Committed to Australia's ICT, electronics and electrical manufacturing industries

AEEMA

"A BUSINESS PLAN FOR AUSTRALIA"

INQUIRY INTO THE STATE OF AUSTRALIA'S MANUFACTURED EXPORT AND IMPORT COMPETING BASE NOW AND BEYOND THE RESOURCES BOOM

HOUSE OF REPRESENTATIVES STANDING COMMITTEE ON ECONOMICS, FINANCE AND PUBLIC ADMINISTRATION

SUPPLEMENTARY COMMENTS BY AEEMA ON TREASURY SUBMISSION NO. 21

"…for Australia, it is often the very things we have competed *on* (lower cost, high relative skills) that we are increasingly competing *against*. The rapid shift of relatively high end manufacturing and services to Asia brings an urgent need for many Australian firms, *and governments*, to re-define and re-articulate their comparative and competitive advantages."

"Often, the focus has been on cooperating locally in order to compete globally. With the new wave of globalisation, perhaps it is time to change the emphasis and think about doing the opposite – cooperating globally in order to compete locally (or perhaps, in order to compete at all?)"[1]

INTRODUCTION

AEEMA provided this Committee with a submission in August 2006 on the state of Australia's manufacturing sector in the context of the current resources boom. Following appearances before the Committee on 7 December 2006, AEEMA was requested by the Committee to provide supplementary comments on Treasury's submission to the Committee.

Summary of AEEMA's Position

AEEMA argues in its submission that the manufacturing sector faces new challenges and opportunities arising from heightened global competition, but equally, that there are crucial opportunities relating to global integration into major supply chains which increasingly originate from those same areas representing the greatest competitive pressure for Australia, namely Greater China/North Asia region.

But these opportunities cannot be exploited in a strategic policy vacuum. Australia appears to have no strategic parameters or policy direction for the future of manufacturing. States such as Victoria, South Australia and Queensland have articulated clear manufacturing policy strategies about the critical place manufacturing occupies in overall economic development - at federal level this more strategic approach is missing. A vision for the sector would recognise and clarify the role of manufacturing to the nation's economy, providing business confidence that *manufacturing does indeed have a future.* Australia needs an accord between all stakeholders to focus as a nation on a *mutually agreed set of goals and actions*. This accord would be the foundation of *a strategic plan for Australia.*

In addition, too much of the nation's public expenditure is being devoted to pure science and technology development, much of which is increasingly being replicated elsewhere in the world. Our focus must move from mere technology development to technology integration, from pure science to more market facing product realisation and production.

As an example, Taiwan spells out a continuum from idea to research to development to commercialisation to 'industrialisation'. Taiwan understands better than Australia the importance of integration into global supply chains and has put in place policies to facilitate that integration. Australia focuses on linear development and is not globally integrated. The increasing complexity of products and the drive to offer differentiated service-enhanced products will eventually force Australian firms to integrate supply chains and encourage greater collaboration.

Should our current level of prosperity decline as a result of declining revenue form mineral resource exports, any failure by Government to have taken compensatory action in other key export earning sectors of the economy will be clearly evident. "Of course, when the resources boom fades our import dependency with manufactures will be a

[1] "Global Chains – Australia's challenge in the evolving world economy". Professor John Houghton. CEDA Project Paper No. 1 ISSN 1832-8814. Pages 18 and 26. Italics added.

graphic embarrassment." (Alex Millmow – University of Ballarat, quoted in The Canberra Times December 11 2006).

Summary and Review of the Treasury Position

In summary, the Government's economic management and industry policy amounts to facilitating the process of structural change such that industries which can compete in the global market will survive.

In its submission, Treasury recognises the 'appreciation' impact of prices growth in the coal and iron ore sectors, and its reinforcing effect on the slowing of manufactures exports. "…booming resources sectors may sometimes bid up wages, further eroding the international competitiveness of domestic manufactures." (page 8, Submission No. 21). This is no doubt true. Additional economic activity in one sector will generally put upward pressures on costs in general. Higher costs have to be paid by <u>all</u> sectors, including manufacturing, so the profitability of exporters and import-competing industries (other than those in the boom sectors) is squeezed.

Treasury rightly notes the gradual decline in protection for manufacturing – tariffs have moved from 35% in the 60's to less than 5% now. Combined with provision of macro/micro economic changes and ongoing management, cheaper imports from developing nations such as China, the removal of unnecessary impediments in the marketplace and the encouragement of human capital formation, Treasury makes the point that Australians are benefiting from the very same structural changes in global trade that have contributed to slower growth in manufacturing exports.

Specific support for Australian manufacturers is cited by Treasury as evidence that 42% of total industry assistance is currently directed towards manufacturing. Programs and agencies such as Austrade, the Export Market development Scheme, the Export Finance and Insurance Corporation, Tradex, Duty Drawback, and improvements to the depreciation scheme are noted as examples of the measures government has introduced to improve exporters' ability to compete in international markets. While these programs can be beneficial in isolated instances, most are non-integrated, ad-hoc and hampered by bureaucratic and administrative burdens for (generally) small companies that have neither the time nor the resources to complete the prolix application processes. They do not amount to a strategic policy approach to foster an internationally focussed manufacturing sector, or indeed to develop a 'Business Plan for Australia.'

Curiously, Treasury observes that measures which subsidise or protect sectors will provide only short-term benefit to manufactures while leading to higher prices and lower living standards (page 13 Submission No.21), while at the same time spelling out the quantum of direct subsidy currently granted to the automotive and textile sectors in Australia, ($4.2billion and $747million respectively). The Automotive Competitiveness and Investment Scheme encourages strategic investment and R&D in the industry as well as the establishment of links between Australian producers and the global industry. While some commentators have stated that calls for a strategic approach to industry policy amounts to 'picking winners', others note that on the basis of applying Treasury's own yardsticks, the automotive and TCF sector programs could justifiably be seen as supporting losers. This is not to say that AEEMA believes support given to the Australian automotive industry is a losing investment – in fact, quite the contrary.

The automotive manufacturing industry is a central player accessing a vast range of low, medium and high technology suppliers from high performance computing and communications, design engineering, robotics, advanced materials, electronics, through to relatively low technology componentry such as fasteners. But what is not understood is that the automotive industry is supported by product suppliers which also support other industries e.g. electronics, metal manufacturing, plastics and materials etc. Even medical device manufacturers depend on the capabilities that are available to support the Australian automotive industry. And then there are the service providers in the entire manufacturing supply chain.

As for textiles, it is worth noting that the Hong Kong Government (with its eye on global markets and access to mass manufacturing in mainland China) has recently identified textiles as one of four growth sectors for electronics, and is committing a substantial level of R&D funding to further this opportunity; the opportunity clearly exists for the Australian textile industry (with its strength in global branding) to collaborate with the Australian electronics industry and to identify business partners in Hong Kong. The 'knitting together' of these opportunities is a role for government and is well beyond the means of small industry groups such as AEEMA whose resources are limited. AEEMA does not have the means or authority to bring together different sectors of Australian industry to realise identified opportunities in the global market place.

It is quite clear Treasury has presented the Committee with a rather hands-off view of the future development of Australian manufacturing, relying on market forces and microeconomic reform alone to achieve sustainable growth. Even in times of a resources boom this strategy is dubious, with 55 consecutive months of trade deficit, growth in foreign debt last financial year of $60 billion (6% of GDP) and a foreign debt interest burden of $21.8 billion, doubling in just over 3 years. AEEMA considers that it is not sufficient for Treasury to simply dismiss poor trade figures as consequent upon the "recent rise due to mining company profits" and to say that "government can more effectively help the economy achieve its productivity potential by allowing the market to operate unimpeded and allow resources to flow to their most efficient use" (Treasury Submission No. 21. page 13). This approach has been failing for years. Australia's internal economy cannot sustain itself in the long term without a broadening of the structure of the economy.

The often-stated saviour of our situation is claimed to be services but these are not yet major export earners compared with the potential of tradeable goods produced through manufacturing. Australia has been poor at capturing the growth potential of manufactured goods relevant to the world economy. The Productivity Commission's report "Trends in Australian Manufacturing" 2003 compares 1975-76 with 2000-01 (page 26 and see attached). It reveals Australia has foregone significant potential GDP growth by ignoring the world opportunities in appropriate manufacturing. Other countries however were tapping into the enormous growth in world trade in manufactured goods and, in particular, in the rapid growth in trade in the high-value sector of manufacturing which is fastest growing and which thereby offers the greatest range of opportunities.

AEEMA member comments

The Committee may benefit from exposure to comments from Chief Executives of organisations active in the Australian electronics sector today.

1. "My approach is to focus on the nature of Australian manufacturing companies. We have seen in the Electronics Action Agenda (and others) that Australian industry is very fragmented, and that it is disproportionately represented by (small) SMEs.

The 'intervention' is not to pick winners, but to allow these SMEs to develop and grow and become international players. Our experience shows that this works well around a (commercial) project such as Telematics . Here, SMEs can add some specialised skills to

a project, whereas they would find it very difficult to promote that narrow skill set overseas successfully.

Certainly, my feeling has been for a long time that Government could be a lead customer, by asking industry to work together to solve business, operational or service delivery issues that Government has. This drives innovation, and gives companies a reference site and a case study to promote overseas.

Our SMEs still find it very hard to break out of a very local view of the world. There are few role models or coaches working with them.

Government can work, not by picking winners or distorting costs, but by actively encouraging these SMEs."

2. "It is interesting to hear the Committee's view that the Government does not pick winners. However, whether we like it or not, there are winners in other countries, Taiwan, Sweden, Belgium for instance, from which lessons can be learnt, and armed with this information we should not follow the losers. If it takes a vastly different cultural and political regime to be a winner, then that in itself is a lesson.

Taiwan authorities for example, have pursued strategies in the creation and establishment of high-tech industries, such as IT industry sectors, as well as new materials, pharmaceuticals, aerospace, and others. Even more significantly, the case can be made that Taiwan's strategies apply not just to a developing country, but to any country which is attempting to keep abreast of the fast-changing technological frontier. It can be argued that competitive advantage will pass increasingly to countries which can master the management of the diffusion of technological innovations, rather than the generation of new knowledge itself. This is a proposition with profound implications for public policy in countries with advanced industries such as the United States, and even more so for countries with strong research traditions but weak manufacturing industries, such as Canada or Australia.

The creation of Hsinchu as a potential Silicon Valley of the East has been anything but orthodox. In the face of Taiwan's low-tech, low-cost manufacturing proclivities, orthodox economic prescriptions would have called for policies that would build on this "comparative advantage ", keeping costs low, the currency under-valued, and protective tariffs in place to keep the high-cost world at bay. This was the Brazilian way, for

example. Taiwan's leaders, on the contrary, set out to create their own comparative advantage where none had existed.

The Taiwanese leadership was also unorthodox in its understanding of the mechanisms and dynamics of new industry creation. The conventional approach, as developed in industrial economics, is to see an industry in terms of the firms that constitute it, and its evolution in terms of the competitive dynamics between these firms. But in Taiwan's case the vision was of a complex industrial ecology, consisting of firms, of course, but also of research institutes, service houses, and public agencies, all interacting dynamically. Thus, what was created first was not new firms, but a public sector research institute, ITRI, which would *act as the vehicle for technology leverage*. The Taiwan approach also departed from the conventional view that sees industrial innovation in terms of new firms developing new products or processes. As new technologies are created in the laboratory, so new firms are created, according to the conventional view, to commercialise them. But Taiwan's leaders never saw this process as being feasible or desirable for their country, at least at its state of development in the 1970s and 1980s. They saw innovation in terms of the second stage, namely, the diffusion of the new product or process to other firms. Their goal was to create an *institutional framework* which would facilitate and indeed accelerate this process of technological diffusion. This was the heart of ITRI's mission in Taiwan.

What was created in Taiwan was, in effect, an artificially induced industrial ecology oriented towards the creation and sustenance of clusters of new, high-technology industries linked directly to the world's most advanced centres of innovation."

3. (please see attached comments from Emeritus Professor Trevor Cole, Member, Strategic Implementation Leaders Group, Electronics Industry Action Agenda, being implemented by AEEMA.)

Conclusion

AEEMA considers that, historically, the intelligent application of industry policy has worked for agriculture, mining, tourism and 'the Sydney Olympics'. If appropriately structured, it *can* work for manufacturing by finding ways of enhancing the effectiveness of the current raft of government-endorsed 'industry' Action Agendas, namely those for advanced manufacturing, science, medical devices, and of course, electronics.

AEEMA is looking forward to Minister Macfarlane's anticipated commitment in 2007 to a new 'global integration' industry policy as a logical and sensible way of supporting the efforts of AEEMA companies to grow our high end manufacturing industries.

ATTACHMENT A

MANUFACTURING IN AUSTRALIA AFTER THE RESOURCES BOOM

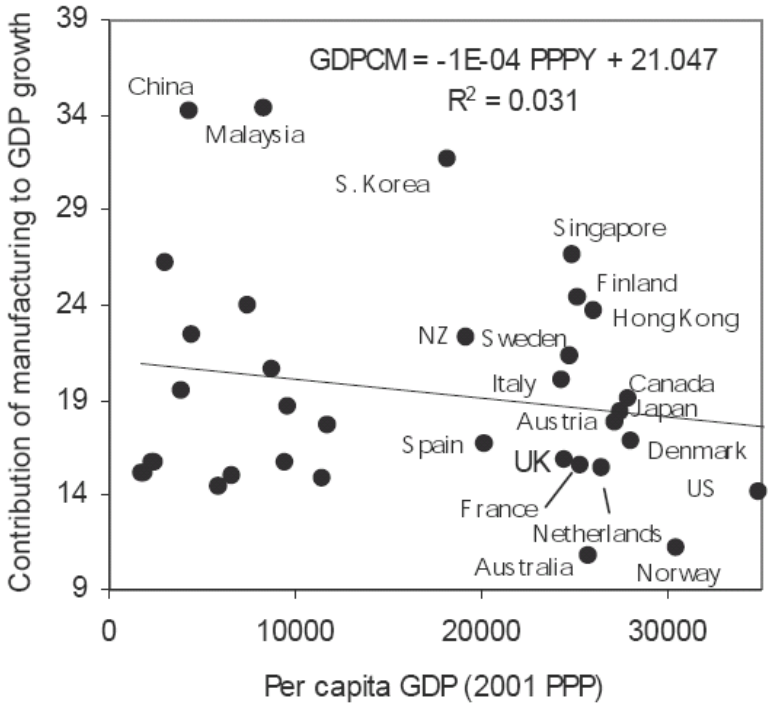
Some comments by Emeritus Professor Trevor Cole

(dec06/manufacturing post resources boom.doc)

It appears that Treasury has presented the Committee with a rather hands-off and pessimistic view of the future development of Australian Manufacturing relying on market forces and microeconomic reform alone as sufficient to achieve a sustainable Australian economy. Even in times of a resources boom this is clearly failing with 55 consecutive months of trade deficit, growth in foreign debt last financial year of $60 billion (6% of GDP) and a foreign debt interest payment of $21.8 billion (doubling in just over 3 years). It is not sufficient for Treasury to simply dismiss poor trade figures as due to the "recent rise due to mining company profits" and to say that "government can more effectively help the economy achieve its productivity potential by allowing the market to operate unimpeded and allow resources to flow to their most efficient use" (The Age Sept 4, 2006). This has clearly been failing for years.

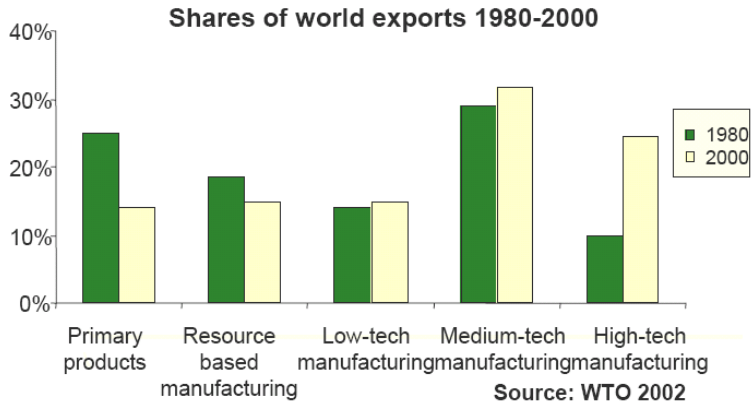
Australia's internal economy cannot sustain itself in the long term without a changing of the structure of the economy by taking better advantage of what technology, well-applied, has to offer. Unfortunately, as Ross Gittins has said (Sydney Morning Herald, December 16-17, 2006), "economists don't actually know much about technological change, so they end up focusing on the day-to-day business of producing and consuming goods and services".

The often-stated saviour of our situation is claimed to be services but these are not major export earners compared with the potential of tradeable goods produced through manufacturing. Australia has been abysmal at capturing the growth potential of manufactured goods relevant to the world economy. This is illustrated in the following figure from the Productivity Commission's "Trends in Australian Manufacturing" 2003 report comparing 1975-76 with 2000-01 (page 26). It reveals Australia has foregone significant potential GDP growth by ignoring the world opportunities in appropriate manufacturing.



So what were the other countries doing? They were tapping into the enormous growth in world trade in manufactured goods and, in particular, in the rapid growth in trade in the high-value sector of manufacturing which is fastest growing and which thereby offers the greatest range of opportunities.

Unfortunately, policy makers in Australia simply have not understood this change in manufacture from high volume, low value into manufacture which is low/medium volume and, most importantly, technology-intensive and of high value. Too often the arguments come back to textile, footwear and clothing – a previously protected low value sector which needed major transition support through the TFC program to cushion it through tariff reduction. Instead, the focus should have been on the burgeoning high value, design-intensive and internationally competitive **fashion** clothing sector within Australia.



Other examples exist to illustrate what is potentially possible in Australia. These range from shipbuilding to medical devices. Incat's (Tasmania) 90 metre plus wave-piercing catamaran ferries dominate the Mediterranean while Austal's (WA) ships are sold internationally and Tenix (SA) has just delivered the fifth destroyer to the Navy. Resmed, Vison Systems and Cochlear epitomise what is internationally achievable in high-tech manufacture of medical devices from Australia.

One other potential within Australia is to address its extremely poor value-adding to its basic commodities. Wood chip is exported rather than paper pulp let alone specialist papers and the printing/inks that create value from the basic product. Similarly, aluminium ingots are exported without Australia producing alloys and rolled products from them. One recognises the enormous improvements that technology and innovation have made to the **processes** within the minerals and primary sectors but it also highlights the limits to growth with current approaches.

These plus others illustrate potential but the scale is currently too small. This can be blamed on an extremely poor understanding of what occurs in such globally-competitive companies and a massive distraction with Australia's focus and public support funding towards research rather than innovation, design, and high value manufacturing.

To get to the heart of the issue requires a clearer understanding of both the design process and the innovation management issues that underpin a company's performance, as well as the cluster and infrastructure factors that can leverage overall regional and national economic performance through innovation.

Effective innovation within companies

Successful companies are those that continue to provide globally cost-effective solutions to a customer's needs. Identifying those needs and assessing the capacity to provide a cost-effective solution are at the core. Good management that continually assesses and reduces the risk of achieving a successful outcome in the proposed product (or service) is one underpinning requirement. Managing the design flow and product/service

realisation stages is the other. Hence companies require management and design skills particular to innovation management and these have little to do with research. **It is a technological / engineering / management issue almost completely absent from higher education programmes in Australia.**

In better understanding how the innovation process works within companies, the definitions of innovation as used by the IR&D Board or by the following one from the EU's Eurostat are both explicit and most relevant: "An innovation … is a new or significantly improved product (good or service) introduced to the market or the introduction within [the] enterprise of a new or significantly improved process. The innovation is based on the results of new technological developments, new combinations of existing technology or utilisation of other knowledge acquired by [the] enterprise".

Most importantly from this description, the company stock of knowledge which is built up and which underpins the company's capacity to continue to produce new and competitive products or services comes from a range of sources – a small subset of which is that licensed in from external knowledge and technology providers. Given Australia's relatively small global scale, it is inevitable that most of this useful external knowledge is likely to come from overseas. The exception might almost only be when there is a good synergistic cooperation between the company and a local private or public R&D provider.

Government recognition of the criticality of the particular skills requirements and of the need for synergy between company needs in R&D and that carried out locally leads to a range of potential policies more effective in supporting innovation.

Cluster and infrastructure factors

Individual companies reliant on knowledge benefit enormously when they are in an environment in which relevant skills, resources, synergistic research and complementary companies are in abundance. The spillovers are multiplied and knowledge re-use is common. Such environments are commonly referred to as clusters.

The characteristics and benefits of clusters have been well covered in a range of studies of effective knowledge economies. The key element is one of interaction and Australia is yet to achieve the innovation-supporting environment well summarised as:

> "The collective work can be achieved only through constant interaction. Engineers move from one firm to the next, samples and prototypes circulate, clubs of users are formed and disbanded, professors are engaged as consultants, and university researchers are recruited by industrial enterprises. A community is gradually formed, characterised by the richness of diversity and bound by sound common knowledge. Innovation networks are a mix of intersecting and interlinked organisations, human actors, machines, facilities, communication infrastructures, documents and materials."

("Between Uniformity and Diversity", Michel Callon and Patrick Cohendet, 12th Convocation, CAETS, Edinburgh, May 1997.)

There are many practical policy programmes which can and have fostered such environments. These include the Centres of Expertise Programme of Tekes in Finland, referred to in more detail below.

The role of government is predominantly one of encouragement and stimulation supported by financial programs that address market failure through appropriate additionality.

Manufacturing appropriate for Australia

As has been said, the word “manufacturing” covers a wide gamut from low value-add mass manufacturing to high value-add specialist and low-volume manufacture. It is the reality that Australian companies source low value-add or mass manufacturing overseas and, in particular, to China. No-one could make a cost-benefit case for such manufacture in Australia unless it is highly automated or has other factors such as transport inhibiting overseas sourcing (an example would be bricks and other building or civil infrastructure materials).

Manufacturing opportunities are growing in focal points of new technology integration such as telematics, complementing existing industries such as the automotive industry. As reported in the Electronics Industry Action Agenda:

> “For example, it is estimated that 90 per cent of all future innovation in the automobile industry will be driven by electronics, with electronics representing up to 40 per cent of a vehicle’s production cost by 2010. According to the Department of Defence, the value of electronics in defence related activities is even higher, with electronics representing up to 80 per cent of the production cost of a modern war ship and a submarine”.
> (Electronics Industry Action Agenda,
> http://www.dcita.gov.au/Article/0,,0_1-2_11-3_475-4_107122,00.html)

(An alternative description of what is meant by high-value-add manufacture has been developed by Cambridge Investment Research in the UK. CIR uses the Trademark phrase ‘High Value Manufacturing’ or ‘HVM’ rather than the phrase ‘high value-added manufacturing’ as a more wholesome function of time-to-market, IP and reinvestments, among other factors such as design. CIR developed a working definition of HVM: “HVM is manufacturing where there is relatively high value created in the supply chain segment involved. In a corporate setting, HVM is usually characterised by higher-than- average expenditure on R&D as a proportion of sales, and/or is highly innovative with respect to product development, design, and/or is associated with above-average levels of intellectual property (IP). HVM often applies to newer markets, where design or manufacturing processes may be fast-moving, new, unfamiliar, or not well tried and tested; and where prototyping, demonstration and lower volume production are all still valuable. Selected business sectors where one realises this are: electronics and semiconductors; additive manufacturing; printing and displays; medical devices, sensors and biotechnology; aerospace; automotive and motorsport; new energy; materials & catalysts; and nanotechnology; and communications.”)

This is not the area of scientists and “research”. It is the area of technology, engineering, design, product realisation, marketing and efficient manufacturing. Australia’s public sector support for “R&D” and innovation over the years has been squandered on a misuse of the word “innovation” and areas of knowledge generation rather than that of design and technology integration into globally competitive products.

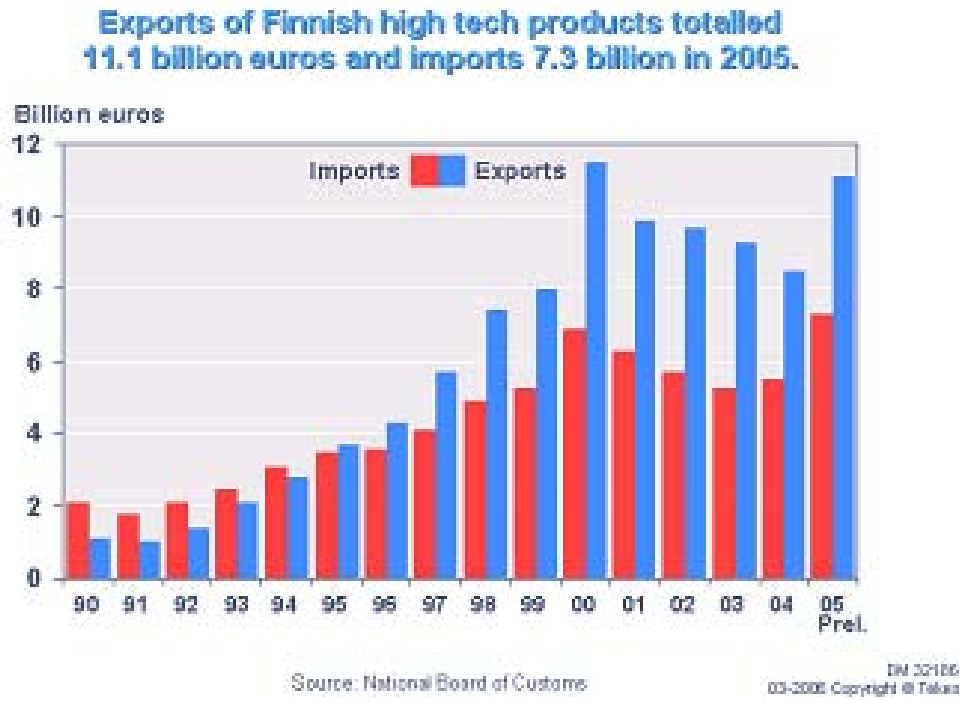
The issue for government innovation policy is as much one of better focus of existing resources as of specific extra targeting of the clear market failure in Australian innovation. This was put usefully by the European Commission referring to market failure: “ … the inability of a system of private markets to provide certain goods either at all or at the most desirable or ‘optimal level’. Market failure occurs, therefore, when private companies cannot or will not provide something because they cannot make a commercial return even where there is demand or need for this something. Under these conditions, the rationale for public provision of or public assistance to private firms in providing this is normally justified as it will lead to employment and wealth creation that would not otherwise have occurred”.
(“A Study of Business Support Services and Market Failure”, European Commission, 2001.)

There are many ways that the high value manufacturing sector could be encouraged to expand in areas self-selected by the individual companies and entrepreneurs or guided by identification of cluster potential. The key aspects range from broad statements recognising the opportunity and importance, through the addressing of the professional skills gap in innovation management, design, marketing and productisation, to supporting the cluster/infrastructure issues that leverage activity.

Evolving the structure of Australia's economy

The starting point is to ask if Australia would be better served if its economy structure evolved in particular directions better exploiting the evolving world trade opportunities and which built on a knowledge and technology-intensive Australia. Following from that is the question of whether government has a role in stimulating and/or supporting such change. To dismiss the role of government in stimulating a change in the structure of the economy(as appears to be stated in the recent Productivity Commission's draft report) is a very risky and shortsighted view. Enormous benefits can evolve from an economy capturing the opportunities in the emerging new sectors of the **world** economy. And significant evolutionary change in a country like Australia is possible within a reasonable timescale as evidenced by international exemplars. For instance, the structure of the Finnish economy evolved as per the following diagram with most significant change in the 1990s.

In the area of technology goods, Finland also demonstrates a diverse capacity to add value through down-stream value adding to its more primary and low value products. It is now a diverse economy in which 23% of its export goods are high-technology manufactures and the trade balance of high-technology manufactures is positive.



That is, high-value manufacture offers a diverse range of opportunities for Australia to generate wealth and, in particular, to create global opportunities for export revenue generation. It cannot be dismissed - but to be successful requires specific forms of encouragement and support.

An overseas innovation system – Finland

Staying with the Finnish example, the separation of higher education research funding between the Academy of Finland, the universities themselves, and Tekes achieves much of the skill base, knowledge base and infrastructure needed for a growing high value manufacturing sector.

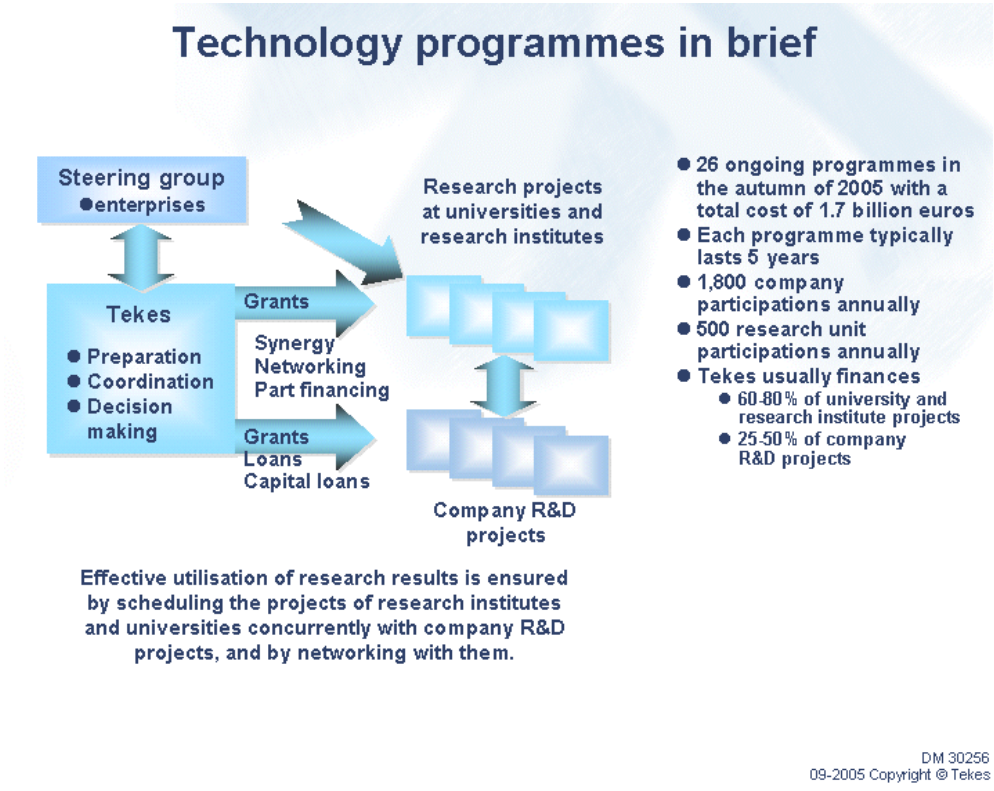
Tekes is the key government player in innovation support (within the Ministry of Trade and Industry!). The goal of the funding for the research projects of universities, research institutes and polytechnics is unashamedly to build “technological competence” (in contrast to the research excellence of the Academy of Finland) through three main categories:

- application oriented basic research
- challenging long-term or medium-term research
- applied research.

Total Tekes R&D funding in 2004 was 409 million euros distributed across 242 projects. These covered:

- R&D grants to companies 165 million euros
- Research funding for universities and research institutes 172 million euros
- R&D loans to companies 31 million euros
- Capital loans for R&D to companies 39 million euros
- Start-up loans to new technology companies 2.2 million euros

Structuring of funding is through Technology Programmes, multiproject programmes initiated, steered and part-financed by Tekes with a focus on a key technology sector. They are implemented in cooperation by companies and research units in which companies can participate with their own projects or by joining common research projects. The projects and results are partially public – a critical issue to enhance spillover even beyond the large number of companies and research units involved in the programmes.



The straddling of projects across higher education research and the large number of companies leads to and fosters the synergies that are critical to cluster development.

Again, there are insights in Finland, Scotland and elsewhere as to how government action and support for clusters can be stimulated and achieve major wealth and productivity outcomes. It is not the intention to go into detail other than to quote the Finnish Prime Minster on 10 October 2006 where he addressed a Brussels Open Day:

> "We have to find ways to best promote the process of bringing innovation into the market and turning them into competitive products at a global level. The formula for effective innovation policy is more than just promoting research and development projects. In Finland, the Centres of Expertise Programme represents the Government's view in how to improve regional competitiveness in line with national and European policies. This fixed-term programme was introduced in 1994 to create new jobs and to foster regional development in the selected fields of expertise. The Government has challenged regional actors to cooperate in joint strategies by using relatively small funding incentives and at the same time giving them a high-level status in the Finnish innovation strategy. From the very beginning the carrying force of the programme has been the active cooperation between universities, research and development institutions, companies and municipalities. Over 5000 companies take part each year in the preparation and implementation of projects. These projects have also contributed significantly to the diversification and renewal of the industrial structure within the regions. The total project volume for 1999-2005 is approximately 500 million euros, which has so far generated 12,000 high-skill jobs and over 1,000 new businesses. The result of the programme is a strong and active network of 22 centres of expertise with 45 fields of expertise."
> www.eu2006.fi/news_and_documents/speeches/vk041/en_GB/170848/
> (The homepages for the Finnish and similar Scottish programmes are at www.oske.net/in_english and http://www.scottish-enterprise.com/sedotcom_home/sig.htm)

Cooperative Research Centres and universities

Consequent upon the above discussion, several comments can be made in relation to the considerable investment in CRCs and commercialisation in Australia.

There is pressure (including the draft Productivity Commission report on research and innovation) for a re-widening of the objectives of CRCs beyond economic outcomes. This should be considered a retrograde step if it dilutes the emphasis on obtaining a national economic return from public expenditure on collaborative public sector/industry innovation-linked research. A reasonable expectation to place on all CRC-type bodies is clear identification of the need and/or opportunity being addressed and an articulation of both the opportunity and the practical pathway to its realisation.

Also, as the Eurostat definition indicates, economic outcomes have as much, if not more, to do with applying existing technologies in new combinations as it does the acquisition of radical or breakthrough technologies. Hence a CRC which is active in current technologies and the means to combine (that is, "design") them into applications is likely to be more successful than a purely research CRC.

The current CRC program is built around a science or technology "push" model of innovation. That is, it too often states to industry "this is what I have invented – apply it!" and claims it is industry's fault when there are no commercial returns. This approach is reflected in the constitution of committees and panels as well as in the traditional "academic" approach to what is meant by excellence.

What is missing is an industry or market "pull" or, even better, an "integrated" approach to the CRC role within the innovation processes of Australia. As has been indicated above, valuable comparisons and contrasts might be made with a number of international programs and funding processes of which Finland's TEKES (http://www.tekes.fi/eng/default.asp) has very strong lessons. Other models exist in Sweden's SOCware program run from the collaborative, membership-based company Acreo (http://www.acreo.se) and based at several universities illustrating that "design" is just as valid as "research" and that short and medium term relevance to industry is most important. A third example is IMEC in Belgium (http://www.imec.be/), an example picked up by the UK's House of Lords in a report proposing a national centre in microelectronics (Chips for Everything: Britain's opportunities in a key global market, House of Lords Select Committee on Science and Technology, Session 2002-03, 2nd Report, www.parliament.the-stationery-office.co.uk/pa/ld200203/ldselect/ldsctech/13/13.pdf).

With regard to commercialisation from public sector research, it is poorly understood in Australia that direct spin-out of a technology-based company incorporating public sector research IP can only ever be a very minor part of technology-based innovation activity. In the cluster around Cambridge in the UK, Gothenburg in Sweden and here at the ATP, such university-linked companies are less than 10% of the overall start-up activity.

The vast bulk of the growth of activity is from indirect start-ups where the key ingredient is the relevant higher education skills of the key founders utilizing their own skills and knowledge to integrate technology into a market-identified opportunity. Also identified as very important in the case of Cambridge is the handful of serial entrepreneurs who have done much in their own right and through stimulation to encourage new venture creation.

The conclusion is that providing relevant skills and attitudes amongst the graduates – especially first degree graduates – will develop the pool of those who will grow technology-based clusters. It is not often that the PhD or academic is the key driver of high-growth, technology-based businesses.

For both graduates and researchers to be "commercially oriented", it is critical that they are exposed to and understand the innovation process and the complete value-chain before commercial outcomes are reached.

Related to this is the increasingly understood fact that university ownership and exploitation of IP will not be a major revenue generator for universities. An interesting contrast is in Scandinavia where the researcher retains ownership. This has generated greater commitment to exploit and a good example exists at Chalmers University in Gothenburg where this has enabled many new companies and also strong involvement of Masters students developing innovation capabilities as they form the commercialising pathway for that IP.

However, within Australia, university structures and attitudes make it very difficult to establish a distinct focal point and the resources to sustain such innovation training activity. This is based on the author's own difficulties experienced when having developed and delivered programs in technology entrepreneurship to both undergraduate and postgraduate students. Of interest is that strong student interest exists in such programs.

Internationally, others have been much more strategic and supportive. In Scotland the Scottish Institute for Enterprise supports and co-ordinates entrepreneurship activities across 13 universities in Scotland. Within England, the Higher Education Innovation Fund (HEIF) exists as a separate source of funding, alongside research and learning/teaching. A total of £171 million has been awarded over 2004-05/2005-06. Resources can be

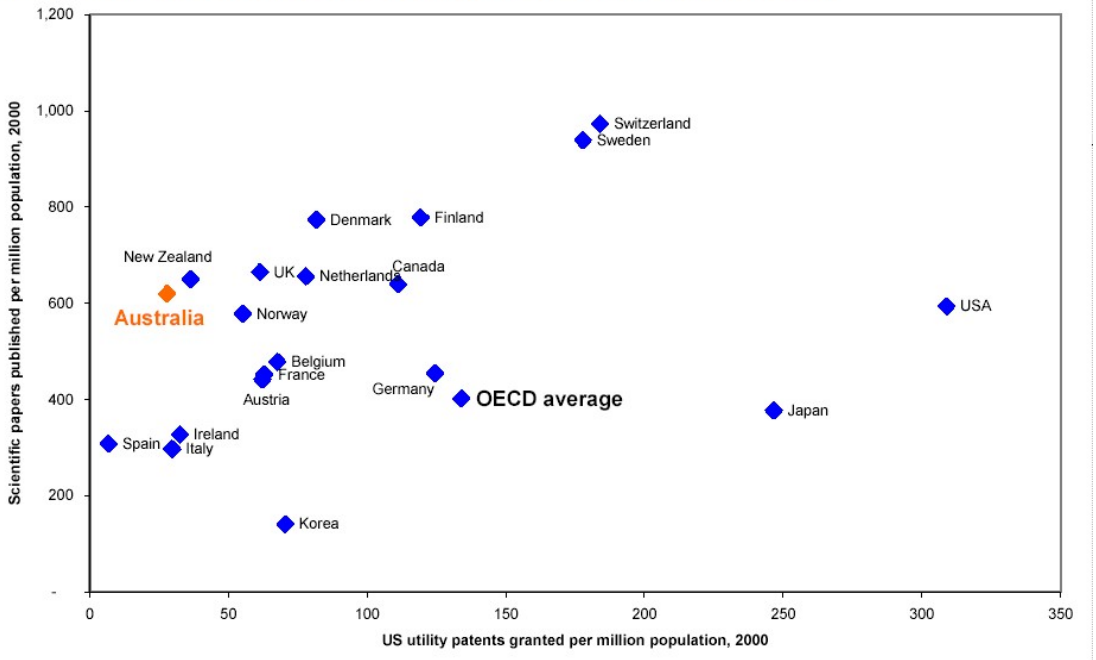
used, not just for spin-outs, but for knowledge transfer, entrepreneurship training, seed venture funding and transferring knowledge into business and the community. ('Investing in innovation: A strategy for science, engineering and technology', DTI, DfES, HM Treasury, July 2002)

Specifically targeted funding such as in HEIF, with priorities on innovation development of the graduates and involvement of them in innovation activity, is perhaps the only way to ensure that resources are not dissipated within traditional university internal funding arrangements.

Mapping of Australian Science and Innovation

A number of the above issues were revealed in the mapping report of 2004 but have received little attention since. Market relevance of the knowledge being produced in Australia is abysmally low - enhanced by other weaknesses in research focus relative to market opportunity. A good indicator of the mismatch between research in Australia and market relevance is the following figure from the Mapping report (page 73):

Figure 2.20: A snapshot of Australia's performance in science and innovation



Source: OECD (2002g), p 317; and USPTO (2002), p A1–1.

Another relevant statement from that report is the footnote to a figure of Commonwealth support to business R&D (Figure 5.34, page 385): "Note: Data displayed on a logarithmic scale due to R&D support being an order of magnitude greater than commercialisation support".

Because they have not received the coverage they should, the following statements from that report are repeated:

· Australia's high-tech exports are less than a third of its imports and Australia 26th of OECD for high tech exports as proportion of GDP (page 12)

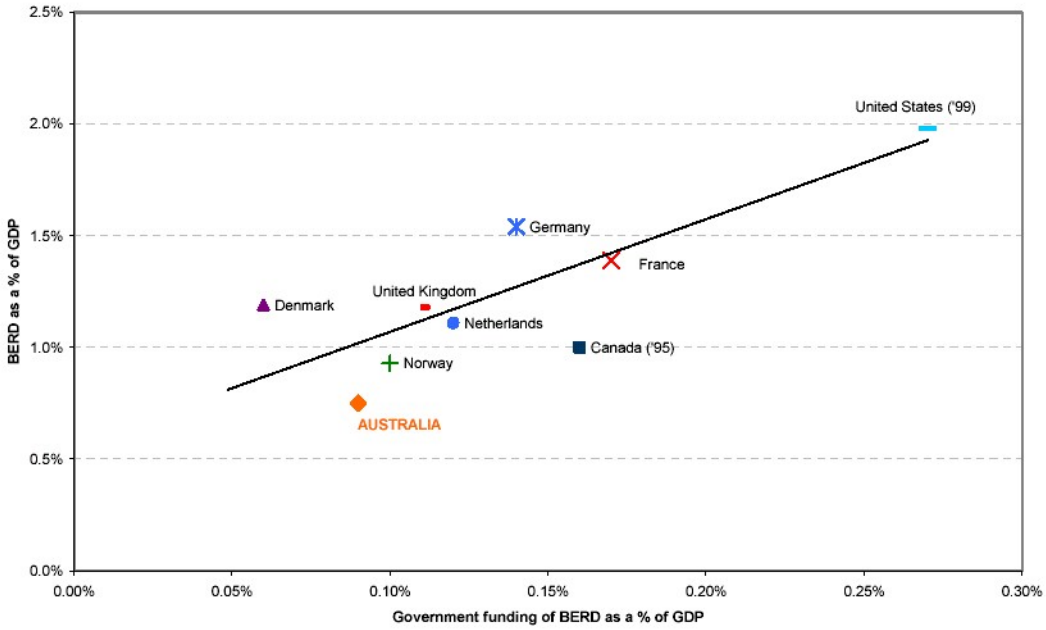
· Australia's manufacturing sector mostly companies with R&D intensity of less than 4% cf Germany and Sweden where more than half manufacturing sector is companies with R&D intensity greater than 5% (page 13)

· Government support for business R&D is low by international standards, being less than half that of leading OECD countries. Australia – with direct plus indirect support at about 0.09% of GDP – provides less support than all but one of the comparison countries, whereas the United States (with support totalling almost 0.30% GDP) is the most generous (page 300)

· Over the past 30 years there has been a rapid growth of world trade in manufactured products. Australia has not been a strong participant in this expansion, unlike such countries as Canada, Sweden, Finland and the Netherlands. Australia has built neither large Australian-based firms, nor areas of strong specialisation, in trade and technology-intensive industries. In 1913, the value of Australian exports was about the same as that of Canada and the Netherlands and five times that of Finland. By 1988, Canadian and Dutch exports were about four times greater than Australian exports, and Finland's exports were only slightly less (page 30)

The Mapping report also reveals Australia as a low supporter of BERD. If public sector support for R&D had a greater emphasis on the wealth creating end related to innovation, then the stimulation of industry would lead to a more internationally comparable level of BERD.

Figure 5.45: Government support (direct and indirect) for BERD, 1997 or nearest year



Source: Derived from data in OECD, Main Science and Technology Indicators, 2002 and OECD, Science, Technology and Industry Outlook, 2002 and Science and Technology Budget Information, 3002–04.

This is not to suggest that particular sectors are to be necessarily overly prioritised. But is does mean that Australia could well benefit from an increased balance of support to innovation in products and services within companies compared with support for unfocused public sector research.

In conclusion, there is a different perspective that can be put on Australia stimulating a strong manufacturing sector. It moves the discussion and focus of support to the technology, design, marketing and engineering skills that are currently in short supply. It stimulates Australia's existing nascent clusters to evolve to fields of international competitiveness. And at base it presents to Australia a clarity of what is meant by innovation and knowledge economy as well as the importance and urgency of evolving Australia to a high value product-developing nation.