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

AEEMA

PUBLIC SUPPORT FOR SCIENCE AND INNOVATION
PRODUCTIVITY COMMISSION ISSUES PAPER
COMMENTS BY AUSTRALIAN ELECTRICAL AND ELECTRONIC MANUFACTURERS' ASSOCIATION (AEEMA)

The Australian Electrical and Electronic Manufacturers' Association Ltd (AEEMA) is the peak national, industry body in Australia representing some 400 infrastructure providers for Australia's ICT, electronics, and electrical manufacturing industries. AEEMA is organised in three principal divisions (electrical, electronics and 'ICT Australia®'); member companies belong to some 17 industry forums and provides secretariat services for three other associations, the Armed Forces Communications and Electronics Association and IES The Lighting Society. AEEMA also supports industry-led clusters linked to national strategic development.

AEEMA's policy platform is based on adherence to competitive market principles, removal of trade barriers including non-tariff barriers, reduced red tape, regulation only where required, equitable tax treatment for business and the removal of impediments to Australian manufacturing that harm its international competitiveness.

AEEMA is leading a national strategic plan aimed at developing further Australian innovation in contract electronics manufacturing of complex products, integrated systems for home networking and telematics, medical electronics and devices, defence electronics systems, photonics and opto-electronics. AEEMA is also closely linked with the principal R&D institutions throughout Australia that specialise in ICT technologies (electronics, microelectronics and photonics) and nanotechnology.

AEEMA enjoys strong links with the Australian Government and state government agencies. AEEMA's Industry Cluster-Queensland is breaking new ground in collaborative and innovative activity for regional, technology-based small to medium-sized enterprises (SMEs). AEEMA has now opened an office in Melbourne to support and service growing industry needs in Victoria, particularly in regard to the emerging transport telematics sector. AEEMA is pro-active in developing strategic alliances with overseas kindred

associations as an innovative means of building commercial partnerships for its members with the members of these industry associations.
http://www.aeema.asn.au/ArticleDocuments/27/Strategic%20Alliances.pdf
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THE PRODUCTIVITY COMMISSION'S ISSUES PAPER

AEEMA welcomes the Commission's review into the importance of innovation to Australia's economic growth and current impediments to the effective functioning of the innovation system, specifically in relation to public support and programs for innovation. It is these particular aspects of the Commission's Terms of Reference that AEEMA will focus on in these comments, with an emphasis on the impacts of such impediments on the manufacturing sector.

DEFINITIONS

There is a plethora of OECD and EU research into the issue of innovation in manufacturing and services but one thing is clear - it is a poorly understood phenomenon. While its linkages with productivity, economic growth, cost savings and supply chain effectiveness are well known, the details about **how** they are linked is not understood. We have rich data about the good outcomes delivered by innovation but we remain unsure about the policy settings needed to deliver those outcomes.

This may be a definitional issue – there are as many definitions of innovation as there are commentators. For many, especially governments, 'innovation' is used as a descriptor for the entire process of commercialisation, from idea to market, so that any targeted polices are aimed at enhancing outcomes across the entire spectrum of these activities. Another definition that appears to have gained currency is 'change that adds value'. The recent Report by the House of Representatives Standing Committee on Science and Innovation uses this approach as the basis for its accepted definition, "…the path of conceiving, developing and implementing ideas through to the generation of products, processes and services. It gives economic value to the nation's knowledge."[1]
It is evident from this definitional approach that there can be many different types of innovation, and this is clearly recognised by the OECD;
Product innovation – the introduction of a good or service that is new or significantly improved
Process innovation – the implementation of a new or improved delivery method

[1] "Pathways to Technological Innovation" June 2006, page 8

Marketing innovation – the implementation of a new marketing method involving changes in design, placement or pricing
Organisational innovation – the implementation of a new method in a firm's practices, workplace organisation or relations.[2]

These different categories of innovation may have characteristics that span more than any one category, and they may also be inter-dependent at times. But the key word in all of these types is 'implementation'. What is recognised as critical to a successful implementation is appropriate support for the two leading phases of innovation: creativity and development. Only then can we have enough "meat on the bones" to build the commercial proposition (industrialising) by which innovative success can be measured.

I**nnovation** is not necessarily **invention** – the most effective innovation involves the application of *existing*, *old* knowledge in new and inventive ways, not necessarily new knowledge itself. Innovation is multidimensional, encompassing a vast array of activities in the whole supply chain including workforce skills, individual skills, leadership, management, technology uptake and cultural understanding (attitudes and behaviours). OECD experts indicate that the single most difficult aspect of facilitating innovation in any policy setting is *changing the behaviour of people.*

MEASURING NATIONAL INNOVATIVE CAPACITY

The most recent econometric analysis of Australian innovation, "Assessing Australia's Innovative Capacity: 2005 Update" [3] is a sample of 29 OECD countries over the last 20 years, from 1973 to 2004. The sample has measured innovative capacities using weighted indices showing the extent of each country's current and accumulated resources and policy commitments to innovation. The key finding from this analysis is that Australia has not made any gains in innovative capacity since 1996 (page 9). "To understand this it is useful to look at the drivers of innovative capacity for Australia…It will be seen that the reasons for recent declines have been i) stagnating R&D expenditure; ii) a decline in IP protection; and iii) a decline in education funding."

There may be more subtle forces at work to explain the decline in innovative capacity indicated in this study. The authors postulate that there is a perception that Australia's IP protection is weak, due to controversy surrounding copyright issues, music copyright and the US-Australia FTA IP issues, of much concern to industry. In fact there has been

[2] op.cit., page 10
[3] Joshua Gans and Richard Hayes, University of Melbourne. www.mbs.edu/jgans

a general decline across the OECD in the perception of IP protection fuelled by digital IP issues and piracy. Australia's decline in the belief that IP protection is rigorous has been greater than the OECD average decline.

CURRENT IMPEDIMENTS TO INNOVATION

Our key strategic capability is the ability to exploit creative and innovative engineering skills which can integrate and adapt technologies sourced globally with local field knowledge to quickly meet niche market opportunities locally and overseas. Any innovation support structure must recognise this at the outset to be successful. The key point to be made here is that Australia's innovation system is not 'externalised'; our major R&D institutions are not developing R&D to meet the needs of the world; technology development must instead be "market facing". This situation has been made worse because public research funding is directed through the publicly funded R&D institutions. Specifically, the latest budget data shows that 40.8% of the 2005-06 expenditure is directed to the higher education sector while support for the major government research agencies comprises 23.9%. Only 17.6% is directed to providing support for the commercialisation activities of Australian businesses. The percentage of BERD financed by the Australian Government remains well below OECD and EU averages, a point well made by the Productivity Commission in its Issues Paper (page 9).

A more effective model is the UK model where Research Councils (comprising representatives of government, research institutes and industry) jointly agree on R&D priorities and then 'tender' out R&D funding to the institutions which can best meet the market-defined need. AEEMA strongly recommends that the details of this UK model be reviewed as part of the Commission's research into innovation support.

In addition, unlike more successful innovation policy settings such as Taiwan, we have no focus whatsoever on the industrialisation stage. The Taiwanese spell out a continuum from idea to research to development to commercialisation to 'industrialisation'. They also seem to understand better than Australia the importance in external industry development of the inter-relationship and bundling of R&D collaboration, manufacture, strategic alliances, investment attraction and export facilitation; we focus on linear development and do not understand these inter-relationships. However, through the Australia Taiwan Strategic Framework Agreement for the electronics/ICT industries (an initiative being implemented by AEEMA on behalf of the Electronics Action Agenda), Australian companies are now starting to engage with the Greater China Region and the USA, an axis which drives the world's major global

supply chains. It is often the smaller operation, like SME's who develop the concept, and they, by definition, need assurances of what is the real market opportunity, and infrastructure to help protect Intellectual Property, and assist with securing access to the market place.

One of the major problems facing innovative companies is the falling level of good skills in Australia. Anecdotal evidence suggests that each year the number of engineering graduates is decreasing by 10%. This is not sustainable and is a long term trend. The main reason for this is the rising cost of HECS for engineering courses and the competition between engineering and other courses that pay more to graduate for the same amount of HECS. AEEMA recommends that the federal government consider reducing HECS for engineering disciplines. The federal government should also offer incentives like the graduate start programme that pays 50% of graduate engineers for the first couple of years. This program was recently abolished.

Another recommendation is that engineers are encouraged to undertake postgraduate studies in product development, entrepreneurship and innovation coupled with industry training. The University of Queensland currently offers such a facility. This would improve the quality of the engineer.

Also, the government should consider the benefits to innovation that a more robust R&D tax incentive would deliver.

Another current impediment to the realisation of any innovative activities in Australia is failure at the critical phase of converting an initial business concept into a proven business concept demonstrated by an industrially-relevant, pre-production prototype of the product or service. The essential essence of any manufacturing industry is its capacity to make products, more often than not comprising bundled products and product related services, to service the needs of customers in the right place, at the right time, and for the right price. The weak link in the innovation chain is often the piece of infrastructure that can link technology with business and capital.
By strengthening these links, then we can deliver the assured, secure path for commercialising and potentially industrialising the initial creative concept. There exist a few "facilitators" in Australia for welding the combination of technology, business and capital through linking appropriate strategic partners. This industry niche needs fostering in a way that delivers fast, efficient and economic outcomes.

A major conclusion of the Electronics Industry Action Agenda Industry Working Group, led by AEEMA, has been that Australia's greatest weakness in innovation continues to be product realisation. Therefore one of the major thrusts of the Action Agenda has been promoting the need for a major national focus on product realisation strategies because an increasing number of products and services (but not all) will use electronics and ICT as the key enabling technology in which to embody the innovation.

We recognise that realising advanced products relies on "innovation technologies" – the very sophisticated computer-based tools and prototyping facilities now available and the high bandwidth networks needed for collaborative "open innovation" and remote access to such tools. In addition, the stages of technical risk reduction in which the early prototypes are assessed for standards compliance or studied for failure modes are what makes the very significant future costs of manufacture and marketing of any prototype justifiable.

AEEMA has long advocated the proposition (which is well understood in successful advanced manufacturing economies such as Japan, USA and in Europe) that integrating understanding of the product development process with the development of skills in technology entrepreneurship provides the other missing leg to a more effective innovation system in Australia. It will always be the entrepreneur who will use mastery of the innovation and product development processes to access the resources needed to convert a market-related opportunity into a successful product or service – acquiring the technology from wherever appropriate, be it overseas, existing capabilities or, occasionally, original Australian research. Therefore product realisation comprises all the tasks and activities that are required to develop solutions that meet a customer's needs and to realise these solutions. The term product realisation includes both product development and production development. Effective product realisation is one of the most important preconditions for future growth of the Australian high technology manufacturing industry.

Significantly many large multinational OEMs have 'in house' product realisation or product development centres. However, Australia's fragmented electronics industry comprising largely SMES does not have the resources for this capability and there is a pressing need to create a collaborative facility (along the lines of the Australian Government funded collaborative research centre concept).

AEEMA member, Peregrine Semiconductor Australia, with funding sourced from the Ausindustry's Industry Collaborative Innovation Program (ICIP), has been leading a project to map the disaggregated nature of Australian industry capability in

microelectronics with particular emphasis on radio-frequency analogue design. This project (the Australian Microelectronics Product Realisation Centre) is a key activity of the Electronics Industry Action Agenda. The vision of the project is to establish an international reputation for Australia as a country of competence in RF microelectronics design and its application in a range of sectors.

The project mapping so far across all Australian states and territories has identified that there are more than 250 firms involved in manufacturing and designing electronic systems in Australia. From this group, 116 firms are directly involved in the use or design of microelectronic components in their electronic systems. Of these, there are 80 firms directly involved in the design of microelectronic chips. Of this subset 31 firms that could sub-contract their design services; the majority of these have skills in digital design.

As the Electronics Industry Action Agenda moves forward, it is intended that the Implementation Group will undertake further feasibility studies for product realisation around technology-defined sectors such as microelectronics and embedded systems, as well as market-defined opportunities relating to electronics in areas such as transport and automotive telematics, medical devices, telecommunications, building systems (including energy efficiency, smart metering and lighting), and, where feasible, develop detailed proposals for product realisation centres.

Australia is a world leader in high frequency RADAR surveillance (the Jindalee Over the Horizon Radar Network – JORN) and has the requisite skills in complex system integration to design, construct, operate and improve such systems. Radio astronomy is another area of strength which has a very bright future with the establishment of the Radio Astronomy Park at Mileura in WA by the State Government and the associated Radio Quiet Zone being set up by the Australian Communications Management Authority (ACMA). These developments position Australia exceptionally well to be selected as the nation to host the Square Kilometre Array (SKA) project. This will be a massive, networked radio telescope with the potential to provide the market impetus to allow the coherence that has been missing to date missing in the Australian electronics. For many years the approach by Governments and industry to the SKA was timid and equivocal. Last year this began to change but there is a lot more that could be done by the Commonwealth, especially in the international domain to support and indeed promote the Australian bid.

But perhaps the most crippling obstacle to effective support for innovative processes and products in Australia is the overwhelming belief in industry that the multiplicity of policy programs, their attendant application processes and the myriad details sought by government for successful innovation assistance are far too time-consuming, costly and onerous. Evidence supplied by AiG in its recent Report into the state of manufacturing in Australia strongly suggests that SMEs in particular are turning away from seeking any support for their innovative activities because the efforts required to obtain that support are too much of a costly burden. Similarly, the House of Representatives Report states clearly that evidence supplied to its review emphasised that the entire application process for innovation assistance is a fraught one for small companies.

Evidence from AEEMA's own members who have tried to navigate the support system is apposite here:

"The big problem I see, drawn from my own experience is there is no common structure in place to expedite the "Change" from 'Mind to Market'. As I see it the only way to achieve this is to take the **"Politics"** out of innovation, innovation is simply **'An Idea Put to Work**. Ideas come from individuals; Ideas are not political and not from the "Private or Public" sector as governments believe. If I come from the private sector why shouldn't I have access to the same funding available to the public sector and vise-versa. You have federally funded Institutionalized Public Organizations such as NICTA that have a proven track record on R& D but lack the entrepreneurial skills to commercialise an idea, there is no linkage as most of the skills needed come from the Private sector. I have the skills to launch my product but didn't have R&D skills to simplify the early stage processes, we lost time, energy and focus in those years. There needs to be a common non political, non geographical, structure put in place that is readily available to the 'Individuals' from where the 'Ideas' came from, with no bias at all. If you look at the number government bodies that have a set range of departmental skills (and they do have excellent skills) they all sound great but they have no linkage or common structure to guide one through the 'Mind to Market' maize. Look at number of individual departments in AusIndustry or Department of State and Regional Development; that's what we need to change. You can spend a lot of wasted time stuck between departments".

"My direct experience of programs like ITOL, COMET and Broadband For Health is that the application process is rather rigid. They have tried to make the process streamlined, and the forms short, which is good, but the paperwork is very formulaic, and does not seem to leave room for the special value of one's proposals to shine through. It makes one feel that the review process is mechanical. The audit requirements cut in at a very low level of funding. I appreciate the need for accountability, but audit represents a sizeable slice of the overhead in any ITOL project worth more than about $100K".

"The amount of controls and tracking is almost 50% of any funding received and always adds pain when doing Audits"

"I think the administrative overheads are somewhat of a barrier to going ahead to apply for assistance. It is a long and tedious process to put together all the information required. While some of it is warranted and a good process to go through if you are about to embark on a large project, other parts seem a little tedious. More of an issue is the quarterly reports and the justifications to be provided if you deviate from the

planned schedule or spending (even when you are achieving to your project plan, but spending less money)"

Finally, some suggestions for addressing related impediments from our membership:

"There are many reasons for the success of Radiata and G2, however a key one for me is the locating of their CEOs (Chris Beard/Radiata and John Gleokler/G2) in the US, surrounded by a willing and vibrant Venture Capitalists along with the US's technology hungry market. Please note that both organisations rely on the low costs of a competent R&D happening back in Australia. They have grasped the concepts that it is all about building the connections with the market and VCs and making sure that they are these researching, understanding are delivering what the market needs. Simply put, this is very hard to do from Australia. Technology ventures need great CEOs that are really plugged into the market. When you look around Australia, where are these people, they are often the Australian Development Manager or CEO of Off Shore companies. Why would they leave a salary of 200K+, with school fees and home loans, to spend 12 months trying to get venture funding with a reasonable chance of failure. The government needs to find a pathway to entice these people to start or support new ventures. We suggest the government undertake a further review of the Australian incubators operated and funded by government, particularly the role and funding of entrepreneurs

This is not to say the news is all bad – many of these 'system' failures (complex application processes, too much detail sought, onerous compliance burdens etc) can be remedied by simplifying the processes and focussing on supporting the *best* innovative activities, not just the ones that can navigate the forms. During the past six years, the Australian Government, through the technology innovation/diffusion programs supported by the Department of Industry, Tourism and Resources, has assisted thousands of SMEs through 'not-for-profit' industry bodies (institutes/associations/networks etc), with the support of a wide range of industry sectors and State/Territory governments. This has helped create and implement highly successful innovative outcomes, giving much welcomed value and return-on-the-investment to Australia. The response of our industry grouping to the current Industry Cooperative Innovation Program which funds collaborative projects linked to action agendas has been favourable.

INNOVATION IN THE AUSTRALIAN MANUFACTURING SECTOR

It is clear that the wealth of a nation is measured in what its industry can produce and what it can sustain through innovation. This assumption is the backbone of the "Backing Australia's Ability – Building our Future through Science and Innovation" policy platform. In Australia the major contribution to GDP has been traditionally the province of primary industry and mining, but this is no longer the case. Output and employment levels in manufacturing now exceed mining and agriculture combined and manufacturing continues to be the dominant source of both hard and soft technological innovation in industry. It is the main employer of technology-based SMEs.

While manufacturing is under increasing pressure from overseas competitors, trade in manufactured goods is growing faster than primary commodities and opportunities for trade have never been greater for Australian manufacturing industries. Technology itself is far from being static and poses new challenges and opportunities for industry to progress. This requires change, improvement or innovation for success. A number of countries in the European Union (which derives some 21% of its GDP from manufacturing, twice that of Australia) are now rebuilding their manufacturing industries; Japan's recent return to a buoyant economy has been a resurgence in 'value add' manufacturing, and Japanese electronics manufacturers are focusing on the strategy of 'product realisation', the high value end of manufacturing, and outsourcing the lower value assembly to other countries.

In fact over the past five years, the total value of knowledge embedded in manufactured goods and services has doubled. The explosion of the manufacture of consumer electronics devices such as the *iPod* driven by the digital revolution has been a major contributing growth engine. In a tactical response, countries such as Taiwan are moving towards the '6 C strategy (computing, communications, consumer electronics, the channel, content and the car), hence Taiwan's strategic commitment to the telematics industry, an area where the Australian electronics industry is now engaging through the Australia Taiwan Strategic Framework Agreement, a major electronics industry action agenda initiative being implemented by AEEMA.

There is another emerging 'growth engine' for manufacturing and that is 'minimal manufacturing', an innovative trend to minimise the industry's environmental footprint. In addition, the convergence of hi-tech manufacturing and new materials enhanced by the development of nanotechnologies has raised the potential of 'micro factories' and 'mini fabs' to service a wide range of industry verticals.

Australia, with its comparative advantages of a solid R&D capability base (particularly in the areas of new and advanced materials), its well educated skills base, its excellent research infrastructure (e.g. the Australian Synchrotron) can be viewed in a more favourable light in the emerging area of 'minimal manufacturing'. In addition, Australian designers are innovative and creative, and our engineers excel at technology integration; our contract electronics manufacturers are agile and globally competitive in small volume, complex product systems.

But these comparative advantages can count for little if Australia's innovation system is not 'market facing' and Australian hi-tech companies are not the 'best of breed' in creating and delivering customer solutions (i.e. value) through tangible goods. Therefore, for global integration to be truly effective i.e Australia's innovation system to be responding to the needs of markets and not just to the needs of Australian technology producers, AEEMA is of the view that the focus of innovation reform and the application of resourcing must be applied upstream of the commercialisation stage – through industrialisation and market development. If this can be achieved the ultimate measurement of innovation will be achieved – new markets, new products and services and new wealth creation for Australia.

Emerging Markets: Space

Beyond radio astronomy (mentioned earlier), there are opportunities for innovation, linked to the creation of new markets and the re-definition of others that already exist, in Antarctic astronomy and space. Australia has been complacent in its custodianship of the two thirds of the Antarctic landmass it claims as sovereign territory and has been equally complacent in developing a coherent national strategy to space.

With regard to Antarctic astronomy, Australia has an opportunity to invest substantially in new capabilities through the current NCRIS round with potential benefit to debris monitoring in space as well as to fundamental astronomical research.

With regard to space, more generally, successive governments have been routinely encouraged to invest in launch projects none of which have succeeded or were ever likely to. This has created, quite rightly, a climate of scepticism and reluctance to become involved with any space activity that may seek and require Government support (not necessarily money) to succeed. The international legal mechanisms which govern space activities were largely established during the Cold War. They are increasingly irrelevant and incapable of creating common understandings and behaviours amongst the increasing number of nations that are making deliberate investments in the establishment of space capabilities.

AEEMA strongly believes that substantial private investment in a number of space-based capabilities, initially in remote sensing space-based sensor networking would follow if a coherent Australian space policy were to be established that brought together the security equities, largely classified to this point, with commercial and civil equities. Historically in Australia there has been a bifurcation between security and Defence equities and commercial and civil equities. Increasing adoption of 'dual use' and

commercial technologies in spacecraft, component miniaturisation, the invention of new materials and the development of new operating concepts are working to provide Australia with a major opportunity in space. The critical missing element is a coherent national strategy and policy.

These comments about space illustrate eloquently that there is no one path to successful innovation. Different markets, existing and potential, require different levers to be pulled if a climate for innovation is to be created in that particular segment. Sometimes money is needed, sometimes encouragement (SKA) and sometimes it's a question of strategy and policy (space).

How a country approaches innovation says a great deal about how that country views its place in the world today and where it seeks to be in the future. The rhetoric notwithstanding, successive Australian governments have chosen not to commit public funding and/or financial resources to increase the level of business-related R&D to the levels comparable with the best of other OECD economies. From the perspective of many companies, particularly SMEs, the level of support that is made available is done so with a large, sometimes crippling compliance overhead. Above all, a successful innovation culture requires a willingness by governments and investors to value risk acceptance rather than risk aversion or risk avoidance. In particular, it may be timely for a further review of the definition of R&D in the context of what activities can be legitimately undertaken to be eligible tax concession purposes and/or for other industry support measures.

CONCLUSION

"In a global economy, innovation-based competitiveness provides a more stable foundation for productivity growth than the traditional emphasis on low-cost production." [4] Because Australia has positioned itself as a leading user and developer of technology and associated solutions, we now have the chance to pursue policies and investment strategies to establish ourselves as an 'innovator nation'. To achieve this we need to build on a foundation of openness to international competition and better protection of IP rights. Areas neglected over the last 20 years, as shown in the 2005 Update, now require focus and *government investment*. These include:

- Ensuring a world class pool of trained innovators by maintaining a high level of university excellence and providing incentives for students to pursue science and engineering careers

[4] 2005 Update, page 14

- Providing incentives for deployment of risk capital
- Educating the community that innovation is a cumulative, step-by-step process, not a big-bang invention
- Continuing to open up Australia to more international competition and investment and increasing the effectiveness of IP protection
- Reducing barriers to entry and excessive regulation on business. These hinder cluster development.

Australia's innovation policy must be cohesive in order to create a favourable environment for private sector innovation. Rather than try to micro-manage individual projects or short term schemes, innovation policy must be consistent and allow markets to choose where to deploy resources and capital. This cannot happen in an environment where there are myriad innovation support schemes across many agencies and access to any such support is fraught with onerous application and compliance rules. Notwithstanding this internal critique of Australia's innovation system, Australia's innovation policy must be refocused on the external environment where the impact of globalisation is determining whether or not domestic policies and strategies will address the opportunities offered by global markets. In essence, this means a higher level of attention and the application of resources to the 'industrialisation' of technologies, a process which includes market development. In short, Australia's innovation system must be globally integrated.

"Ultimately, policy should not be judged on whether a particular company or even industry flourishes but on whether, taken as a whole, Australian firms are increasingly able to develop and commercialise innovation for global competitive advantage and as a source of prosperity for the nation." [5]

[5] 2005 Update page 15