 billion, most of which would be used to retire some of the State's \$3.6 billion in debt. The money saved from interest repayments - about \$30 million over three years - will go to equipping schools with PCs and putting them online. The state government will also be taking another leaf out of New Brunswick's book by developing an Internet-based one-stop shop for a range of government services.

Tasmania has also received a substantial contribution from the Commonwealth through the Networking the Nation or Regional Telecommunications Infrastructure Fund (RTIF).

Mr Rundle and a number of his advisers have visited New Brunswick and are quite explicit in saying they are looking to the Canadian Province as a working model of the changes they are hoping to implement in Tasmania. As in New Brunswick the Tasmanian government has formed partnerships with a carrier, Telstra, and an equipment supplier, Nortel, the common link between the two projects. It is also following the New Brunswick example in pursuing call centre business and has funded a major centre to research and monitor developments internationally in electronic commerce at the University of Tasmania.

¹ "State, Territory and Local Government Assistance for Industry" (Industry Commission Report No. 55, AGPS, Canberra, October 1996), the overview document is available at <http://www.indcom.gov.au/inquiry/stateass/final/index.html>

² the Ireland case study is a summary from the Allen Report - "Spectator or Serious Player: Competitiveness of Australia's Information Industries"

³ <http://www.dist.gov.au/itt/tskforce/allen/appendd.html>

⁴ at <http://www.forbairt.ie>

⁵ These include Sun Microsystems, Hewlett-Packard, Oracle, 3Com, Cisco Systems and Intel.

⁶ Some of the Silicon Valley IT workers commute from elsewhere in the Bay area, hence the apparent discrepancy between the population and workforce figures.

⁷ Stephen Levy of the Centre for Continuing Study of the Californian Economy quoted in the Survey of Silicon Valley, *The Economist*, 29 March, 1997

⁸ Castells, Manuel, "Rise of the Networked Society", Blackwell, Oxford, UK, 1996

⁹ Saxenian, Annalee, *The Regional Advantage: Culture and competition in Silicon Valley and Route 128*, Harvard University Press, Cambridge, Massachusetts and London, 1994

¹⁰ Route 128 refers to a ring road around Boston, which links a number of high tech companies, universities and research institutions. Up until the early 1980s the two regions were seen as roughly equivalent as the centres of the United States' high tech, particularly information technologies innovation and companies. While Route 128 has continued to grow, and is still the country's second most important IT region, it has fallen well behind Silicon Valley in the past decade.

¹¹ Castells, *ibid*

¹² According to *The Economist* in "Vital Intangibles", A Survey of Silicon Valley, *The Economist*, 29 March, 1997

¹³ This summary draws heavily on "Telecommunications as a Catalyst for Regional Development: the New Brunswick Example", by Marina and Greg Cavill, unpublished (1997) and two presentations by Mr Gerry Pond, CEO of New Brunswick Telecom at the Australian Telecommunications Users' Group Conferences in 1996 and 1997.

¹⁴ low real estate costs, low cost of government, no payroll tax, relatively low rates of pay and high retention rates.

¹⁵ "Worms of recession eat at Apple Isle's core", by Bruce Montgomery, *The Weekend Australian*, 28 February-1 March, 1998

Appendix A: Purpose of the Study and Terms of Reference

1 Purpose

To enable the Technology and Industry Advisory Council (TIAC) to more effectively contribute to the Information and Policy Council (ICPAC) in terms of ICPAC's major objective of developing a more significant role for Western Australia in the emergence of a global information industry.

The Federal Government has raised national debate on the Global Information Economy by the recent release of the Mortimer Report, the Goldsworthy Report and the Information Policy Advisory Council Report. Each of these reports approach the issues from different viewpoints and, as such, offer some variations in their recommendations to government. There is a need for the Western Australian community to consider both its position within this national debate, and its various options for participating in the National and Global Information Economy.

2 Terms of Reference

- 1 Briefly outline the current structure of Western Australia's information and communication industry.
- 2 Using appropriate references identify the key issues and forces associated with a region such as Western Australia participating in the global information and communications market
- 3 Outline four broad scenarios for Western Australia's participation in the global information and communications market.
- 4 Develop policy directions that the State would need to consider in order to achieve the outcomes in the scenarios described in 3. above.

Appendix B: TIAC Steering Committee for this Report

Chairman:	Mr Rob Meecham
TIAC Member:	Ms Leslie Chalmers
TIAC Member:	Mr Tony Tate
Department of Commerce and Trade (Office of Information & Communications)	Mr Michael Ashford

Executive Officer:	Mr Earl White
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Work on this study was completed by Peter Morris of Morris Moorhouse & Associates. He was assisted by Thomas Dickson in gathering much of the Western Australian economic data contained in the report.

The project was undertaken through the offices of Dr Lynn Wadley of Curtin University Consultancy Service.

Appendix C: Industry Consultation

Following the production of the first draft of this report a comprehensive process of industry consultation was undertaken. This occurred in two phases: holding an Industry Forum and individual briefing sessions for a number of industry groups.

The Industry Forum was held at Technology Park, Bentley on Thursday, 30 July and was attended by representatives of all the major Information Industry associations as well as representatives from State Government and the leading companies and organisations from the sector. The Forum included a presentation of the Draft Report and then the participants working in groups, commenting on particular issues.

1 Industry Forum Attendees

Michael	Ashford	Dept of Commerce and Trade
Jeff	Beale	Beale Telecommunications
Jo	Blignaut	Dept of Commerce and Trade
Sharon	Browne	Scitech Australia
Mal	Bryce	Dow Digital
Louise	Capewell	Dept of Commerce and Trade
Andy	Dent	Australian Computer Society
Phil	Edmiston	Silicon Graphics
Steve	Floyd	Gibson Quai & Associates
Barney	Glover	Curtin University of Technology
Mike	Grant	Imago Cooperative Multimedia Centre
Robert	Gray	Australian Multimedia Industry Association
Walter	Green	Australia Telecommunications Users' Group
Ivan	Gustavino	CyberResearch
Warwick	Holder	Netsource
Chris	Isaac	Curtin University of Technology
Richard	Joseph	Murdoch University
Barry	Judge	Telstra
Joe	Luka	Australian Multimedia Industry Association
Rob	Meecham	TIAC
Peter	Morris	Morris Moorhouse and Associates
John	O'Sullivan	Australian Computer Society
Monish	Paul	Dept of Commerce and Trade
David	Price	AAP Telecommunications
Larry	Quick	Dow Digital
Nigel	Radford	TIAC
Bernie	Robinson	IBM
Lance	Sanderson	Communications Expert Group

David	Taylor	AOT Consulting
Lynn	Wadley	Curtin Consultancy Services
Tony	Watson	Australian Computer Society
Earl	White	TIAC
Zelko	Lendich	University of Western Australia

2 Others with whom discussions were held subsequently

Rob	Ackland	Contract and Management Services
Hugh	Beggs	AlphaWest
Geoff	Booth	Telstra
Geoff	Gander	Intellect
Lyn	Girdlestone	Chamber of Commerce and Industry WA
Brendan	McCarthy	Chamber of Commerce and Industry WA
Paul	Tzaikos	Contract and Management Services
Tim	Ungar	ERG

3 Notes from Group Discussions

(a) Group 1

Agree in principle with the Draft Report, much of what it proposes are already being addressed by the Office of Information and Communications.

The Report requires more emphasis on detail, with a bolder, stronger and more accountable mechanisms for delivery.

It should not focus only on mining and resources.

(b) Group 2

Believe the report is fine as a starting point, there needs to be more detail and not so much emphasis on mining.

There is not sufficient attention given in the report as to the shift from an industrial to an online economy. It looks at the future from an IT&T perspective which sees the technologies as an "add-on" to existing structures, it does not take account of the scale of change we can expect. The report should be setting a vision into the future which acknowledges the online economy's different characteristics.

An aspect of this is that in the future content and services will be king, not IT&T.

Ideas such as TimeShift, Distributed learning and Distributed work are all very useful. WA's expertise in Mining, Transport, Environmental management, Engineering, Health services and Sports management all offer opportunities.

There needs to be Greater Industry/Government/Association interaction.

As this transition continues the danger Vendor lock-in will become increasingly important. We need to consider this as companies when signing agreements and at a government(s) level.

There needs to be a focus on strategy for Economic Development which states the outcomes clearly in terms of jobs and growth.

An action plan needs to be created which is measurable, reportable and accountable.

(c) Group 3

The group agreed with the Draft Paper but felt the Vision Statement was too Perth-centric and did not take sufficient account of regional Western Australia.

The document lacks a "compelling event" which will serve as a driver for the necessary changes outlined in the recommendations.

The process needs a high level tactical path.

Additional work which needs to be undertaken (to be run in parallel):

- data collection/analysis on the industry to ascertain the reasons for existing successes and failures, and;
- generate an economic plan to attract technological infrastructure. It may be possible to use a major WA issue (eg remote communication services) as vehicle to enable WA to enter international "time shifts" by "being there". (Health & Education could be the foundations leading to export possibilities for both industries.)

There is a need high profile approach from government to realise the full potential of the sector, maybe a Minister for ITC is required.

Further comments:

- focus on application not delivery mechanism;
- Government should not issue prescriptive RFT (eg, for bandwidth), they should be framed in terms of service delivery to enable and encourage innovation from industry, and;
- encourage but don't mandate R&D in procurement

(d) Group 4

There is a need to support fast growth ICT companies. The business creation process should be modelled so that barriers can be identified and strategies developed to overcome them.

Emphasise R&D as a key element (eg purchasing criteria).

Align Universities, TAFE Colleges and other educational institutions' strategies with the goals outlined in the draft document.

There is a serious and urgent need to educate politicians of the changes ICTs are bringing generally and to become more sophisticated about the industry.

Western Australia's share of Federal initiatives needs to be maximised

(e) Group 5

The report lacks an implementation strategy to ensure it doesn't just vanish.

The Summary Report is less readable than original – non-specialist got lost.

“TimeShift” & resource-based development needs to be put into an executive summary.

There is a need for a strong and active champion at government level.

The Victorian Government pressures MNCs which have a base in that state to be good corporate citizens. How do we get them here, how do we get the Western Australian Government to do become more proactive in this?

Western Australia's push into this area needs a sexier title to match “Multimedia Victoria”.

There is a need to incorporate examples such as the CSIRO's current proposal for a high performance computing/visualisation centre of excellence into the strategy.

The Oil & Gas industries are relatively weak on ICT locally. It may be possible to pool expertise in Mining IT and Oil & Gas knowledge together to generate new applications.

Possibly unjustified criticism, does SBDC provide export-oriented support? In particular, could a “work-for-dole” scheme be used to provide older business admin people to “supercharge” our 15-25 y/o into businesses.

Australian Interactive Multimedia Industry Association (WA Chapter) Submission

The AIMIA WA Chapter Executive Committee offers the following ideas to the *From Mines to Minds* Workshop held on 30 July 1998.

Ideas for how the Office of Information and Communications can help/stimulate the Interactive Multimedia Industry in Western Australia.

1. Promote delivery of government services and information using online and disc-based methods.
2. Draw a clear distinction between *Information Technology & Telecommunications* (process driven) and *Interactive Multimedia* (content driven) industries. While IMM is clearly seen by many as part of the broader IT&T industry, the difference in the culture of the companies and people involved is quite great.
3. Provide funding assistance to local government and community groups in rural and remote WA, to establish Web sites (using services of commercial developers).
4. Provide funding assistance to *Regional Development Commissions* and *Business Enterprise Centres* in rural and remote areas to provide e-commerce training and facilitation services (through commercial training providers).
5. Introduce requirement for government departments to spend a given proportion of their training budgets on disc-based and online interactive training programs.
6. Provide funding for a series of seminars/forums to educate government departments (including CAMS and State Supply) on how to provide appropriate specifications for IMM projects. And to educate the IMM industry on government tendering requirements.
7. Provide venues with projector and sound equipment for IT&T and IMM associations to hold meetings (eg., the Queensland government provides such facilities within their *Industries Assistance Board* building).
8. Provide funding to create a Web-based directory and showcase of WA's IMM content providers.
9. Provide budgetary and other incentives to encourage government departments and statutory authorities to adopt e-commerce.
10. Establish quarterly forum events to report to the IT&T and IMM industries re progress on all projects that the OIC is involved in, to get industry feedback/input on these.
11. Assist in funding a program of e-commerce education seminars for the public and SMEs throughout Western Australia.

Appendix D: New Rules for the New Economy

by Kevin Kelly
- summarised from Wired, September, 1997

1 The Law of Connection: embrace dumb power

The network economy is being driven by two forces: the falling price and size of microchips and the explosion in their use in devices of all kinds.

There are 200 million computers in operation today but there are 6 billion non-computer microchips in everything from a stove, motor car and stereo.

This non-PC is the net that begets the Network Economy.

2 The Law of Plentitude: more gives more

Curious things happen when you connect all to all. Mathematicians have proven that the sum of a network increases with the square of the number of members. In other words as the number of nodes in a network increases arithmetically, the value of the network increases exponentially.

The first fax put into operation in 1965 was worth nothing, despite the millions spent on R&D producing it, because it had no other machines to communicate with. The real value in a fax machine today is not so much the value of the machine but the value of connecting to the 18 million machines already online.

The fax experience suggests that the more plentiful things become, the more valuable they become. But this notion directly contradicts two of the most fundamental axioms we attribute to the industrial age.

First axiom: Value came from scarcity; diamonds, gold, oil and university degrees were precious because they were scarce.

Second axiom: When things were made plentiful they became devalued; carpets no longer indicated value when they could be woven by the thousands on machines.

The logic of the network is the opposite of much we have been raised with. The value in the product or service of itself declines while the network which invents, manufactures and/or distributes becomes increasingly important.

In the Network Economy, scarcity is overwhelmed by shrinking marginal costs. When the expense of churning out another copy becomes trivial (and this is happening in more than software), the value of standards and the network booms.

3 The Law of Exponential Value: success is non linear

The networked economy has produced a growing number of examples of exponential growth: the Internet, the facsimile as mentioned earlier, and Microsoft. During its first ten years Microsoft (founded in 1977) produced negligible profits. Not until 1985 were the company's results anything out of the ordinary and from that point they exploded. Fax machines were a 20 year "overnight" success. Similarly the Internet, its foundations established in the early 1960s was all but invisible outside the cognoscenti until 1991 when it began growing at a dizzying rate.

The compound successes - which have been likened to growth in a biological system - all hinge on the prime law of networks: that value explodes exponentially with membership, while this value explosion sucks in even more members, the Law of Increasing Returns.

The subtle but crucial point from these examples is that this explosion did not ignite until approximately the late 1980s. Something happened then. That something was the dual big bangs of cheap, ubiquitous chips and falling telecommunications charges. It became feasible - that is dirt cheap - to exchange data almost anywhere anytime. The net began to nucleate.

4 The Law of Tipping Points: Significance Precedes Momentum

In retrospect it can be seen from these cases of exponential growth that there was a point of no return - success was virtually inevitable. To use biological analogies, there is a point where a disease has infected sufficient numbers of hosts that it has the momentum to be classified an epidemic; the tipping point. In biology the tipping points of fatal diseases are fairly high, but in technology they seem to be much lower.

There has always been a tipping point in any business - industrial or networked - after which success feeds upon itself. However the fixed low costs, insignificant marginal costs, and rapid distribution that we find in the Networked Economy depresses tipping points below the levels of industrial times; it is as if the new bugs are more contagious, and more potent.

Lower tipping points mean that the threshold of significance - the period before the tipping point, during which a movement, growth, or innovation must be taken seriously - is also dramatically lower than it was during the Industrial Age. Detecting events while they are beneath this threshold is essential.

In the past an innovation's momentum indicated significance. In the network environment significance precedes momentum.

5 The Law of Increasing Returns: make virtuous circles

As we have seen, the prime law of networking is the law of increasing returns: value explodes with membership and the value explosion sucks in more members.

Silicon Valley can be seen as an example of this pattern. Each new successful start-up attracts others which attract more capital, skills and more start-up companies.

The Law of Increasing Returns is far more than the traditional idea of economies of scale. Henry Ford used his success to improve production techniques which enabled him to cut prices, sell more fuelling more innovation and even better production methods enabling him to dominate his industry. While the law of increasing returns and the economies of scale both rely on positive feedback loops, the former is propelled by the amazing potency of net power and the latter is not. Industrial economies of scale increase value linearly while the law of increasing returns builds value exponentially.

The advantages gained by a successful player in an industrial age market can and will tend to be retained by that organisation far more easily than the law of increasing returns permits in a network market.

The law of increasing returns favours the early. The initial parameters and conventions that give a network its power quickly freeze into standards.

6 The Law of Inverse Pricing: Anticipate the cheap

A curious aspect of the Network Economy which would astound a person living in 1897 is that the very best gets cheaper each year. Through most of the industrial Age, consumers experienced slight improvements in quality for slight increases in price. But the arrival of the microprocessor flipped the price equation.

In the information age consumers count on drastically superior quality for less price over time. The price and quality curves diverge so dramatically that it sometimes seems as if the better something is, the cheaper it will cost.

As microchip prices have plunged while there capacity has improved we are at the beginning of a similar curve in the telecommunications arena.

As the function per dollar coast of these products improves exponentially they have a massive flow-on effect into virtually every other industry. Just as this pattern is turning microchip and communications-based products and services into commodities – pushing them on a downward slide ever closer to being free - these technologies are having the same effect on every other industry they touch. The challenge is to develop new things faster than they are converted into commodities and forced down the price slide.

7 The Law of Generosity: follow the free

If services become more valuable the more plentiful they are (Law 2.), and if they cost less the better and the more valuable they become (Law 6.) then it follows that the most valuable things of all should be those which are given away.

Microsoft gives away its Web browser, as does Netscape. Qualcomm, which produces Eudora, a widely used e-mail program is also given away generating revenue from upgrades.

The examples are growing. It is hard to imagine such a strategy being adopted 50, or even ten years ago, but now it is seen as entirely logical banking on the network economy's new rules. Because compounding network knowledge inverts prices the marginal cost of an additional copy (intangible or intangible) is near zero. Because value appreciates in proportion to abundance, a flood of copies increases the value of all copies. Once the product's worth and indispensability is established, the company sells auxiliary services or upgrades, enabling it to continue its generosity and maintain this trend.

This pattern can apply to tangible products as well as software. The pricing strategies of mobile phone companies are an excellent example, virtually giving away handsets in return for capturing business to their networks.

It is natural to ask how companies are expected to survive in a world of generosity. Three points will help:

- Think of free as a design goal for pricing;
- While one product is free this positions its "cousin" products to be valuable. Sun Computers gives away its Java software to help sell network servers, Netscape hands out browsers to help sell commercial server software, and;
- Following the "free" enables a company to rehearse the inevitable.

Another way to view this effect is in terms of attention. The only factor becoming scarce in a world of abundance is human attention. Giving away products attracts attention, or mind share, which then leads to market share.

8 The Law of Allegiance: feed the web first

The distinguishing characteristic of networks is that they have no clear centre and no clear perimeter.

The network is an extremely volatile environment, rich with possibilities. For investors and companies deciding which options to take up this can present problems. Standards are the computing industries approach to narrowing the huge number of possibilities to something manageable. Standards strengthen a network, their constraints set a path which allows innovation and evolution to accelerate.

In a network as for a country, the most reliable way for an individual to increase their wealth is for the system to grow. But there are a number of points on which this similarity between countries and networks do not hold:

- on a network no geographical boundaries exist, relations flow 24 hours a day, seven days a week, 365 days a year;
- relations in the Network Economy are often more tightly coupled, more intense, more persistent and more intimate than many in a country, and;

- multiple overlapping networks exist with multiple overlapping allegiances.

9 The Law of Devolution: let go at the top

The tightly linked nature of any economy, but particularly the network economy, makes it behave ecologically. The fate of organisations is not entirely dependent on their own actions. The fate of their neighbours, allies, even competitors can determine their fate.

In the Network Economy there is no shortage of opportunities. Niches appear, and disappear, quickly. One day you are king of the mountain, the next day there is no mountain at all.

Biologists describe the struggle of an organisation to adapt to its environment as a long climb uphill, where uphill means greater adaptation. In this example an organism which is best adapted is located at the peak; it is easy to imagine examples from the business world.

Unlike the Industrial Economy, and its comparatively steady path of market development, in the Network Economy it becomes increasingly difficult to work out which peaks are the highest and which are mirages. To aim for a mountain top which is believed to exist, or will soon exist, with a multi-million dollar development program is certainly not for the faint hearted.

The harsh news is that getting stuck is a certainty in the new economy. Sooner rather than later a new product will be eclipsed at its prime. While one product is at its peak another will move the mountain (and the previous conqueror from its view) by changing the rules.

This means companies must be able to reverse and come down the mountain to tackle the next one.

But organisations, like human beings, are hard-wired to optimise what they know and not to throw success away. Companies find devolving (a) unthinkable and (b) impossible. There is simply no room in the enterprise for the concept of letting go - let alone the skill to let go - of something that is working, and trudge downhill toward chaos.

And it will be chaotic and dangerous down there. The definition of lower adaptability is that you are closer to extinction. Finding the next peak is suddenly the next life-or-death assignment.

The biological nature of this new era means that the sudden disintegration of established domains will be as certain as the sudden appearance of the new. Therefore, there can be no innovation unless there is also expertise in demolishing the established.

10 The Law of Displacement: the net wins

Over the past century materials have been displaced by information: cars have become lighter and perform better. Most of the energy a car consumes is used to move the car, not the passenger(s). So if the car's body and engine can be reduced then less power is needed and the engine can be even smaller and so on down the same slide of compound values that microprocessors have followed.

The replacement of many of a car's bulkier items with chips and intelligence can drive this pattern further still. In time we will begin to think of vehicles not as cars with chips but as chips on wheels. Other solid, tangible items such as aeroplanes, houses and farms will become more important for their electronics and connectivity for control and monitoring than the atoms we have seen them as.

Where the economics of software and other information industries were seen as special cases within the "real" economy they will steadily replace the old until the behaviour of the Network Economy becomes the whole economy.

11 The Law of Churn: Seek sustainable disequilibrium

In the Industrial Age the economy which was fine-tuned to optimal efficiency. Those companies and industries which employed thousands had/have to be protected at all costs.

This "steady state" approach does not exist in the network world: players are interlinked and constantly evolving, constantly in flux with boundaries changing all the time.

Change is well known in the Industrial Economy and the transitional period we have been in. But the Network Economy has moved from change to churn. Churn topples the incumbent and creates a platform ideal for more innovation, and this tends to hover on the edge of chaos. Companies come and go quickly

Donald Hicks of the University of Texas has studied the half life of Texan businesses over the past 22 years and found their longevity has dropped by half since 1970. That is change. Austin, the city in Texas with most of the state's Information Industry companies has the shortest expected life spans for businesses and, paradoxically, has the fastest growing number of jobs and the highest wages. That is churn.

Hicks said, "the vast majority of employers and employment on which Texans will depend in the year 2026 - or even 2006 - do not yet exist." In order to produce 3 million new jobs by 2020, 15 million new jobs must be created in all, because of churn "Rather than considering jobs as a fixed sum to be protected and augmented", Hicks argued, "the state should focus on encouraging economic churning - on continually re-creating the state's economy."

12 The Law of Inefficiencies: Don't solve problems

Economists once thought that the computer age would bring massive productivity increases but it has not. This is because productivity is exactly the wrong thing to care about.

There have been productivity gains in the US and Japanese manufacturing industries through the 1980s and early 1990s but not in the service industries - and why should we expect them in this sector? Any job that can be measured for productivity should probably be eliminated.

The management theorist, Peter Drucker, has said that in the Industrial Age the task of each worker was to discover how to do his job better. In the Knowledge Economy, where machines do most repetitive work in manufacturing, the task for each worker is not "how to do this job right" but "what is the right job to do?" In the coming era, doing the exactly right thing is far more productive than the same thing better. Determining the difference will be invisible to productivity measures.

Wasting time and being inefficient are the ways to discovery. Peter Drucker has said, "don't solve problems, seek opportunities". When you are solving problems you are investing in your weaknesses; when you are seeking opportunities you are banking on the network.

The wonderful news about the Network Economy is that it plays right into human strengths. Repetitions, copies and duplication all tend toward the free, while the innovative, original and imaginative all soar in value.

Appendix E: Europe Proposes a Customs-Free Internet

By John Parry, TechWeb
(22/2/98; 11:58 am. Eastern Standard Time - US)

The European Union will submit proposals shortly for making the Internet free of customs fees -- adding its weight to a US. proposition, World Trade Organisation (WTO) officials said. But developing countries are still wary of embracing the Internet into the organisation's work program. "We simply don't know enough about it," according to Egyptian Ambassador Mounir Zahan.

The US. formally put the proposal on the World Trade Organisation agenda on Thursday, asking for work to begin on the Internet legislation later this year. US. Ambassador Rita Hayes said Washington wants WTO members to agree to renounce levies on electronic transmissions.

No such levies exist now, according to US. officials, but the idea might arise unless formal legislation is passed.

The International Telecommunications Union (ITU) has estimated that annual Internet expenditure -- now in the region of \$8 billion -- may rise to as high as \$327 billion by the year 2002.

ITU is trying to draft an international regime to police the Internet and, according to US. officials, the World Trade Organisation could be pulled into the process by trying to control the electronic sale and delivery of goods and services. These would include audio and video products and services such as consulting, accounting, and advertising.

With the US. proposal the only one on the table so far, delegates are waiting for the European Union to come up with its own ideas. The union has said it is working on an international charter that will cover trade aspects as well as wider-ranging areas.

The union is also planning a ministerial-level conference later this year to discuss these issues as well as the registration of Internet addresses.

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