A REPORT

Increasing Australia's level of international research collaboration via the CRC Program.

Outcomes of the CEO's visit to northern Europe

4th October – 28th October 2009

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PROLOGUE

With the endorsement of the CRCA Board, from 4th-28th October 2009 I visited northern Europe, having meetings in the UK, Finland, Netherlands, Germany, Denmark and Belgium.

The objectives for this trip were threefold:

1. To look at collaborative research programs in other countries and consider how the CRC Program rates in comparison and to see if there are any good ideas we could adopt;
2. To educate those countries about the CRC Program, and
3. To explore the will and potential for collaborations with Australia on large-scale, industry-driven applied science, with particular focus on the CRC Program as the optimal vehicle.

Why were those countries chosen? Simply because they are amongst those which we would instantly consider as being "innovation nations"; countries predisposed to the concept of innovation and recognised as successful at it. If there was anywhere in the world that Australia could learn from, then these are the countries to look at.

Of course there are countries not on the list that would be equally worth looking at, such as Sweden, Norway, France – but you really can't cover everything in one trip.

All in all I met with at least 70 people over the month (and also presented at a seminar to around 25 people). The meetings had been arranged via the relevant Embassies in Australia or through the DIISR post at the Australian Embassy in Brussels. The meetings were aimed at the highest possible level. While I didn't meet with a Minister, I did get next best thing in meeting with Department Secretaries, Branch Heads and CEOs.

So where the objectives met? I'd say "most certainly". At very least an increased level of understanding from both sides has resulted. I'm a realist and never expected that I'd return home with a bagful of new collaborations but as a direct result of my discussions a number of exchanges have already occurred, whilst a foundation has also been established for future interactions. I did identify a will to cooperate with Australia, as well as some of the impediments to that occurring. It's all about just adding my bit of fertiliser to the vege patch.

This report is not a dissertation on the details of every meeting I had, nor everything I was told. It describes some of the programs operating in northern Europe, but certainly not all. As in Australia, each country's innovation system is comprised of a multitude of programs. This report focuses only on broadly describing those that are aimed at developing industry-researcher collaborations similar to the CRC Program. References are included should the reader require more detailed information. Where there are no references the information has been sourced directly from personal communication.

EXECUTIVE SUMMARY

The CRC Program has led the world in terms of industry-driven applied research. Other countries view it with envy, and sheer amazement at its age and size. Through the establishment of the CRC Program in 1991 Australia blazed the trail for collaborative research, and other countries are only now embarking on that same path.

The establishment of the CRC Program was a bold and ambitious move, and one that Australia should be very proud of.

There are many other collaborative research initiatives established throughout the world, and while not being identical to the CRC Program, share similarities and have concepts embedded within their structure that are worth considering in the evolution of the CRC Program and the CRCs themselves.

Meanwhile, Australia has talent in collaboration, and other countries recognise this fact. However the tyranny of distance remains the key stumbling block. We can overcome this by developing a clear and unique value proposition that ensures that other countries recognise the unique benefits that we have to offer.

DISCUSSION

All countries visited in this tour are members of the European Union (EU). Consequently, the developments and innovation policies instigated by the EU Commission set the context for many of the programs these countries have and are developing.

This discussion will begin with the activities established by the EU Commission, and then discuss the initiatives being undertaken by each country.

Interestingly, stimulating innovation has become a key policy initiative for each of these nations, and not only due to the Global Financial Crisis. Even before the Crisis hit innovation was still high on the agenda as these countries struggled with the impacts of globalisation, aging populations, and diminishing home-bred resources. Initiatives at the EU have focused efforts, yet each country is going about things in slightly different ways.

The concept of collaborating on research with other countries outside the EU is also gaining a lot of traction. Climate change issues would appear to be the impetus for this new wave of thinking, as countries realise that climate change is a global issue and no one country can solve it all by themselves.

What is the situation?

With reference to innovation around the world, the EU feels that it is falling behind the game. A paper in 2006 stated:

"In a remarkably short period of time, economic globalisation has changed the world economic order, bringing new opportunities and new challenges. In this new economic order, Europe cannot compete unless it becomes more inventive, reacts better to consumer needs and preferences and innovates more." [1]

The situation has received further attention as the EU attempts to deliver itself from the Global Economic Crisis:

"Innovation is considered as the key to fight the current economic downturn by helping businesses to grow and create jobs to counterbalance layoffs elsewhere. In order to promote innovation in the EU as effectively as possible, innovation support needs to be based on a clear policy rationale and to demonstrate the capability to make a real difference." [2]

What are they doing?

In 2005 the EU members agreed to the "Lisbon Strategy", setting a comprehensive array of policies and reforms designed to make Europe's regulatory and economic framework more innovation friendly.[3] Crucially, this includes the bold target of increasing R&D spending across the EU to 3% of GDP (the current average is 1.8%[1].) All EU members are now endeavoring to meet that target.

Second, the EU invested heavily in its Framework Programs for Research and Technological Development. These are funding programs created to support and encourage research. The First Framework Program (FP1) ran from 1984 to 1988 with a budget of €3.7 billion. This budget increased over time, with FP6 (2002–2006) operating to a budget of nearly €18 billion. However a major increase occurred in 2007 as the Framework Program was extended to enable it to be the key vehicle addressing the goals of the Lisbon Strategy. Today's FP7 carries a massive budget just over €50 billion and is the European Union's chief instrument for funding research over the period 2007 to 2013[4]. Each year, through an entity called "CORDIS" calls are made for research projects in specific areas. Any research team can submit an application, however any teams from outside Europe must bring their own funds to the table.

Third, in mid-2008 the EU Commission issued a communication detailing its desires and views on a pan-European cluster policy. A cluster is defined as "a group of firms, related economic actors, and institutions that are located near each other and have reached a sufficient scale to develop specialised expertise, services, resources, suppliers and skills.[5]" This is basically a drive to develop "Silicon Valley's" in Europe. The EU has since established a high-level European Cluster Policy Group to explore ways on how to best assist EU countries in supporting clusters.[6]

Fourth came the latest development when in late 2008 the EU also established the European Institute of Innovation and Technology (EIT). This is intended as a new

[1] Note: Australia was 1.78% in 2004 and the OECD average was 2.26% in 2006

research flagship for excellence in higher education, research and innovation. It is managed through a Governing Board which sets the strategic direction for the EIT and is responsible for the establishment of Knowledge and Innovation Communities (KICs).

The EIT will focus on strategic priority areas where given the nature and scale of the innovation challenge, action at European level could generate the 'critical mass', which could not be achieved by Member States alone. The EIT will be fairly small scale in the initial period until 2013 - just two or three KICs[7].

The first of these KICs are yet to be established, however the first call for applications was made on 2 April 2009 and closed on 27 August. 20 proposals were received of which 18 are being evaluated. These proposals had to be in the key areas of :

1. Climate change mitigation and adaptation;
2. Future information and communication society, and
3. Sustainable energy[8]

Interestingly, the KIC program, and its establishment process (see Appendix A) is suspiciously similar to that of the CRC Program under the 2007 pre-O'Kane review guidelines.[9]

Whilst being incredibly similar, there are some fundamental differences between KICs and CRCs. First, the work themes for KICs are defined by the EU, and second, funding is different with a strong link to other EU funding mechanisms (ie: FP7). Furthermore, there is a strong emphasis on commercialisation and the development of spin-off companies (as per the CRC Program prior to the O'Kane review in 2008). Engagement with non-EU countries is encouraged but convincing details of why, as well as their funding mechanism, must be included in the application.

Another EU program that is of relevance to CRCs is the Eureka Project, and therein the Eurostars program.

Eureka is an association of EU countries, all of which have a declared interest in working together on industry problems. Eureka has a Board whose representatives are high level officials. Eureka began in 1985 as an effort to stimulate industry R&D, and in particular to strengthen the competitiveness of the EU as the USA and Japan were considered much stronger and the EU wanted a concentrated approach.

Eureka started with 12 countries, and now has risen to 38. All the research is driven by industry (ie: bottom up approach). 70% of the partners are industry, of which 40% are SMEs. Countries don't have to be a member to participate in Eureka, but if they are members then they get voting rights. Full members are only required to install a contact point and a funding scheme, however there is no requisite concerning the amount of funds in their budget.

Eureka spends around €1 billion each year on 2-300 new projects.

A new component of the Eureka project is the Eurostars program. Eurostars is an international R&D program whose participants are funded by the 38 Eureka member-countries and the EU Commission. In addition to SMEs, universities, knowledge institutions and larger corporations are also able to participate in the cross-national innovation consortia, however, it is the SME that applies for Eurostars-funds. [10]

The concept of opening of Eureka to international collaboration is a very hot topic at the moment and is being given consideration by the Eureka Board.

What does this mean for CRCs?

It is early days yet, however the KIC program could prove to be a significant dimension in the EU innovation policy into the future, and a potential venue for international collaboration.

Eureka / Eurostars is also worthy of a watching brief as they consider launching into international collaborations.

Furthermore, although CRCs are not eligible to receive funding from FP7, they should keep an eye on the CORDIS calls, and the applications granted, to identify potential collaborators. There is an opportunity here for closer working relations between the CRCA and the Forum for European-Australian Science and Technology cooperation (FEASTS).

What is the situation?

The UK has a population of 61 million. It has 116 Universities and 166 Higher Education Institutions. There are 4.8 million private sector enterprises, 99.9% of which are SMEs employing 13.7 million people. The GDP per capita for the UK is US$43,785[11].

What are they doing?

The UK Government channels its innovation strategies through the Department for Business, Innovation and Skills (BIS). Its mission is "building a dynamic and competitive UK economy by: creating the conditions for business success; promoting innovation, enterprise and science; and giving everyone the skills and opportunities to succeed."[12]

The majority of university research funding is provided by BIS via the UK Research Councils, for both basic and applied science.

There are seven Research Councils in the UK (see Appendix B). Each have their own goals and strategies, but they also come together under the auspices of the Research Councils UK (RCUK) which undertakes a coordinating role and gets them all to work together toward a common goal.

The RCUK mission is to "optimise the ways that Research Councils work together to deliver their goals, to enhance the overall performance and impact of UK research, training and knowledge transfer and to be recognised by academia, business and government for excellence in research sponsorship."[13]

However through RC's there is no program similar to CRCs. The RC's do fund some small collaborative work (akin to ARC-Linkage) but that's as far as it goes. In their words, they have nothing like a "Challenge-Driven-Innovation-Centre". They tend to focus on large issues from the top down approach, rather than addressing them from bottom up.

A few years ago BIS apparently realised that the UK was good at research, but not good at getting commercial value back to the taxpayer. Often the results would be commercialised offshore with little if any benefit to the UK. That realisation spawned a drive towards the facilitation of knowledge transfer, and the most significant change has been the development of the Technology Strategy Board (TSB).[14]

The TSB is all about driving innovation. Its role is to "stimulate technology-enabled innovation in the areas which offer the greatest scope for boosting UK growth and productivity". It promotes, supports and invests in technology research, development and commercialisation. It aims to spread knowledge, bringing people together to solve problems or make new advances.[15]

The TSB is funded by BIS to the tune of around £700 million per year. TSB funds Knowledge Transfer Networks (KTN). These are groups of individuals that have a shared interest in an area of emerging technology. KTNs aim to improve the UK's innovation performance by increasing the breadth and depth of knowledge exchange

between companies and between business and academia in specific areas of technology.[16] Currently there are 25 KTNs with 45,000 members (see Appendix B).

What does this mean for CRCs?

The closest thing in the UK to a CRC are the KTNs. However these, and the TSB are really only just starting to take shape. Yet it appears that while the TSB is strong on the concept of "challenge-led innovation" they don't seem to be allowing industry to identify the challenges; rather TSB will do that for them.

It is early days, yet the TSB and the KTNs could prove to be a useful vehicle for international collaboration with the UK.

What is the situation?

Finland has a population of 5.2 million. It has 20 Universities. There are 190,600 private sector enterprises, of which 190,000 are SMEs employing 620,000 people. The GDP per capita for Finland is US$52,989.

Finland has a reputation for innovation. They are a people with a natural tendency toward the concept of innovation. Finland is also characterised by a process of Government that works more in accordance with a business plan than to a set of policies; so while that makes changing things a bit slow, it also means stability and no surprises.

The Finnish voters are very supportive of funding for innovation. Finland invests around 3.5 per cent of its GDP in R&D (businesses account for around 72 percent of expenditure whilst the remaining funding comes from the government budget. The government's share of this total is €1.7 billion, representing 4.5 percent of the total budget and just under 1 percent of GDP) and they plan to invest even more.

The Finnish Government plan to increase the share of R&D to 4% of GDP by 2011. In order to achieve this target, public R&D expenditure will be increased by €400–500 million.[17]

The Government recognises that although Finland has achieved a lot in the area of innovation (particularly through companies such as Nokia) it cannot rest on its laurels. Finland ranks well on some comparative statistics, for example:

- The growth of the economy has been among the fastest in the world since the middle of the 1990s
- Labour productivity has increased rapidly in industry, particularly in the electrotechnical industry, surpassing the level of the United States
- Finland ranks amongst the top countries in comparisons of competitiveness conducted by the World Economic Forum and the International Institute for Management Development
- Among the younger age groups, the proportion of people with a higher education degree is one of the highest in the world
- The share of researchers and R&D staff among the employed is higher in Finland than in the other EU countries, the United States and Japan

However, on other statistics Finland is less than perfect:

- Measured by GDP per capita, Finland is in 15th position of OECD countries
- Nearly 9% of the labour force remains unemployed in Finland, which translates as almost 280,000 people
- The population is ageing rapidly and the dependency ratio is weakening more steeply than in the OECD countries on average
- The R&D intensity of the service sector (R&D costs in proportion to the value of production) does not reach the level of the top OECD countries
- Immigrants represent about 1.7% of the population, while their proportion in Sweden, the Netherlands and the United States is at least 10%

- Foreigners represent about 6% of all doctoral students in Finland, while their share is more than 15% in Switzerland, the UK, Belgium, the USA, Australia, Sweden, Denmark and Norway, for example.[18]

What are they doing?

Tekes (pronounced TECK-ESS) is the Finnish Funding Agency for Technology and Innovation. It is the main public funding and expert organisation for research, development and innovation in Finland. Tekes funds R&D projects in companies, universities and research institutes, and especially promotes innovative, risk-intensive R&D projects. Tekes's operations in Finland and abroad employ approximately 400 people.

Tekes receives annual funding of around €600 million. Every year Tekes finances some 1,500 business R&D projects, and almost 600 public research projects at universities, research institutes and polytechnics.

Tekes facilitates also R&D cooperation globally, nationally and regionally. International businesses registered in Finland can benefit from the same public funding services as their Finnish counterparts.

The focus areas of Tekes strategy are listed in Appendix C. Tekes funding for research, development and innovation will be guided by these priorities in the coming years.

Tekes runs programs that provide opportunities for carrying out R&D projects and for developing business expertise and international cooperation. The programs target strategically important areas of R&D that Tekes has identified together with the business sector and researchers.[19]

A significant new form of cooperation between the industrial sector and academia are the Strategic Centres for Science, Technology and Innovation (SHOKs). The first 6 SHOKs have been established and are listed in Appendix C.

Existing consortia of companies and research units apply to Tekes to be recognised as a "SHOK". If successful, they will gain prestige, as well as access to €120 million. They will work in close cooperation, carrying out research that has been jointly defined in the strategic research agenda of each Centre, and will operate for a five-to-ten-year period.

SHOKs offer units involved in cutting edge research, and companies which use the results of research a new way of forming close partnerships. Research plans are drawn up jointly by business and research units. The centres help channel new and existing financial, human and other resources into important areas for business.[20]

Another initiative is National Competence Clusters, managed and coordinated through the OSKE program[21]. These function as a new development platform for exploiting cutting edge know-how, for strengthening cooperation between centres of expertise located in different areas, and for supporting the division of responsibilities and tasks between them. A Competence Cluster brings together key actors in centres of expertise situated in different regions to collaborate on the exploitation of the growth potential of international business. At the same time, they are a channel for spreading and utilising knowledge and expertise.[22]

The program is coordinated by a multi-disciplinary Committee appointed by the Government. In the Committee there are representatives from relevant ministries and other interest groups. The Committee is assisted by the Secretariat with experts

representing the Ministry of the Employment and the Economy, the Ministry of Education and Tekes.[23]

What does this mean for CRCs?

Innovation in Finland is well funded and well regarded. SHOKs are the closest thing they have to CRCs, yet they are different. They are the pinnacle of industry : researcher collaboration, established from existing collaborations into prestigious "shining lights" that meet national needs. On one hand they are opportunities for collaboration; whilst on another the concept is worth considering as a possible future funding model for successful collaborations developed through the CRC Program.

THE NETHERLANDS

What is the situation?

The Netherlands has a population of 17 million. It has 14 Universities. There are 50,000 private sector enterprises, 99.7% of which are SMEs employing 3 million people. The GDP per capita for the Netherlands is US$52,019.

What are they doing?

"SenterNovem" is an agency of the Dutch Ministry of Economic Affairs. It has a policy budget of around €1.3 billion. SenterNovem promotes sustainable development and innovation, both within the Netherlands and abroad. It aims to achieve tangible results that have a positive effect on the economy and on society as a whole. Their plan for innovation is aimed at economic impact, and not just in dollar returns – ie: they invest where the results will make a difference to the people.

SenterNovem converts government policy into reality. On behalf of the Dutch government they implement policy regarding:

- Innovation
- Energy and Climate Change
- Environment and Spatial Planning[24]

The Ministry of Economic Affairs has identified 6 key areas that are deemed to be critical to the Netherlands, or where they feel the nation has a real competitive advantage and/or strong potential to excel[25]. These are listed in Appendix D.

Operating within these key areas are around ten "Top Technological Institutes" (TTIs). These are joint ventures between industry and the academia[26]. According to the Ministry, the only program in the world that is similar to the TTIs is the CRC Program. The ten TTIs are listed in Appendix D.

SenterNovem describe their work as being all about "ambition and agenda". Once they establish the ambition they then look to see who is working in the same area and try to lever off them, as well as using their own investment. They use the EU's FP7 and Eureka programs as much as they can. Also, through analysis of the FP7 funding allocation the "hot spots" for research and technology, and themes thereof, can be identified. This is a useful means to find potential collaborators. SenterNovem then arranges the alignments.

SenterNovem have a team working on these alignments and investigating likely candidate countries for international collaborations. There is interest in collaborating with Australia (particularly as a consequence of a visit to Canberra by the Ministry's Deputy Director General in 2008) however they have currently chosen to devote their resources to other countries – not due to lack of desire but purely through lack of resources.

What does this mean for CRCs?

The Netherlands hold the CRC Program in high regard. The Deputy Director General of the Ministry of Economic Affairs visited Australia in 2008 with the specific desire of experiencing the CRC Program first hand. Many of his learning outcomes have since been incorporated into TTIs. However TTIs are not necessarily aware of the work that CRCs are doing. TTIs are an opportunity for collaboration, and a way for the Dutch to "do more with less". This provides a real opportunity to bring Australia onto the Dutch innovation agenda.

GERMANY

What is the situation?

Germany has a population of 82 million. It has 103 Universities and 176 universities of applied science. There are 1.7 million private sector enterprises, 99.5% of which are SMEs employing 12.4 million people. The GDP per capita for Germany is US$44,660.

What are they doing?

Germany has a complex system of funding innovation. This is largely a factor of the nature of the way that the States and the Federal Government interact, ie: the 16 German states are granted a large amount of autonomy. This is a direct consequence of World War II.

The Federal Ministry for Education and Science (BMBF) has a budget of €10.2 billion (the biggest in Germany's history). BMBF fund research in technological key areas in the framework of general or specialised funding programs.

The States generally fund the universities, and all universities conduct research.

Both the Federal Government and the States jointly fund the important scientific research institutions. For example, the German Research Foundation (DFG) has a budget of €1700 million, of which around €1000 million is from the Federal Government and €600 is from the States (€7 million from other sources.)

The system is complex, but apparently it works! However, recently the Federal Government has realised that Germany needs to work together as a nation if it is going to make major strides in innovation.

The German Federal Government has introduced the national "High-Tech Strategy for Germany". This is, for the first time, a national strategy for innovation policy. It was developed in a joint effort by all Federal Government departments. The High-Tech Strategy marks a paradigm shift in research and innovation policy, aimed at making Germany the most research-friendly nation in the world.[27]

Until 2009, the German Federal Government will make available a total of approximately €15 billion for cutting-edge technologies and technology spanning programs with the aim of strengthening innovation. This investment will contribute substantially to achieving the goal the Lisbon Strategy.

The Federal Government's High-Tech Strategy establishes the following innovation policy priorities:

1. Developing lead markets
2. Improving the cooperation between science and industry
3. Accelerating direct application of research findings

The second priority involves two major components : a national cluster strategy; and the Competence Networks Germany campaign which is being conducted by the Federal Ministry of Economics and Technology.[28]

The "Competence Networks Germany" campaign comprises research organisations, companies and academic institutions doing research with a thematic focus. They are regionally concentrated, yet operate nationally. Currently there are 128 Networks of Competence across 35 regions of Germany. There are 9 topics, orientated to the structure of the German economy. The topics include all steps of the supply chain and the respective research areas (see Appendix E).

The networks of competence initiative operates through and external agency based at VDI/VDE/IT in Berlin. The main responsibilities of the agency are to advise interested networks, perform quality management and ensure the representativity of the members of the initiative. In addition, the agency is responsible for ensuring intensive cooperation with the involved competence networks and offers the networks a variety of custom-made services.[29]

In many ways the VDI/VDE/IT is similar to the CRC Association.

Other notable networks of publicly funded research institutes in Germany are:

- The Max-Planck-Gesellschaft, which conducts basic research in the natural sciences, life sciences, social sciences, and the arts and humanities;[30]
- The Helmholtz-Gesellschaft, a network of the national laboratories in Germany; [31]
- The Leibniz-Gemeinschaft, a loose network of institutes performing basic to applied research[32]; and
- The Fraunhofer-Gesellschaft, performing applied research with a focus on industrial collaborations[33];

Fraunhofer is often claimed to be the closest program in the world to CRCs. The major similarity is that Fraunhofer is all about researchers working closely with industry. There are 60 Fraunhofer institutes throughout Germany. They are active internationally with offices in a number of other countries (eg: USA, Russia). There are 17,000 people involved, and a budget of €1.5 billion per year.

One big difference with Fraunhofer institutes and CRCs is in the way they are funded. One third is basic funding from the Federal Government, while the other two-thirds comes through contract research on behalf of industry and publicly funded research projects. That means that the Fraunhofer institutes have to sing for their supper. They are commercial, and have to do contract research in a competitive world to survive. Consequently Global Financial Crises and the like can have a real impact on their viability.

Fraunhofer institutes are autonomous. The government doesn't tell them what to do, but it does decree the general areas via its basic funding. The customers are industry and in particular SMEs. The research covers all sorts of areas, however Humanities, Arts and Social Sciences are intentionally excluded because there is little contract research to be found in that discipline.

Similarly to CRCs, Fraunhofer institutes are very closely associated with universities, to the degree that the head of an institute must be the head of a University Faculty or Department. Fraunhofer believes this adds real strength to the collaboration.

To become a Fraunhofer institute working bodies merely need to apply. They need to meet a set of criteria that show their work is valuable. The Fraunhofer Headquarters determine the themes.

Fraunhofer are trying to strengthen international links, and this will be part of discussions in 2010 when a German delegation visits Canberra.

The other network with similarities of sorts to CRCs is the Leibniz-Gemeinschaft, and in particular Leibniz X

Leibniz X was established in 2004, and is funded by the BMBF. Leibniz X was created to support all Leibniz institutions in the area of knowledge and technology transfer.

Leibniz X analyses potentials and competences, screens for knowledge and technologies which can be imparted towards the industry or could be used to increase numbers and volumes of third party research grants or contracts. Leibniz X makes its mentoring services available to all interested scientists, engineers and technicians of Leibniz-Gemeinschaft. Additionally, Leibniz X provides external management support to speed up the formations of new spin-off companies.[34]

Another component of Germany's complex innovation system that is of relevance to CRCs is the DLR and the Eureka Project, and therein the Eurostars program.

DLR is Germany's national research centre for aeronautics and space[35]. The International Bureau at DLR supports the BMBF in its international activities, with the aim of networking research and education activities across the world. Its central responsibilities include the support and establishment of steady international cooperation in the areas of research and education.[36]

In this context, the International Bureau advises German institutions on the subject of international research cooperation and provides financial support for the development of new contacts and collaborations. The International Bureau is also strongly involved in the conception, coordination and planning of BMBF activities aimed at advertising Germany as a key research location.

What does this mean for CRCs?

It's interesting to see just how different Fraunhofer (apparently the closest thing in the world to CRCs) actually is to CRCs. It is also interesting to see the interest that Germany has in the CRC Program, and their growing interest in collaboration.

Aside from Fraunhofer, there are strong opportunities for the opening of collaboration dialogue with Leibniz X and the Networks of Competence.

However the main problem continually put forth regarding the idea of working with Australia relates to the tyranny of distance. The Germans feel that they would be much more eager to work with Australia if we weren't so far away! We can't do anything about that, but we can work on our value proposition.

A high-level delegation is to visit Australia in early 2010. CRCs are already on their agenda.

What is the situation?

Denmark has a population of 5.4 million. It has 8 Universities. There are 20,800 private sector enterprises, 99.9% of which are SMEs employing 1 million people. The GDP per capita for Denmark is US$62,626.

What are they doing?

Denmark is working to become a real powerhouse for innovation. It suffers from a lack of natural resources and must rely on innovation if it wants to have a healthy economy. Its overall innovation system is tailored to stimulate innovation in SMEs. Innovation policy stands high on the Governments agenda, and is managed through the Ministry for Science, Technology and Innovation. Within that Ministry are four Agencies;

- the National IT and Telecom Agency,
- the Danish University and Property Agency,
- CIRIUS Denmark, and
- the Danish Agency for Science, Technology and Innovation.[37]

While being the key Ministry, as in Australia this is not the only part of the Government where research and innovation occurs or is stimulated. The Ministry of Climate and Energy; Ministry of the Environment and the Ministry for Economic and Business Affairs for example all have research components.

The Ministry for Science, Technology and Innovation has developed a national action plan for the promotion of innovation and dissemination of knowledge in Denmark.[38] The plan has two goals:

1. Danish companies must be more and continuously innovative;
2. Knowledge dissemination and collaboration between universities and industry shall be strengthened.

The first goal sets three key ambitions to be achieved by 2010:

a. 45% of small enterprises shall be innovative (currently 40%)

b. 55% of medium enterprises shall be innovative (currently 50%)

c. 75% of large enterprises shall be innovative (currently 65%)

Additionally,

d. 12% of all private companies will employ staff with academic backgrounds

e. 10% of SMEs and 30% of large enterprises shall collaborate with universities

f. The number of PhDs will be doubled

g. The participation by Danish companies in international consortia will increase.

Part of addressing the second overall goal is the establishment and financing of GTS institutes, which are 9 non-profit research and knowledge institutions (see Appendix F). These provide SMEs with access to state-of-the-art R&D competencies and facilities. They do this by selling consultancy services and participating in joint projects. They serve around 20,000 Danish companies per year.

The GTS institutes are "authorised" by the Ministry to be recognised as GTS. This is granted for a 3 year period on a performance contract. Through the contract they can receive around €40 million.

The Danish National Advanced Technology Foundation is an independent body within the government administration that offers grants in the form of co-funding for high-technology research and innovation initiatives and projects.

Each initiative or project must meet three criteria:

- Obvious commercial potential.
- Technology transfer.
- Collaboration between public-sector research institutions and private-sector companies. Centres for Higher Education and/or public-sector companies may also participate.

The Danish National Advanced Technology Foundation's capital is increased gradually via the annual National Budget. The Foundation invests the capital and only utilises the interest accrued. The goal is for the Foundation to have a base capital of €16 billion by 2012. [39]

Since commencing in 2005 the Foundation has invested €87 million in the development of 51 new advanced technologies. These funds are matched by the project participants. When assessing applications the foundation takes the approach of a Venture Capitalist and sees itself as an "investor" rather than a funding source.

The success rate for overall applications is low, around 20%, though once they make a shortlist the rate is closer to 50%. Applications are reviewed by the Board, which is comprised of very senior industry people. Intellectual Property is managed simply by the Foundation demanding that the partners reach an agreement within 60 days. If they cannot then they lose the funding!

The Danish Government has also developed a program to stimulate research with SMEs that is directed at meeting the needs of their customers. The program for "User-Driven Innovation" is administered by Danish Enterprise and Construction Authority, which is part of the Ministry for Economic and Business Affairs.

The program aims to strengthen user-driven innovation in the private as well as the public sector. Applicants and projects from both sectors are welcomed, including educational institutions, cultural institutions, and knowledge institutions. Projects working in cross-sectoral consortiums are particularly encouraged.[40]

To obtain grants from the program, projects must include and examine user needs in news ways. This could include, among other things, development and testing of new methods and tools, building competencies, training, networking, or knowledge dissemination. The program has an appointed Board consisting of representatives from both business and public sectors. The Board determines the overall strategy of the program, selects the thematic issues, and evaluates and prioritises applications to the program.

Foreign partners are permitted in projects as long as the overall aim is to strengthen user-driven innovation in Danish companies or public institutions.

The program for "User-Driven Innovation" is all about trying to stimulate the economy by getting SMEs to actually research what their clients want.

What does this mean for CRCs?

Denmark is moving toward establishing itself as a powerhouse for innovation, it recognises the importance in collaborating internationally.

The GTS Institutes are an obvious first port of call. Much of the work they undertake is in similar areas to a number of existing CRCs (eg: water, meat quality). Furthermore, they are interested in collaborating with Australia.

Denmark is working to become the leading country in clean energy. A significant amount of its electricity is already supplied by wind farms. It is also looking at establishing itself as a demonstration site for electric cars.

There are masses of opportunities in Denmark and a strong will to work with Australia.

CONCLUSIONS

Throughout the European Union a great deal of funding is being devoted to innovation as member countries endeavor to meet the goals of the Lisbon Strategy. Each country visited is taking a slightly different approach to stimulating innovation with programs tailored to meet their own cultural and economic needs. Collaborative research is a key component of those initiatives. However in almost all cases the programs are driven by a top-down approach, with the Government choosing the overall themes where they feel needs innovation to occur. These are usually areas where the Government feels the nation needs stimulus, or where they feel the nation has a competitive advantage or capacity to excel.

Most of these collaborative programs are on a small scale, and Australia's CRC Program eclipses them all. These countries are innovative, but have only just twigged to the idea of collaboration whilst Australia blazed the trail 18 years ago. The Hawke Government's decision to establish the CRC Program was certainly a bold and ambitious move that today leaves other countries in awe. It certainly is something that we can be proud of.

Nonetheless, while other collaborative research programs do not meet the size or novel capacity of the CRC Program, it is not to say that should be dismissed as "weak cousins". Some of these smaller initiatives could be useful models for the next steps in the life of CRCs. Programs like Finland's SHOKs or Denmark's GTS give prestigious labels to established collaborations that apply and meet the criteria, and work within the innovation themes set by the respective Governments. This could be a logical growth step for CRC collaborations whereby via the CRC the topic is identified by the partners and once proven to be highly successful with demonstrable significant national benefits, could then evolve into a prestigious national collaborative centre. The Government would be charged with picking the key themes, but the list from which they choose would have been developed by industry via the CRC Program.

Meanwhile, Europe is keen on collaborating internationally. This is partly influenced by the drive to reach the Lisbon targets, also by the related increase in funding for the Framework Program and the establishment of European Institute of Innovation and Technology. At a higher level, international collaboration has moved from being merely a theory to becoming a practical necessity, potentially as a result of climate change and the recognition that it is a global rather than national issue.

There are opportunities for Australia. These countries are receptive to the idea of working with Australia, but we need to define our value proposition. It's not just about having great researchers – there are plenty of them in Europe – it has to be something else that makes us really unique and important.

One option would be to market Australia as a unique laboratory. The structure of our industry, our natural resources, our vast distances, our "can do" approach, our Governance structure, and even the sheer fact that we are a young nation where systems, approaches and attitudes are not influenced by a millennia of history can be real features making us attractive to other nations.

Australia is apparently only responsible for around 2% of the world's innovation. We could spend $ billions trying to get to 3%, or we could do what we are good at and focus our efforts on collaborating with the other 98%. The CRC Program leads the

world in terms of industry-driven applied science. We have the skills and we have the track record. The challenge now is in defining our value proposition and moving the notion of collaborating with Australia from a "could do" to a "must do".

APPENDIX A

THE EUROPEAN UNION

Description of Knowledge Innovation Communities (KICs)

Definition :

- KICs will be highly integrated, creative partnerships including education, technology, research, business and entrepreneurship that will produce new innovations and new innovation models and inspire others to emulate them.
- The proposed Centre shall include at least one higher education establishment and one private company.

Stakeholders:

- The key stakeholders will include: business (large and small companies), entrepreneurs (including SMEs), technology, public and private research, education and investment communities (private investors and venture capital), local, regional and national governments and research funders including charities, foundations and civil society.

Deliverables:

- A KIC will deliver measurable societal, economic and entrepreneurial learning and business impact. Specific activities of a KIC are to:
  - address long-term challenges in the themes and identify and tackle new opportunities for innovation in Europe;
  - transfer higher education, research and innovation activities to the business context and commercial and societal applications (stimulating innovation in large firms as well as creating spin-offs and start-ups and supporting SMEs);
  - attract, keep and work with partner organizations and top-class talent from around the world;
  - develop entrepreneurial people and bring them to business;
  - maximize the share of financial contribution from the private sector;
  - address leading innovation-driven research essential to the KIC objectives
  - set up new schemes of innovation-focused education through EIT-branded master, doctorate and post doctorate education.

Partners:

- The activity of a KIC must involve at least 3 independent partner organisations. The partners must be established in at least 3 different EU Member States and must include at least one higher education partner and one private company.

Structure:

- A KIC is expected to have a strong management and governance, however shall have substantial overall autonomy to define their internal organisation and composition.

Lifetime:

- The KIC must address a long-term horizon of 7 to 15 years, but with short-, mid- and long terms objectives that follow the mission of a KIC.

Funding:

- In order to have a significant European impact a KIC should rely at cruising speed on a total spending of at least 50-100 million € per year. The KICs may be financed for up to 25% of its global expenditure over the first four years through the EIT budget, drawing in the rest through other sources of financing (e.g. co-funding from European funds).

Contract:

- The long-term cooperation between the EIT and each KIC will be formalised within an initial seven-year Framework Partnership Agreement1. This agreement shall specify the common objectives, the nature of actions planned and the general rights and obligations of each party.

Application Process

- Online registration of interest
- Submission of detailed proposal; 4 parts :
  - A: administrative information and executive summary;
  - B: the body of the proposal. Describes the KIC, what it wants to accomplish, its strategy, activities, work program and processes, business plan;
  - C: addresses the credibility of the proposal, particularly in terms of the organization, management and governance of the KIC, the individual capability, capacity and international reputation of the partners; IP management
  - D: a declaration from the legal representative of each partner,

- Eligible proposals are evaluated by panels of independent experts
- Two stage process. Experts provide Governing Board with shortlist.
- Shortlist invited to interview.
- Governing Board make final decision.
- All applicants receive written feedback.
- Appeal possible.

APPENDIX B

THE UNITED KINGDOM

List of Research Councils:

- the Engineering and Physical Sciences Research Council,
- the Economic and Social Research Council,
- the Scientific and Technical Facilities Research Council,
- the Natural Environment Research Council,
- the Arts and Humanities Research Council,
- the Biotechnology and Biological Sciences Research Council and
- the Medical Research Council.

List of Knowledge Transfer Networks:

- Aerospace & Defence
- Biosciences
- Chemistry Innovation
- Creative Industries
- Digital Systems
- Digital Communications
- Electronics
- Energy Generation & Supply
- Financial Services
- HealthTech & Medicines
- Industrial Mathematics
- Intelligent Transport Systems
- Environmental Sustainability
- Low Carbon
- Materials
- Nanotechnology
- Modern Built Environment
- Photonics & Plastic Electronics
- Sensors and Instrumentation

APPENDIX C

FINLAND

Focus areas of Tekes strategy:

The focus areas of Tekes strategy are

- wellbeing and health
- knowledge society for all
- clean energy
- scarce resources
- built environment
- intelligent systems and environments
- service business and service innovation
- interactive media

List of SHOKs

- Forest cluster: Forest Ltd
- Information and communication industry and services: TIVIT Ltd
- Metal products and mechanical engineering: FIMECC Ltd
- Energy and the environment: CLEEN Ltd
- Built environment innovations
- Health and well-being

APPENDIX D

THE NETHERLANDS

List of areas identified as critical :

- Flowers and food
- High-tech Systems and Materials
- Water
- Creative industries
- Chemistry
- Life Sciences and Health

List of Top Technological Institutes (TTIs) :

- Telematica Instituut
- Dutch Polymer Institute
- Material innovation institute (M2i)
- Top Institute Food and Nutrition
- Top Instituut Pharma (TI Pharma)
- Center for Translational Molecular Medicine (CTMM)
- TTI Groene Genetica
- Technologisch Top Instituut Watertechnologie (TTIW)
- Topinstituut BioMedical Materials

APPENDIX E

GERMANY

Networks of Competence topics:

- Biotechnology
- Health and Medical Science
- Transportation and Mobility
- New Materials and Chemistry
- Production and Engineering
- Aviation and Space
- Energy and Environment
- Information and Communication
- Micro-Nano-Opto

APPENDIX F

DENMARK

List of GTS Institutes:

- AgroTech - Institute for Agro Technology and Food Innovation
- *Alexandra Institute* (IT research)
- *Bioneer* (biomedicine, biomedical technology and biotechnology research*)*
- *DBI* **(**Danish Institute of Fire and Security Technology**)**
- Danish Institute of Fundamental Metrology
- Danish Technological Institute (supply technological services)
- DELTA Danish Electronics, Light and Acoustics
- DHI (water and environment research)
- *FORCE Technology* (knowledge and technology-based service provider)

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Local CRCs 'unmatched for collaboration'

But Australia must work at cultivating global research co-operation, writes **Joanna Mather**.

Michael Hartmann says even in the internet age distance is a major hurdle for Australia. Photo: ANDREW TAYLOR

Finland is renowned as an innovative country — its spending on research and development as a share of gross domestic product tallies more than 3 per cent a year. Denmark and Germany came close at 2.5 per cent in 2007.

Yet Michael Hartmann insists one aspect of Australia's innovation system is the envy of all three countries — our co-operative research centres, or CRCs.

Hartmann is chief executive of the CRC Association, so you would expect him to say that. But after a month-long, fact-finding tour of Europe, he is adamant he's seen and heard enough to legitimately make the claim.

"Australia should be pretty darn proud of the CRC program," he says. "It was a really bold and ambitious move back in 1991 and it's only now that other countries are starting to emulate what we're doing."

The CRC program encourages industry to partner with public research organisations for projects with real-world applications. It does this by making grants contingent on funding commitments from both parties.

But the news isn't always good. Even in the internet age, distance remains an enormous drawback for Australia, Hartmann says.

"A common theme was, 'hey, you've got great research, you are doing great work but you are just so far away'," he says.

As part of the Lisbon Process, the European Union has set an R&D spending target of 3 per cent by next year. In Australia, spending on R&D as a share of GDP is 2 per cent, according to the Cutler review of Australia's innovation system.

The network of nearly 50 CRCs scattered across the country is a core component of that spending; investment in the program totalled $3 billion over the past 19 years.

Hartmann says the CRC model of collaborative applied science is unmatched anywhere in the world — as far as he's seen — in terms of the length of the time it has been operating and the magnitude of the funding involved.

"I had been led to believe that there were programs over there that we could emulate and I found it's the other way around," he says. "We remain the benchmark."

Hartmann's recent trip took in Finland, Denmark, the United Kingdom, Germany, the Netherlands and Belgium.

He met government ministers and officials to promote the benefits of collaborating with Australia's CRC network.

It's only now that other countries are starting to emulate us.
MICHAEL HARTMANN

It was a mission inspired by recommendations contained in the Cutler review that said Australia should cultivate international research collaborations to boost innovation.

Hartmann says given Australia's relatively remote location, the country needs to work extra hard to sell itself and its researchers as unique value propositions.

"What we need to do is come up with a reason why it's going to be beneficial to them to make that extra leap and come to Australia," Hartmann says.

Along with promoting Australia as a "natural laboratory" for things like solar power, it should play on the fact industry here is less encumbered by historical factors, he says.

"Some of the countries in Europe I visited do things in a way that is stifled or bound by millennia of history. We don't have a lot of those problems in terms of the structure of industry."

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