

Directions for Industry Policy

in Western Australia within the

Global Knowledge Economy

March 2002





WESTERN AUSTRALIAN
TECHNOLOGY & INDUSTRY ADVISORY COUNCIL

**Directions for Industry Policy in Western Australia
within the Global Knowledge Economy:
Sustainable Prosperity through Global Integration**

March 2002

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Foreword

Since the release of our discussion paper, "Drivers and Shapers of Economic Development in Western Australia in the 21st Century" in September 2000, debate has intensified on the impacts of globalisation and the knowledge economy on regional economies, such as Western Australia. New terms, such as 'Branch Office Economy', have been coined to describe the adverse impact of international corporations merging and consolidating their core intellectual property functions at locations external to Western Australia and Australia generally.

Following analysis of feedback from industry and the wider community on the "Drivers and Shapers" report, TIAC developed terms of reference for this follow-up study. While we acknowledge the continuing underlying strengths of the WA economy, we believe the development and implementation of a proactive set of industry policies is an imperative for the current State Labor Government led by Dr Geoff Gallop. This report identifies and describes both the opportunities and the challenges facing Western Australian industry as a consequence of the impacts of globalisation and the advent of the knowledge economy. The report proposes a clear course of immediate action for the government, in partnership with industry, that provides the best chance of continuing strong economic growth and, even more importantly, a significant growth in full-time, highly skilled, quality jobs.

TIAC is strongly of the view that this report provides the appropriate template for a set of sound industry policies for Western Australia. The recommended policy directions have been developed in such a way that they can be embraced by industry. Indeed success will be maximised when industry is fully on board and supportive of Government industry policies.

I would like to thank Professor Peter Sheehan, Professor John Houghton and Mr Ainsley Jolley from the Centre for Strategic Economic Studies, Victoria University of Technology, Professor Ron Johnston from the Australian Centre for Innovation and International Competitiveness and Mr Peter Morris from Whitehorse Strategic Group.

Bruce Sutherland
Chairman
TIAC Steering Committee

Executive Summary

Interpreting the Knowledge Economy

The starting point for this study is the fact that globalisation and the transition to a knowledge-based economy are driving a transformation of the nature and structure of the world economy. The rise in the *knowledge intensity* of economic activities and the increasing *globalisation* of economic affairs are driving pervasive change affecting every industry, firm, individual and region.

This transformation is not a matter of one or two technologies or industries. Nor is it just another way of emphasising the ICT revolution or any particular new technology, such as biotechnology. These are all important, but they are not the whole story. Knowledge generated on a global basis is being applied to all industries, and many existing industries are very advanced. For example, the Australian mining industry is a global leader in innovation and development. The response of existing industries will be as important as the creation of new industries, and will give rise to many new business opportunities.

In seeking to understand emerging trends, much of the contemporary literature emphasises the *systemic* nature of relationships and activities in the economy. The systemic approach recognises a whole range of non-market linkages that are central to the economic system (such as organisational and institutional persistence, cooperation, alliances, information exchange and mutual dependency), as well as the role of organisations other than firms.

This systemic character is of three main forms. One is the persisting influence of past events on present and future outcomes (*path dependence*). The second is the complex linkages between many different institutions and organisations at a given point of time, such as those that determine the level of innovation (*the innovation system*). The third is the linkages between the various aspects of a complex system involved in the creation, production and distribution of a product, or a set of products (*the product system*).

Recognition of this systemic character has many important implications for policy. They include the need to focus on a region's innovation system and on the positioning of its firms within global product systems. This systemic character also implies that, however urgent and transformative it is, change must be evolutionary, with a progressive strengthening of the organisations, institutions and systems supporting regional growth.

The major elements in the global knowledge economy all impact on the choices made by firms about where to locate their activities. These impacts may weaken the position of many economies. Indeed, the new technologies have made possible the consolidation of particular aspects of the product system in preferred locations on a global basis. This has led to the 'hollowing out' of peripheral regions in many important respects.

Thus a central challenge facing many economies is to use the increased access to global markets and information sources that the new economy makes possible to offset the impact of global consolidation on the structure of their economies.

The Position of Western Australia

Like Australia as a whole, Western Australia is forced to address the challenges facing small peripheral economies in the emerging world. But it does so from a base of centrality in certain resource areas, and in some other areas as well. This report, as indeed most discussions of the State's longer-term future, is essentially concerned with this interplay between the problems of small peripheral economies and the opportunities provided by the State's existing strengths.

Several conclusions emerge from a review of the situation of Western Australia at the beginning of the 21st century. The State has continuing strengths in a range of goods industries, and in the services that underpin these industries. This is evident not only in the mining and resources sector but also in manufacturing, where employment has continued to grow against the national trend and where exports are growing strongly in specific niche areas.

On the other hand, there are several signs in the State of that 'hollowing out' of domestic capabilities characteristic of a peripheral economy in a globalising world. These signs include falling full-time employment in recent years in certain service areas (finance, cultural services and personal services); slower than national employment growth in communications and a low share of the ICT industry activity; and sharp falls in business sector R&D in recent years. It is perhaps too early to draw any definitive conclusions from these signs, but these are early warnings of powerful forces at work.

This suggests that our conclusion above about many peripheral economies applies also to this State. That is, that a central challenge for policy in Western Australia is to use the increased access to global markets and information sources that the new economy makes possible to offset the impact of global consolidation on the structure of the economy.

The Role of Industry Policy

The role of industry policy is one of the most contentious issues in applied economics. The position taken in this report is that, in the global knowledge economy, factors giving rise to market failures are pervasive, and even systemic, and that in appropriate circumstances government policy can generate an improved outcome. This means that there is a definite role for carefully specified industry policies. But it must be clearly recognised that governments as well as markets can fail and that, as far as possible, such policies should enhance rather than confound the operation of market forces.

This position is consistent with the dominant trend in the theoretical and empirical literature, with much of the specific literature about the knowledge economy, and with the practice of many governments around the world in responding to the emerging economic situation. If industry policy is to be effective, it is also vital that the programs in which it is expressed be up to the scale of the challenge facing Western Australia. This implies that they are both sufficiently well resourced, and sufficiently well targeted on a limited number of programs, to make a real difference to the structure of economic activities in the State. The many industry policy initiatives that currently operate within the State may be too small and diverse to have

such an impact. Our assessment is that a coordinated program of the order of \$200 million a year for four years, or about 1% of GSP over the four year period, would be of a sufficient scale to influence the long term structure of the Western Australian economy.

This report is about the directions for industry policy in Western Australia. It does not attempt to develop detailed policy specifications, to prescribe specific funding levels nor to allocate a suggested level of funding over policy areas or specific programs. The detailed development of policies, and the allocation of funding, is a matter for the Government and its departmental advisers. We do emphasise, however, that financial responsibility involves not only short-run management of revenue, expenditure and debt, but also requires that prudent attention be given to the long run health of the State's economy.

Directions for Industry Policy in Western Australia

The key directions for industry policy in Western Australia should be the following:

1. *A strategic, whole of government approach to industry policy.* The policy needs to be strategic in that its various elements are integrated into a coherent whole and in that the many relevant activities and resources of government are brought to bear to achieve the overall objectives. Focus and priority setting, and hence adequate support (in terms of both funding and staff) of a small number of programs, is also critical.
2. *Systematic programs to increase the number, scale and impact of globally oriented firms active in the State.* In our view, these programs should have three elements:
 - a strong investment attraction program, focused specifically on firms which bring dynamic benefits to the Western Australian economy and innovation system, and using support measures which recognise those dynamic benefits;
 - continued and expanded programs to support the emergence of local firms to global competitiveness; and
 - a new linkage program, to promote and deepen the linkages between globally oriented firms and other firms and organisations within the economy.

Taken together, these programs would aggressively pursue new investment in the State by global firms, support the growth of local firms looking to world markets and develop in a systematic way the linkages between various types of firms and organisations in Western Australia. The report outlines a methodology for identifying, and providing incentives to, firms that will enhance, in systemic ways, the ability of the State's economy to compete and prosper in a rapidly changing world. It also draws on the important UNCTAD document, *World Investment Report 2001: Promoting Linkages* (UNCTAD 2001), to develop an outline of a linkage program that would be quite new in the Australian context.

3. *Initiatives to build the Western Australian innovation system.* These initiatives should focus particularly on increasing the scale of innovative activities, on generating greater collaboration, shared focus and hence critical mass within the innovation system, and on facilitating stronger international linkages.

4. *Programs to generate increase leverage off national policies.* Resources within the State are inevitably limited, so that systematic attention needs to be given to ensuring that Australian Government programs are fully utilised to support development within the State.

Consistent with the theme of Minister Clive Brown's address *Building WA: A Strategic Partnership* of 4 September 2001, a number of these programs could be effectively developed and delivered through a public-private partnership. Thus their delivery might involve both the proposed Western Australian Business Investment Centre and existing agencies, and they need to build on, enhance and where necessary replace existing programs in these areas.

A Profile of a Western Australian Knowledge Economy

The report also outlines one possible scenario for Western Australia's future in the knowledge economy, and hence provides one profile of continued prosperity for the State in this emerging world. This profile is intended to give substance and direction to the policy process, by illustrating one possible outcome of a successful policy process. It is neither a forecast nor a projection, but a scenario to provide a quantitative framework for the development of policy. In the current era of turbulent change, it is not possible to predict future outcomes with any certainty, and forecasts or projections which claim to do so are misleading. But policy should be developed and implemented with an awareness of the key magnitudes involved, and of the possible outcomes of policy initiatives. The scenario is intended to provide such a framework, with regard to full-time employment.

One specific feature of this WA scenario is renewed growth in the goods industries, with an increase of 40,000 new full-time jobs (1.7% per annum) over the period. Reflecting policy initiatives in terms of innovation and the environment, agricultural employment shows renewed growth. Mining employment continues to expand, and policy supports accelerated growth in manufacturing. The key policy impacts are in manufacturing and agriculture. If achieved, this growth in full-time employment in the goods industries would be one continuing way in which Western Australia is different from the rest of Australia.

However, the major source of employment growth over the period is knowledge based services, which provides half of the increase in total full-time employment. Many of the policy initiatives taken by the Government, and many of the increased activities of foreign firms, are concentrated in business services, where full-time employment is assumed to grow by 6% per annum on a strengthening base. A number of areas are seen as contributing to the growing business services sector: further progress in building global activities in mining services; expansion in environmental services, to meet both local needs and international markets; increased innovation and technology support services, and so on. It is also presumed that there is increased spending by both the public and the private sectors on education, and that health employment continues to grow. The profile also assumes some improved performance in Western Australia - as a result both of policy and of a stronger, more globally integrated economy - in those areas in which polarisation is particularly evident (finance, information technology and communications services and cultural services).

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1 Introduction

This report is a sequel to the TIAC report *Drivers and Shapers of Economic Development in Western Australia in the 21st Century*, released in September 2000. The focus of that earlier study was the fundamental reshaping of global economic activity that is currently occurring, and the structural implications of this process for Western Australia. The central argument was that, in spite of its remarkable achievements over the past thirty years and its current strengths, the Western Australian economy will need to change substantially over the next decade or so if the current quality of life in the State is to be maintained and enhanced. The present study attempts to take the analysis further, by exploring in more detail the opportunities for structural change and growth in Western Australia and the industry policies by which such change and growth might be stimulated.

The context of this report is shaped both by the objectives and intentions of the Western Australian Government and by recent international developments. Thus we recognise the importance to the Government's policy objectives of the three forms of sustainability - economic, social and environmental - and endorse these as the appropriate context for this report. We also endorse the three roles for industry policy outlined by Minister Clive Brown in his address *Building WA: A Strategic Partnership* of 4 September 2001: creating a true partnership between Government, industry and the community to promote economic development, developing an 'open for business' regulatory and fiscal environment, and working with industry and business to improve the State's capacity for economic growth. The partnership approach is central to contemporary industry policy, and in large part this report addresses ways in which such a partnership can stimulate sustainable growth in output and employment in Western Australia. An appropriate regulatory and fiscal context is also critical to sustainable growth, and we also note the budgetary constraints on industry policy that the Minister highlighted in his address.

Recent events, such as the terrorist attacks in the USA on 11 September 2001 and the coordinated international response, have highlighted the reality of key aspects of the global knowledge economy, especially the degree of global integration in terms of crisis, impact and response and the pervasive role of information technology and other advanced technologies. They have also highlighted the risks inherent in a narrowly based economic structure, whether that be in Singapore or in Western Australia. These events have also led some governments to realise that many of the risks facing nations and regions cannot be adequately met by the unfettered operation of market forces alone. Addressing such risks often requires a more coordinated marshalling of the skills and resources of the whole community. This conclusion is relevant to the task facing Western Australia in terms of economic structure and industry policy.

2 Industry Policy in a Changing World

2.1 The Global Knowledge Economy: Some Policy Implications

The starting point for this study, as for TIAC's previous report, is the fact that globalisation and the transition to a knowledge-based economy are driving a transformation of the nature and structure of the world economy. This is changing the ways in which people live and work, changing demands on national, state and local governments, and changing people's attitudes to work, leisure, economic development and the environment. Many believe that forces are at work that will reshape national and regional economies, and the societies that they serve, to an extent comparable to the original Industrial Revolution. The implications for sub-national regions are also widely held to be profound. Governments around the world are responding with a vigorous round of new 'knowledge economy' policies.

These two interlinked factors – the rise in the *knowledge intensity* of economic activities and the increasing *globalisation* of economic affairs – are the main defining features of the emergence of the global knowledge economy. However, it is important to note that the term 'Knowledge Economy' refers to the overall economic structure that is emerging, not to any one, or a combination of, these phenomena. The global knowledge economy is the quite new set of economic activities, structures and relationships that is emerging in a world of high and increasing knowledge intensity and globalisation.

Perhaps the most important fact about the knowledge economy is that it is pervasive. Its rise is a pervasive change affecting every industry, firm, individual and region. It is not a matter of one or two technologies or industries. Nor is it just another way of emphasising the ICT revolution, the Internet or any particular new technology, such as biotechnology. These are all important, they are all aspects of the way in which knowledge intensive global competition pervades all aspects of economic life. But they are not the whole story.

Nor is there a simple distinction between the 'new' and the 'old' economies. Many existing industries are very advanced. For example, the Australian mining industry is a global leader in innovation and development. Equally, the injection of knowledge into the 'low tech' food and wine industries in the past decade or so has produced great benefits for Australia. Thus the response of existing industries to these challenges will probably be as important, if not more important, than the creation of new industries – although they should not be neglected.

Some of the more specific characteristics of the knowledge economy as it affects Western Australia, and of its policy implications for the State, are analysed in the body of the report. But it may be useful here to note some of the broad themes that have emerged from the international literature and from the practice of governments. A fuller discussion is to be found in Supporting Paper 1.

A viable response to the challenge will involve major changes in direction, long term strategy and consensus. Many national and regional governments have concluded that, if major change is not undertaken, the economic future of their region may be limited in the new economy. Thus many have embarked on new policy initiatives, aimed at facilitating change in the nature

of the local economy in fundamental ways over the medium term. While there have been failures, there are also many success stories (such as Ireland, Israel, Finland and Scotland) to attest to the fact that successful change can be achieved in small, open economies.

Achieving such change requires a long-term strategy, based on a realistic assessment of a region's strengths and possibilities in the light of emerging trends. If such a strategy is to be implemented in a stable and sustained way, it must be underpinned by a consensus of the main interest groups. That this can be achieved is again evident from the case of Ireland, where their remarkable achievements (about 10% per annum growth for almost 15 years) depend heavily on such a consensus.

There will be opportunities and threats across the whole of government. In the new economy, activities across the whole of government are affected by global competition and technological change, and can provide opportunities for competitive growth. For example, health, education, sport and recreation and the environment are all activities of real economic importance. This means that a government response to the knowledge economy must entail the involvement of, and coordination with, a much wider range of agencies than was previously the case.

A viable response will require a global view, for every firm, industry and policy. Another imperative is that the global strategic view is now mandatory, for almost all firms and policy makers. Even small firms must take decisions in the light of global technology trends and of competition, even in their home markets, from many diverse sources. Policy makers must also act on the basis that rapidly changing global trends might impact quite quickly on their decisions. This is a major change and one that is likely to prove difficult for many managers and analysts, especially in small business.

It will also involve identifying and building competitive activities and firms. In the global context, it is important to know what are the competencies and activities available to a given region, which will provide a long-term competitive base in the knowledge economy. These may not be obvious, and can to some extent be created by sustained policy initiatives. Investment in understanding these underlying competencies, and in developing measures to enhance and exploit them, is likely to provide strong returns over the long term.

Firms and regions need to identify, and where possible strengthen, their place in global product systems. One important feature of the global knowledge economy is that the processes involved in the creation, production and distribution of goods and services are being increasingly managed on a global basis. This often involves consolidation of specific activities in locations with special advantages in each activity: financial control, marketing and brand management in head office, R&D in centres with critical mass and advanced capability, production in dispersed, low cost countries. Firms and regions in the middle - lacking either a critical mass of advanced capabilities or very low costs - are in danger of being damaged by this consolidation process.

The innovation system will be central. The regional innovation system and its components – knowledge and networking infrastructure, R&D and learning institutions and networks, policy institutions, linkages – is an important framework for analysis and policy. Understanding the strengths and weaknesses of the regional innovation system can provide a focal point for policy, both in terms of filling gaps and in using strengths as sources of competitive advantage.

A viable response will involve growing small firms, in part through improving their access to knowledge, capital and international partners. The growth of small firms is critical, as are policies to facilitate this growth. For small firms to grow requires better access to knowledge, capital and partners, and indeed increasingly to international partners and to international sources of knowledge and capital. Thus these three factors are becoming increasingly central in policy. Programs to improve knowledge access for small business, to strengthen the flow of seed and venture capital, and to facilitate international partnerships between relatively small business are being increasingly emphasised in many countries.

It will be necessary for regional authorities to coordinate with and leverage off national or supranational policies. In many countries, considerable attention has been given by national and regional authorities to making maximum use of supranational or national policies, a classic example being Ireland's use of European Union policies and programs. During the 1990s, Australia was slow to respond in any substantial way to the knowledge economy trends. It is likely that the Australian Government will introduce new policies and programs to address these issues. States that are active and prompt in taking up, and leveraging, any such policies are likely to gain substantial benefits.

2.2 The Position of Peripheral Economies

Most of these considerations about the knowledge economy and its implications apply to nations and regions generally. But it has become increasingly clear that location matters for economic development. The major elements in the global knowledge economy - globalisation, the widespread adoption of information and communication technologies, and the increasing importance of knowledge – all impact on the locational choices made by firms. As noted above, these impacts may weaken the position of many economies.

Globalisation and market liberalisation have reduced the capacity of national governments to intervene in their economies, in particular to redistribute resources or to cross-subsidise, to the same extent that they have in the past. The parallel reduction in barriers to trade and investment has led to far greater foreign direct investment and to expansion by multi-national corporations into new markets. These trends have on the one hand been facilitated by, and on the other hand have limited, the influence of national governments.

Information and communication technologies have generated both centripetal and centrifugal effects in terms of locational decisions. Many commentators have argued that the widespread adoption of these technologies will bring about the 'death of distance' and make location irrelevant. But the evidence is growing that they are reinforcing change in both directions.

That is, while the new technologies do indeed provide the possibility for widely dispersed agents to participate more fully in the economy, they also make possible consolidation of firm activities in preferred regions. This latter effect has led to extensive discussion in the international literature of ‘core’ and ‘peripheral’ regions.

In this literature, regions have been distinguished as either core or periphery by their economic structure and their profile in terms of the international division of labour. In the core regions a large proportion of the labour force works at skilled tasks. In the simplest case, core regions undertake activities that incorporate relatively high wages, advanced technology and a diversified production mix, whereas activities in peripheral regions involve low wages, more rudimentary technology and a simple production mix. These differences are, on the whole, about levels of linkage and access. In the core complexity, technology and control are the norm in terms of economic, cultural and political life. Individuals and organisations working in these sectors in core regions tend to be active, innovative and the leaders. Peripheral regions tend to be passive, traditional and dependent.

Several aspects of the process of knowledge creation and use are relevant here, and are discussed in more detail in Supporting Paper 2. Work based on codified knowledge (knowledge written down and expressed in ‘code books’) is more likely to be relocated to peripheral regions, while work which has a high tacit knowledge component is becoming more concentrated in particular locations around the world. Information and communication technologies have enabled low-level inputs to the creation of knowledge products and services to be moved extremely quickly, easily and cheaply. The high-level inputs, on the other hand, remain far less mobile and are becoming even more location-specific. This dynamic, particularly when combined with the increasing importance and value of knowledge intensive work, is having a profound impact on the location of high value work in the global knowledge economy.

As a result, there is a strong tendency for research and development to be undertaken at the core rather than at the periphery, making it virtually inevitable that there will be a lag between the centre and outer regions in terms of technology adoption. The lower proportion of knowledge workers in peripheral economies means not only will adoption be slower but that it is unlikely that the full benefits of new technologies will be captured.

More generally, the new information and communication technologies have made possible the consolidation of particular aspects of the product system in preferred locations on a global basis. This has led to the ‘hollowing out’ of peripheral regions in many important respects. Thus a central challenge facing many economies is to use the increased access to global markets and information sources that the new economy makes possible to offset the impact of global consolidation on the structure of their economies.

2.3 Path Dependency, Innovation Systems and Product Systems

Traditional economic theory operated mainly in terms of discrete, independent firms interacting through markets, and recognised only transactions between firms mediated through the market. By contrast, much of the contemporary literature emphasises the *systemic* nature of relationships and activities in the economy. The strength of the systemic approach is that it recognises a whole range of non-market linkages that are central to the economic

system (such as organisational and institutional persistence, cooperation, alliances, information exchange and mutual dependency), as well as the role of organisations other than firms.

This systemic character is of three main forms, each of which is relevant to understanding the impact of the knowledge economy on firms, regions and nations. One is the persisting influence of past events on present and future outcomes (*path dependence*). The second is the complex linkages between many different institutions and organisations at a given point of time, such as those that determine the level of innovation (*the innovation system*). The third is the linkages between the various aspects of a complex system involved in the creation, production and distribution of a product, or a set of products (*the product system*).

A process is path dependent when its evolution is inherently influenced by past events, in that it cannot shake off the effects of those past events. Feedback mechanisms operating over time will often generate path dependence. These feedback mechanisms, and the path dependence that they generate, mean that an economy may get 'stuck' on a self-reinforcing path. Such a self-reinforcing path may be either virtuous or vicious. That is, these mechanisms may reinforce competitive factors that are consonant with global trends and generate strong growth. But, if a region is deficient in the factors driving global growth and necessary for full participation in that growth, these feedback mechanisms may lead to further erosion of the position of the region.

Recognition of the systemic character of modern economies has many important implications for policy, including the need to focus on a region's innovation system and on the positioning of its firms within global product systems. It also means that, however urgent and transformative it is, change must be evolutionary, with a progressive strengthening of organisations, institutions and systems supporting regional growth.

2.4 Industry Policies for Peripheral Economies

The forces of polarisation and concentration evident in the global knowledge economy pose particular problems for peripheral economies, as we have seen. These issues include:

- the tendency for knowledge intensive activities to cluster in areas of critical mass and strong tacit skills, and hence in core countries or regions;
- the tendency for peripheral centres to be excluded from value-adding activities within product systems, and to be forced back to low value production activities assigned on the basis of global competition, often at prices close to marginal cost and hence providing little scope to recover fixed costs; and
- the tendency for returns within product systems to be concentrated where the knowledge and market power is also concentrated.

Thus there is a risk that peripheral economies may come to have an increasingly marginal position in the world economy, with the high value activities and jobs increasingly located in the major countries, and indeed within specific regions within those countries. There is a good deal of evidence, for many countries, that this is actually occurring.

On the other hand, trends in terms of globalisation and the information technology revolution offer, at least in theory, the potential to allow smaller firms and regions to participate more actively in global markets and in global product systems. Thus a central challenge for industry policy in peripheral economies is to achieve high value growth, and the good jobs that go with it, through greater integration into the global economy, and in spite of the tendencies for exclusion noted above.

In response to these trends, important elements in the industry policy of a number of regions removed from the core of global wealth generation (both nations and sub-national regions) have included:

- measures to improve the functioning of the regional innovation system;
- initiatives to facilitate the growth of new and emerging local firms within the region, both in existing industries and in new industries;
- initiatives to attract foreign firms to invest in the region, particularly in industries where their presence would mesh with the activities of local firms and strengthen the regional innovation system;
- programs to deepen the linkages between such firms and domestic firms and other relevant organisations; and
- programs, such as cluster support activities, to assist both local and foreign firms operating in the region to increase their integration into global product systems and markets.

Each of these elements are relevant to the situation facing Australia as a whole, and Western Australia in particular.

3 The Situation of Western Australia

The economic position of Western Australia in terms of the foregoing discussion is quite unique. For while it shares with the rest of Australia a broadly peripheral status in relation to the world economy, and indeed this is more marked in some ways than in the eastern States, in certain resource areas Western Australia is a central player in global product systems. Thus Western Australia is forced to address, in an acute way, the challenges facing small peripheral economies in the emerging world. But it does so from a base of centrality in certain resource areas, even though this centrality is in areas that represent a declining share of world GDP, as well as a central position in some other niche areas. This report, as indeed most discussions of the State's longer-term future, is essentially concerned with the interplay between the problems of small peripheral economies and the opportunities provided by the State's existing strengths.

Many aspects of Western Australia's situation in the global knowledge economy were reviewed in TIAC's previous report published in September 2000. Here we explore a further three elements of that situation especially relevant to the objectives and content of industry policy in the State.

3.1 Employment Trends

If an economy is becoming increasingly divorced from the principal activities generating increased wealth and prosperity in the global economy, it is likely that the quality of jobs available in that economy will decline. That is, the country or region may see a rise in low value jobs, requiring relatively low levels of human capital and hence paying low wages, and a declining share of high value jobs. One important sign of the problems facing Australia as an increasingly peripheral economy is the evidence that the quality of the jobs being created in Australia has been declining.

A recent analysis of national trends over the past decade has shown that the concentration of job growth in lower value jobs has been very pronounced (Borland et al 2001). For example, over the decade to August 2000 nearly half of the overall growth in jobs in Australia consisted of part-time casual jobs, and average earnings in a part-time casual job was only about 30% of that in a full-time permanent job. For all occupations other than managers and professionals, all of the new jobs created in the 1990's were part-time jobs. In terms of earnings level (see Table 1), nearly half of all new jobs in this decade paid less than \$300 per week, and there was no net increase in jobs paying over \$600 per week. There was indeed substantial growth (48.4% over the decade) in jobs paying more than \$1400 per week. But, because of the decline in the number of jobs paying between \$600 and \$1400 per week, in net terms there was no increase in jobs paying more than \$600 per week.

Thus during this decade of relative prosperity the Australian economy continued to generate job growth, but in net terms it was all in jobs which were low paid, either because they were part-time or because they were low level full-time jobs. In other words, the type of jobs created during the 1990s is consistent with the hypothesis that Australia is becoming an increasingly peripheral economy.

Table 1. Job Creation in Australia, by Earnings Level, 1990-2000

| Weekly Earnings Level (2000 values) | ('000 persons) | | Change 1990–2000 | |
|--|----------------|---------------|------------------|-------------|
| | 1990 | 2000 | ('000 persons) | % |
| Under \$300 | 939.5 | 1482.6 | 543.1 | 57.8 |
| 300–600 | 1857.4 | 2460.2 | 602.8 | 32.5 |
| 600–900 | 2232.4 | 2108.5 | –123.9 | –5.5 |
| \$900–1400 | 1266.9 | 1243.9 | –23.0 | –1.8 |
| Over \$1400 | 269.7 | 400.3 | 130.6 | 48.4 |
| Total | 6565.8 | 7695.4 | 1129.6 | 17.2 |

Source: Borland, Gregory and Sheehan (2001) *Work Rich, Work Poor*, Centre for Strategic Economic Studies, Melbourne, p14.

It is beyond the scope of this report to explore these issues of job composition in detail for Western Australia. But, as a means of taking account of the importance of the issue of the types of job created, we focus on full-time rather than total employment in analysing the labour market of the State. Certainly it seems inevitable that one central focus of industry policy will be full-time jobs.

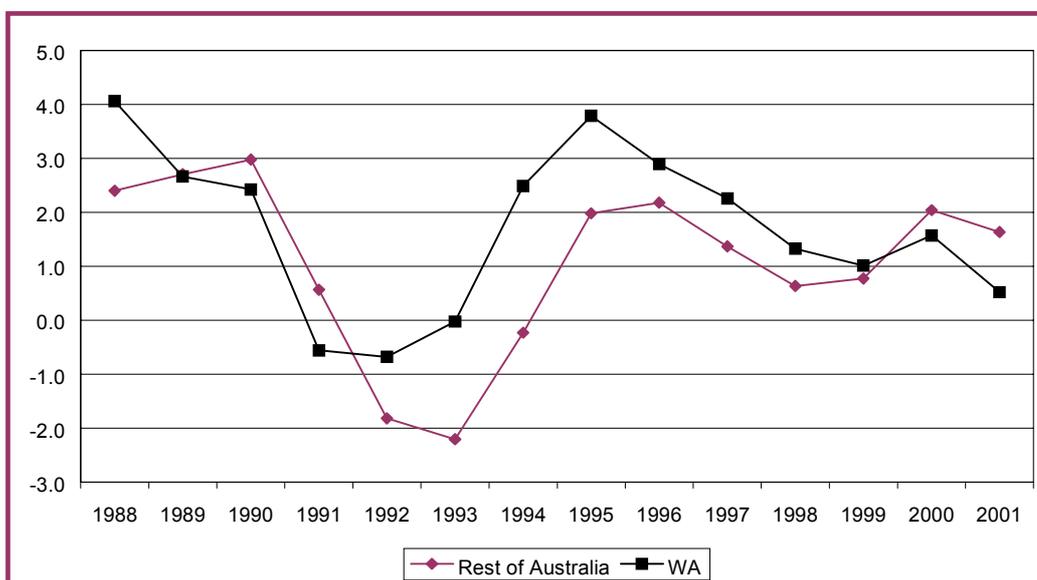
Figure 1 shows the average per cent change per annum in full-time employment over a three year period for Western Australia and for the rest of Australia, using data for May of each year (see also Table 2). Western Australia has traditionally shown more rapid growth in full-time employment than the rest of Australia - over the full period 1985-2001 the average growth rate was 1.8% for the State as against 1.2% for the rest of Australia. This was particularly pronounced over the three years to May 1995, with average annual growth of 3.8% in the State by comparison with 2.0% in the rest of Australia. But after the mid 1990s this trend became less marked, and in recent years it has been reversed. In particular, in the three years to May 2001 full-time employment in Western Australia has grown by only 0.5% per annum, by comparison with 1.6% for the rest of Australia. These and other facts suggest that the State's ability to generate full-time jobs has been declining over the past five years or so, both absolutely and relative to trends in Australia as a whole.

In terms of the composition of that growth by industry (see Table 2), one notable feature is the strength of full-time employment in the goods industries¹ in the State. Over the period 1985-2001 full-time employment grew quite strongly in Western Australia in both mining (1.6%) and in manufacturing (1.2%), whereas it fell in both areas in the rest of Australia, and in construction it grew at twice the rate for the rest of the country. In terms of both the goods industries as a whole, and the goods related service industries, full-time employment growth was substantially faster than for the rest of Australia over 1985-2001. For the last six years to 2001 this is also true, with both these groups of industries showing stronger full-time employment performance in Western Australia than in the rest of Australia, but the absolute growth rates in WA have fallen significantly (Table 2). Over this period the goods industries

¹ For the purposes of this analysis we use a simple aggregation of employment by industry into four categories: the goods industries, the goods-related services industries, knowledge-based service industries and other service industries. For details see Supporting Paper 3 and Sheehan et al. (1998).

grew by only 0.5% per annum, and the goods-related services industries by only 0.1%, in Western Australia.

Figure 1. Three-year Change in Full-time Employment, 1985-2001 (% pa)



Source: ABS (2001), *Labour Force Survey*, cat. no. 6203.0, Canberra. Data are for May of each year.

By contrast, growth in full-time employment in knowledge-based services in Western Australia has been close to that in the rest of Australia for both periods shown in Table 2 although, as we shall see below, there are signs of weakness over the past three years. One important reason for the slower growth of aggregate full-time employment in the State since 1995 lies in the fall in full-time employment in other services, with such employment in government services, cultural and recreational services and personal services all being lower in Western Australia in May 2001 than in May 1995.

Table 2. Employed Persons by Industry, Full-time (average annual growth rate %)

| | 1985-1995 | | 1995-2001 | | 1985-2001 | |
|--------------------------|------------|------------|------------|------------|------------|------------|
| | WA | ROA | WA | ROA | WA | ROA |
| Goods | 1.6 | -0.4 | 0.5 | 0.4 | 1.2 | -0.1 |
| Goods-related Services | 1.5 | 1.2 | 0.1 | -0.6 | 1.0 | 0.5 |
| Knowledge-based Services | 2.9 | 2.7 | 2.9 | 2.9 | 2.9 | 2.8 |
| Other services | 4.5 | 2.1 | -0.6 | 1.5 | 2.6 | 1.9 |
| Total | 2.3 | 1.2 | 0.9 | 1.1 | 1.8 | 1.2 |

Source: ABS (2001), *Labour Force, Selected Summary Tables, Australia, Quarterly*, cat. no. 6291.0.40.001, Table g6, Canberra. Growth rates are based on data for May of each year.

However, trends over the past six years in full-time employment need to be interpreted with care. Two distinct three-year periods are apparent, as is clear from Table 3. Employment in the goods industries was stagnant in both Western Australia and the rest of Australia over 1995-98, but in both cases grew by about 1% per annum over 1998-2001. After reasonable growth over 1995-98, full-time employment in goods-related service industries has fallen sharply in both regions since 1998, as a very pronounced shakeout in wholesale trade has not

been offset by adequate growth in retail trade and in transport and storage. The decline has been somewhat more rapid in Western Australia than in the rest of the country.

Table 3. Employed Persons by Industry, Full-time (average annual growth rate %)

| | 1995-98 | | 1998-2001 | |
|--------------------------|------------|------------|------------|------------|
| | WA | ROA | WA | ROA |
| Goods | -0.1 | 0.0 | 1.0 | 0.9 |
| Goods-related Services | 1.5 | 0.0 | -1.3 | -1.1 |
| Knowledge-based Services | 5.0 | 1.8 | 0.8 | 4.0 |
| Other services | -2.8 | 0.7 | 1.6 | 2.4 |
| Total | 1.3 | 0.6 | 0.5 | 1.6 |

Source: ABS (2001), *Labour Force, Selected Summary Tables, Australia, Quarterly*, cat. no. 6291.0.40.001, Table g6, Canberra. Growth rates are based on data for May of each year.

Knowledge-based services employment grew by 5% per annum in the State over 1995-98, with full-time employment growing strongly in business services, health, education and cultural services. By contrast, full-time employment in health and education grew slowly in the rest of Australia over this period. But since 1998 full-time employment in knowledge-based services has been subdued in Western Australia while accelerating in the rest of the nation. The main factors for Western Australia for this trend, which has occurred in spite of continued strong growth in business services employment, has been a fall of over 20% in the finance industry and slow growth in employment in communications services, education and health.

Full-time employment in other services has been consistently weaker in the State than in the rest of Australia since the mid 1990s. Indeed, apart from property services, each of the components of other services (government administration, sport and recreation, and personal and other services) had lower full-time employment in 2001 than in 1995. Other than for government administration, this is in sharp contrast to the position in the rest of Australia.

There may be some tendency to associate this slowing in service sector employment with cyclical trends in the goods industries, and particularly in the resources industries that are uniquely important in Western Australia. But the evidence does not support this interpretation. In particular, full-time employment in mining and manufacturing was strong in the three years to May 2001, the period for which service sector employment was especially weak, whereas the reverse is true in the preceding three years.

The main lessons from this analysis are threefold. Firstly, there appears to be a medium term problem in Western Australia in terms of the growth in full-time employment. Indeed, seasonally adjusted full-time employment was lower in December 2001 than at the end of 1999. This is a trend that seems partly to reflect the structure of the economy and that might be addressed, to some extent, by industry policy. Secondly, relatively strong growth in key goods industries, and particularly in manufacturing and mining, remains a strong feature of the Western Australian labour market. This is so even though growth rates over the past five years have been much slower than in the previous decade. Thirdly, in recent years the State has seen slower than national average growth in full-time employment in knowledge-based

and other services, the most rapidly growing employment sectors in the global knowledge economy.

3.2 Export Trends

While employment trends can provide valuable insights into the overall outcomes of economic activity, export patterns provide one window on strengths and weaknesses, especially for an internationally oriented economy such as Western Australia. Here, and in more detail in Supporting Paper 3, we provide an analysis of exports of goods and services from the State for the last decade or so.

3.2.1 Commodity Exports

In terms of goods, our analysis suggests that commodity exports from Western Australia (excluding confidential items at the two digit level) can be usefully divided up into four categories, by size and growth rate. These categories are rapidly expanding resource exports, traditional resource exports, other expanding exports and all other exports (Table 4).

Table 4. Western Australian Commodity Exports, 1990-91 and 2000-01

| | 1990-91 | 2000-01 | Average Annual Growth 1990-91 to 2000-01 |
|------------------------------------|----------------|----------------|---|
| Rapidly Expanding Resource Exports | 1856.5 | 9780.8 | 18.1 |
| Traditional Resource Exports | 7022.3 | 12276.4 | 5.8 |
| Emerging Exports | 569.2 | 2992.1 | 17.0 |
| Other Exports | 96.3 | 179.1 | 6.5 |
| Confidential Items (93,98 and 99) | 4982.2 | 5784.1 | 1.4 |
| Grand Total | 14526.6 | 31012.3 | 7.9 |

Source: ABS, unpublished trade statistics, obtained from TradeData.

Three resource areas (non-ferrous metals, petroleum and gas) have shown very rapid growth in exports over the past decade (18.1% pa), to reach nearly \$10 billion in 2000-01. Examination of information on projects under way and in the pipeline suggests that these are also the dominant areas in which growth is likely to occur over the next decade. The second category consists of 12 more traditional resource based industries, which have shown more subdued export growth over the past decade (or, in some case, have seen a fall in exports). The most important of these areas are metal ores, gold, cereals, textile fibres and fish. For the group as a whole, overall growth was 5.8% per annum over the decade and total exports exceeded \$12 billion in 2000-01. Exports for this group as a whole are likely to continue to grow more slowly than for the expanding resource industries.

The third category consists of 26 other two-digit industries with a growth rate of at least 10% over the decade. This category is striking both for its strength and diversity. In total the 26 industries have generated nearly \$3 billion of exports in 2000-01, with an overall average growth rate over the decade of 17%. A selection of these industries (those with exports in 2000-01 of over \$100 million as well as a growth rate of at least 10 %) is shown in Table 5. As illustrated by that table, the emerging exports group is very diverse, ranging from oilseeds

and fruit and vegetables to pharmaceuticals, telecommunications equipment, transport equipment and specialised machinery. These data suggest that the WA economy is developing globally oriented activity in a wide range of different areas, and that some of these areas should be an important focus of industry policy. There are many points of potential further growth, but these are diverse niche areas based on a small number of firms.

Table 5. Western Australian Commodity Exports, 1990-91 and 2000-01: Selected Emerging Exports

| | 1990-91 | Average Annual Growth | |
|--|--------------|-----------------------|-----------------|
| | | 2000-01 | 1990-91-2000-01 |
| Oil Seeds and Oleaginous Fruits (22) | 0.0 | 139.8 | 212.5 |
| Pharmaceuticals (54) | 5.0 | 192.6 | 44.0 |
| Iron and Steel (67) | 5.2 | 146.5 | 39.5 |
| Cork and Wood (24) | 7.0 | 106.1 | 31.2 |
| Telecommunications Equipment (76) | 16.9 | 129.4 | 22.6 |
| Dyeing, Tanning and Colouring Materials (53) | 114.8 | 497.0 | 15.8 |
| Vegetables and Fruit (05) | 42.7 | 167.7 | 14.7 |
| Inorganic Chemicals (52) | 73.3 | 261.6 | 13.6 |
| Other Transport Equipment (79) | 89.3 | 294.8 | 12.7 |
| Specialised Machinery (72) | 62.1 | 166.0 | 10.3 |
| Total of Above | 416.3 | 2101.5 | 17.6 |

Source: ABS, unpublished trade statistics, obtained from TradeData.

The fourth category consists of 23 two-digit industries which are small exporters (a total of \$179 million in 2001) and for which exports are growing relatively slowly. A substantial level of exports which are classified as confidential at the two-digit level (\$5.8 billion in 2000-01) are excluded from the four categories. But the growth rate of excluded exports is low, so that the central point of the analysis should not be distorted by this exclusion.

Western Australia is highly export oriented, and growing exports of goods will continue to be central to the economy. In the resource area growth is likely to be focused on oil and gas, and especially on the North West Shelf. But there are also a significant number of areas in which exports are increasing rapidly from a small base, particularly in specific agricultural products and in elaborately transformed manufactures. These emerging niche export industries are likely to be important for future industry policy.

3.2.2 Exports of Services

In the global economy, exports of services are growing more rapidly than exports of goods, and this trend is widely expected to accelerate over the next decade or so. Given this fact, and the slow growth likely in the State's traditional resource exports, rapid expansion of exports of services from the State will be necessary if Western Australia is to sustain its position as a strong exporting state over the long term.

Table 6. International Trade in Services, Western Australia and the Rest of Australia, 1992-93 to 1999-2000

| | 1992-93 | | 1999-2000 | | Percent Change 1992-93 to 1999-2000 | | WA Share of Australia | |
|----------------|--------------|------------------------------|--------------|------------------------------|---|------------------------------|--------------------------|-----------------------|
| | <i>WA</i> | <i>Rest of Australia</i> | <i>WA</i> | <i>Rest of Australia</i> | <i>WA</i> | <i>Rest of Australia</i> | <i>1992- 1993</i> | <i>1999- 2001</i> |
| | \$m | \$m | \$m | \$m | (% pa) | (% pa) | (%) | (%) |
| Transportation | 447 | 4,419 | 669 | 5790 | 4.1 | 2.7 | 8.4 | 9.7 |
| Travel | 670 | 5,234 | 1349 | 9690 | 7.2 | 6.4 | 9.5 | 10.3 |
| Other Services | 200 | 3,748 | 286 | 7742 | 3.7 | 7.5 | 5.1 | 3.5 |
| Total | 1,317 | 13,401 | 2,304 | 23,222 | 5.8 | 5.7 | 8.1 | 8.2 |

Source: ABS, unpublished data.

Data on exports of services are much less readily available than on exports of goods, and are of more doubtful quality. But some data are available, at a fairly aggregate level, on exports of services by State, from 1992-93 to 1999-2000, from the Australian Bureau of Statistics (Table 6). These data suggest that the overall growth in exports of services from Western Australia has been close to the national average, but that this growth is focused on transportation and travel, including travel related to education. In both of these areas growth in exports from the State from 1992-93 to 1999-2000 was ahead of the national average. By 1999-2000, Western Australia had about 10% of national exports in these two areas, broadly consistent with its share of national population.

But the trends are different in the most rapidly growing ‘other services’ area. Here the growth of exports from the State was less than half the national average, with rapid growth being concentrated in NSW, Victoria and Queensland. By 1999-2000, Western Australian exports of other services amounted to only about 3.5% of national exports. It is well documented that these services are one of the most rapidly growing areas of world trade, and this area should also be an important focus of industry policy. Thus this low level of, and slow growth in, other services exports is a matter for concern, and for policy focus. However, these figures should not be taken entirely at face value, for there are continuing reports from companies and other organisations of strong levels of exports of services, especially in mining and construction services. Some of these apparent exports of services may be captured in outward investment flows rather than in cross-border trade flows. That is, the contribution of services by a Western Australian firm to a project in another country may be part of their investment in the project, rather than a result of a purchase of services by a firm in that country.

3.3 The Innovation System

The centrality of the national or regional innovation system to competitive growth in the knowledge economy was emphasised above. A number of features of the Western Australian innovation system seem particularly relevant to the discussion of industry policy and of the long term economic direction of the State.

They include the following:

- it is high quality in particular areas, with capabilities of international standard;
- it is small, both absolutely and relative to the scale of the WA economy, and may be declining in scale;
- it has been dominated by the mining industry, although this appears to be changing;
- it is in some respects bifurcated, with different components of the innovation system focussing on different areas; and
- it has only limited international linkages.

These characteristics of the State's innovation system are analysed in Supporting Paper 3, and are briefly documented here.

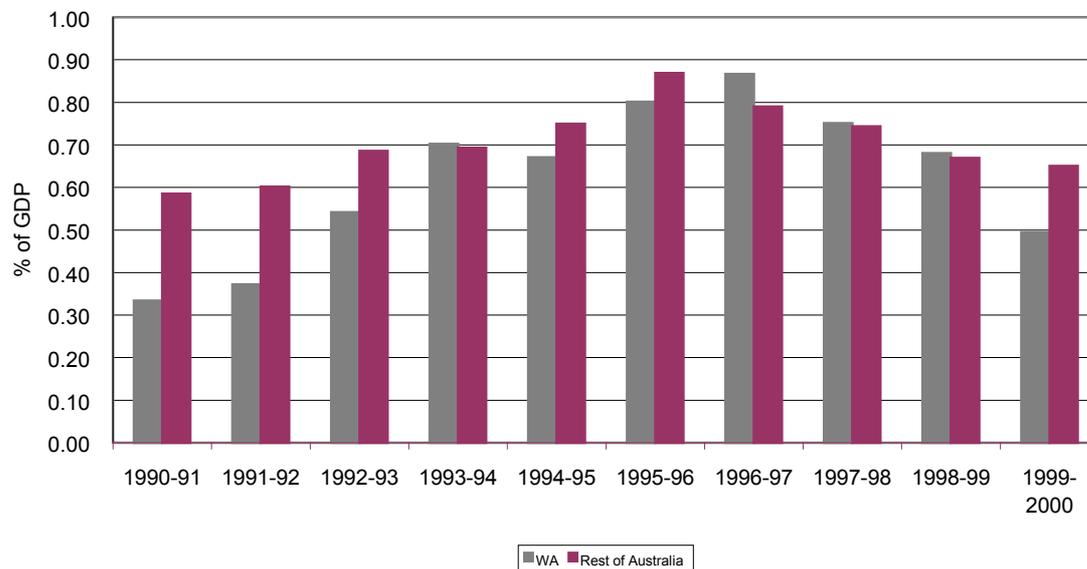
3.3.1 The Scale of the Innovation System

Innovation within a single firm has been defined as 'applying ideas new to the firm in products, processes, services, organisation, management or marketing' (Bryant 1998), and innovation in a larger unit (an industry, a region, a nation) can be defined by extension. This approach makes clear that innovation is not only about big changes but also about 'the million little ideas' that lead to increased efficiency (Romer 1992). Innovation is also about much more than R&D, although typically R&D spending accounts for more than half of all spending on innovation. Given data limitations on innovative activities other than R&D, it is often necessary to approach innovation systems through R&D data.

At the end of the 1980s the scale of Western Australia's innovation system, at least as imperfectly measured by the level of R&D, was small, both absolutely and relative to the size of the economy. Business R&D as a share of GSP was about half of that for the other States, and spending by both higher education institutions and government constituted a lower share of GSP in Western Australia than in other states. An important development during the 1990s was that business R&D surged in the State, so that by 1996-97 business R&D was a higher share of GSP in Western Australia than in the rest of Australia (Figure 2). However, this surge has not been sustained, and business R&D has fallen much more sharply in the State than in the rest of Australia between 1996-97 and 1999-2000, the fall being from 0.87% of GSP to 0.49% of GSP.

The result of these factors is that, at the end of the 1990s, the scale of the Western Australian innovation system, as measured by the level of R&D spending, was about 75% of that for the rest of Australia, relative to GSP levels. With total R&D spending of about \$750 million per annum in the State, policy needs not only to address these signs of falling levels of spending on innovation but also the extent to which a system of this scale can provide critical mass in a number of areas. Failing such action, there is a danger that a continued 'hollowing out' of R&D might lead to a further fall in the scale of the State's innovation system.

Figure 2. Business R&D as a Share of GSP, Western Australia and the Rest of Australia, 1990-91 to 1999-2000



Source: ABS, unpublished data, consistent with *Research and Experimental Development, Business, Australia*, cat. no. 8104.0, Canberra

3.3.2 Bifurcation in the Innovation System

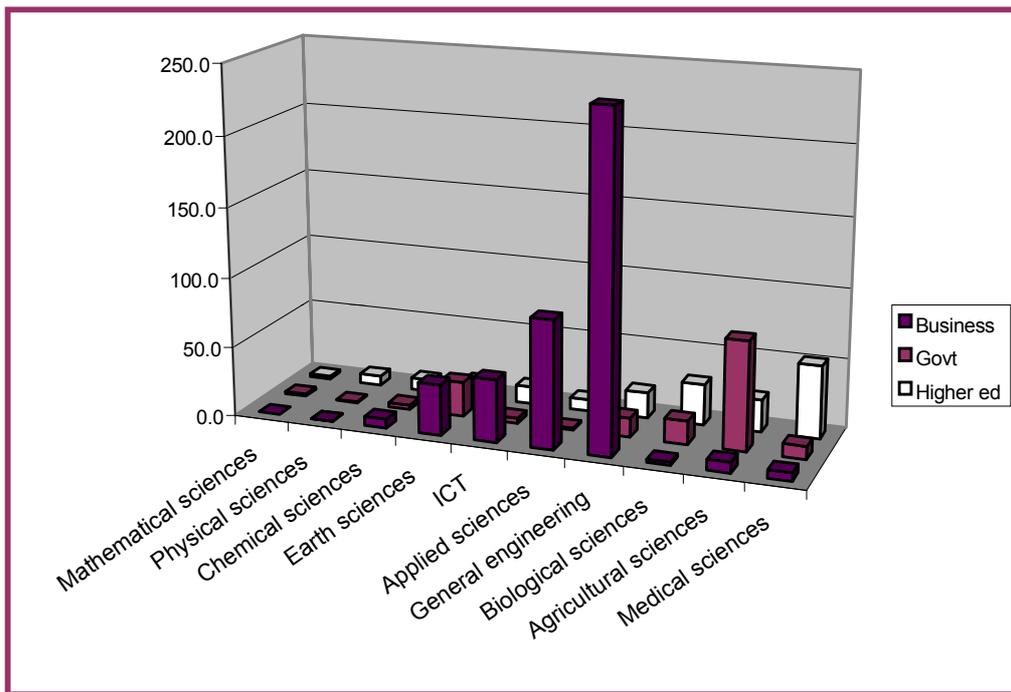
At the heart of the concept of an innovation system is the idea that the institutions and organisations in a given region should cohere together in mutually supportive ways. That is, the different elements should be related to one another in systematic ways, so that they each reinforce the ability of the overall system to achieve the outcomes desired by the participants. The alternative to this is that the innovation system is bifurcated, in the sense that the major players seek their own diverse goals in isolation from one another and that there are few mutually reinforcing linkages. In such a bifurcated system it will be harder for either firms undertaking innovation or institutions undertaking research and development to achieve critical mass within the system. These are of course two conceptual extremes, and each innovation system will have elements of linkage and of the independent, unconnected pursuit of innovation.

Australian innovation systems tend to be strongly bifurcated in this sense, with the innovative activities of business, government and higher education having largely developed separately from one another. Developing greater linkages between these three players has been a central theme of national policy for some fifteen years. While some progress has been made, much remains to be done.

The evidence of the R&D data, at least, suggests that the Western Australian innovation system remains more bifurcated than those in the other states. Figure 3 shows R&D in Western Australia by field of research (excluding social sciences and the humanities), for the three main sectors. Reflecting an applied focus in mining and manufacturing, three quarters of

business R&D in 1998-99 was in general engineering and in applied science, with about 5% in ICT and 4% in earth sciences. But the central focus of government research was in agricultural sciences, which together with earth sciences accounted for two thirds of government R&D expenditure. In higher education institutions the priority areas were different again, with nearly half of all R&D in the natural sciences being in biological and medical sciences, areas in which R&D spending by both government and business in the State is low.

Figure 3. R&D, by Field of Research and Business Type, Western Australia, 1998-89



Source: ABS, unpublished data, consistent with Research and Experimental Development, Business, Australia, cat. no. 8104.0, Canberra.

To some extent, it is appropriate that different sectors focus on different areas of research, having regard to their diverse responsibilities and objectives. But the extent of the bifurcation in the Western Australian case is very pronounced, being more than the rest of Australia as a whole, and this must limit the extent to which the innovation system in the State functions as effectively as it might, in terms of economic and social outcomes per unit of expenditure. Given that the overall level of R&D spending is low by national and international standards, limited coordination between activities in different sectors is likely to make it more difficult for critical mass to be achieved in any particular activity.

3.4 Conclusion

Two disparate conclusions emerge from this brief review of the situation of Western Australia at the beginning of the 21st century. One is that the State has continuing strengths in a range of goods industries, in the services that underpin these industries, and in some other areas. This

is evident not only in the mining and resources sector but also in manufacturing, where employment has continued to grow against the national trend and where exports are growing strongly in specific niche areas.

The second is that there are several signs in the State of that ‘hollowing out’ of domestic capabilities characteristic of a peripheral economy in a globalising world. These signs include falling full-time employment in recent years in certain service areas (such as finance and cultural services); slower than national employment growth in communications and a low share of the ICT industry activity; and sharp falls in business sector R&D in recent years. It is perhaps too early to draw any definitive conclusions from these signs. But in our view they are consistent with broader international experience, and should be treated at least as early warning of powerful forces at work.

Thus this review of the situation in Western Australia suggests that our conclusion above about many peripheral economies apply also to this State. That is, that a central challenge for policy in Western Australia is to use the increased access to global markets and information sources that the new economy makes possible to offset the impact of global consolidation on the structure of the economy.

4 A Framework for Industry Policy in Western Australia

The nature of the situation facing Western Australia, noted above and documented in more detail in TIAC's September 2000 report, implies that immediate and substantial action is necessary to support the evolution of the State's economic structure. An important part, but not by any means the whole, of this response needs to be in the area of industry policy. Our contribution in this report to defining the nature of this industry policy response is in three parts. In this section we outline a proposed framework for industry policy, while in the next section (and more extensively in Supporting Papers 4-9) we briefly review at an industry level some of the key opportunities for Western Australia. In the final sections we outline the main elements of the proposed approach to an industry policy for Western Australia, and provide a brief profile of the shape of a knowledge economy for the State, as a guideline for one potential outcome to which policy might aspire.

4.1 The Role and Objectives of Industry Policy

The role of industry policy is one of the most contentious issues in applied economics. It is acknowledged in the literature that there exist a wide range of factors giving rise to deviations from the competitive market paradigm – sunk costs, economies of scale and scope, oligopoly, externalities and complementarities, information and coordination failures, and incomplete markets. The existence of these factors implies that, in a wide range of possible circumstances, market forces alone may not produce the best outcome for society. Their existence may, therefore, justify government intervention to generate a more socially beneficial outcome.

Yet, disagreements are evident on two main matters. Firstly, there is no uniform view regarding the empirical importance of these theoretical effects, and on the extent and relevance of deviations from the market paradigm in various types of economies. Secondly, there are disagreements about the potential for government to act effectively to produce a preferred outcome in the face of deviations from the market paradigm. Some argue that such deviations are limited and are more than offset by the likelihood of government failure, so that it will be rare for any improvement in economic activities to be achieved through industrial policies. Others argue that deviations from the market are pervasive and that in appropriate circumstances a strong and committed government can be very effective, so that there is a major role for industry policies.

The position taken in this report is that, in the global knowledge economy, factors giving rise to market failures are pervasive, and even systemic, and that in appropriate circumstances government policy can generate an improved outcome. This means that there is a definite role for carefully specified industry policies. But it must be clearly recognised that governments as well as markets can fail and that, as far as possible, such policies should enhance rather than confound the operation of market forces.

As will be apparent from other arguments in this report, the position that we have adopted is, consistent with the dominant trend in the theoretical and empirical literature and with much of the specific literature about the knowledge economy. Not only does the theoretical literature

emphasise a wide range of deviations from the purely competitive model, but an extensive body of empirical studies has documented the practical importance of these matters. For example, we have stressed above three ways in which non-market linkages within the economy take on a systemic character - the persisting influence of past events on present and future outcomes (*path dependence*), the complex linkages between many different institutions and organisations influencing innovation (*the innovation system*), and the linkages between the various aspects involved in the creation, production and distribution of a product, or a set of products (*the product system*). It has also been widely documented that many of these factors are especially important in the knowledge economy, given the information asymmetries, sunk costs, spillovers and path dependency associated with the generation and application of knowledge. Finally, this approach to industry policy is consistent with the practice of many governments around the world in responding to the emerging economic situation. These matters are taken up further in Supporting Paper 10.

In broad terms, we adopt a definition of industry policy similar to that given by Lall, in which industry policy includes:

"...all actions taken to promote industrial development beyond that permitted by free market forces. Industrial policy can be thought of as having two elements: functional interventions and selective interventions. Functional interventions are those that remedy market failure without favouring any one activity over another. Selective interventions are designed to favour individual activities or groups of activities in order to correct sub-optimal resource allocation, in a static or a dynamic sense." (Lall 1994, p65)

In particular, in terms of the approach to be adopted in this report, industry policy is interpreted as covering policies, strategies and initiatives directed at influencing the structure and long term performance of the economy, in the context of longer term global trends. Our position is that industry policy can influence in beneficial ways the long term structure and performance of the economy, provided that it is carefully specified and implemented, and that it makes use of market forces as far as is possible.

One consequence of this approach is that we do not, in this report, address a range of important matters concerned with the more efficient operation of the existing economic structure, such as improvements in the regulatory and cost environment in which firms in Western Australia operate. Nor do we extensively explore such critical issues for performance in the knowledge economy as education and training, although there is some discussion below and in Supporting Paper 9.

This is not because we wish to diminish in any way the importance of these factors for economic development, and note that this centrality has been recognised by the Government. But it seems more useful to concentrate on those structural issues that have been less fully canvassed in the current debate, and which are consistent with our interpretation of the term 'industry policy'. We also emphasise as far as possible what Lall calls functional interventions, rather than selective interventions targeted at particular industries or sectors.

² Lall (1994, p. 65).

In terms of our understanding of community and Government expectations in Western Australia, an appropriate specification of the key outcomes to be sought from industry policy in the State might be an industry structure that delivers the following:

- sustainable growth at a high level, over say a ten year time horizon, in the context of developing trends in the global economy;
- strong growth in high quality jobs (full-time employment at good earnings levels) over the next decade; and
- a foundation for continued, broadly based growth beyond the next decade.

While difficulties and uncertainties about the future position of the State have emerged in the second half of the 1990s, the decade from 1985-95 was one of the better decades in terms of economic performance in its postwar economic history. We thus take the annual growth rates achieved over that decade (3.8% growth in real per capita GDP and 2.3% growth in full-time employment) as broadly indicative of preferred growth rates over the next decade.

4.2 The Overall Policy Response

It follows from the foregoing discussion that any policy initiatives developed to achieve these outcomes need to take specific account of the emerging realities of the global knowledge economy. Thus they need to stress the application of knowledge, but throughout the economy and not just in high-tech industries. They need to recognise the dangers that peripheral economies may become increasingly marginalised in the global economy, and the warning signs that ‘hollowing out’ may already be taking place in Western Australia. Given the reality of globalisation and the State’s high degree of openness, they need to be intensely focused on global markets and on trends within those markets, and especially on Western Australia’s close links with Asia. Finally, to secure the social fabric, they need to be focused on the creation of additional jobs, especially good quality jobs.

In our view, the key strategies to achieve the proposed outcomes should include the following:

1. *A strategic, whole of government approach to industry policy.* The policy needs to be strategic in the sense that its various elements are integrated together in a coherent whole and also in that the many relevant activities and resources of government are brought to bear to achieve the overall objectives.
2. *Systematic programs to increase the number, scale and impact of globally oriented firms active in the State.* These programs should have three main elements:
 - a strong investment attraction program, focused specifically on firms which bring dynamic benefits to the Western Australian economy and innovation system, and using support measures which recognise those dynamic benefits;
 - continued and expanded programs to support the emergence of local firms to global competitiveness; and

- a new linkage program, to promote and deepen the linkages between globally oriented firms and other firms and institutions within the economy.
3. *Initiatives to build the Western Australian innovation system.* These initiatives should focus particularly on increasing the scale of innovative activities, on generating greater collaboration, shared focus and hence critical mass within the innovation system, and on facilitating stronger international linkages.
 4. *Programs to generate increased leverage off national policies.* Resources within the State are inevitably limited, so that systematic attention needs to be given to ensuring that Australian Government programs are fully utilised to support development within the State.

The Western Australian Government already operates programs in many of these areas. While we have not undertaken a detailed review of these programs, it does appear that these programs are extensive in number and diverse in objectives, generally of small scale and only loosely coordinated with one another. In a world of global competition, industry policies need to be closely targeted to specific objectives, and to be of substantial scale in relation to those objectives, if they are to be effective. Thus the scale of the industry policies to be adopted is a critical issue.

One important aspect of the terms of reference for this report was the analysis of the key strengths of the Western Australian economy, and of the opportunities that these provide for industry policy. The next section of the report provides a brief review of a wide range of such strengths and opportunities, in four areas:

- the exploitation and conservation of natural resources, covering the mining, energy and agricultural sectors, together with the environmental industries;
- diverse valued added goods and services in other areas relating to the creation, production and distribution of goods;
- various opportunities arising from changing global lifestyles, and from WA's attributes and position in relation to those changing global markets;
- various opportunities in different areas of human services.

Activity and employment in each of these various areas should be enhanced by the broad industry policies referred to above, and we do not explore in any detail specific policy issues in these areas. More detailed analysis is provided in Supporting Papers 4-8.

4.3 Financial Strategy and the Scale of Industry Policy

The Western Australian Government is rightly concerned to ensure the security and integrity of the State, in an increasingly uncertain world, through its financial and economic policy. One key symbol of this security is the State's AAA rating, and the financial management requirements which must be achieved to ensure that this rating is maintained. The Minister for State Development, Tourism and Small Business (Hon. Clive. Brown) highlighted the

relevance of these issues for industry policy in his statement *Building WA: A Strategic Partnership*, released on 4 September 2001. The slowing world economy in the wake of economic and other developments in the USA since that statement make this concern for the financial security of the State even more appropriate.

It is important to note, however, that the economic and financial risks facing the State are much wider than those captured in short-run budget and debt figures. Given the measures taken in the 2001-02 Budget to curtail the growth of expenditure and to increase revenue, the most important risks to the State's financial security now lie in the broader economic context rather than in the specifics of budgetary policy. In particular, those risks relate to short and medium term trends in the international economy and to the position of Western Australia in relation to emerging global trends. While little can be done by Australian policy makers to affect the path of the global economy, action can and should be taken to address the structure of the State's economy and its position in a changing world.

In a financial sense, and in relation to some of the key measures used by the international rating agencies, the position of Western Australia has improved dramatically over the past decade, and remains strong in national and international terms. Net debt as a share of GSP has fallen from 15% in 1995 (and from much higher figures in earlier years) to less than 6% in 2001, and is projected in the 2001/02 Budget to remain broadly at about 6% for the next four years. In two states, public sector net debt is negative (Queensland and Victoria), but Western Australia has the lowest figure of the four states with a positive net debt ratio. More generally, on this measure and on others, such as net interest payments as a share of revenue (about 2.5% in 2000/01, or 4.5% including nominal superannuation payments), the State's financial position is strong by international standards.

In the context of a strong financial position but with broader risks facing the State in terms of economic structure and the global economy, it would be appropriate to incorporate strategies to address these risks into the State's financial strategies. Thus, it would be prudent to devote some new resources to a targeted, efficient program to develop in Western Australia an industry structure conducive with long term competitive growth, as well as using the resources currently devoted to industry initiatives within a more integrated and focused framework. Given the financial parameters reviewed above and the extent of the structural risks to the State, an integrated four-year program costing in total say 1% of GDP (about \$800 million) would be a responsible approach to the industry policy issues. It should also be of a scale sufficient to facilitate a significant change in the State's economic structure.

However, there is a good case for some significant part of the costs of such a program to be funded by the Australian Federation rather than by Western Australian taxpayers. The State has been severely affected by the redistribution of general purpose payments which has been administered by the Grants Commission over the past decade in particular. This has now reached the point that, in spite of Western Australia's status as a large and developing state, its share of Commonwealth general purpose payments is now below an equal per capita share.

Another, if more controversial, measure of this imbalance is the per capita subsidy provided by Western Australia to the Australian Federation - the net effect of Commonwealth revenues raised from activities within the State and Commonwealth payments to individuals and

organisations within the State. This net subsidy was estimated by the Western Australian State Treasury to be \$1,455 per capita in 1999-2000, more than three times the per capita contribution made by New South Wales and Victoria (WA Budget Paper No. 3, 2001-02 Budget). The other three states and the Northern Territory were the beneficiaries of the net subsidies provided by Western Australia and the two largest states.

To a significant degree, these effects are due to the impact of the resources industry in Western Australia on Australian fiscal federalism, and on the financial arrangements that are embodied in it. Big resource projects generate increases in gross state product (GSP) and in State revenues without as big an increase in employment as other comparable increases in GSP. The boost to State revenues, while only a relatively small part of total government revenues from such projects, is treated by the Grants Commission as an increase in revenue capacity, and leads to a reduction in Federal funds. As the Commonwealth receives the lion's share of tax revenue from resources projects, this increases the net fiscal subsidy from WA to the Australian Federation.

It is unreasonable for the Australian community as a whole to take such a large share of revenues from resource projects, without contributing substantially to programs to build a sustainable and employment intensive economic structure in Western Australia. Thus some re-adjustment of revenue sharing arrangements between the State and the Australian Government would be appropriate, to provide partial funding for enhanced industry policies for Western Australia.

5 Areas of Strength and Opportunity

Our analysis suggests that there are a number of areas of strength and opportunity which could provide a focus for policy programs. These include:

- the exploitation and conservation of natural resources, focusing on minerals and energy resources and related services activities, agriculture and its related services activities, and the environment management and protection industries;
- the creation, production and distribution of goods, focusing on opportunities in engineering and manufacturing, information technology and telecommunication services, new and emerging technologies;
- changing global lifestyles, focusing on wine and related industries, tourism and a range of possible time zone and amenity based activities; and
- human services, focusing on health and health care services, education and related services, and the sporting, recreational and cultural industries.

These are explored in detail in the Supporting Papers.

5.1 The Exploitation and Conservation of Natural Resources

More so than any other state economy, Western Australia retains a central competitive position in a number of goods producing industries, so that these industries remain at the heart of the State's future prosperity. But it is vital to recognise that these industries, while producing goods, are increasingly founded on and integrated with knowledge intensive services activities.

It goes without saying that the *minerals and energy sector* is very strong in WA, in both national and global terms, and contributed \$12.5 billion to Western Australian GSP in 1999/2000. It was also the fastest growing industry sector in the state in terms of contribution to GSP, its share rising from 14.3 per cent in 1989/90 to 20.1 per cent in 1999/2000. The resources sector has also contributed significantly to the expansion of exports from Western Australia in the past decade. But while the value of mining and energy production is high, the sectors are extremely capital-intensive. The Australian Bureau of Statistics estimated that there were only 32,800 full-time employees in the industry in May 2001, although different estimates are available on the basis of different definitions of the industry. There are, however, strong linkages from the resources sector to other sectors of the economy, and these will be vital for future development in a number of areas.

Exports of mining and mining-related products make up a declining share of world merchandise trade. Between 1990 and 1998, their share of world merchandise exports dropped from 17.4% to 12.2%. Technological progress has resulted in less use of minerals and energy per unit of gross world product. In addition, resource prices have fallen relative to other prices, reflecting both weak demand and significant innovation in the supply of resources.

To a significant extent, this weakness in the world market for resources was disguised during the 1980s and 1990s by Australia's growing competitiveness as a source of supply. But only limited growth in the value of Australian mining output is likely over the next five years. Despite this subdued outlook for the Australian resources sector, the outlook for the Western Australian resources sector is more promising because of its relatively abundant unexploited resource base. More than half by value of all resources projects in Australia that are either committed or subject to feasibility study are in Western Australia. But even in this State it is unlikely that the rate of expansion enjoyed in the 1990s will be maintained.

Ownership consolidation is dominating Australia's mining industry. The process, sparked by the need to get bigger to reduce costs and to attract global investment funds, has left few companies untouched. CRA was merged into Rio Tinto in 1996. North Ltd and Ashton Mining were acquired by Rio Tinto in 2000. Alcan took full control of the Gove bauxite-alumina mine in 2000. Anglo American has acquired Shell's Australian coal assets and, through its subsidiary AngloGold, interests in the Australian gold industry. BHP has merged with Billiton and Pasminco, the world's biggest integrated zinc producer, is operating under voluntary administration. There is much speculation about future mergers and acquisitions impacting on the independence of the remaining major Australian-owned resources companies, and it is likely that a large international company will acquire many or all of the assets of Western Mining Corporation.

The Australian resource industries are global leaders in technology, processes and systems. The mining services industry is strong, and a major part of this industry operates from Western Australia. The Minerals Council of Australia has claimed that the mining technology, services and equipment industry is one of Australia's fastest growing export industries, with exports in 2000 of around \$1.5 billion. It has also suggested that Australian companies have developed more than 60% of all software used in mining around the world. While the general point is undoubtedly correct, the details of these claims are difficult to verify from other sources.

Agriculture has been a declining sector in the State for some years, both in terms of output and employment and relative to national trends. This seems to reflect market conditions, major environmental problems and insufficient innovation in the industry. While full-time employment in the industry (including forestry and fishing) in the rest of Australia has increased since the mid 1990s (being about 9% higher in 2001 than in 1995), employment in Western Australian agriculture has continued to fall. Nevertheless, full-time employment in the industry in the State is still comparable with that in mining, even though agriculture contributes less than 4% of GSP.

A real opportunity exists to develop a competitive, ecologically sustainable and growing agricultural sector in the State, based on innovative techniques. This will also involve substantial growth in agricultural services. Policies to achieve this need to focus on major environmental initiatives, enhanced innovation, the use of new technologies and marketing,

The *environmental services industries* are very important for the future of Western Australia. The State has a strong base of expertise and firms, linked to its key economic strengths, and employment in the industries was estimated at about 17,000 in 1999-2000. With the State

facing important domestic environmental challenges and with real international opportunities, especially in Asia, these industries offer prospects for strong employment growth. Above all, they can make an important contribution to the sustainable growth of the State. Industry strengths and opportunities appear to be in water and wastewater markets, renewable energy, solid waste management, environmental services to mining and agriculture, analytical instruments and services and environmental engineering. Capitalising on these opportunities requires a comprehensive strategy involving a serious, collaborative process to improve the environment, policies to encourage innovative solutions and initiatives to build on existing environmental strengths.

5.2 The Creation, Production and Distribution of Goods

We have stressed above the extent to which global economic activity is being concentrated in integrated systems for the creation, production and distribution of goods, and the necessity for firms and regions to consider their position within such systems. Outside the resources industries, Western Australia seems to be strong in a diverse range of niche areas where specific expertise and comparative advantage has been assembled. Many of these areas seem to be based on the capabilities of specific firms, organisations and individuals, and are to that extent fragile. Understanding and enhancing these emerging areas is an important role for policy.

In manufacturing, a number of such areas have been identified above from the export statistics, such as pharmaceuticals, iron and steel, telecommunications equipment, other transport equipment and specialised machinery. Even within these two digit industries the State's strengths seem to be very specific, rather than broadly based. Western Australia has considerable strengths in *engineering and related manufacturing* areas in a number of industries, including construction and related engineering services, marine engineering and related activities. There are also niche strengths in *information technology and telecommunication services*, in which the disadvantages of distance have spurred innovative developments in spite of the lack of more broadly based industry capabilities.

Looking somewhat longer term, a range of new and *emerging technologies* offer opportunities for the development of new industries. The State already has some strengths in biotechnology, a strength that can be further developed. Other areas of possible opportunity include rare earths and new materials, linking back into the State's minerals and mining base, and emerging areas related to the production and use of new materials, such as nanotechnology.

5.3 Changing Global Lifestyles

Increasing wealth, shifting demographics and emerging opportunities are changing global lifestyles and opening up a range of possibilities for lifestyle related developments. One obvious strength upon which Western Australia can capitalise is the *wine industry*, for which considerable opportunities exist for further expansion. This industry is also a good model for other potential industries. While rooted in the rural sector, it is a highly knowledge intensive industry making good use of advanced technology. It also caters for a growing, global market for high value products, and the Western Australian industry is focused at the high value end of the market. There are also opportunities to further develop a range of wine related

industries, such as tourism and educational activities related to the wine industry and wine regions, in such a way as to maximise the development potential from synergies between existing strengths and build them into interrelated clusters of development.

Tourism more generally is also a major opportunity for the State. Western Australia typically attracts more than its population share of international visitors to Australia, and has immense potential to develop the higher value forms of tourism. These include those visits involving longer stays, such as cultural tourism and eco-tourism, as well as tourism directed to the many diverse regions of the State.

Western Australia's position in the same *time zone* as much of Asia, including the whole of China, could also be used to advantage. Wherever travel is involved, be it for business activities, education, health services, tourism or whatever, communication 'back to base' is greatly eased by being in the same time zone. Western Australia's climate and environment also afford opportunities for and a range of *amenity based activities*, such as special niche areas of travel and tourism – eg. conferences and conventions, major sporting events, sports clinics and camps, and so on.

5.4 Human Services

Increasing wealth and changing demographics and lifestyles are also changing demand, with demand for health services, continuing education and a wide range of recreational activities set for continued growth over the coming years. As the population ages and becomes more affluent there is no doubt that *health and health care services* will be increasingly important. There are opportunities for Western Australia to build on niche strengths in medical research and further develop a range of health services for both local and visitor populations.

Similarly, *education and related services* present opportunities for further development in terms of both local and visitor populations. And, as noted above, there are many avenues for developing the *sporting, recreational and cultural industries*.

It has not been possible, in preparing this report, to investigate the potential of the human service industries as fully as would have been appropriate in a longer study. *Education and training*, for example, is at the heart of any region's response to the global knowledge economy. This centrality has many dimensions. In traditional terms, education and training has been seen as a discrete sector which provides much of the embodied knowledge and skill base for the economy, and which can be important also in terms of the export of educational services. More recent approaches have stressed the role of the education and training system as central to the 'learning economy', and to the process of continuing individual and organisational learning and innovation which are vital to economic success and to social viability. These matters are explored further in Supporting Paper 9.

6 Directions for Industry Policy in Western Australia

The broad framework of the industry policies recommended has been summarised above, and here we elaborate the specific characteristics of these policy directions. These matters are also discussed further in Supporting Paper 10.

We have also argued that it is vital that these programs be up to the scale of the challenge facing Western Australia. This implies that they are both sufficiently well resourced, and sufficiently well targeted on a limited number of programs, to make a real difference to the structure of economic activities in the State. There is no definitive measure of the level of resources necessary to have such an impact. Nevertheless, as previously noted our assessment is that a total industry policy program of the order of \$200 million a year for four years, or about 1% of GDP over the four year period, would be both responsible and of a sufficient scale to influence the long term structure of the Western Australian economy.

In the material that follows we do not attempt to develop detailed policy specifications, nor to allocate the recommended level of spending over policy areas or specific programs. The detailed development of policies, and the allocation of funding to them, is a matter for the Government and its departmental advisers, and is beyond the scope of this report.

6.1 An Integrated, Whole of Government Approach to Industry Policy

The Western Australian Government already operates many programs in the general area of industry policies. For example, Box 1 provides a list of the financial assistance schemes for industry, which have been operated by the Department of Commerce and Trade in recent years.

We have not undertaken a detailed review of these and other programs, but it does appear that these programs are extensive in number and diverse in objectives, generally of small scale and only loosely coordinated with one another. For example, total expenditure on grants, subsidies and transfer payments by the Department of Commerce and Trade in 1999-2000, which presumably covers all of the spending external to the Department involved in the programs listed in Box 1, was \$22 million. According to documents provided by the Government to the National Innovation Summit in 2000, the total annual spending on the four programs listed in Box 1 under 'Build the Knowledge Economy' was \$5.2 million.

In a world of global competition, where firms and individuals are mobile and many regional governments are actively seeking to restructure their economies, industry policies need to be closely targeted to specific objectives. They also need to be of substantial scale in relation to those objectives, if they are to be effective.

Thus industry policies need to be strategic, in three senses. First, they need to be coordinated and focused in terms of a limited number of programs, which can achieve critical mass and have a real impact. This means that the existing programs need to be reviewed, with a view to individual programs either being integrated into the broader strategy and expanded, or terminated. Secondly, there is a need to pull together activities across the whole of government, so that relevant programs from various agencies are effectively targeted on the common objectives. Thirdly, there is a need to marshal the full resources of government in

Box 1. Department of Commerce and Trade Financial Assistance Schemes

| POLICIES | PROGRAMS AND SCHEMES |
|---|---|
| Business Planning Service | Maintain a Competitive Business Environment |
| Provide Strategic leadership | Sponsorship and Industry Promotion |
| Build the Knowledge Economy | Western Australian Innovation Support Scheme (WAISS) Centres of Excellence in Industry Focused R&D (Major funding support) Centres of Excellence in Industry Focused R&D (Strategic Plan support) Regional Cooperative Research Fund |
| Develop World Class Infrastructure | Jervoise Bay Bentley Technology Park Industry Incentive Scheme |
| Improve Access to Investment Finance | Centres of Excellence in Industry focused R&D (Strategic Funding Support) Industry Incentive Scheme Western Australian Innovation Support Scheme (WAISS) |
| Enhance the Capability of Business Managers and Employees | Business Planning Services Small Business Improvement Program Export Planning Service Industry Sector Association Executive Officer Support Scheme |
| Facilitate Access to Markets | Business Visit Scheme Export Market Support Scheme (EMSS) Export Planning Service International Projects Market Support Scheme Marketing Research Initiatives Fund Regional Trade Promotion Program |
| Support Industry's Efforts to Expand Opportunities | Business Planning Service Business Visit Scheme Export Market Support Scheme Export Planning Service International Projects Market Support Scheme Marketing Research Initiatives Fund Regional Business Assistance Program Regional Headworks Development Scheme Regional Trade Promotion Program |
| Stimulate Development of Regional Businesses | Industry Relocation Scheme Regional Assistance Development Program Regional Headworks Development Scheme Small Business Improvement Program Regional Trade Promotion Relocation Feasibility Scheme Regional Development Commissions Regional Development Policy |
| Stimulate Development of Aboriginal Enterprises | Aboriginal Business Funding Scheme Aboriginal Community Economic Development Workshops Program Indigenous Business Incentives Program Establishment grants Regional Development Policy Regional Development Commissions |
| Coordinate Government Services | Regional Development Policy |

Source: WA Department of Commerce and Trade, 'Industry Policy', mimeo, 2001.

order to achieve the scale necessary to be effective. This may mean, for example, supplementing limited program funding by coordinated government purchasing and the integration of expenditures in such areas as education and health care with industry development initiatives and goals.

6.2 Developing Globally Oriented Firms in Western Australia

At the heart of our recommended industry policy for Western Australia is a much more systematic and active approach to increasing the number and level of operation of globally oriented firms active in the State, and to maximising the benefits to the State from the operations of those firms.

Thus we propose that the Western Australian Government adopt a three-pronged approach to develop the pool of globally oriented companies undertaking activities in the State, and to maximise the economic benefits from their activities. The elements of this approach are:

- a strong investment attraction program, focused specifically on firms which bring dynamic benefits to the Western Australian economy and using support measures which recognise those dynamic benefits;
- continued and expanded programs to support the emergence of local firms to global competitiveness; and
- a new linkage program, to promote and deepen the linkages between globally oriented firms and other firms and institutions within the economy.

Consistent with the theme of Minister Clive Brown's address *Building WA: A Strategic Partnership* of 4 September 2001, these programs could be effectively developed and delivered through a public-private partnership. Thus their delivery might involve both the proposed Western Australian Business Investment Centre and existing agencies, and they need to build on and enhance existing programs in these areas. The more detailed specification of each of these elements below draws on important recent developments both in the international literature and in the practice of governments in many countries.

6.2.1 Investment Attraction in the Knowledge Economy

Governments all around the world, including the Western Australian Government, are active in the process of attracting foreign investment, and in inducing footloose domestic firms to invest within the region. As the level of global integration becomes more intense, these activities are of increasing importance. Until recently, international linkages and offshore investment were the province of the large multinational corporation, but this has already changed markedly. Now quite small firms actively seek international partners, technology exchange and foreign investment, and this trend will continue to gather pace.

The rapidly evolving global knowledge economy is changing the drivers of investment. The traditional factors (large markets, the possession of natural resources and access to low-cost unskilled or semi-skilled labour) remain relevant, but they are diminishing in importance – particularly for the most dynamic industries. Many activities in integrated production systems are technology-intensive and dynamic. Location decisions have to be based on the ability of host economies to provide the complementary skills, infrastructure, suppliers and institutions to allow firms to operate technologies efficiently and flexibly, and to link them into global production systems. (See, for example, various papers in Dunning, 2000). These considerations support the more broadly based investment attraction program proposed above.

The increasing mobility of investment is making local conditions more, not less, important. The increased freedom to move does not mean that international production spreads equally to

all locations. Mobile factors only go and “stick” in places where efficient complementary factors exist. Consequently, *industrial clusters* are playing an increasing role, particularly in technology intensive activities.

These developments pose important policy challenges. Many countries risk becoming marginalised and cut off from the dynamics of international production because they cannot meet the new requirements for attracting and retaining high quality investments. Simply opening an economy is no longer enough. There is a need to develop attractive configurations of locational advantages. This calls for new approaches, going beyond the first and second generation investment promotion policies noted below.

In first generation investment promotion policies, countries or regions adopt market friendly policies. They liberalise their investment regimes by reducing barriers to inward FDI, strengthening standards of treatment for foreign investors and giving a greater role to market forces in resource allocation. In second generation investment promotion policies, governments go a step further, and actively seek to attract investment by “marketing” their locations. This approach leads to the setting up of investment promotion agencies. Third generation investment promotion policies take the enabling framework and a proactive approach towards attracting investment as the starting point. They then proceed to target key investors at the level of industries and firms to meet their specific locational needs at the activity and cluster level, in light of industry development priorities and in partnership with existing firms operating in the State. This is the approach proposed for Western Australia.

In traditional approaches to attracting investment the focus has been on the direct benefits that such investment can bring to the economy, in terms of increases in GSP, employment and government revenues. The typical methodology for assessing these benefits takes the economy to be a static one, with a relatively fixed and predictable structure, so that project benefits can be estimated by input-output and multiplier calculations that make use of that fixed structure. Thus these benefits from investment might be referred to as the static benefits.

By contrast, the contemporary conception of the economy as a global knowledge economy is one of dynamic processes of change, driven by global competition and by the increasing application of knowledge to the creation, production, marketing and distribution of both goods and services. In such an economy some activities are of considerably greater value than others, because they support such processes of change and of the innovative application of knowledge. Such economies are also characterised by extensive linkages – at the local, regional, national or international level – which are vital to knowledge-based competitiveness, and which are as a result vital to the ability of the economy to compete and to generate high levels of income and good quality jobs.

Thus investments may be beneficial to the economy in a whole host of ways not captured by the traditional static benefit calculations. These beneficial effects will relate to the quality of the activities undertaken, to the linkages and the relationships fostered and to their significance in the specific circumstances of the Western Australian economy. Hence they will enhance the ability of the State’s economy as a whole to compete and prosper in a rapidly changing knowledge economy. Projects with such beneficial effects will then give rise to future benefits in terms of increases in GSP, employment and revenues, by leading to new investment and product development by existing firms and to the creation of new firms.

For some projects, this context might substantially enhance the benefits that they bring to the Western Australian economy, and make them worthy of greater support. For others, less competitive in this changing world and with few linkages to other organisations, it might mean that the static benefits overstate their relative attractiveness to the State. Because these benefits, where they exist, relate to the ability of the economy to deal with change, we refer to them as dynamic benefits. Many of these dynamic benefits emerge from qualitative factors, in the sense that the quality of the activities, linkages and processes matter greatly to the long run benefits.

In our view, an important part of a new industry policy for Western Australia should be a more aggressive and systematic process to attract investment by globally oriented firms. But this process should focus on investments that support processes of structural change within the economy, that contribute to the innovative application of knowledge and to the extensive linkages which are vital to knowledge-based competitiveness. In other words, the investment attraction process should give full weight to the dynamic benefits that such investments can produce, and the incentives provided should reflect those dynamic benefits as well as the traditional static benefits.

For such a policy to be implemented, a methodology is required to enable the dynamic benefits to be quantified. An outline of such a methodology is provided in Box 2. The key steps in the methodology are to document in some detail the product system and innovation system contexts within which the project is situated, to identify the most important dynamic benefits for a given project, and to use a range of possible methods to quantify the magnitude of these dynamic benefits. The methods to be used will vary with the type of benefits being assessed. The maximum level of incentive that might be provided to attract the investment can then be determined within the limit of the sum of the static and dynamic benefits.

6.2.2 Supporting Emerging Local Firms

Small and medium-sized firms have played an increasingly important role in the global knowledge economy. They are proving an important mechanism for achieving a more productive and efficient use of resources, and enhanced competition. As a result of the pressures of globalisation and knowledge intensification, economies of scale have become less significant in some areas, and large firms are moving to a focus on specialised core capabilities, outsourcing non-core activities to small and medium sized enterprises.

This impact is evident quantitatively, in terms of revenue and employment generation, and qualitatively, in terms of the flexibility and innovativeness of small and medium-sized firms. Thus, in most OECD countries, small and medium sized enterprises account for 95% of enterprises and are responsible for 60-70% of jobs, and a disproportionate share of new jobs - indeed in many countries they are responsible for the total net full-time job growth over the past five years.

Box 2. Summary of a Direct Assessment Methodology for Project Evaluation

1. Comprehensive Project and Firm Profile

The first step is to assemble, in a standardised format, a comprehensive profile of the project and of the firm that stands behind it. This should include information on

- the specific characteristics of the project itself;
- the competitive position of both the project and the firm in world markets;
- the positioning of the project/firm in global product systems,
- the links and alliances with local firms proposed;
- the level of innovative activity planned, and the degree of integration with the State innovation system;
- the level of skill and expertise involved in the project, and the quality of jobs created;
- the level of investment in skills development planned, and the potential for spillover to other firms and the local education and training base.

2. Analysis of Static Benefits

The assembly of detailed project information enables the direct and indirect static benefits to be estimated, in terms of increases in GDP, employment, exports and State revenues. These calculations would be done by standard methods, using inter alia an estimated State input-output model.

3. Product System and Innovation System Contexts

To facilitate the analysis of dynamic benefits it will be valuable to document in some detail the product system and innovation system contexts within which the project is situated. This involves situating the project/firm within its network of suppliers, clients and competitors, and documenting the main actors in the regulatory framework and the support infrastructure for the project. Such an analysis will normally have local, national and international dimensions. It would be assembled using existing knowledge within the Government, information provided by the firm in question and other sources.

4. Identification of Key Dynamic Benefits

The potential dynamic benefits of project will be very diverse, and those that are substantial will vary greatly from project to project. Thus the next step is to use the project and firm profile and the analysis of the product system framework to identify the most important dynamic benefits for a given project. These key potential benefits will then be the subject of detailed analysis.

5. Quantification of Key Dynamic Benefits

This stage involves quantification of the key dynamic benefits identified above. The methods to be used will vary with the type of benefits being assessed. In some cases, such as the impact of R&D and innovation, well-documented quantitative measures such as the social rate of return to R&D are available. In many other cases, such as the impact of supplier and customer linkages and technology transfers or knowledge spillovers, interview based case studies are likely to be necessary. For follow-on investment benefits, scenario studies may be required.

6. Risk Assessment

The data assembled above - concerning the project and the sponsoring firm, its position within the industry and the level of integration within both the local economic structure and global markets - will provide a strong base for a risk assessment of the project and of the sponsoring firm.

7. Overall Assessment of Risk Adjusted Benefits

The final stage is to bring the assessment of static and dynamic benefits, and of the risk profile, together in an overall assessment of the risk adjusted benefits of the project.

But, more significantly, it is the entrepreneurship associated with new firm formation and demise, and the associated characteristics of speed and flexibility, that is proving to be a powerful generator of new economic activity in the global knowledge economy. As the OECD notes:

"Productive entrepreneurship is now one of the main drivers of economic growth. It is associated with the ability of individuals to begin new ventures, the quantity and quality of start-up firms, and the ease with which enterprises can enter and exit the market. In a *churning process*, new establishments are created, some existing ones expand, and others dissolve operations. The entry and exit of firms shifts market share from the less to the more efficient, self-selects winning firms and leads to knowledge and technology spillovers." (OECD 2001, p2)

However, the emerging global knowledge economy is also producing dramatic changes in the business environment for small firms. These are of two types. One concerns access to and investment in intangible assets such as technology, management skills, quality of business organisation, marketing and information services, while the other relates to access to capital on favourable terms. These two needs identify a new arena for effective industry policy.

The growth of small firms is critical, as are policies to facilitate this growth. For small firms to grow requires better access to knowledge, capital and partners, and indeed increasingly to international partners and to international sources of knowledge and capital. Thus these three factors are becoming increasingly central in policy. Programs to improve knowledge access for small business, to strengthen the flow of seed and venture capital, and to facilitate international partnerships between relatively small businesses are being increasingly emphasised in many countries.

Western Australia continues to have an entrepreneurial culture, with a significant number of models of small local companies that have succeeded in national and indeed international markets. The Government already has a number of programs to support the emergence of such companies, operating in conjunction with Australian Government programs. Expansion of the more successful of these programs, with specific regard to the role of early international linkages in supporting the growth of small companies, should be an important priority.

6.2.3 The Importance of Linkage Programs

As noted above, the competitiveness of the domestic enterprise sector and the existence of a pool of skilled people are key to foreign investment. Strong local firms attract investment. The entry of global enterprises, in turn, feeds into the competitiveness and dynamism of the local enterprise sector. The strongest channel for diffusing skills, knowledge and technology is the linkages between global, national and local firms and institutions. Such linkages contribute to the growth of a vibrant local enterprise sector, the bedrock of economic development.

Well-targeted incentives to support the creation and deepening of linkages can have a positive impact. One approach involves encouraging linkages through various measures to bring local suppliers together with national and foreign affiliates and to strengthen their linkages in the key areas of information, technology, training and finance. This is a broad approach exemplified by the Industry Supply Office of Western Australia (ISO), and similar agencies in other states. It basically improves the enabling framework for linkage formation. There is a raft of specific measures that can be taken in this respect. Such measures can include, for example, the provision of information and matchmaking to help domestic firms link up with foreign affiliates; encouraging foreign affiliates to participate in programs aimed at the upgrading of domestic suppliers' technological capabilities; promoting the establishment of supplier associations or clubs; the joint provision of services (especially training); and various schemes to enhance domestic suppliers' access to finance.

Another approach goes further in that it involves the establishment of specific linkage promotion programs combining a number of the measures just mentioned. This is a proactive approach that is typically focused on selected industries and firms, with a view to increasing and deepening linkages between global enterprises and local firms.

Such strategies are enhanced if governments can nurture specific clusters that build on the economy's competitive advantages and capitalise on the natural inclination of firms to cluster. However, such a targeted approach, especially the development of a locational "brand name", is difficult and takes time. It requires sophisticated institutional capacities. This gives rise to another challenge: the need to coordinate policies across various administrative levels.

Linkage programs occupy an important area at the intersection of enterprise development and investment policies. Indeed, the more policy measures aimed at promoting linkages are consistent with, and embedded in, a broad range of policies that facilitate enterprise development, the higher are the chances for linkage-promotion policies to succeed. Consequently, both institutional and policy coordination and integration are essential.(UNCTAD 2001)

6.2.4 A Western Australian Linkage Program

Historically, local investment and activity in Australia was encouraged by high tariff barriers, which 'forced' investors to locate production activities within Australia in order to access the Australian market. This gave way to a situation in which tariff barriers fell, but there was still significant focus on local purchasing policies (eg. civil offsets). Through deliberate policy changes, and through neglect of the purchasing implications of deregulation (eg. telecommunications), privatisation (eg. water and electricity) and outsourcing (eg. government IT), Australian governments have often failed to grasp the opportunities and necessities involved in the development of a vibrant local economy linked into global production systems.

Some countries have taken a more proactive approach by setting up specific Linkage Programs dedicated to increasing and deepening linkages between global enterprises and local firms. These programs combine several of these specific measures and typically focus on a limited number of industries and firms. Such targeting is almost inevitable when governments

allocate scarce resources for industrial development, and it is economically justifiable when different activities offer varying scope for technological learning, skill building or spillover benefits. (For analysis of a wide range of linkage programs see UNCTAD 2001.)

Common objectives of Linkage Programs are to increase local production and employment, to improve the current account, to make investment more rooted in the local economy and, above all, to upgrade the capabilities of local enterprises. Three elements are common to national-level linkage programs:

- the provision of market and business information;
- matchmaking by such means as trade fairs or data bases; and
- support for local enterprises through provision of managerial and technical assistance, training, audits and, occasionally, financial assistance or incentives.

Linkage programs at the sub-national level tend to be more focused. Their objectives go beyond simply creating linkages, increasing employment and balancing trade, and include:

- intensifying interaction among firms in a cluster of industries or in a (spatially dispersed) network of enterprises;
- creating an environment conducive to continuous technological upgrading; and
- enhancing the quality of investment and rooting global enterprises more firmly in the local economy.

Cluster-oriented programs seek to build on location specific capabilities and use “third generation” investment promotion strategies. They exploit the two-way interaction between clusters and investment, one strengthening the other. The emphasis is on moving up the value chain and linking local value chains with global ones.

The main ingredients of successful linkages programs are:

- Strong political commitment. Programs pursued at the sub-national level may have more impact, particularly in large countries, since they allow for a focused approach and a bundling of resources, and are more amenable to close interaction among stakeholders.
- Clear delineation of the lines of responsibility, with coherence among goals and measures. Some linkage programs, notably in the newer generation of cluster-oriented programs, tend to have conflicting or overlapping lines of authority, with overall policy responsibility and implementation situated in different ministries and agencies. Such a situation calls for special efforts to coordinate the program.
- Effective public-private partnerships. Linkages will only be sustained if they are technically viable and commercially profitable for the firms involved. To be convincing and generate mutual trust, linkage programs need to be staffed by professionals with the appropriate skills and background, and to have the support of the local business community.

Table 7: Specific Government Measures to Create and Deepen Linkages

Information and Matchmaking

Provision of information:

- handouts and brochures
- constantly updated electronic databases
- linkage information seminars, exhibitions and missions

Matchmaking:

- acting as honest broker in negotiations
 - supporting supplier audits
 - providing advice on subcontractor deals
 - sponsoring fairs, exhibitions, mission and conferences
 - organising meetings and visits
-

Technology Upgrading

- technology transfer performance requirements
 - partnerships with global enterprises
 - incentives for R&D cooperation
 - home-country incentives
-

Training

- promoting supplier associations
 - collaboration with private sector for one-stop services
 - support for private sector training programs
 - collaboration with international agencies
-

Finance

- legal protection against unfair contractual arrangements and practices
 - tax incentives to encourage shortened payment delays
 - limiting payment delays through legislation
 - guaranteeing the recovery of delayed payments
 - indirect financing of suppliers through their buyers
 - tax and other incentives to firms providing long term funds to local suppliers
 - co-financing development programs with the private sector
 - direct role in financing local firms
-

Source: UNCTAD (2001) *World Investment Report 2001: Promoting Linkages*, United Nations, New York & Geneva, 2001, p210.

The more linkage promotion programs are embedded in policies that facilitate enterprise development in general the higher is the likelihood that they will succeed. It is vital to have well-functioning institutions to channel two-way flows of information between governments and stakeholders and to provide industrial services.

6.3 Building the Western Australian Innovation System

The earlier discussion has highlighted the importance of a strong and integrated innovation system for competitive growth in the knowledge economy. A number of features of the Western Australian innovation system seem particularly relevant to the discussion of industry policy. There are in the State many areas of innovation of high quality, with capabilities of international standard. Many, but by no means all, of these are linked to the mining and resources industries. But the system as a whole is small, both absolutely and relative to the scale of the WA economy, and may be declining in scale. It is also in some respects strongly bifurcated, with different components of the innovation system focussing on different areas, and has only limited international linkages.

It is important to recognise that while national and regional innovation systems have largely the same broad components, the particular mix and nature of the inter-relationships is by no means standardised. Different countries have produced different, but essentially equally successful national innovation systems. It is also worth noting that effective innovation systems have been developed successfully in a number of small countries or regions.

For example, Finland, with its population of 5 million and its largely inhospitable terrain, has been widely regarded as one of the great success stories in terms of transformation into a knowledge economy. Key features of its national innovation system have been identified as including

- high levels of linkage and consultation between government and industry;
- strong and well-resourced Science Parks and incubators;
- very strong geographic clustering of industries;
- strong systems of encouragement and assistance for entrepreneurs;
- highly respected and widely used system of program evaluation;
- direction of the proceeds of sale of public utilities to investment agencies;
- an extensive outward orientation of local venture capital industry, particularly to the US;
- a significant role for universities in investment in new ventures; and
- triennial strategic plans developed by the Finnish Science and Technology Council.

Canada, which has many similarities with Australia, has a national innovation system which is characterised by:

- a systemic approach to develop linkages between all key players in the knowledge economy;
- an effective information access system about research and technology;
- achievement of critical mass by concentrating industry and public research geographically;
- considerable emphasis on, and investment in, networking;
- active experimentation in the finance sector, leading to a range of new commercial instruments to support start-up firms.

In contrast, the national innovation system of Singapore has the following major features:

- a strong ethos of national planning lead by the National Science and Technology Board;
- major science and technology parks with very high occupancy;
- successful attraction of inward investment;
- very high levels of computer literacy and usage;
- a focus on partnerships with major multi-national corporations; and
- financial assistance and incentives to firms to develop research facilities and technological capabilities.

Initiatives to strengthen the Western Australian innovation system should focus particularly on increasing the scale of innovative activities, on generating greater collaboration, shared focus and hence critical mass within the innovation system, and on facilitating stronger international linkages. While we do not attempt to specify here the particular policy instruments that should be employed, in our view it is clear that substantial, long term investment in building a more integrated innovation system of greater scale must be a key direction for industry policy in Western Australia.

6.4 Leveraging Off National Policies

Given that resources within any region are inevitably limited, enhancing those resources by accessing funds at a national or supra-national level is of the utmost importance. One successful case of such activity is the case of Ireland, which has utilised European Union funds to a massive extent in support of its industry development programs. For Western Australia this means accessing Australian Government funds. This imperative is distinct from the widely held, and in some areas correct, view that the State does not get the share of those funds that it deserves at the present time.

Thus, systematic attention needs to be given to ensuring that Australian Government programs are fully utilised to support development within the State. Some specific means by which this objective might be pursued are canvassed in Supporting Paper 10.

7 Profile of a Knowledge Economy for Western Australia

To make some of our analyses and suggestions as to the direction of policy more concrete, we have assembled one possible scenario for Western Australia's response to the knowledge economy. The profile is intended to give a picture, in terms of employment outcomes, of one scenario for the continued prosperity for the State in this emerging world. It is thus intended to give substance and direction to the policy process, by illustrating the possible outcome of a successful policy process. It is neither a forecast nor a projection, but a scenario to provide a quantitative framework for the development of policy.

In terms of this profile, one key feature of the WA economy by 2011 will be a significantly larger number of both local and international firms operating from WA to pursue global markets, and particularly Asian markets. These local and foreign firms will cooperate closely, in a wide range of alliances and joint ventures, to pursue these markets, and will have well developed linkages to domestic firms and other organisations in WA. The activities of these firms will be supported by a much stronger innovation system, which is considerably larger in scale and has extensive global linkages, and in which there is much greater integration between R&D and the commercial activities of firms. The growth of these firms will also be supported by a much more systematic integration into the programs of the Federal Government.

Table 8. Full-time Employment: Western Australia, 1985-2011, by Industry Type

| | <i>Employment Level ('000 persons)</i> | | | | <i>Change (percent per annum)</i> | | | <i>Change ('000 persons)</i> |
|--------------------------|--|--------------|--------------|--------------|-----------------------------------|----------------|----------------|------------------------------|
| | <i>1985</i> | <i>1995</i> | <i>2001</i> | <i>2011</i> | <i>1985-95</i> | <i>1995-01</i> | <i>2001-11</i> | <i>2001-11</i> |
| Goods | 183.0 | 213.5 | 219.8 | 247.0 | 1.6 | 0.5 | 1.2 | 27.2 |
| Goods-related Services | 122.0 | 142.2 | 142.9 | 157.9 | 1.5 | 0.1 | 1.0 | 15.0 |
| Knowledge-based Services | 128.0 | 170.4 | 202.3 | 287.1 | 2.9 | 2.9 | 3.6 | 84.8 |
| Other services | 62.0 | 96.3 | 92.8 | 122.1 | 4.5 | -0.6 | 2.8 | 29.3 |
| Total | 495.0 | 622.4 | 657.8 | 814.1 | 2.3 | 0.9 | 2.2 | 156.3 |

Source: ABS (2001), *Labour Force, Selected Summary Tables, Australia, Quarterly*, cat no. 6291.0.40.001, Table g6, Canberra.

These firms will be especially active in the areas of opportunity outlined in this report, and their growth will be supported by policies in particular areas that are dovetailed with broader State industry policies. These effects can be charted by growth in full-time employment.

One specific feature of this scenario is increased growth in the goods industries, with an increase of about 27,000 new full-time jobs (1.2% per annum) over the period (see Tables 8 and 9). Reflecting policy initiatives in terms of innovation and the environment, agricultural employment is assumed to show renewed growth. Mining employment continues to expand, although at a slower rate than over the past two decades, as technological change and the various aspects of the knowledge economy impact on employment levels in this industry. It is assumed that policy supports continued growth in manufacturing employment, so that a growth rate similar to that of recent decades is maintained. The key policy impacts are seen as being in manufacturing and agriculture. If achieved, this growth in full-time employment in

the goods industries would be one continuing way in which Western Australia is different from the rest of Australia. Nevertheless, growth in the goods sector excluding construction accounts for less than 10% of full-time employment growth. Some reasonably strong growth in employment in the goods-related service sector is also assumed, driven particularly by employment in retail trade.

However, the major source of employment growth over the period is knowledge-based services, which provides over half of the increase in total full-time employment. The impact of many of the policy initiatives presumed to be taken by the Government, and many of the increased activities of foreign firms, are concentrated in business services, where full-time employment is expected to grow by 6% per annum on a strengthening base. A number of areas are seen as contributing to the growing business services sector: further progress in building global activities in mining services; expansion in environmental services, to meet both local needs and international markets; increased innovation and technology support services, and so on. It is also presumed that there is increased spending by both the public and the private sectors on education, and that health employment continues to grow. The profile also assumes some improved performance in the State (as a result both of policy and of a stronger, more globally integrated economy) in those areas in which polarisation is particularly evident (finance, information technology and communication services and cultural services).

In many respects this scenario involves a return, in the 2001-11 decade, to employment growth rates achieved over the 1985-95 decade. The main variations reflect both the changing external environment, the changing economic structure and the presumed impact of policy in a number of areas listed above. These factors are above all reflected in the rising importance of knowledge based services in employment growth – these industries contributed 33% of full-time employment growth between 1985 and 1995, but contribute 54% in the scenario.

It would be a substantial achievement if Western Australia was to achieve an increase in full-time employment of 2.2% per annum over the decade 2001-2011. If such an outcome is to be achieved, it will be largely as a result of rapid growth in employment in knowledge based services, and hence in the various industries which utilise those services.

Table 9. Full-time Employment: Western Australia, 1985-2011, by Industry and Industry Type

| | <i>Employment Level ('000 persons)</i> | | | | <i>Change (percent per annum)</i> | | | <i>Change ('000 persons)</i> |
|---|--|--------------|--------------|--------------|-----------------------------------|----------------|----------------|------------------------------|
| | <i>1985</i> | <i>1995</i> | <i>2001</i> | <i>2011</i> | <i>1985-95</i> | <i>1995-01</i> | <i>2001-11</i> | <i>2001-11</i> |
| Agriculture, Forestry and Fishing | 39.0 | 38.3 | 31.3 | 34.6 | -0.2 | -3.3 | 1.0 | 3.3 |
| Mining | 25.0 | 28.9 | 32.8 | 34.5 | 1.5 | 2.1 | 0.5 | 1.7 |
| Manufacturing | 69.0 | 78.4 | 83.8 | 92.6 | 1.3 | 1.1 | 1.0 | 8.8 |
| Electricity, Gas and Water Supply | 11.0 | 9.1 | 8.2 | 7.8 | -1.9 | -1.7 | -0.5 | -0.4 |
| Construction | 39.0 | 58.8 | 63.7 | 77.6 | 4.2 | 1.3 | 2.0 | 13.9 |
| Goods Industries | 183.0 | 213.5 | 219.8 | 247.0 | 1.6 | 0.5 | 1.2 | 27.2 |
| Wholesale Trade | 31.0 | 41.7 | 36.1 | 39.9 | 3.0 | -2.4 | 1.0 | 3.8 |
| Retail Trade | 61.0 | 70.5 | 73.0 | 80.6 | 1.5 | 0.6 | 1.0 | 7.6 |
| Transport and Storage | 30.0 | 30.0 | 33.8 | 37.3 | 0.0 | 2.0 | 1.0 | 3.5 |
| Goods-related Service Industries | 122.0 | 142.2 | 142.9 | 157.9 | 1.5 | 0.1 | 1.0 | 15.0 |
| Communication Services | 10.0 | 10.5 | 12.1 | 14.0 | 0.5 | 2.4 | 1.5 | 1.9 |
| Finance and Insurance | 22.0 | 21.6 | 18.1 | 19.0 | -0.2 | -2.9 | 0.5 | 0.9 |
| Business Services | 25.0 | 50.3 | 67.6 | 121.1 | 7.2 | 5.1 | 6.0 | 53.5 |
| Education | 29.0 | 38.1 | 41.4 | 53.0 | 2.8 | 1.4 | 2.5 | 11.6 |
| Health and Community Services | 37.0 | 45.9 | 58.4 | 74.8 | 2.2 | 4.1 | 2.5 | 16.4 |
| Cultural Services | 5.0 | 4.0 | 4.7 | 5.2 | -2.2 | 2.7 | 1.0 | 0.5 |
| Knowledge-based Service Industries | 128.0 | 170.4 | 202.3 | 287.1 | 2.9 | 2.9 | 3.6 | 84.8 |
| Accommodation, Cafes and Restaurants | 13.0 | 23.0 | 25.7 | 41.9 | 5.9 | 1.9 | 5.0 | 16.2 |
| Property Services | 8.0 | 11.9 | 13.0 | 17.5 | 4.1 | 1.5 | 3.0 | 4.5 |
| Government Administration and Defence | 23.0 | 29.5 | 27.8 | 32.3 | 2.5 | -1.0 | 1.5 | 4.5 |
| Sport and Recreation | 3.0 | 5.6 | 4.1 | 4.8 | 6.4 | -5.1 | 1.5 | 0.7 |
| Personal and Other Services | 15.0 | 26.3 | 22.2 | 25.8 | 5.8 | -2.8 | 1.5 | 3.6 |
| Other Service Industries | 62.0 | 96.3 | 92.8 | 122.1 | 4.5 | -0.6 | 2.8 | 29.3 |
| Total | 495.0 | 622.4 | 657.8 | 814.1 | 2.3 | 0.9 | 2.2 | 156.3 |

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Steering Committee and Consultant Team

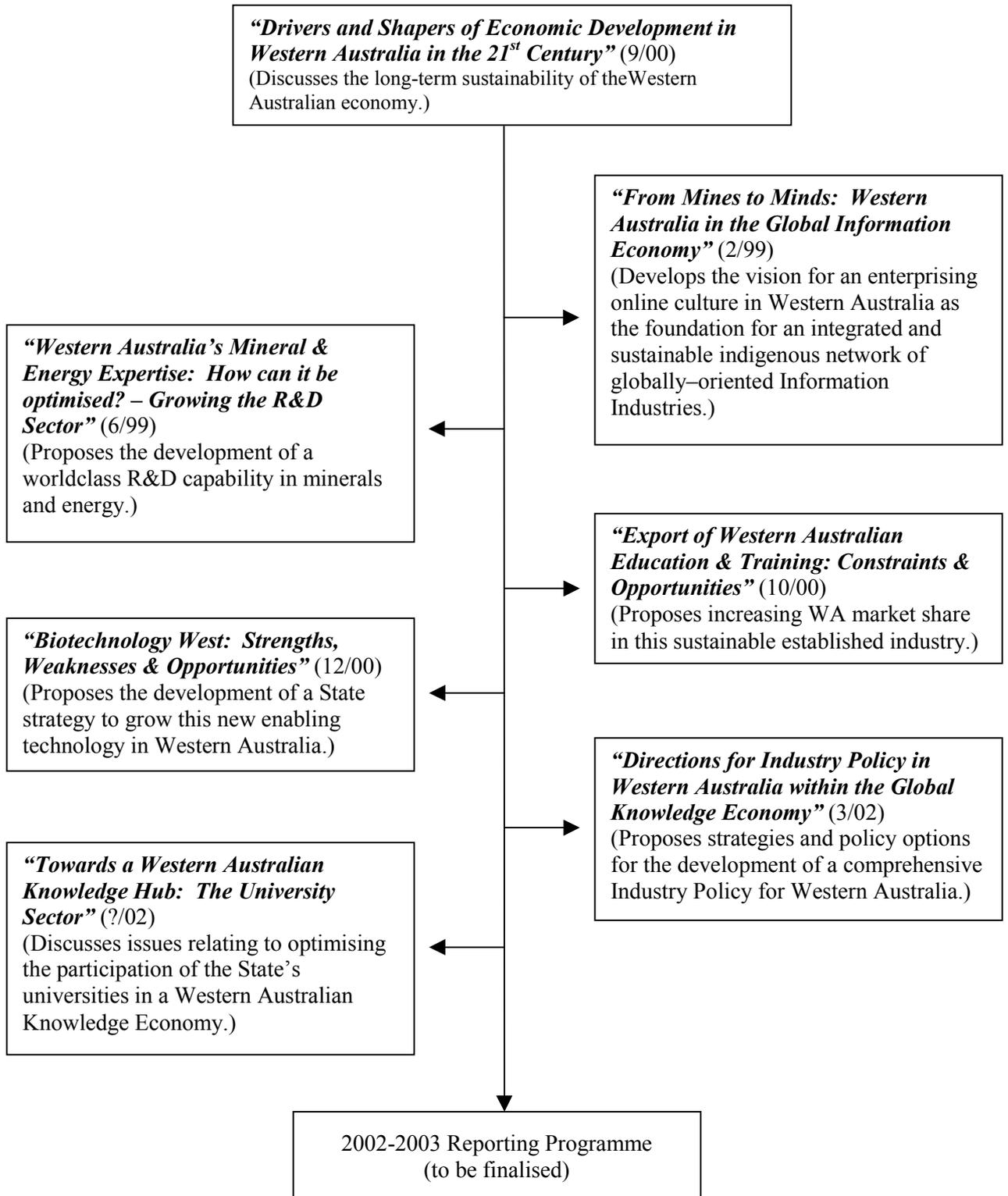
The membership of the Technology and Industry Advisory Council (TIAC) Steering Committee for this project is listed below:

| | |
|------------------------|---------------------------|
| Mr Bruce Sutherland | TIAC Member (Chairperson) |
| Ms Sharon Brown | TIAC Member |
| Dr Brian Hewitt | TIAC Member |
| Mr Rob Meecham | TIAC Member |
| Professor Lance Twomey | TIAC Member |
| Mr Tim Ungar | TIAC Member |
| Mr Earl White | Executive Officer (TIAC) |

The Steering Committee was assisted in its task by:

| | |
|-------------------------|---|
| Professor Peter Sheehan | Centre for Strategic Economic Studies, Victoria University of Technology |
| Professor John Houghton | Centre for Strategic Economic Studies, Victoria University of Technology |
| Mr Ainsley Jolley | Centre for Strategic Economic Studies, Victoria University of Technology |
| Professor Ron Johnston | Australian Centre for Innovation and International Competitiveness |
| Mr Peter Morris | Whitehorse Strategic Group |

“Towards a Western Australian Knowledge Economy”



Copies of completed reports can be obtained from our website – www.wa.gov.au/tiac.

Western Australian Technology & Industry Advisory Council

Background

The Technology and Industry Advisory Council (TIAC) was created by legislation in 1987 (Technology Development Amendment Act - No. 32 of 1987) and was continued under Section 20 of the Industry and Technology Development Act 1998.

TIAC was preceded by the Technology Review Group 1978-83, and the Science, Industry and Technology Council (SITCO) 1983-87.

Council is made up of representatives from various sectors of the State's economy who, in terms of the relevant Act, use their varied background and experience to provide independent policy advice to the Minister so as to make a significant contribution to the development of strategies relating to the State's economic development.

Members of the Council are appointed by the Minister, under Section 22 of the Industry and Technology Development Act 1998 so as to be representative of the interests of the people of the State.

TIAC reports through the Minister to Parliament under Section 26(1) and Section 26(2) of the Industry and Technology Act 1998.

TIAC reports under the Financial Administration and Audit Act 1985 through the Department of Commerce and Trade under Section 26(3) of the Industry and Technology Development Act 1998.

Objectives of the Industry and Technology Development Act 1998

The objectives of the Industry and Technology Development Act 1998 under Section 3 are:

- (a) To promote and foster the growth and development of industry, trade, science, technology and research in the State;
- (b) To improve the efficiency of State industry and its ability to compete internationally;
- (c) To encourage the establishment of new industry in the State;
- (d) To encourage the broadening of the industrial base of the State;
- (e) To promote an environment which supports the development of industry, science and technology and the emergence of internationally competitive industries in the State.

Functions of the Western Australian Technology and Industry Advisory Council

The Council, under Section 21 of the Act is required to:

- (a) Provide advice to the Minister, at the initiative of the Council or at the request of the Minister, on any matter relating to the objects of the Industry and Technology Development Act 1998;
- (b) Carry out, collaborate in or produce research, studies or investigations on any matter relating to the objects of this Act, including matters relating to:
 - (i) the role of industry, science and technology in the policies of Government,
 - (ii) the social and economic impact of industrial and technological change,
 - (iii) employment and training needs and opportunities relating to industrial, scientific and technological activities in the State,
 - (iv) the adequacy of, priorities among and co-ordination of, scientific, industrial and technological activities in the State,
 - (v) methods of stimulating desirable industrial and technological advances in the State,
 - (vi) the application of industrial, scientific and technological advances to the services of the Government,
 - (vii) the promotion of public awareness and understanding of development in industry, science and technology.

The Ministerial advice takes the form of reports and discussion papers which undergo a public consultation phase before submission to the Minister.

Participation on State and Federal Government Advisory and Funding Committees and Councils

Council has accepted invitations for representation and participated in:

- (a) The State's Co-ordination Committee on Science and Technology;
- (b) The Steering Committee for the CSIRO National Centre for Petroleum and Mineral Resources Research;
- (c) The "State Funding Advisory Committee" (SFAC);
- (d) The State's "Information and Communications Policy Advisory Council" (ICPAC);
- (e) The Department of Commerce and Trade's "Technology Operations Group" (TECHOP);
- (f) The Federal Government's "Commonwealth, State and Territory Advisory Council on Innovation".

Promotion and Public Awareness Raising Activities

Council's promotional and public awareness raising programs consist of two main types:

- (a) The 2020 Breakfast Seminars, which are short, economic development focused, information dissemination events;
- (b) The Science and Technology Forums which were established under the State's Science and Technology Policy in April 1997 in order to "raise the awareness of science and technology in the community and increase the community's input in the State's directions in Science and Technology".

Financial Provisions

The expenses of Council are provided for under Section 15 of the Industry and Technology Development Act 1998 via the Western Australian Industry and Technology Development Account.

Present Membership

Mr John Thompson
TIAC Chairman
Managing Director
Scientific Services Ltd

Mr Rob Meecham
Director of the Business Development Unit
South Metropolitan of TAFE

Mr Rex Baker
Chairman (formerly)
Executive Committee/Board of Directors
Worsley Alumina Pty Ltd

Dr Nigel Radford
Chief Geochemist
Normandy Group

Dr Lesley Borowitzka
Manager Technical Marketing
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Dr Paul Schapper
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Ms Sharon Brown
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Professor Lance Twomey
Vice Chancellor
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Mr Mick McGinniss
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