Australian Academy of Technological
Sciences and Engineering
NSW Division

Technology *ENTREPRENEURS*
- Critical to Innovation Success

ATSE Seminar
Tuesday, 26 August 2003
Sydney

AUSTRALIAN ACADEMY OF TECHNOLOGICAL SCIENCES AND ENGINEERING

NSW DIVISION

The Academy (ATSE) is an independent, non-government organisation dedicated to the promotion in Australia of scientific and engineering knowledge to practical purposes for the benefit of Australia. The ATSE unites Australia's most eminent engineers and applied technologists in an unrivalled academic and advisory institution for the engineering and technological sciences.

It encourages excellence, the growth of outstanding talent, and the study and discussion of issues of importance to formulate informed public debate and policies, and interaction with like-minded bodies overseas.

The ATSE is a body of 600 Fellows of proven ability and experience, elected to membership through eminence of leadership, individual achievement, or innovative management in industry. Approximately 30 new members are invited to join each year.

The Academy provides a unique resource of proven Australian skills and experience in:

- Physical technologies
- Biological technologies
- Engineering including infrastructure
- Management of technological industries

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Australian Academy of Technological Sciences and Engineering

NSW Division Seminar 2003

Technology Entrepreneurs -
Critical to Innovation Success

Proceedings

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Technology Entrepreneurs—Critical to Innovation Success
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Country Embassy Rooms,
NSW Department of State & Regional Development
Lvl 44, Grosvenor Place, 225 George St, Sydney.

The Symposium Organising Committee comprised Professor Trevor Cole FTSE (Convenor), Dr Doreen Clark AM FTSE, Dr Bob Durie FTSE, Mr Keith Daniel FTSE, Dr Peter Jones, FTSE, Dr Tony Lawrance FTSE , Dr John Nutt AM FTSE, Professor Rolf Prince AO FTSE.

Proceedings Editor: Dr Tony Lawrance FTSE

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THE AUSTRALIAN ACADEMY OF TECHNOLOGICAL SCIENCES AND ENGINEERING

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FOREWORD

The Academy of Technological Sciences and Engineering has long had a mission for promoting new technology in Australia and particularly in New South Wales. This is the fourth in a series of seminars[1] on the theme of technological innovation that we have organised in recent years. It focuses on the people factor which is arguably the most important.

Entrepreneurship is an attitude of mind . . . acceptance of risk, self-confidence and passion.

Entrepreneurship is an attitude of mind. Those who have it, and are successful, are a rare and precious breed. It involves seeing a little further over the horizon. It requires the acceptance of both personal and corporate risk. It derives its strength from extreme self-confidence and passion. Such a champion must be absolutely determined and have persistence and resilience because failure is close at hand. Above all, entrepreneurship must be soundly based on judgement and experience, and it requires a plethora of skills. Entrepreneurs do not deserve the bad name they are given in this country.

An enterprise must have both the individuals and a culture that allows innovators to flourish. That is a complex combination, which comprises two parts, fundamentally opposite in character. On the one hand, any business must be efficient. It must deliver its products competitively, eliminate waste and unnecessary effort, and ensure reliability. Innovation is the delivery of new technology which adds value and, by its very nature, involves newness and hence greater risk. Failure is always close at hand. Good leadership gets the balance right.

An innovative nation is the partnership between industry and research, government and the community

The key to an innovative nation is the partnership between industry and research, government and the community, with each having a vital role to play. Australia has had some notable successes but it falls short in encouraging innovation when compared to other countries.

"Innovative culture in Australia needs strengthening."

At the last ATSE symposium Dr Robin Batterham, Australia's Chief Scientist, said: *"Innovative culture in Australia needs strengthening.*" and proposed *"a target increase of 10 times current effort."* He went on to say *"This will require cultural changes, particularly with respect to entrepreneurship"*. Lord May, President of the Royal Society, London and an Australian, was more blunt: *"In industry R & D, Australia ranks very poorly*".

"An important deficiency is a lack of the pool of experienced entrepreneurs".

That lack of entrepreneurship in Australia was a recurring theme in our previous seminars, touched on by speakers from different backgrounds. The venture capitalists pointed out that adequate finance was available in Australia due to the increase of superannuation and institution funds in the sector, but, and I quote from Geoff Brooke of Rothschilds, *"An important deficiency is a lack of the pool of experienced entrepreneurs"*. And to highlight the deficiency, Charles Lindop, Director of Business Programmes at the Australian Technology Park, Redfern said, "*First and foremost, there is very little entrepreneur education in this country"*.

So, the need is real and urgent. There is much to be done.

In conclusion, I wish to acknowledge that the success of this Seminar is largely due to the Convenor, Professor Trevor Cole, and his Organising Committee who are identified elsewhere in these Proceedings. And I thank the NSW Dept of State and Regional Development for generously providing the splendid facilities in which this Seminar was held.

JG Nutt AM FTSE
Chair, NSW Division
Academy of Technological Sciences and Engineering

[1] ATSE Seminar 2001—*"Commercialising Innovation*"; ATSE Seminar 2002 "*Living with Risk*"; ATSE National Symposium 2002—*"Owning Innovation"*.

EXECUTIVE SUMMARY

The Academy of Technological Sciences and Engineering (ATSE) assembled an outstanding group of speakers to address the topic *"Technology Entrepreneurs*", which had been identified as a high priority issue in the promotion of Australia as a smart country. This was the fourth in a series of seminars[1] on the theme of technological innovation that ATSE has organised in recent years. It focused on the people factor which is arguably the most important. The presenters included two Academy Fellows who run billion dollar industries, another Fellow who had headed a global engineering firm, the head of the premier engineering think-tank in Australia, a distinguished engineering-academic Fellow, an entrepreneur with 25 years experience of creating high-growth companies, the Chair of the Australian Innovation Council, and the Professor and Co-ordinator of Entrepreneurship at INSEAD, France, the leading business school in the world outside the United States.

The Seminar outcomes take the form of Recommendations.

The issue is urgent. At the 2003 ATSE Symposium, **Dr Robin Batterham, FAA FTSE,** Australia's Chief Scientist, said: *"Innovative culture in Australia needs strengthening*", and he proposed *"a target increase of 10 times current effort."* **Lord May, OM AC Kt FRS FAA FTSE** President of the Royal Society, London, and an Australian, was more blunt: *"In industry R & D, Australia ranks very poorly*". That lack of entrepreneurship in Australia was a recurring theme in ATSE's previous seminars touched on by speakers from different backgrounds. **Professor Trevor Cole FTSE** articulated the benefits by repeating comments coming from the Innovation Summit — *"Australia will need to develop an ideas-based, can-do economy and society . . . the pay-offs are jobs, wealth and a better quality of life"*. **Geoff Brooke** of Rothschilds, identified one of the major blockages which has decided the selection of the Seminar topic—*"An important deficiency is a lack of the pool of experienced entrepreneurs"*. The current seminar explored how that would be rectified, and focused on the identification and training of people.

In this seminar, **Peter Farrell FTSE** described the types of people needed, in typically forthright fashion: *"The guys we look for are guys that have an appropriate technical background, have worked for a large organisation, got thoroughly dissatisfied, and gone and got an MBA so they are ready to hit the ground running . . . They do not expect (initially) to run anything—they come to learn"*. Those few word encapsulated the essence of the Seminar's presentations and discussions, the pathways ahead, and the restraints and blockages in the Australian scene.

Innovation has many definitions—**David Miles**, Chair of the National Innovation Council, gave an appropriate definition. He said, *"it is the process by which ideas are transformed through economic activity into sustainable, value creating outcomes, that is, inter-tradable products processes and services*". It is this process which is the basis of entrepreneurship. **Wal King AM FTSE**, CEO of Leightons amplified that somewhat: " *You need to push the boundaries but push the boundaries sensibly. You must have a market for what you are doing.*" **Trevor Cole** then focused the discussion beyond the initial science and idea: "*It is not scientists and PhDs graduates who form the bulk of those who grow (high value-adding exporting) companies"* it is the entrepreneur who takes things "*beyond the idea*" as **Peter North** puts it.

Roger Allen, Founder of the Computer Power Group, stated that "*there is no shortage of investment capital in Australia, with $600 billion in superannuation and other funds growing at $50 billion or so a year",* which reinforced several other opinions. But why is there a shortfall in the delivery cycle? **John Nutt AM FTSE** looked wider when he said; "A*n innovative nation is the partnership between industry and research, government and the community".*

Governments do have roles to play. *"Is this Federal Government committed to innovation? . . . Yes it is",* answered **David Miles**, but expanded that by saying *"In many ways we are not getting that message across well enough within the current programme".* **Trevor Cole** proposed a different reason: *"Regrettably the government . . . (has) focused on the first (creating ideas) to the neglect of the second (business translation*)". **Peter North** felt that *"Australia's technological potential doesn't seem to be even on the radar screens of the most talented young Australians when they are deciding their future careers".*

David Miles outlined the Government support programmes: " *Backing Australia's Ability is costing $3 billion over 5 years in addition to that already invested—$5.4 billion for science and innovation"*, but then answered his own question; " *The reasons why we lack the skills, and why the current programmes are being reviewed, is that we have to create an environment where people in the Australian business community can learn on the job."*

"Learning on the job"—this was emphasised by most of the speakers. The Engineering and Technology of SET requires a different mindset to that of the scientist. *"The process of going from need to global market is a process distinct from research, having its own inputs, processes, outputs and skill base"* said **Trevor Cole**. **Roger Allen**

reinforced that by saying "*The only way to learn the stuff is to go through it. It is pretty hard to teach, it is pretty hard to absorb—you really learn it by getting out there and doing it".*

The overseas speaker ATSE brought to Australia for the occasion, **Professor Phillip Anderson** of INSEAD, benchmarked the deficiency from his own findings: *"there is an inherent disconnect in entrepreneurship . . . the problem is a real lack of experience".* There is a dichotomy in solving this problem. Experience requires judgement and knowledge across the spectrum of entrepreneurship skills, but if the opportunities are limited, how is the pool of entrepreneurs to be increased.

What fields of activity are involved? **David Miles** gave one answer: "*Successful commercialisation has three components—a capital component, a management skills component, and an innovation component; and it stands on a base which is the environment . . . Clearly the role of government is to create that environment—to create a business environment, to create an education environment, to have programmes in place . . . The capital is a dual responsibility. The gap is the development of management skills (and experience)".*

Phillip Anderson then developed an approach based on INSEAD's philosophy. *"Apprenticeship/ mentor-ship . . . is what we are trying to accomplish . . . to grow entrepreneurs we need to apprentice them to people who can lead growth ventures . . . people fall down on . . . simply company building . . . the problem for most general managers is they are not trained to contribute immediately to an entrepreneurial organisation".*

If we are seeking a pool of skilled entrepreneurs, the conditions in Australia encourage a brain drain. **Roger Allen** quoted from his experience: "*Australia has had a lot of leakage over the years . . . people who may well have that experience have gone overseas and worked in companies overseas—they have left Australia (to work), or they have gone off and founded their company overseas".* That suggests that Australia should keep a register of such people, formally or informally networking the group, so that at an appropriate time and with the right incentives, they are enticed back—perhaps an entrepreneurship equivalent of a Federation Fellowship.

Peter North, Chairman of the engineering think-tank, the Warren Centre**,** believes "*we need to take a very special and spectacular leap*" across "*the cultural chasm*" so that "the technology-driven commercial enterprise is at the very core in setting Australia's economic policies and priorities". He articulated an initiative worthy of further study: " *. . . first, a short-term visa to enter the entrepreneurial world—a 9 month program in technology entrepreneurship for talented graduates . . . ":* second, *"a three-year professional doctorate in integrative engineering, not an academic PhD, but an advanced workplace-based program, developing a new class of unique engineering-trained leaders with the intellect and practical and professional skills to lead a commercial research and product development unit much earlier in their careers".* He believed this would result in a "*highly-developed professional, the 'integrative engineer*' " who would facilitate moving "*beyond the idea*".

Wal King had no such problems in an established, successful, forward-looking corporation, which is a lesson in itself. "*Innovation means renewal and improvement. The organisation must allow a culture that enables people to innovate within the framework of values. People must be motivated and rewarded. Our structure of Leighton Holdings and subsidiaries allows innovation that happens every day, over and over and over again. We acknowledge we are in the risk-taking business, but we are not in the unlimited risk-taking business."*

He then articulated a philosophy that would apply to the nation as well as to individual companies. "*To really summarise our view, it is taking calculated risks, investing in people, investing in technology, being able to adapt to a changing market place. We need to innovate every day of our lives, we need to keep running that race—that race will never end. I would say not to take risks, not to innovate in the end will prove an even greater risk for those organisations that do not push the boundaries . . . Unless you innovate, people will leave, the organisations will wither".*

Warwick Watkins stressed that we *"have totally under-invested in the soft and hard infrastructure of entrepreneurship".* He feels "*we need to have increased investments in both those aspects of technology and entrepreneurship*"— including the "*flagship and the big hairy projects. Entrepreneurs are an important, perhaps critical, asset to an enterprise".* But, as he later states, *"we lack methods to value and recognise the true worth of such intangible assets and ways to represent them on the balance sheet.*

RECOMMENDATIONS

Technology Entrepreneurs have special skills and experiences fundamental to the successful delivery of innovation. The recent ATSE Seminars[3] have identified a shortage of these skills in Australia as a result of lack of opportunity, unfocused education, the brain drain and a business culture in SMEs which does not encourage investment in long-term innovative thinking. The qualities required of a successful entrepreneur are vision, initiative, self-confidence and ambition, combined with judgement and experience in technology, finance, marketing, and management. Such qualities can be taught to some extent, but most are learnt by working in a suitable entrepreneurial environment. There is a lack of such opportunities in Australia.

The problem is deep-seated in spite of the competitive business environment. A change will require the training of such champions not unlike that in any other field of endeavour—early identification, coaching and training, opportunities for participation, and suitable rewards for success, financed by programmes, which underpin national priorities. These skills are significantly different to science, being focused on commercial application rather than discovery.

Recommendation 1.

The Federal Government should recognise that the successful innovation process requires greater support for the end of the science, engineering and technology (SET) chain, and not only at the start. Government initiatives should focus on skills relating to commercialisation.

The gap in the development of entrepreneurial management skills and experience needs to be overcome. Governments, and the established business community, have responsibilities and leadership roles to encourage formal and informal education and business environments through courses and networks.

Recommendation 2

The Federal Government, in partnership with industry, should initiate an entrepreneurship mentoring or "apprentice" programme in industry.

Incubator and clustering networks create informal environments where attitudes are shared and skills fostered. Programmes within such clusters need to focus on bringing marketing and management together with researchers to encourage multi-skilling.

Recommendation 3

Incubator and clustering networks should be encouraged and supported by facilities focused on the realisation of the products of technological development.

Education for roles in entrepreneurial businesses should be studied and implemented. The basis of a strong science and engineering community is a sound foundation in primary school, building on it in secondary school, with extension at tertiary level, in both TAFE and university. Without this there is little hope in producing the technology entrepreneurs necessary to commercialise scientific discoveries.

Recommendation 4

Government should support an Australian-based technology entrepreneurship programmes at appropriate educational institutions.

Recommendation 5

Governments, educationalists and the community should give strong support for the study of science, engineering, and technology-related subjects, within the school systems of Australia.

Australia should keep a register of technology entrepreneurs who have left Australia for overseas experience, formally and informally networking the group, so that at an appropriate time and with the right incentives, they are enticed back.

Recommendation 6

An entrepreneurial technology equivalent of the Federation Fellowship of the Australian Research Council should be established and funded in the area of commercialisation.

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[3] ATSE Seminar 2003 *"Technology Entrepreneurs*"; ATSE National Symposium 2002 - *"Owning Innovation".* ATSE Seminar 2002 "*Living with Risk*"; ATSE Seminar 2001 - *"Commercialising Innovation*";

TECHNOLOGY SUCCESS

Mr WARWICK WATKINS

WARWICK WATKINS is the Director General of the Department of Lands and the Surveyor General and Registrar General for NSW, with responsibility for spatial, land and property information and all Crown Land matters in NSW. He is also Deputy Chair of the Australian Land and Water Research and Development Corporation and a Pro Chancellor at the University of Technology, Sydney. His previous appointments have included CEO of the Department of Information Technology and Management, and CEO of the Department of State and Regional Development within NSW, Australia.

Ladies and Gentlemen,
There is no doubt the focus here today is on modern technology, the areas that many of us have grown with over the last couple of decades. If we go back through the history of Australia, the whole concept of entrepreneurship and innovation is well blooded right through to our agricultural roots. So, if it has been embedded within the psyche of the Australian body, why has it not flourished to the extent that we need across the broad spectrum of the activity base to make Australia both a diverse, vibrant and successful country?

we have totally under-invested in both the soft and hard infrastructure of entrepreneurship

We would say that to identify and invest collectively in those areas of entrepreneurship—the soft and hard infrastructure—we have totally under-invested in both.

Let me touch on a few of those points as I go through. At a time when we are looking for increased value, we see the plethora of textbooks and events such as this, at leaders in academia and other places standing before us and talking. The only thing that really matters is if we actually put the hard rubber on the ground and we materialise the outcomes both in bottom line financial results, and more importantly, in the intellectual or knowledge capital—the intangibles that are tied up within the human interface in much of our activities.

If we trace the way in which we have all looked at our businesses over the last two or three decades—and the way the institution of accounting and private market place people, both from the investor as well as other arenas, value our businesses—you see this in stark reality. The whole dot.com crash period over the last number of years reflects this.

It is society's inability to value those intangibles that is holding us back. But accountants talking about financial management or management accounting could rattle off the structural aspects of accounting standards that would make us feel very comfortable.

The real issue here is that we have lacked, and still lack, a method to value and recognise the true worth of .....people assets.

The real issue is that we have lacked, and still lack, a method to value and recognise the true worth of the intangible assets—the people assets. There are too many managers who are driven by short-term shareholder value in both the public or private sector, driving the return on the physical assets. They are ignoring the material returns and investments in the intellectual capital tied up in the technology systems, data and, more importantly, in the staff.

I welcome the resurgence in the last couple of years in Europe and the United States of work to quantify this aspect of knowledge and intellectual capital.

Some of the significant technology based companies are now starting to see in excess of 60 to 70 per cent of the true value of their businesses is not represented on the balance sheet.

The challenge is how we represent that on the balance sheet.

The challenge is how to represent that on the balance sheet. A lot of work is going on. From a New South Wales Government perspective, I am currently working on this in my own organisation with Commonwealth and private sector people, and one or two global technology companies. We are trying to get greater value and the management tools. I have given a commitment to report in my next annual report.

This is not just from the point of view of the traditional and legislative requirements that I must report on from the point of view of an organisation. I run a number of organisations in that context—a government trading enterprise— and yes I do have to make a profit, I do have to pay a dividend, I do have to benchmark myself. All those things that we are used to and yes, some of mine is a monopoly, but I still have targets that I have to meet.

So I have given a commitment to actually report, not just in those materialistic aspects from an accountancy point of view in June next year. But to have a significant section on this whole area of knowledge and intellectual capital. Because if you look at the land and property information area—and I am the Surveyor General and Registrar General for New South Wales, and you think about it—I doubt whether there is a person in this room, except some of our international guests, that are not a customer of mine. Every day we do about $4 million worth of business and about 18,000 enquiries on our internal data bases, which is all the property and land information for the State. So in one shape or form many of us have a mortgage to a bank or institution and so this whole construct that I am driving very much underpins the social and economic worth of the State.

There is no better area for me to focus on in the few minutes I have got than to try and draw out a few examples from that, and underpin what I have just been talking about. If we go back a couple of decades before it was possible in Australia to go and readily scan documents, it was the Land Titles Office, as it was then called, that sent its core sets of data to the United States to be scanned. That heralded in a significant period of technology development and enabled us to reduce the workforce from some 1200 to 1300 down to, in that business now, to be roughly half that size. I do not regard that as an achievement because in the sense that I think we waste too many resources and we create corporate anorexic organisations and too many of us get rewarded for doing that, and that is very short term.

The real challenge for all of us is how we actually retain those staff and put them into meaningful areas and grow the business and to grow business in different directions. That interface between technology and human endeavour is the one that I think is the real focus today.

If you go back and look at the work by Michael Porter on competition between nations and the other work of people like him, and the ilk that he represents, it is all about the identification of that competitive advantage. There is no doubt in this day and age that the entrepreneurship and the innovativeness of our human capital are those that are going to give us that edge.

So what are we doing about it as a nation? What are we doing about it as a State? There is no doubt that in more recent years with "Backing Australia's Ability" and the investment in CRC's and the investment in R & D capacity (be it sub-optimal we all would agree) I have welcomed, as many of you have in the room, the investment in this area that was not there two decades ago.

..... the ICT and bio technology centres have set a new benchmark … how (are) these new investments going to invest, not just in the hard infrastructure but also in the knowledge infrastructure

There is no doubt that the ICT centre of excellence and the investment in biotechnology centre of excellence are welcomed by a lot of us in the room. But I would like to think they have set a new benchmark and a new threshold from which we have to leverage off. All of us will be looking at backing Australia's ability to see how the new investments are actually going to invest, not just in the hard infrastructure but also in the knowledge infrastructure.

Let me just touch now for a couple of minutes on the whole aspect of education and the great debate. I have the privilege of being on the UTS council and being a pro Chancellor there. I have the opportunity, sometimes I relish it and other times I do not, to actually delve right into this debate at the moment of higher education. How we create, I guess, the value change between education, the student outcomes and the investment in the R & D underpinnings, right down to shareholder value and products and services that build the wealth in our nation.

Irrespective of the politics of the day there is no doubt that the area of research and development between industry, academia and State and National governments has been, and continues to be, a need of major refurbishment. That is why we welcome the types of initiatives that have come from both the State and Federal governments.

It will be a sorry day if the universities, collectively, do not look at their complementarity rather than their competitiveness

In this whole area of education at the moment I think it will be a sorry day if the universities, collectively, do not look at their complementarity rather than their competitiveness as we go forward.

It should not be a matter of us creating A class, B class or C class universities. It should be a matter of us identifying what are the competitive strengths, what are the outcomes that we want and what are the niche markets that we need to produce—and where do the students fit. In other words, how are we going to create the entrepreneurs of the future and equip them with the type of education, zeal and zest for life that is needed for us to take the economy forward?

I see some hope in that and I also see some of the doggedness that exists that is certainly a companion to the concept of entrepreneurship. We heard with the opening speaker that without that doggedness you do not survive anyway.

If that doggedness and that sense of self-protection becomes the thing that does not enable use to unlock the value in our universities over this next 18 months to 2 years, I think we will rue the day and miss the opportunity. I must say all these comments are personal comments, being involved in a lot of these things—I look at CSIRO and see CSIRO in the same position, and the flagship and the big hairy projects that they have got going, and wonder whether they fit in this chain.

we do need to have increased investments in both those aspects of technology and entrepreneurship and we need greater investment in valuing of the human capital

So let me finish by saying that yes, we do need to have increased investments in both those aspects of technology and entrepreneurship and we need greater investment in valuing of the human capital. We need new tools to be able to do that and we need new and invigorated investments to be able to realise the potential.

There is no doubt that in New South Wales and Australia, the economic climate over the last 5 years to 10 years, and hopefully going forward for the next 3 to 5 years has been conducive for all of us trying to grow a knowledge-based and increasingly reward-based economy.

I wish the seminar well and I am pleased to be able to open it this afternoon, thank you.

RAISING INNOVATION PERFORMANCE IN AUSTRALIA

MR DAVID MILES

DAVID MILES is Chairman of the IR&D Board, and Consultant with Corrs Chambers Westgarth Lawyers. He is also Chairman of the National Innovation Council and chaired the National Innovation Summit held in February 2000, and subsequently was Chair of the Innovation Summit Implementation Group. In addition, David is a board member of BAA Australia and is the independent Chairman of Uniseed Pty Ltd.

Ladies and gentleman.

My interest is largely in areas of the growth of new knowledge industries where we may fall behind and lack the impetus that will be necessary to take us forward. I have often quoted—I cannot give you a source for it, but it has become a bit like folk lore—that there is a view that for 60 per cent of the children currently in pre-school in Australia, the jobs they will hold down for most of their working life have not been invented yet. Unless we do invent them, and we do create new businesses, and we do create new industries, then we are going to fall well behind on the world stage in terms of a productive and growing economy.

Innovation has many definitions—

Innovation has many definitions and you will probably hear a number of them this afternoon. Let me give you mine.

"The process by which ideas are transformed through economic activity into sustainable, value creating outcomes, that is inter tradable products processes and services . . . and creates jobs and new knowledge-based industries".

The process by which ideas are transformed through economic activity into sustainable, value-creating outcomes, that is, inter tradable products, processes and services, to which I would add: creates jobs and new knowledge-based industries.

What I have been asked to do this afternoon is to give you some outline of what programmes there are in place from the Commonwealth Government initiative. Then I would be interested to hear how it is that you respond to those programmes. This is a crucial time while the Federal Government carries out its mapping exercise in constructing and backing Australia's ability to innovate.

Is this Federal Government committed to innovation? Yes it is!

Is this Federal Government committed to innovation? Yes it is! It has demonstrated that with the investing in growth statements in 1997; the formation of the Prime Minister's Science, Engineering and Innovation Council (PMSEIC); the 1999 "Knowledge and Innovation Statement; and the 2001 "Backing Australia's Ability.

What I would like to know, I am sure you would like to know and I certainly know the key Ministers would like to know is: is all this as yet making a difference? If it is not making the difference that it should be making, how can it make that difference?

The Federal cabinet adopted during the course of last year nine priorities for this term of government. There were many who thought that the innovation, the focus on Science and knowledge based industries might slip off the agenda. It did not happen and there is a very good reason why it did not happen because some of these initiatives here are actually beginning to bite in the cabinet room.

PMSEIC is indeed becoming a source of significant idea generation

PMSEIC is indeed becoming a source of significant idea generation in terms of taking the Australian Government's approach to the knowledge economy forward.

Backing Australia's Ability is costing $3 billion over 5 years in addition to that already invested: $5.4 billion for science and innovation.

Backing Australia's Ability on any view is a bloody awful lot of money: $3 billion over 5 years in addition to that already invested: $5.4 billion for science and innovation in the 2003 budget allocation. This money, which is in the system, some of it still to come out, is in addition to what was already spent in

that area. Of course it is in addition to the outcome of the Wills report and the increase in medical research funding.

The ongoing analysis and improvement issue is the current mapping exercise—an overview of all that is currently going on at Commonwealth level and how it can be complemented by what is going on at the State level. So you have that as a foundation.

My job this afternoon is to talk about what programmes are in place. Hopefully, I can get some feedback from you as to whether you think this money is being well directed under the current programmes, as indeed the government is interested to know.

A recent paper prepared by the Prime Minister's Science Committee dealt with the issue that you are really focussing on today: how do you actually take the idea and make some money out of it, create some jobs and create a new business.

It made recommendations, and I am not going to dwell on them. My experience in the innovation debate, my very recent experience with the Industry Research and Development Board and certainly my experience following the Innovation Summit in terms of putting strategies forward, is that we got a fair few ideas. But we are not terribly good at taking them anywhere.

The House of Representatives recently had a go at research and development in Australia and came up with 48 recommendations. There is nothing really new in that report, and the mapping exercise is probably the most carry-forward item in terms of what the Federal Government at least should do next.

Of course what the Federal Government does is so important in terms of how the State and Territory Governments follow and how they put the complementary programmes in place to make sure that people have available to them the opportunities to access the programmes.

There is an innovation awareness programme that is currently beginning to take shape, although a good deal of the innovation awareness programme, facilitated by the National Innovation Council, is largely money that was already committed in many areas. That programme funds the ABC Science Unit—what our national broadcaster endeavours to do in terms of science education. It funds "Science meets Parliament". It funds the National Innovation Festival. They are all activities designed to raise awareness. Yet it is my perception that we still have a lot further to go if we are going to achieve a higher level of awareness and an understanding of how important the innovation agenda is to the development of the Australian economy—and indeed our way of life.

it is my perception that we still have a lot further to go . . . to achieve a higher level of awareness and an understanding of how important the innovation agenda is.

The National Innovation Awareness strategy gives you some break-up but it is largely focussed, quite unashamedly, on small and medium sized enterprises. It is also focussed towards the young people of Australia, with a view to encourage them to pursue knowledge intensive careers—to pursue science careers, to understand what innovation is, and how it may be used to develop a career path to create jobs and to create opportunities. Again it seems to me that in many ways we are not getting that message across well enough within the current programme.

The National Innovation Awareness strategy . . . is largely focussed on small and medium sized enterprises, and towards the young people of Australia.

We are not getting that message across well enough within the current programme.

So we have a challenge. Largely what we are doing in these programmes is spending the dollar, not the $100. It is a big gap between $1 and $100 and I happen to be an advocate, and some of you may wish to debate with me, that it is not the government's job to find the $100.

Maybe it is its job to find a bit more than the $1 but the $100 has to come from an enterprising business community and that is the area in which we need to do an enormous amount of work.

There is a big gap between $1 (ideas) and $100 (production) . . . . . it is not the government's job to find the $100 . . . it has to come from an enterprising business community

Successful commercialisation has three components—capital component, management skills component, and innovation. . . the base is the environment.

Successful commercialisation has three components—a capital component, a management skills component, and an innovation component. It stands on a base that is the environment.

Clearly the role of government is to create that environment. To create a business environment, an education environment, and to have programmes in place so that the stool sits squarely and balanced.

The role of government is to create that environment.

The capital is a dual responsibility. At a pre-seed level, at that early stage, grabbing hold of the idea, giving it some shape, is a very difficult concept for modern capitalism to grasp. Indeed I think the experience in Australia has been that at the pre-seed level we have certainly had market failure in terms of picking up our ideas and being able to take them forward. It is vital at a pre-seed level that we get that aspect right so the seed capitalist and the venture capitalist can join in at the appropriate level where they are far more comfortable to make the investments and take them forward.

The real gap is in the management skills.

The real gap is in the management skills.

an environment where people in the Australian business community can learn on the job.

The reasons why we lack the skills and why the current programmes are being reviewed is that we have to create an environment where people in the Australian business community can learn on the job.

The Chairman said at the outset we have to be prepared to accept some failure, to learn from those failures, then to create a pool of people with the capacity to generate ideas without being discouraged.

Governments as well as private enterprise have to be prepared to lose some money.

In order to create that environment, Governments as well as private enterprise have to be prepared to lose some money. You cannot go out to your business community and say; "We want you to be bigger risk takers. We want you to take more risks. We want you to be adventurous in terms of developing projects. We want you to commit more to R & D; we want you to commit a percentage of your turnover to R & D. Yes, we will give you some help on the way"; unless the government is also prepared to put some money up and expect, in many circumstances, not to get it back.

I think we are getting to that point slowly. However we have a good deal more work to do. I dwell in a relation to the pre-seed capital area—an area in which I have a particular interest because of my involvement at Uniseed. You will hear from Roger Allen, later, about the government's initiative in relation to the pre-seed funds that effectively came into being during the course of last year.

What is the message there over a short period of time? It is $104 million, approximately, that is there in the system, contributed approximately three quarters by the Federal Government and the balance raised privately by the four funds that were successful in getting the licences.

$104 million and the funds are up and running. You might find this strange in this environment and community that they are finding it difficult to get (at this stage at least) enough good ideas. Yet everywhere we go, and the conferences we go to, people stand up at podiums like this and say we are really an innovative country—we are brim full of ideas.

The people who are so essential at taking those ideas to market. That is, the people who are going to manage them and inject private capital, and take them to second and third stage funding, and maybe to the public market, are saying to us: the way things are constructed at the moment there is not a plethora of really good ides out there that have commercial opportunity.

We are not interacting enough between the business community and public research institutions.

So are those ideas in too raw a state? Probably! Are we interacting enough between the business community and public research institutions, where far and away most of the research is done in Australia? The answer to that in my opinion is, no!

We have an Innovation Investment Fund; Renewable Energy Equity Fund; Biotech funds; Pre- seed, R & D Start—$550 million; A small Comet programme; tax concession programme. All these are government funded. Many, like capital market reform, fall in the government's place too. But are we getting maximum value from what, as I said earlier, is a significant amount of money and a significant commitment?

You have to add on to all this the State Government initiatives that have been taken in various ways to these various funds. These are not "centres of excellence"; they are a separate part of the programme. This is money in the system or money currently available to take innovative ideas to market.

we lack the entrepreneurial attributes, skills and experience.

This is what we seem to lack: the entrepreneurial attributes, skills and experience.

It will be remedied if we have focus on our education system—beginning at the primary level

Are we a nation that is short on entrepreneurs? I do not know, but I suspect we are, and the situation is going to be remedied in the short term. It will be remedied if we have focus on our education system—beginning at the primary level—and if we really grasp that issue.

are we still training people to be employees rather than employers?

Of course we have our higher education system under review at the moment but are we doing the right thing at the very beginning of our education system? Or are we still, across Australia, generally training people to be employees rather than employers?

We have a looming crisis in our teaching profession in Australia in the lack of properly trained teachers.

We have a looming crisis in our teaching profession in Australia if you look at the figures over the last week or so—about the lack of teachers we will have, about the lack of properly trained teachers. What pressure is that going to put on the education facilities? What pressure is it going to bring to bear to see if we cannot modify our curriculum, so that 10 or 20 years hence, if some of the seeds that we are sowing now within our business community are going to be taken advantage of. Who will actually come out of their education? Sure, with qualifications; sure, with a depth of knowledge and with what seems to be generally identified as the qualities for people who want to be entrepreneurial; and who will want to establish and create businesses for themselves?

entrepreneurial schools . . . are not the solution

That is the real challenge, and there are some theories around at the moment—I probably will cut across some ideas that some people have here—that what we do is we start entrepreneurial schools; that we must bring people in and teach people how to be entrepreneurs. I do not believe for one moment that that can be the solution.

What we need to do is to connect the enterprising people in our business community with the people within our research communities; the people that have the ideas; the people that are within our universities. We just now have a disconnect and we somehow have to change that—that is the challenge.

We have recently had an announcement that there has been an increase in business expenditure in R & D. It is unfortunate the way we call it expenditure rather than investment. I always thought you spelt bird B-I-R-D, but that is the way, in many respects, it is looked upon in many aspects of Australian business. It is an expenditure and, to a large extent, if we are going to make that sort of expenditure, then we ought to get something back out of the system. Something for making that investment in our own future and therefore governments should be more encouraging of industry and business to connect to that expenditure.

I personally do not think government can be much more encouraging in that area when you look at the components of "Backing Australia's Ability".

Yes it will be reviewed, and those programmes are being examined. There is a good deal of input from many aspects of our society—our research community, our academic community, and the business community—about looking at

those programmes and saying "How can we make them work better".

But in the end, as in what you are talking about here today, it is the people issue where we need to make a difference. If we can start to get that message across within our research institutions. If we can start to get a new level of respect between the Australian business community and those who are committed in our institutions of higher learning and in our research institutions. If we can have those groups work together, then we will make a lot more headway than any long term multi-million dollar government programmes—although the government programmes still need to be there.

I was at a dinner the other evening and someone said to me that they found something surprising, having returned to Australia after some 20 years absence overseas. He gave me this example: let us say there is a particular research institution or a major research university, say in the US, that makes a commitment or has a distinct body of expertise—let us say in nano technology. If there is an industry over there that sees it can make and develop enterprise out of the benefits of nano technology, then there is a very strong propensity in the US for that industry or that business to go to that university and say; "You are exploring in an area which we think has potential future for our business, can we put $10 million on the table and can we be one of the players? Can we make an investment in your research for the long term benefit of our business because that is where we have set our goals?"

To inculcate that sort of culture into Australian business, and to have it accepted without cynicism to create a partnership whereby people can work together I think is something that we need to work very hard at. We need to talk it up and so many of the people in this room have the opportunity and, no doubt, have the audiences from time to time to spread that message.

We need to get some of these skills injected into our research focus, the formal business skills of looking at the idea, seeing where it is going, putting it in some shape, taking it forward.

We need to get some of these skills injected into our research focus, the formal business skills of looking at the idea, seeing where it is going, putting it in some shape, taking it forward. Yes, we have people with skills, there are people in this room who are very skilful at that but there are not enough of them outside this room or indeed outside a number of forums that go on about this around Australia currently.

Finally, I think that is what we have at the moment. We are unforgiving of failure and so even our young people are frightened to fail, frightened to take a risk. We do not pick people up and take them on to the next stage and we are only going to solve that over a long period of time in terms of education.

The Chairman emphasised earlier, recognition of entrepreneurs and entrepreneurship—we did a survey last year at the National Innovation Council where we went and asked a range of groups. One of the groups we went to ask was of secondary school students. We asked them what they thought about entrepreneurship, or who was an entrepreneur and surprise, surprise, they came up with a couple of pretty crook names—Alan Bond and Christopher Skase.

Maybe we have to think of another word, it is not a good word in our language and kids do not relate to it. Yet the same survey demonstrated to us that the number of these people who would really like to go out and run their own business and work for themselves and use their brains to develop their talent was a very very high percentage, even within our current education system. But they cannot see anywhere to go.

Mum and Dads do not help. "Son I wouldn't do that. Make sure you get a good steady job, you want to make sure that every fortnight the eagle flies and you get an envelope. Don't put your assets at risk. You are doing what? You are giving up your job and you are going out on your own and you have doubled the mortgage on the house?" We do not help. We come from that conservative gold watch community.

I would like to think that in forums like this we can create an impetus to learn how to have fast fail strategy, to understand what the innovation process is, to understand how important it is to our economy. Then to appreciate that there are a number of programmes there—some of those programmes under utilised— that need to be more widely accessed Then we may start to get somewhere. With a review of BAA and BAA2 and what is coming in the future we can, perhaps, really take it forward.

I do not think at this stage we have maximised the opportunities that are there and forums like this can only add to that opportunity.

Mr Chairman, thank you.

ENTREPRENEURSHIP IN THE LARGE CORPORATION

MR WAL KING AM FTSE

WAL KING, AM FTSE is Chief Executive Officer, Leighton Holdings Limited, Australia's largest engineering construction company, with a market capitalisation of $ 2.5 billion. This is a position he has held since 1987. He was Australian Businessman of the Year in 2002, and in 2001 he was awarded the Peter Nicol Russell Medal by Institution of Engineers Australia, its highest individual award. He is Director of Coca-Cola Amatil Limited and a Council Member, Business Council of Australia, a Member, Advisory Council of the Australian Graduate School of Management, and President, Australian Constructors Association.

I am going to focus on the practical side of innovation . . .

Practical driven, market driven.

Ladies and gentleman,
What I am going to try and focus on this afternoon is the practical side of innovation and try and get it done in half an hour if that is at all possible. Practical driven, I suppose, market driven.

We have just completed a bottle making plant in South Australia. Australia used to import $300 million worth of wine bottles per year.

Making wine bottles is not exactly rocket science and our people came up with the idea of producing a specialised plant with lots of flexibility to produce wine bottles. We took the idea to AMCOR and AMCOR embraced the idea and that plant is now operational at Gawler in South Australia and produces some 300 million bottles a year and in fact AMCOR has now doubled the capacity of it. We are now building another plant alongside it for another 300 million bottles a year. Therein, Australia is going to save something like half a billion dollars a year in imports of wine bottles. Now as I said, wine bottles is not exactly rocket science so in this whole issue it needs to be driven practically and from a market perspective.

I guess you would say that technology entrepreneurs are people in companies that vigorously explore new opportunities, with the aim of inventing new ways to work and live that better achieve outcomes in terms of standard of living and quality of life.

We are in the risk taking business but we are not in the unlimited risk taking business.

I would say that at Leighton we put this theory into practice through our business strategies with one important criterion. We acknowledge we are in the risk taking business but we are not in the unlimited risk taking business.

In recent times there has been a lot of airplay about the AMC magnesium plant in Queensland, the sorts of accusations that we threw the baby out with the bath water and did we know what we were doing. We precisely knew what we were doing when we took that contract on. We took it on a cost plus basis, until the point at which the engineering was sufficiently developed and we could put a price on the table. At the end of the day the price was so far beyond the envelope of the original budgets that of course, as we well know, that project tanked and a lot of people have been singed unfortunately.

Today I would really like to give you some insights into the strategies that underpin Leighton, which have resulted in Leighton's fantastic development to date, and which will continue growth in the future.

"Nothing worthwhile ever happens quickly and easily. You achieve only as you are determined to achieve and you keep at it until you have achieved."

I would like to look at some of the underlying principles that we apply in innovation and say. *"Nothing worthwhile ever happens quickly and easily. You achieve only as much as you are determined to achieve, and you keep at it until you have achieved."*

"Organisations do not compete, people compete and it is people that innovate"

Organisations do not compete, people compete, and it is people that innovate. There must be an embedded desire by the people in the organisation to continually improve performance by innovation, over and over and over again.

That is the way we work.

Another great quote says, *"The rung of a ladder was never meant to rest upon but only to hold a man's foot long enough to enable him to put that foot somewhat higher.'*

Innovation means renewal and improvement. The organisation must allow a culture that enables people to innovate within the framework of values. People must be motivated and rewarded.

Innovation means renewal and improvement. The organisation must allow a culture that enables people to innovate within the framework of values. People must be motivated and rewarded.

Our management structure allows freedom—you must have freedom, you cannot have bureaucracy. Freedom goes with accountability. But you cannot have people roaming endlessly—you have to have some core values to hold your organisation together.

The core values of Leighton are as follows.

- We act with integrity, we believe we recognise the needs of the community, albeit from time to time, as we well know, certain sections of the community find it hard to recognise their need.
- We foster a performance driven culture; we create a safe, challenging and, when I wrote this originally, a fun workplace. People thought I was being quite flippant but I believe the workplace should be fun. If you cannot have fun and earn profits you should do something else.
- We encourage innovation and technological leadership, the things we are talking about here today.

They are the core values that hold Leighton together and we expect all of our people to act within those particular parameters. So we would put people first, and our basic values are:

To provide a safe and healthy workplace for all employees, —sub-contractors, consultants and business partners

To attract, retain and develop the next generation of managers—in line with the Group's forecast growth objectives

To operate within community standards—and support their social and environmental sustainability.

To invest in resources and training—to gain a competitive advantage through managerial, technological and market leadership

To ensure that all group employees understand, accept and operate within the core values and code of ethics of Leighton Holdings and those of the relevant operating company.

We thus have basic values and objectives listed across three of our areas which are financial, people and operational. Then we allow our people to go on and do the things to achieve the results. We are not a prescriptive organisation.

Leightons is Australia's largest construction group. We employ more than 15,000 staff and they are probably moving on up to 20,000. We operate through Australia, Asia and the Pacific. We have annual revenues of around $5.6 billion and we have work around $10 billion and we believe that will go on up probably to some $12 billion over the period ahead.

Our structure of Leighton Holdings and subsidiaries allows innovation that happens every day

Of course that was not always the case. Leighton was established as a private engineering company in 1949. Our structure of Leighton Holdings and subsidiaries allows innovation that happens every day, over and over and over again.

All the rocket scientists and boofheads told me this was an impractical and impossible structure and it would fail—it would never work, it never will work. I am still told that, I suppose every month, by an array of consultants who have brilliant ideas on how to improve it.

It is a competitive structure that allows flexibility and focus. We allow people to achieve the outcomes. They are rewarded, motivated and it is very successful.

We say it is a competitive structure that allows flexibility and focus. From a holding company we set what we call the rules of racing. So the boundaries of each of our construction companies is defined in terms of operational issues, financial parameters, core values.

Then we allow those people to go on and achieve the outcomes. They are rewarded, motivated and it is very successful.

That is within a business strategy, a strategy of geography, a strategy of market products, a strategy of delivery systems and we have sitting in the middle of that what we call our brands. It is a strategy that builds on the group's core contracting skills and financial strengths and provides stability through the very cycles we go through in the construction market.

If you look at the construction market it has been up and down. It is currently on quite an upswing that should be good for the engineers and constructors in Australia. It is moving on up to another peak around 2006 and questions are addressed to me, "What are you going to do in 2006?" I say, "Don't worry I'll think of something," as we usually do. In an industry that in fact has 3 or 4 years growth in front of it, that is probably rare these days.

Leighton is well positioned to capitalise on the upturn having an extremely strong balance sheet to support the high level of activity. Expertise and people management skills to deliver large complex projects. We have a very large modern fleet of plant and equipment.

For example, if I was to talk about innovation, we are the fourth largest users of Caterpillar equipment in the world. We have recently taken the rights for oil sampling systems for Australia and Asia. You have on site now a little box of tricks that is probably three times the size of that desk that John is sitting at. When the equipment comes in, in real time you can take a sample of oil from one of the gear boxes or transmissions or steering or whatever and that is immediately compared with a data base for that oil for that piece of equipment et cetera.

In the United States the military have installed this. In the US there are literally hundreds of millions of dollars of oil tipped down the drain, not in a literal sense, but taken out of equipment that is, in fact, perfectly good oil. We believe that we are going to save ourselves tens of millions of dollars of oil with this system.

When the equipment comes in, the oil that is analysed in an engine can tell you whether there is any leakage in any of the transmission systems, the radiator systems, the coolants, or the hydraulic systems. We have all that technology, so we are driven commercially to innovate. We have to. We are in a competitive world.

Some of the flavour of the big projects we are doing is the Parramatta to Chatswood—well I guess it is not Parramatta to Chatswood any more after Michael Costa's announcement the other day—it is Chatswood to Epping Rail Link let us say. We have got two great big tunnel boring machines that are burrowing underground. If anyone is interested in looking at big technologically advanced pieces of equipment they should contact the company and we will organise from time to time some underground visits. It is just a marvel in technological innovation.

We have a series of long term mining contracts. We are the lowest-cost mining producer. We produce more than 70 million tons of coal a year and in the last several months we have been awarded more than $1 billion worth of mining contracts here in Australia. You can see we have a lot of contracts going on out there for many many years.

Through our John Holland company we have also been involved in complex projects around Gladstone, the new Gladstone refineries.

In the Australian property market we have more than $1.7 billion worth of projects on the go. This particular project is just down the road here, the corner of Kent and Sussex—twin 33 storey towers, 77,000 square metres of office space. It is the second largest building in Sydney in terms of office space behind this particular building we are in here.

The whole project has been a $630 million exercise and has been pre-leased and pre-sold to Westpac.

In operations and maintenance, the group has been a leader in clean-up work and we are in the environmental market. We have three areas in which we operate. In fact we operate in the trash and recycling area that you see here. We operate in environmental clean-up and most of the clean-up work that you see done around Sydney up and down the Parramatta river in fact has been done by our organisation, Thiess.

I guess one of the more high profile and interesting jobs we did as an environmental clean up was the clean up at Maralinga in South Australia with the atomic bombs that were let off there. We operate in things like managing water treatment plants and the like. We operate in a number of markets that require continual innovation. This is an expressway going out of Manila, the north Luzon expressway.

The second part of my presentation—I would just like to talk of some of the strategies that drive our growth and one would be managing change.

1968 was the year I joined the company so I can take credit for all this growth I guess. In 1968 Leighton had a revenue of $17 million, this year it is $5.6 billion. We believe very much that within a 3 year period we will be doing more than $7 billion a year and that requires investment in people, it requires investment in technology and adapting to the markets.

Some comments were made about innovation, well you need to push the boundaries but push the boundaries sensibly. In our organisation from time to time we have employed a theoretical chief engineer or a theoretical scientist and it has always been a failure. The innovation those people did was completely remote from the organisation. They wrote brilliant papers that found their way to the bottom drawer. You must have a market for what you are doing.

In 1987 we had some 6,000 staff. As I said, we are currently around 15,000 staff and our projections show that we will go to some 20,000 staff.

We have to have a broad range of skills to support our business and the quality of people and the freedom through our decentralised structure with accountability and rewards allows that innovation to take place.

"if you have enthusiastic people with clear commitments . . . you should not be concentrating on the process, (but) on outcomes, . . . within a framework, and people will innovate. People are very innovative, it is the bureaucracy that really stifles innovation."

Our staff operate with a high degree of responsibility in autonomy. They are encouraged to think outside the square, to take risks but risks that are within the parameters in the culture that we define.

As I said work should be fun. I think if you have enthusiastic people with clear commitments to outcomes you should not be concentrating on the process, you should be concentrating on the outcomes, provided it is all done within a framework and people will innovate. People are very innovative; it is the bureaucracy that really stifles innovation.

There is no point in innovating if there is no market.

There is no point in innovating if there is no market and market has to be within a reasonable period of time to allow in fact results to be achieved. The value of knowing your market in its geography, community values, the needs of a client, there are financial imperatives and particularly the investors that sit

behind you.

Leighton has been a successful company because we have delivered to our investors, the people that own us. If you do not deliver and you cannot produce results there will be no future.

I would say that not to take risks, not to innovate would prove in the end an even greater risk for those organisations that do not push the boundaries. When you do that people will leave, the organisations will wither . . . We need to innovate every day of our lives

So to summarise, we take calculated risks, invest in people, invest in technology, and adapt to changing market place. That has been the driving force behind the success of Leightons over some 50 years.

I would say that not to take risks, not to innovate would prove in the end an even greater risk for those organisations that do not push the boundaries and leave their people in boxes and cubes. When you do that people will leave, the organisations will wither. I believe our approach has been a great approach. We need to innovate every day of our lives, we need to keep running that race, that race will never end

If I could perhaps end with a little story that is alleged to be true, I am not sure whether it is or not. There was alleged to be a great engineer from the General Electric Group, a gentleman called Steinmetz, who worked with General Electric for many years. He retired but he was involved in a lot of research and development apparently.

After he retired, one of their big factories were having problems with some of the machinery lines so they called Mr Steinmetz back to try and determine what the problem was in this factory of very complicated machines.

Mr Steinmetz got his board, as most engineers do, walked around, looked at all the machines, studied the machines, and eventually went up to this huge machine and put a chalk mark on the big gearbox . Lo and behold, they pulled the cover off that gearbox and there was the problem.

In due course General Electric received an invoice from Mr Steinmetz for $10,000 and they were outraged, he was only there for part of the day. So they asked him to itemise the account to justify his account.

Mr Steinmetz sent in his account and his account was $10,000 in total. It was $1 for making the chalk mark on the machine and $9,999 for knowing where to put the chalk mark.

ENTREPRENEURSHIP WITHIN HIGH-GROWTH COMPANIES

MR ROGER ALLEN

ROGER ALLEN has over 25 years experience of creating and growing global businesses in the information technology industry. He grew the Computer Power Group from a small Australian business to a truly international group with revenues over $300m, employing over 2,000 professionals through 50 offices around the world. He co-founded CP Ventures Limited in 1984. In July 1996 he joined with Roger Buckeridge again to form Allen & Buckeridge Pty Ltd where he leads A&B's role with 5 investee companies and is on the boards of six investees of A&B.

Ladies and Gentlemen,
I am going to talk from the other end of the spectrum about early stage company creation, early stage venture capital for innovation both from the public sector as well as from the private sector. Commercialisation of R & D is a hot topic in Australia. I will focus on the human capital aspects of that, but before I do I shall briefly look at early stage venture capital in Australia.

It is very important when you look at the venture capital statistics that AVCAL have put out to understand that it includes later stage and buy-out funds. In the US the statistics look at buy-out, later stage private equity as a different asset class. It is important to pull the statistics apart to really look at the amount of capital available for commercialisation of R & D in the early stages of investing. Now, if you look at the macro picture there is no shortage of investment capital in Australia, with $600 billion in superannuation and other funds, growing at $50 billion or so a year.

There is no shortage of investment capital in Australia with $600 billion in superannuation and other funds growing at $50 billion or so a year.

The issue is, is there an investable case for early stage VC? Is there a track record of providing competitive investment returns to investors through super funds or other sorts of funds for these early stage companies? There is a plethora of government programmes addressing gaps in the market et cetera. Most are reasonably well structured—they are fairly small. While they don't make a huge impression, they probably trigger other behaviour greater than the absolute dollars.

The solution is not going to come from government funds

But the solution is not going to come from government funds. The solution obviously is there, with that amount of investment. We are all aware through recent publicity of the investment returns that can come from public equity markets. So the real task is to show sustainable long term returns to investors, of around 5 per cent greater than from the stock market (which, on a long-term basis, is say 10 per cent). Therefore a minimum.

15 per cent return is required on a long term basis

15 per cent return is required on a long term basis on average, more like 20% given the illiquities and risk profile. If we can demonstrate that consistently then there will be plenty of money. Investors are just as rational as they are in the US or in other markets. They will go where the returns are, as part of a balanced portfolio. The challenge is to produce those returns. This results from human capital and the quality of management, much more than the technology, or the quality of the technology.

I will talk about entrepreneurship, but I will focus on management teams, not on the single entrepreneur. We tend to think of the entrepreneur as a solo person pulling everyone along. Clearly there is a role for pretty strong entrepreneurs, and we do not have enough of them. But it is more about building management teams.

If you look at the commercialisation of R & D in the equity sector, often there will not be an entrepreneur as such who was the founder, who dreamed up the idea and took it all the way through. It will be much more about recruiting management teams to commercialise someone else's idea. That is entrepreneurial when you go in and take the risks by managing an early stage company.

In some cases it will be bringing management teams in, once you have got it up to the first stage, or the first couple of stages of growth. I stress that because solo people by themselves do not usually take it all the way through—that is the exception, not the rule. It is usually about building a depth of team specialist in this early stage. There were lots and lots of issues in early stage companies that are unique and very different in early stage companies to later stages.

70 to 75 per cent of all VC globally goes into ICT. The other major sectors of biotech and medical are increasingly blurred with ICT, bioinformatics and medical devices

My comments will be coming from an ICT perspective, because that is my history and background, and it is about 70, 75 per cent of all VC globally that goes into ICT. I think many of the lessons and many of the issues are very much the same across other sectors. The other major sectors of course biotech and medical are increasingly blurred with ICT, bioinformatics and medical devices and other things like that. So I think the issues are pretty general.

We should not really be that surprised by the lack of depth of entrepreneurial and management talent in this early stage area in Australia. If you look at the ICT industry, it is dominated by multi-nationals or by the user community. People working with users or working in multi-nationals just do not see the entire picture.

Australia is a sales outlet . . . the people . . . do not get exposure to the whole picture . . . needed when running a small early stage company.

At the end of the day when you look at it globally Australia is a sales outlet. It is a little bit as if you are running an Australian business looking at your Darwin office. It is probably even a bit smaller than that. The management teams in these countries, by and large, are about sales and support. The people working in there just do not get exposure to the whole picture. It is more so in the computing industry than perhaps the telecom industry. It is the sales offices that you need when you are running a small early stage company.

They are obviously not the CEOs of the whole company—they are not the finance officers of the whole company—they do not get involved in capital raising—they do not get much involved in strategy. They do not get involved in product management or business development strategies or R & D or driving engineering, all the main functions of a company. They really only see the sales channel, they are really following all the rest of it that tends to be done at head office or internationally. So if you are recruiting people, where are you going to recruit these management teams from? If you are recruiting people out of the industry, then you are getting people who really just do not have the breadth of experience you need.

They are in companies that have already got these other functions in place usually at Head Office, and they tend to have very limited exposure to that. Some companies tend to be extremely sales focussed, do not do anything locally, and there are other companies that obviously have to put down deeper roots and do other functions here, but by and large, I think my comments are pretty accurate. Other people, of course, come out of the user community where you are working for a large bank or government or whatever, installing IT. That is obviously a completely different game to running these sorts of companies.

So at the end of the day, we have never had a strong industry. It has been a very small struggling sort of industry over many years so we just do not have any depth of people who have been through it. Even more so on a global basis.

The only way to learn the stuff is to go through it. It is pretty hard to teach it.

(There is) a lot of leakage . . . people who have gone overseas and worked . . . who have that experience but . . . who founded their company overseas.

One of my other key messages I think is the only way to learn the stuff is to go through it. It is pretty hard to teach it, it is pretty hard to absorb it, and you really learn it by getting out there and doing it. So by definition we really do not have much by way of depth. We have also had a lot of leakage over the years you might say and people who have gone overseas and worked in these companies overseas. They may well have that experience but they have left Australia to work overseas, or they have gone off and founded their company overseas, or they have worked in those sorts of functions I have just described— but they have worked for international companies.

That is just a fact of life in Australia. It is a very open economy—people travel. There are language and other issues and Australian talent in the ICT countries has actually been quite well recognised. There are quite a number of Australians running serious businesses internationally, and in the ICT area, including many of those functions that I talked about before.

I have come across the heads of engineering and you often see them in the sales and other functions. The head of R & D in one very major IT company I found the other day, was ex CSIRO, and had worked in Australia for a little bit, but he had gone overseas 20 odd years ago. So Australians tend to migrate and disappear into the infrastructure elsewhere. They are not very visible.

Of course as has already been mentioned we have had a culture of not jumping up and working for these start-up companies but working for the larger companies and the like. I gave a talk at the University of New South Wales a number of years ago and it was exhorting people to think about joining start-ups or having ideas and spinning them out et cetera. The Dean there who had recently come from MIT just said, "I can't believe how all my students are joining consulting companies or IBM or Microsoft". Where he had come from, MIT, and from many of the other tech universities in the States, everyone was talking about the start-up they were joining or they were going to found et cetera. It is quite a different culture and mindset as we know.

....important functions for these early stage companies . . . which have a very skinny management team . . . (are) . . . the CEO (who) has to have a broad skills . . . a lot of time is fund raising . . . cash flow is everything.

I want to go back to some of these functions that are really important for these early-stage companies and where the gaps are in this management. Obviously the gap at the top, at the CEO level, is critical. In the early stage, a company CEO has to have a broad coverage of a lot of skills. You have a very skinny management team and a lot of your time is about fund raising. For these companies, cash flow is everything. Raising the next round of investment and the like is an incredibly time consuming job. It requires you run the company on the one hand and do this capital raising on the other.

People who have not been through capital raising for a very early stage company that is, maybe, pre revenue and totally or certainly burning money—losing money, it is a tough job. It takes a long time and, as I say, you still have to be running the business and growing it at the same time.

The whole issue of marketing—and I mean marketing not selling—is trying to figure out how to get this technology, how to get these products to the market. These days, if you take a piece of software, there are pieces of software that sell for $20 million, of the SAP type large systems, that same software could be sold through an ASP model on a pay as you go basis. Or it could be, as ASP is in fact doing, put in a box and sell for a few hundred bucks.

So your model for how you take the product to the market in some areas, particularly software, is all over the place in terms of the way you could possibly take it to market. Mostly you have to have some form of partner, some sort of distribution and channels and the like. So just figuring out your going-to-market strategy, and then making all the connections you have to make when you are starting off, is critical. Obviously not everything you are trying to do is going to work and you have to be able to respond extremely rapidly. When you are burning cash and you have 3 or 4 months cash left you cannot afford too many mistakes.

The whole CFO function is critical and usually what you end up with, as CFO in these early stage companies, is really an accountant and sometimes a junior accountant. It is a small company and therefore you have a small, junior relatively inexperienced low cost sort of person. Yet as I was just explaining the whole fundraising part of it, controlling the cash, negotiating lots of deals, the CEO needs an absolutely strong right hand person in a CFO, a real CFO type function. Often the complexities you are dealing with are the equivalent to dealing with somebody in a large company, a sort of micro scale and you have got pretty skinny resources to go with it.

I have already mentioned product management and the whole business development function—these are all critical.

The area that in a way took me by surprise and I still think is not well understood is the whole technical side. We sort of think, "*Okay we understand we have gaps in management and marketing but we have a strong technical base. The people who have built this product, be they in the university or private sector."*

We have smart technical people building the technology. . . but turning it into robust products that have road maps going for multiple years, that have industrial strength, quality, support and documentation is the problem.

But what we have done (as one of my top technical guys said to me years ago when we set up an office in the States and ended up recruiting a serious management team—and this guy was absolutely one of the best technical guys) he said, *"I now understand the difference between R & D and engineering."* That is the point. We have smart technical people, as good as anywhere in the world for that matter, building the technology. But turning it into robust products that have road maps going for multiple years, that have industrial strength, quality, support and documentation is the problem. In one of our companies at the moment, we have been asked by our major distributor on day one, "We need 20 languages" to cover this product roll-out if you are going to have a global partner et cetera. So the difference is having some nice software that runs in a relatively local environment just down the road to a scaleable, high quality, properly support product globally .

One of the issues we have come across is selling to Wall Street firms that have got the scale of their computing platforms greater than anything in Australia. How do you test that, when you are building some of the software? How to you test the transaction rates?

In other cases we have seen products that we have seen in Scandinavia. Even though they are from a global manufacturer they are not released in Australia. The software just is not imported into Australia. There are all sorts of issues that you need to address on the technical side of the house. Whilst that is our platform from which we go—our technical base—there is a big gap between that and having products that can really roll out to major corporations around the world.

.....providing 24/7 global support around the world

An adjunct to that is providing 24/7 global support around the world. Again, many of these products, as they get out there, require that sort of level of support. I do not know that too many managers in Australia who have run 24/7 global support centres. The same with quality programmes and the like. To sell products in some areas require quality regimes, interoperability testing, all sorts of other formal certification are required. Many of those programmes do not exist here and it is quite difficult to get done from here. Sometimes the standards are different from Australian or not prevalent in Australia.

So there are plenty of issues there and again the management team that have been through those and know their way around those sorts of issues. They know where to go and how to put the systems in place quickly, but at the same at time low cost—these are crucial skills that are required.

The other thing is there is very little understanding of venture capital and the rules of the road, you might say. Again in the major areas—certainly in the US and increasing parts of Europe, Israel et cetera—it is well understood that the venture capital structures that are used are very different from regular sort of structures and companies. We have seen a lot of problems in the service provider infrastructure—in lawyers and accountants and advisers to the founders, or the entrepreneurs, or even the universities—as to what in the US would be a very standard term sheet, where everybody goes through it and you argue about one or two points but 80 or 90 per cent of it is given.

No matter which VC you go to, that is what you are going to get. You argue about the two or three things that are a little bit different, whereas in some cases here you are really starting from square one.

So also the advisory community—the support there is also an issue but in particular focussing on the management teams and knowing to push on and areas not to. As an example, one of the US leading VC's I was with just recently, closed a couple of deals and the legal fees were $10,000 for those deals in total. We had a deal that closed. It was a half million dollar investment and legal fees were $250,000 because there were three investors, one in Hong Kong, one in Australia and one in the US and none of them—well two of them at least—had not been involved in VC's. Mix that with US lawyers and you can imagine what happens.

The whole process of the early stage. . . they have got pretty well down pat, even though the actual agreement is quite complicated. . . ways of streamlining and cutting

The whole process of the early stage—getting companies up, keeping the fees—they have got pretty well down pat, even though the actual agreement is quite complicated They have ways of streamlining and cutting through a lot of this stuff

It very much applies I think to the public sector, the universities and other institutes and the like. There is a big disparity between those that have really embraced the whole commercialisation thing and are a fair way down the track in setting up their own structures and in figuring out their own criteria, like who is going to share in the equity or licence fees—is it the university, it is the department, is it the researchers? As an investor you cannot be going through those for the first time on a deal otherwise it will take months and months. Arguing the toss over things that are pretty much standard industry practice. There is a lot of stuff like that. As I said, there is a huge disparity as we go around universities—from those that have done a few deals and built up their own expertise and their own rules of the road to others that are still trying to solve these problems from day one.

As an investor you cannot be going through those for the first time on a deal . . . arguing the toss over things that are pretty much standard industry practice

The other thing I really want to talk about here is that for a lot of technology companies it is product. I make the distinction here between technology companies and services companies (and a lot of what we are talking about coming out of the universities and the like is technology). It has serious R & D behind it—it has intellectual property. It almost certainly is going to have to go to the global markets. It is not just an issue about the size of the market; it is really about where global business deals are done. Most businesses, when they start up in these areas, have critical relationships with a whole bunch of other players. They are building their technology on someone else's platform; they are partnering with people to get to the market and the like. A lot of the issues are really about getting these deals done on a global basis. It is not just about being where the major market is. These deals are done at Head Office.

Every company is different, and you have to look at them individually. But to generalise, most of these technology companies need to go global on day one. They cannot start-up in Australia and get to a first step here then go international. They must be "Born Global".

you never make it (in Australia only) because the Australian market is extremely small, Australian companies are usually followers of new technology

The traditional mantra was get your early customers in Australia, get yourself profitable and then you can go offshore and expand from that. The problem is you never make it because the Australian market is extremely small. Australian companies are usually followers of new technology, not leaders—and many are subsidiaries. In fact many of your first customers are really partners, so they are really part of the food chain and the rest of the food chain exists internationally.

The other thing is that very early stage money—that first round money—you burn it all up on the local market. You end up hiring a local management team and the local management team then start to think they are the ones that will take the products offshore. They try to do it out of Australia, or they move, and I think that is pretty much a flawed concept, at least in most areas in ICT. While these companies need to be created, they need a global structure from day one. When you are starting the company from scratch, the company should be headquartered where you want it to finish. We are not talking about big offices and lots of people, but where the CEO is based, and where your

need a global structure from day one

legal structures and the like are.

In many cases in the IT industry, that is the US. Other companies that are much more focussed on Asia. One of our companies is now based out of Beijing and a couple is in Europe. There are some that are Australian only but they are nearly always services companies, not technology or product companies. So the issue about building a management team in many ways is actually not an Australian issue. In that case you are actually recruiting in the US or you are expecting the team itself to move, or some parts of the team.

it is almost a recipe to fail to think you can actually run these businesses out of Australia by travelling

It is a vexed issue. I think it is almost a recipe to fail to think you can actually run these businesses out of Australia by travelling, albeit on the plane every other month or every other week to go to these markets. That is just nowhere near optimum and you need everything going for you in these early companies. I did that myself for umpteen years and I know it was not anywhere near optimal.

You go over there, you have these meetings, and they say "Great, come and meet so and so." "No I'm on a plane, I'm leaving tomorrow, I'll be back in a month." You know it just does not work. Moving Australians from here over to those markets often does not work either. What you are looking for often in that management team is experience in that market, a lot of it about networking, a lot of it being able to get access into other companies in the business development function, raising capital, having a track record in that market. It is pretty tough for an Australian to go over there. There are exceptions, but they are just those—exceptions. Most people will not succeed.

There are a lot of Australians of course who have got experience in those markets. They come back to Australia and then they may go back again. That obviously has a much greater chance of success. It is important if you are doing that that you actually have the look and feel of the country wherever you are. I have seen over the years the Aussie companies go over there and promote their Australianness and in the technology field that is not a great idea. You do not hide the idea that you are Australian but you adopt standard practice. You try and look and be like everybody else—adapt, be a chameleon.

You do not hide the idea that you are Australian but you adopt standard practice. You try and look and be like everybody else.

When a VC is looking at 1000 odd plus investments—and in a year investing in 5—then you do not want to have all these wrinkles or look different. The hard thing is getting the technology to the market and succeeding. Using complex structures or having an Australian entity that you have to invest in Australia—all those sorts of issues just make the game so much harder for international investors.

These companies need to attract international talent—say US talent. Putting an option plan into an Australian entity for a US executive just is not really going to cut it. Complexities, tax issues. Also the Australian VC industry at best is relatively small. You can maybe get the capital up for the companies to get up to the first or maybe second stage, but then you are going to bring in other investors, those investors will inevitably be international investors and you need structures that they are familiar with. Again you do not want to have to fight the structure; you figure out whether the company is worth investing in and get rid of the rest of the obstacles. Keep it as simple and standard as possible.

The other issue about trying to do it from Australia is the stress and strain on families, the travel—the personal issues are huge and I have seen so many deals get into strife at the end of the day. People get into marriage or family difficulties because of the stress and strain of travel and time away from home and the local activities. Often they suffer from the prolonged absences.

This is not optimum for the investors and it is not optimum for the management teams. There are plenty of issues that come up from that—cultural issues and the like. They are a lot better than they were. Years ago it was pretty tough to get US management or European management into an

Australian company but I think they are now much more used to dealing with global companies. The Israelis have done us a huge favour there and everyone is very familiar with the Israeli model.

Many people of course have now got offshore R & D centres. In China and India, Brazil and other places. So managing R & D teams across the world is still hard but it is a lot more acceptable and getting people who have experience in doing those things and are not the traditional old style US very insular people is a lot easier.

I think the situation is improving

I will finish on a positive note because I think the situation is improving. We have identified problems but overall we are making progress. Apart from the MIC programme back in the 1980's that fizzled out, a number of VC's got their start then. But if we look at the more recent burst of the tech boom, which started I suppose around 1996, 1997 or so, there is a significant—still shallow—but a significant, number of management teams, entrepreneurs who cut their teeth in that. Some of them are coming through exits now, 3, 4 or 5 years later. We have a lot that failed. We have actually hired people from companies that failed. Guess what, you learn an awful lot from those failures, so we have invested in some people who failed totally last time around. So there is a body of managers. A lot of people, when the dot.com boom was at its frenzy, a lot of people did leave the large companies chasing the stock options and making all the money. Some of those have actually stuck and some of those people actually like working in a business where they can have a huge impact versus working in the large companies.

.....you learn an awful lot from those failures

The other thing that has helped us is that the large companies are not such pleasant places to work any more themselves. It used to be that was a nice comfortable gold watch, as David said, and that does not exist any more. There are so many people being laid off, cut, down-sized, early retirement and everything else. A lot of the people working for those multi-nationals I talked about get pretty tired of taking orders all the time from overseas and being the first guys to get cut and other things like that.

There is also a strong number of people coming back from international experience

There is also a reasonable number of people coming back with international experience. The bubble itself—a lot of people went to business school and went into early tech companies and other people—well 9/11 has actually caused a lot of people to think they would come back. A number of people have come to me and said, "Well we were going to come back anyway," and that sort of crystallised their thinking a little bit.

The other thing we have going for us is Australian women. I cannot tell you the number of Americans and Europeans and other, who met their wife overseas somewhere and promised they would come back to Australia, or else have a real empathy for Australia because their wife or partner happens to be Australian.

So it is easier than it was, but still a stretch. The whole industry, the whole world is much more global. It is tough when you are little because you are spending US$ or you are spending Euros and that puts a greater strain on cashflow and everything. You are stretching your lines of resource that is true of investors and VC's as well as management teams. It is difficult but there is no choice coming from Australia. We need to accept the model and get better at implementing it in our start-up companies. Just like Israel.

Thank you

AN INTERNATIONAL PERSPECTIVE ON ENTREPRENEURSHIP EDUCATION

PROFESSOR PHILLIP ANDERSON

PHILIP ANDERSON is the INSEAD Alumni Fund Professor of Entrepreneurship at INSEAD, in Fontainebleau, France. He is also director of the 3i VentureLab, and is the coordinator for entrepreneurship. His Ph.D. is in Management of Organisations from Columbia University. He currently teaches courses in entrepreneurship, venture capital, and the strategic management of innovation. His research interests include the formation of entrepreneurial firms, managing growth, processes of technological evolution, managing change and innovation, and strategies for private equity investors.

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Ladies and Gentlemen,

I will talk about how business schools contribute to entrepreneurship, why INSEAD has an entrepreneurship area, and what are we trying to solve. We would like to be as entrepreneurial as the people we serve. Later you will hear what engineering schools can do,

"INSEAD . . . is the leading business school in the world outside the United States"

INSEAD is the leading business school in the world outside the United States. In the Financial Times rankings, it was tied for sixth in the world behind five of the American business schools. INSEAD is the most global business school, no more than 10 per cent of the faculty of the students coming from any one country. So one of the world's top ten business schools is in your backyard and wishes very much to be a good neighbour which is why I accepted this invitation.

What I will talk of is our vision, and what we do in entrepreneurship, because it will give you a take on where a business school might contribute to the overall picture.

INSEAD develops general managers who contribute immediately to growth factors. Business schools are about one thing and one thing only. It is the only place in the world providing a general management education. You will end up knowing enough about finance, marketing, operations, human resources, accounting et cetera, to be able to contribute in a general management capacity instead of being functionally specific, i.e. an accountant or engineering manager.

"The problem for most general managers is they are not trained to contribute immediately to an entrepreneurial organisation"

The problem for most general managers is they are not trained to contribute immediately to an entrepreneurial organisation. We work with many, many firms that will hire a star sales person, and in an entrepreneurial environment, the results might not be there. Likewise with CFOs—a top banker in a top corporation, may flounder in an entrepreneurial environment. Sometimes it is a simple problem. Sometimes it is a matter of mindset; sometimes it is a matter of simply not understanding what are the differences between early stage companies and later stage companies. So I want to emphasise that the problem we are not addressing at INSEAD, is a lack of commercialisation.

the vast majority of technology that is developed by public or non profit groups ought not to be commercialised through entrepreneurship . . . they should be thinking of licensing

In the vast majority of cases, technology that is developed by public or non-profit groups ought not to be commercialised through entrepreneurship. They should be thinking about licensing rather than thinking about starting companies with this kind of technology.

Commercialisation is very important, there is overlap with entrepreneurship, but many in the engineering fraternity in particular, think of entrepreneurship perhaps for the wrong reasons.

Many technologies that should have been successful have never made it

to market because some big bureaucratic company got caught up on the politics of the company. All Deans of engineering schools have been put under tremendous pressure, from university Chancellors to the alumni, to take technology out of the laboratory and make little companies so that Australia looks more like Silicon Valley. Generally speaking, that does not work well, mainly because technology developed in a public or university environment was not started with the idea of solving a big market problem.

. . . the idea that the entrepreneur is a hero is more or less a myth

Second is the perceived problem of not enough 'founders'. American business schools in particular that have entrepreneurship departments are almost monomaniacal about the entrepreneur. But the idea that the entrepreneur is a hero is more or less a myth.

I sure there is no shortage of founders

The biggest bottleneck in Europe is that there is not the rest of the talent pool needed to support an individual who wants to found a company. There are more than enough 'founders', but there is a shortage of chief technical officers, VP's of marketing, and CFOs. I am sure there is no shortage of 'founders'. I cannot speak of Australia.

the risk reward ratio is higher than it needs to be . . . entrepreneurs are in the business of minimising risk

At INSEAD we deal with entrepreneurship, and in the geographies that we are in, we have observed that the risk reward ratio is higher than it needs to be. Entrepreneurs are not in the business of assuming risk, they are in the business of minimising risk to the extent that they can, and entrepreneurship is riskier than it needs to be.

Entrepreneurs take a lot of risks into account, financial risks, marketing risks. But one of the most important risks is execution risk. There is more execution risk than necessary because many people do not know how to build a company although they know how to build a technology. We strive to reduce execution risk, that inability to build a company, in bringing to market a really interesting innovative idea. Now, some of the things that create risk are societal, and we cannot do much about that. We cannot change cultures, or tall poppy syndromes, or whether there is enough venture capital, or whether your tax structure is the right one — that is not our task.

"there is an inherent disconnect in entrepreneurship having to do with experience . . . the problem is a real lack of experience.

One of the reasons why risk is too high is that there is an inherent disconnect in entrepreneurship having to do with experience. Most people are not entrepreneurs, they do not know any entrepreneurs, they will never be an entrepreneur in the course of their career, and of those who do, it very few who end up being serial entrepreneurs, doing it more than once. So the problem is a real lack of experience. People doing this for the first time constantly re-invent the wheel. We think that general managers can be built to support the people who want to found companies to avoid many of the experiential disconnects. Almost nobody coming out of undergraduate school, or even out of business school, or a master's in engineering, or a PhD, is ready to found a company. In business school, we have to overcome the perception which many people have that entrepreneurship is a job when it is actually a career. There are exceptions, but the people who can do that are rare birds indeed.

There is nothing at INSEAD that will be as worthwhile as the experience of working directly and intimately with somebody who is successful at leading a growth venture.

We advise our students not to think about starting a company straight out of INSEAD, even though they are 28 and 29 year olds who have worked with world class companies. Most of them first need to build a resume and a career that will position them at some future point to be someone in whom an investor can have confidence. In that, nothing is more crucial than the step of apprenticeship. I have counselled thousands of students that if they ever get the opportunity to sit at the right hand of someone like Peter Farrell and observe how it gets done, take that job, no matter what the salary is. There is nothing at INSEAD that will be as worthwhile as the experience of working directly and intimately with somebody who is successful at leading a growth venture.

The best resume for somebody who is preparing to lead a growth venture, as opposed to start a coffee shop or similar, is to gain solid corporate experience, and then break into the growth venture world, learning from experience what is different about growth ventures on somebody else's nickel. With such experience they are then prepared at some point to be part of the senior team for a growth venture, be it business development, or marketing, as CFO, or engineering manager. Only then is the typical person ready to be a founder or a CEO.

In Silicon Valley, and in the UK, professional investors, particular savvy ones, are allergic to first time entrepreneurs. Now that sounds weird, everybody has to be a first time entrepreneur, right? What they are saying is—if you have never worked in a growth venture setting before, you are going to undergo a great deal of learning about just plain company building and raising capital. You are going to be doing that on my nickel—I wish you had done that on somebody else's nickel.

There is a classic chicken and egg problem here between Steps one and two. I have said that the best thing for anybody to do is work at the right hand of a Peter Farrell or Bill Gates, when he was starting a company. But most people are not ready to create value for Peter Farrell and Bill Gates who are not running charities. MBA graduates cannot contribute effectively, so why should they be hired?

Budding entrepreneurs need to be apprenticed to people who lead growth ventures, but they cannot be apprenticed to such people unless they are already to hit the ground running and create value

Budding entrepreneurs need to be apprenticed to people who lead growth ventures, but they cannot be apprenticed to such people unless they are already to hit the ground running and create value. That is the problem we solve. The entrepreneurship area at INSEAD takes trained general managers, typically trained in business schools for the likes of Siemens or HSBC, and teaches them to go into growth ventures, making a contribution from day one. The problem we address is why growth ventures typically do not grow. The single most important reason is that most budding entrepreneurs are 'problem' driven, and not 'marketing' driven.

There is an old joke that defines an economist as somebody who knows a thousand ways to make love but does not know any girls. When you think about it, that is a problem for a lot of entrepreneurs. They absolutely know their technology stone cold but they do not know any customers, any distribution channels, nor do they know anybody that they would hire as a sales person. Who they know are other people with whom they went through engineering school.

starting a life sciences company, for example, a B round of funding comes from being in partnership with a major pharmaceutical company

Take a typical problem in industrial marketing. Starting a life sciences company, for example, a B round of funding comes from being in partnership with a major pharmaceutical company. It is extremely difficult in North America and Europe to raise a second round any other way. Well how on earth are you supposed to do that? It does not matter if you are the world's best biologist. If you do not know what problems Glaxo Smith Klein or Bristol Myers Squibb need to solve, and are willing to pay you to solve, your odds of success are really quite poor

"Device mentality"..... the vast majority of engineers create devices . . . a single device is not a company

The second thing we deal with is what I call the 'device mentality'.

Generation after generation of venture capitalists has told me a device is not a company, and the vast majority of engineers create devices. Therefore, it is not clear they know what the growth path is, how the product family grows, and how a continuing stream of revenue is created? If there is only a single device and not a company, the technology should be licensed; not people encouraged to build a business around it.

people fall down on . . . simply company building

The third thing that people fall down on is simply "company building". We do a lot of work with Intel Capital, one of the few truly global private equity investors. What Intel Capital tell us is that the private equity investors in Europe, the venture capitalists, are every bit as sophisticated as those in North America, but the problem is that too many of them cut their teeth in the City of London. They are really good at valuations, spreadsheets, and cash flow control, et cetera, but they do not know anything about company building. Building a company is a skill set that most people simply do not acquire without some form of apprenticeship.

(There is)...lack of social capital

The fourth reason why entrepreneurs typically fail to grow ventures is a lack of social capital. They simply do not know the right people that they need to know. They do not know how to get a distribution channel, they do not know how to get customers, and they do not know where to go to hook up with third parties for example. This is really where we at INSEAD fit in. We help develop managers who are capable of building companies and overcome the problems to solve in a growth venture.

Our fundamental mission is not to create more founders . . . it is to deepen the talent pool

Our fundamental mission is not to create more founders. Our fundamental mission is to deepen the talent pool. We teach a course in new ventures. When we have business plan competitions, 75% of the plans that the MBAs come up with are for a coffee shop in Paris or a concierge service or a little bed and breakfast in Italy. These are wonderful lifestyle businesses, but there is no professional investor going to back it because the typical MBA simply does not have the technical savvy to come up with a business plan for a growth business.

we educate general managers . . . to take their apprenticeship in an entrepreneurial firm"

We educate general managers to take their apprenticeship in an entrepreneurial firm. Tomorrow's CTOs, CFOs, marketing VPs, and VPs of business development come from this background.

We connect talent with opportunity

We connect talent with opportunity.

We encourage ventures to come to INSEAD and say; "I'm looking for somebody with this kind of experience, this kind of background". We hook the right people with the right opportunities.

connecting ventures to larger firms

We also take responsibility for connecting start-up ventures to larger firms. We have an extraordinary network, particularly in Europe. There is hardly any firm worth knowing in Europe that we do not know. We know what their problems are, what they are interested in, and we would be totally remiss not to take advantage of the opportunity to introduce the entrepreneurs we know to the large firms they need to work with and vice versa.

"research based management development"

Last but not least, our bread and butter, the thing that we do most, is research-based management development. We do not teach courses in basic entrepreneurship. What we are really good at is being trained social scientists who do management development that is rooted in research. We do not try to propagate what everybody already knows about entrepreneurship. We like to find the problems, the anomalies, the not yet known things, and develop fresh insight from original rigorous social science research. Then we teach that.

In my business we cannot do research unless we can translate that into management development, enhancing people's ability to build a company with reduced execution risks.

Now at INSEAD, entrepreneurship is far more than simply start ups and the eco-system around them, the venture capitalists, underwriters, consultants, lawyers et cetera.

For us we really do four things in my department—that is one of them and it is very important but we are also very interested in people who buy

out companies and transform them. The kind of thing that Peter did with Resmed in the past. He took an existing company and essentially set the clock back to zero, transforming its business model. That is to us at least as entrepreneurial as starting a new company from scratch and in some ways it is more difficult.

I saw a bumper sticker in the United States once that said, "God created the world in 7 days because he had no installed base." When you think about it there is an awful lot of truth in that. It is an awful lot harder to start with a company that has a history and traditions and culture and to change that than it is to start a green field type of operation.

INSEAD has a very long history of educating the heads of Europe's great family firms

Another thing we do is help corporate ventures when somebody is trying to start a new organisation inside an existing company. The fourth thing we do is family enterprise. Family enterprises may or may not be entrepreneurial but INSEAD has a very long history of educating the heads of Europe's great family firms. For us, what makes family enterprise particularly interesting, is that it is one of the great training grounds where the next generation sits at the right hand of the previous generation and learns how to do this.

.....what we try to emphasise are a broad curriculum, live cases, course projects and field studies and entrepreneurship.

The things we try to emphasise are a broad curriculum, live cases, course projects and field studies and entrepreneurship. We offer that to MBAs.

We are still very much building our executive education curriculum but I hope this gives you some idea of the range of things that a world class business school takes upon itself. The first is my course; it is a very simple course. It is how do you tell the difference between a mediocre opportunity, a good opportunity and a great opportunity, from the perspective of a corporate partner or a venture capitalist or somebody whose support you need. We have far too many people writing business plans about things that really were not worth their time. So we needed a course that started saying, "Look I can't give you a recipe for where to find entrepreneurial opportunity, but I can tell you if you pitch this to a venture capitalist. I can tell you what are the lenses through which he or she will decide whether you are the next Cisco or whether you are not worth bothering with.

We do have courses on how to start a new venture. We have another course on how to manage growth. We have two mini courses, one on how to develop a business plan, and the other on how to develop an investor presentation. The business plan course is more general. It is aimed at people who do not necessarily want to raise venture capital. The second one is aimed very much at people who want to do that.

My friends in Silicon Valley tell me that many of them do not even read business plans right now. It is twelve Powerpoint slides tops and they will make the funding decision based on that. Well we need to teach our students how to write those twelve slides.

Business development—how do we build that set of relationships with suppliers, with channels, with third parties? Private equity—how does that work, how do you work with them, what do they do? Realising Entrepreneurial Potential is a course about how to become an entrepreneur by buying and taking control of an existing company and in this economic environment, given how wealthy many INSEAD MBAs are, for a lot of them buying a company is easier than finding a job. So this is a pretty popular course.

Management Buy-out teaches what the KKRs and the Thomas Lees of the world do, how these big by outs work. *Turn-around and Transformation* are put in italics because we are not teaching it yet but we certainly will, it is a crucial element of that. We have a course we are starting this year on Corporate Entrepreneurship, a course in Family

Enterprise, one on Entrepreneurial Leadership which is more about the loneliness of the entrepreneur and how people overcome that and Family Assimilation tries to pull it all together.

So this is a far more comprehensive curriculum than the traditional business plan course and maybe a venture capital course that you can see at many other places. We like to do live cases. My favourite kind of case would be, for example, Peter Farrell. He would be my case protagonist and I would call up Peter and say, "What is . . . for you," and we would not write a case generically about Resmed. We do not write cases about decisions Peter made 12 months ago, we want to know what is on his mind right now. The carrot for Peter to come to Singapore or to Fontainbleu is to see what 104 extremely smart people from many different backgrounds are going to do with this case after they have spent a night in his shoes.

apprenticeship / mentor-ship . . . is what we are trying to accomplish

Again you can see what we are trying to accomplish here. It is apprenticeship, it is mentorship. It is not merely listening to Phil Anderson and his lectures, it is thinking along with leading entrepreneurs that we think prepares people to go into a venture setting and hit the ground running. All of our courses have projects where the students have an option to work with entrepreneurial companies. We have a course called Field Studies in Entrepreneurship that positively compels them to work with either an entrepreneurial company or a venture capital organisation and get a little bit of experience on their resume that says, "Okay, I really do understand something about this growth venture setting."

Beyond the MBA curriculum we have to do other things than simply offer courses. We are launching this next year something called INSEAD Innovasia whose purpose is to provide a lot of outreach and connect large companies with entrepreneurs and I think that is going to do a lot for us in terms of connecting talent with opportunities and connecting ventures with larger firms. I am the head of the international centre for entrepreneurship that does a great deal to link INSEAD alumni and partners to the kinds of projects that students are managing for example.

We have one R & D centre that I manage, the 3i Venturelab, and are raising money for three more, in each of those areas, corporate entrepreneurship, family enterprise, by outs and turnarounds. The Venturelab is really devoted to start-ups. 3i is one of the world's leading private equity firms and we sponsor research that is jointly of interest to INSEAD and to 3i.

We have an INSEAD angel network

We have an INSEAD angel network that actively looks at angel funding of ideas, whether they are from INSEAD alumni or not. They have to come through our network one way or another. This year we are really trying to push forward our plans for a Euro fellows programme that will allow up to twelve talented young technologists or scientists, trained in Europe with EU passports, to spend a year, not in residence at INSEAD but working with us at INSEAD with a management team that would be headed by a veteran entrepreneur who is an INSEAD alumnus plus some of the students.

The idea is to get them to the stage where they are ready for seed funding by professional capital. The average European engineer and scientist has not the faintest idea how to take an idea and put it into a form that would excite a seed capital investor and we are hoping to overcome that particular kind of challenge.

....it is not enough for business schools to offer a curriculum

So the message here is it is not enough to offer a curriculum. I think what a business school really does have to do is offer some limited and focussed outreach.

Some dogs that did not bark, some things that we do not do, which I think is just as important as what we do do. We do not do massive entrepreneur training programmes and if you buy my notion that we deepen the talent pool. We leave that in Singapore, for example, to Singapore management university or NUS or NTU or one of those organisations. We do not see that as a distinctive competence of INSEAD. We do participate in awards and competitions but it is not a key theme for us. We help found the European Business Plan of the Year competition among European business schools but the fact of the matter is that most business plan competitions do nothing more than teach people how to write a business plan. That is great and I am all for that and that is terrific but that is a very limited objective and let us not kid ourselves that there are going to be ten great companies coming out of the average business plan competition.

The third thing we do not do and will never do is run an incubator or a technology park or something like that. We do not have that skill set, we do not know anything about real estate. We are very simple people, we do research based management development and we prefer to be a supplier of educational and management development services to incubators and not be one ourselves. We do not run our own venture capital fund. We think that if we did it would be very hard for us to work with venture capitalists and why should they work with somebody who is competing with them? That seems kind of silly. My friends at LBS, the London Business School, disagree with me on that one but we have agreed to disagree.

We do not do university and public technology commercialisation. As I said before I think that is a broader skill set than the one that we have. We really do not focus that much on government policy analysis because I think there are economists and political scientists and all kinds of people who are far more capable of telling governments what to do than I am. My customer is the manager, not necessarily the policy maker.

The role of business schools . . . is to educate a general management talent pool

So let me summarise. The role of business schools within this overall eco-system that you would like to develop and that ATSE is going to be a key player in, is to educate a general management talent pool.

It will be great if I educate people that found companies, that would be nice, it would be icing on the cake but it is not how I measure myself. Our goal is to overcome the disconnects that come from the fact that most people simply never get experience as entrepreneurs and there is a real chicken and egg problem to overcome that. We try to help people prepare themselves for apprenticeships, we try to build their social network and we try to build their know how in how one grows a company, which is not a skill set one acquires at the typical Fortune 500 firm.

Our goal is to overcome the . . . fact that most people simply never get experience as entrepreneurs.

We take a very broad view of entrepreneurship. It involves more than just start-ups. You made a comment that for example most entrepreneurs come out of corporations and I think you are exactly right. So if we do not spend any time thinking about corporate entrepreneurship in Australia it is like not sowing any seed corn on the ground—what is the point? We have a broad curriculum but very targeted outreach. The curriculum is very broad, the range of things we do in terms of reaching out to entrepreneurs is really quite narrow and our fundamental philosophy is that we have to fit into an eco-system.

We do not want to be a technology park; we want to work with technology parks. We do not want to be a venture capitalist; we want to work with venture capitalists. We do not want to be the people that provide entrepreneurship one-on-one training, we want to work with other people who do that, and want to leverage INSEAD's unique skill set. Thank you very much.

STIMULATING INNOVATION AND ENTREPRENEURSHIP IN AUSTRALIA[4]

PROFESSOR TREVOR COLE FTSE

TREVOR COLE is the Peter Nicol Russell Professor of Electrical and Information Engineering at the University of Sydney, Fellow of the Academy of Technological Sciences and Engineering, Executive Chairman of the Australian Microelectronics Network and Member of the Industry Research & Development Board. His interest is regional economic development and he has formulated and teaches a program in technology entrepreneurship.

This talk is structured to address the why, what, how and who of technology entrepreneurship. That is:

- Why is it important to stimulate innovation and entrepreneurship?
- What needs to be done to achieve effective results?
- How should Australia go about it?
- Who are the people that are needed to carry it out?

WHY

At the macro level, Australia's foreign debt is at record highs, and the current account deficit, as well as the trade deficit, continues to grow at a rate of about $3 million per hour

What keeps me awake at night are news articles like this—"Deficit fuelled by drought and borrowing—record trade deficit, current account deficit, net foreign debt." At the macro level, Australia's foreign debt is at record highs, and the current account deficit, as well as the trade deficit, continues to grow at a rate of about $3 million per hour. We have been here about three hours, and in that time Australia's foreign debt and trade deficit, if this is an average month, has grown by $10 million. That is a very worrying issue. This is faster that the growth in GDP, meaning that Australia's indebtedness grows in real terms.

Another issue of importance is that low skilled jobs are disappearing. I am not talking about productivity improvement - the fact that 25 years ago it was 500 man days to load a cargo ship and it is now down to 8 man days. Rather, it is the social changes—that call centres are disappearing to India, and the list goes on and on.

Automation and information technology mean low-skilled jobs are disappearing—the social consequences are a very high degree of social polarisation

Sydney has serious issues of social polarisation between those at the luxury of the harbour and those who are on the outer fringe suburbs. But at the local and regional level other, equally important, changes are impacting on the future sustainability of a quality lifestyle for Australians:

- Automation and information technology mean low-skilled jobs are disappearing
- The social consequences are a very high degree of social polarisation

Jobs are created through the circulation of wealth within society. Wealth is created within entrepreneurial companies through the value-adding stages of design, production and application of goods, processes and services.

WHAT

There are two fundamental requirements needing to be satisfied:

- Appropriate education & re-education
- Globally competitive industry and commerce

Re-education is just as important as the initial education because as Ms Marie Donnelly of the European Union has said, *"80% of technology is less than 10 years old – 80% of people acquired their education more than 10 years ago"*.

[4] (Note, due to a recording failure, this is a highly condensed and edited version of the actual talk.)

As far as Australia being an advanced industrialised country, then the following Table 1 from the World Bank provides a sobering perspective:

TABLE 1[5]: Australia's Manufacturing Exports

Ranking	Country	Manufactured Exports (% of Total)
1	NEPAL	99%
2	JAPAN	95%
3	SWITZERLAND	94%
4	KOREA REP.	92%

53	CENTRAL AFRICAN REP.	43%
54	EL SALVADOR	41%
55	TRINIDAD AND TOBAGO	39%
56	AUSTRALIA	39%
57	KYRZYGISTAN REP.	38%
58	GAMBIA, THE	36%
59	URUGUAY	36%

Admittedly the figures are slightly out of date but, nevertheless, is it really comforting that Australia stands slightly ahead of Kyrzygistan, Gambia and Uruguay?

There has always been an historical weakness in Australian industry brought on by colonial and imperial decisions. Successive governments have failed to appreciate the depth of the weakness and the particular changes needed if Australia is to improve in value-added manufacture. The attitude has been one of "it is industry's fault" whereas, as Barry Jones has said, *"To condemn as non-competitive industries in Australia which were explicitly programmed not to compete seems to be as unfair and as absurd as insisting that non-vertebrates should show some backbone."*

But there is a vision of what industry might be like in the 21st century and the contribution it can make. On more than one occasion, it has been said that if only Australia could emulate the successes of companies like Resmed, Cochlear and Vision Systems into 100 such companies then our current account deficit problem would be gone.

The seeds of what needs to be done has already been covered in a paper prepared by Dr Robin Batterham, Chief Scientist and Mr David Miles, Chair of the Innovation Summit Working Group to PMSEIC on 30 November 2000, *"To be successful in the 21st century Australia will need to develop an ideas-based, can-do economy and society. This means an economy and society that is proficient at both creating ideas and translating a substantial proportion of them into new business opportunities—the pay-offs are jobs, wealth and a better quality of life. Australia will be a nation where the words science, innovation and entrepreneurship are synonymous with excitement"*.

Australia will need to develop an ideas-based, can-do economy and society . . . the pay-offs are jobs, wealth and a better quality of life..

That is, there are two distinct processes at work:

- Creating ideas
- Translating ideas into business opportunities.

Regrettably the government . . . (has) focused on the first (creating ideas) to the neglect of the second (business translation).

Regrettably the government focus and support programs since the Innovation Summit (including the 2.9 billion dollars in Building Australia's Abilities) have focused on the first, to the neglect of the second. Indeed, less than 20% of the $5.4 billion allocated in 2003-04 to science and innovation by the Federal government goes into commercialisation and business development—and this even includes the funds going to CRCs!

There is a structural dysfunction between that proportion of expenditure on R&D in Australia which goes to the more applied and developmental end of the innovation process compared with the successful, modern industrialised

[5] http://wbln0018.worldbank.org/psd/compete.nsf/0/cb0b394a31d5294b852564e40068daca

countries such as Sweden, Finland etc.

. . . the process of going from need to global market is a process distinct from research, having its own inputs, processes, outputs and skill base

The issue is that the process of going from need to global market is a process distinct from research, having its own inputs, processes, outputs and skill base. The input is market opportunity and useful knowledge which may be, and usually is not, based on the results of research. It is this process from need to global market that underpins the industry success of the trading partners and which has been neglected through deeply seated structural and cultural market failures in Australia.

The best indicator of Australia's progress to a modern knowledge-based economy needs to be an output indicator – not the crude input indicator of expenditure on R&D. Growth in high technology exports as a percentage of total exports is a valuable target to which Australia might aim.

. . . we should aim for clusters of high value-adding product and service development companies (who export).

Much has been written on what a modern knowledge based economy looks like and what are the factors that underpin success. In essence, we should aim for clusters of high value-adding product and service development companies whose outputs are predominantly exported.

HOW

We know what we want to do but this is not the same as:

- How to do it, and
- Who is going to do it?

Research has shown that a region's gross product varies as the business birth rate within that region. It is also known that the majority of technology-based start-ups fail. The logical consequence is that Australia needs many, many technology-based start-ups. Of those that survive there will be many that can be classified as "solid performers" and only a small proportion will become the global "stars". Unlike much of the thinking in Australia, both types are needed because it is the sheer scale of business activity that will create the skills and infrastructure and culture needed to underpin the global stars. And 100 companies at $25 million per year can be just as important as 25 companies at $100 million per year.

So how do other countries use government programs to create such an environment?

Finland has much to teach Australia. In particular, in the differentiation of the Academy of Finland funding, more basic research in universities while the better-funded Tekes (www.tekes.fi) offers its grants and projects across the spectrum of applied research in universities, through collaborative activities with industry and to industry itself. This is in support of projects and programs addressing the company and sectoral needs of industry which are impeding the development of effective clusters—including business development, marketing and internationalisation.

Another key area needing to be addressed is a much better appreciation of what actually forms the growth pathway for eventually successful companies. The work of Amir Bhide[6] in looking at the Inc 500 high growth companies identifies pathways more common than the venture-capital/business-plan approach so strongly advocated in Australia.

Instead, characteristics such as opportunistic adaptation, risk transfer, syndication, and personal abilities need identification and fostering if the high-risk promising start-ups are to appear and become possible VC investments much later up the growth curve. For this group it is personal savings/credit and bank loans that form a much greater source of capital than any venture capital.

[6] (*The Origin and Evolution of New Businesses*, Oxford University Press)

WHO

. . . it is not scientists and PhD graduates who form the bulk of those who .grow (high value-adding exporting) companies.

Who then are the people who are needed if Australia is to achieve its vision of clusters of high value-adding, exporting companies? This is a again an area of confusion within Australia because it is not scientists and especially not PhD graduates who form the bulk of founders and teams growing such companies in other economies.

The Inc500 study of high growth companies has 48% of founders have four year degrees while only 15% have MBAs and 20% other higher degrees.

. . . more importantly is the addressing of the transition phase.

Also there is the clear distinction between the people and their skill bases needed at the two critical stages of promising start-up dependent on principal's effort in niche markets and large corporations with multiple assets, embedded coordination mechanisms and mass markets. Even more importantly is the addressing of the transition phase between these two extremes.

Of course, there are programs that can stimulate and support the development of such people. The most comprehensive could well be the suite of programs at Chalmers University in Gothenburg, Sweden. The CHAMPS executive development programs address leadership within globally competitive technology-based firms, while the Chalmers School of Entrepreneurship and the School of Innovation Engineering and Management address the founding and support professionalisms needed to create the sustainable technology clusters so successful in Sweden.

. . . the Scottish Institute for Enterprise may be the best example for cross-university collaboration for achieving the people and skills required.

Other countries have learnt from the experiences of Scandinavia. Within the UK the University Enterprise program has created centres of relevant education and support of which the Scottish Institute for Enterprise may be the best example for cross-university collaboration for achieving the people and skills required.

Many other important role models and initiatives can be identified. Stanford University has excellent web-based support for technology entrepreneurship education and has stimulated an international community through the Roundtable of Entrepreneurship Education for Scientists and Engineers. The Cambridge Entrepreneurship Centre illustrates how even "traditional" universities have a role to play, while the initiative of the South East England Development Agency to stimulate an International Institute for Innovation and Entrepreneurship linking key economic development regions around the world (of which Sydney is one) offers important opportunities.

Individual programs do exist around Australia from Swinbourne, Universities of Adelaide, South Australia, Sydney and elsewhere. But their level of support and penetration pales in relation to what is needed to create those who will be the creators and growth agents for the technology-based companies Australia needs.

HENCE

Australian companies and capabilities are fragmented and need both aggregation and infrastructure support

Technology Entrepreneurship in Australia needs greatly enhance recognition, stimulation and support

In summary then,

- Entrepreneurs use technology and innovation as tools
- Australian companies and capabilities are fragmented and need both aggregation and infrastructure support
- Applied research, design, and product realisation underpin the growing technology-based organisation
- Management is needed for both start-up and growth
- Technology Entrepreneurship in Australia needs greatly enhance recognition, stimulation and support.

UNLOCKING AUSTRALIA'S POTENTIAL: DEVELOPING TECHNOLOGY ENTREPRENEURS

PETER NORTH

PETER NORTH was a founder and fundraising leader, and is now Chairman of The Warren Centre for Advanced Engineering. Since 1979, he has been non-executive director in leading companies - Leighton Holdings Ltd (Australia's largest engineering construction company) and Leighton Asia Ltd; Chairman of Mildara Wines and director of Mildara Blass Ltd (leading winemakers); and Chairman of Malco Industries Ltd (heavy engineering) and Heggies Bulkhaul Ltd (bulk chemicals and minerals transport). He is currently director of Cochlear Ltd (world leaders in the bionic ear) and Chairman of Cochlear's Technology and Innovation Committee.

It seems a while since we started talking seriously about Australia's technological potential - how much Australian technology can contribute to our future economic strength; the importance of value-adding through technology; and the importance of technology in reaching into niche markets in a competitive globalised world.

Just when was it we started talking dirty like that? Fifteen years ago … twenty? However long ago it was, the world's financial community still regards the Australian dollar as essentially a commodities currency. There are probably no more than five technology-driven companies in the ASX top 100, and we still need seminars on "creating the innovative corporate culture", on "encouraging entrepreneurship", and on "establishing and funding new ventures".

There are probably no more than five technology-driven companies in the ASX top 100.

Australia's technological potential is still there. In fact, there's a massive dam, full to the brim with potential. Yet it seems we still have some difficulty finding the key that unlocks the floodgates, the key that will release a surging and unstoppable wave of technology entrepreneurship to commercialise this technological potential; to build greater competitive strength and new opportunities into existing companies; and to give birth to dozens of substantial new technology-driven companies, each elbowing for room among the traditional inhabitants of the ASX top 100, creating real, enduring wealth and satisfying employment and careers for future generations of Australians.

the pure and applied research we do in this country is remarkable … it commands a special place

If we are really serious about unlocking Australia's technological potential, there are two imperatives. Clearly, we must maintain the strength of Australia's world-class research programs: in virtually every field, the pure and applied research we do in this country is remarkable. It commands a special place, not only for the quality of its technological outcomes, but also for its ability to achieve self-renewal, to reinvigorate its political support and public funding, to open new frontiers, and to attract and develop new generations of world class researchers.

we need to cross the culture chasm so we can create an equally special place for the technology-driven commercial enterprise

But equally clearly, we need to cross the culture chasm, so we can create an equally special place in our society for the technology-driven commercial enterprise. A special place where it is not just some admirable quirk producing the odd Cochlear and Resmed, tucked away among the minerals, media, consumer and financial companies that dominate the ASX top 100. We need a special place where the technology-driven commercial enterprise is at the very core in setting Australia's economic policies and priorities, at the very core as we are building successful investment strategies, and critically, at the very core when the most talented young Australians decide their future careers.

If we are to reach that special place, we have to deal with that culture chasm - the chasm between the importance Australia's technology community attaches to our technological potential and the prevailing situation.

On the one hand, the technology community sees Australia's technological potential driving Australia's economic growth and prosperity in the 21st century, but we are not selling that view very well. The prevailing situation is that to economic policy-makers, the technology-driven commercial enterprise is politically useful but not economically central. It presents an interesting investment play while the main money is on miners, media giants and financial institutions. But most critically, Australia's technological potential doesn't seem to be even on the radar screens of the most talented young Australians when they are deciding their future careers. The most talented young Australians focus their career choices on medicine and law and merchant banking, not on the thrills and spills and personal and intellectual challenges of making careers and money out of technology.

The prevailing situation is that the technology-driven enterprise is politically useful but not economically central . . . (it is) an interesting investment play while the main money is on miners, media giants and financial institutions . . . most critically, it doesn't seem to be even on the radar screens of the most talented young Australians

There is indeed a chasm we must cross, and as Peter Farrell quoted recently …"you don't cross a chasm in two small leaps". We must devise a quite special leap to win the hearts and minds of the most talented young Australians so they can lead us to that promised land where the technology-driven commercial enterprise does indeed have a very special place.

we need to take a very special and spectacular leap… (into) the world that lies beyond the idea

I submit that we need to take a very special and spectacular leap to transform some of the best of Australia's young super achievers into a whole new breed of technology entrepreneur, a new and much-admired elite, living, breathing and thriving in the world of commercial innovation. It is the world lies beyond the idea: understanding the technical possibilities and commercial potential of a new engineering or medical or scientific development; orchestrating its uptake into new commercial products or services; and creating and succeeding within a commercially-successful innovation culture which thrives and feeds on itself by creating commercially successful technology-driven enterprises.

Just how might we start this ambitious transformation?

We must be imaginative. We must sell our ideas very convincingly to talented young people who already are overwhelmed with attractive choices. We need to adopt new and imaginative approaches. Let's start with two that might be worth exploring.

first, a short-term visa to enter the entrepreneurial world

The first envisages an exciting, attractive short-term visa for some of our most talented graduates to briefly enter the inner sanctum of the entrepreneurial world, to get a taste without career commitment, to see what it might have to offer, and maybe profit in doing so, even if they don't stick around.

The second is a 'trail by fire' experience . . . a passport to technology leadership.

The second is a 'trail by fire' experience for only a few of the very best. But the upside is a passport towards leadership much earlier in their careers, leadership of a substantial commercial research and product development program, and subsequently to move into a CEO role leading a substantial technology-driven enterprise. There are very few talented people capable of filling such roles today.

Let's see what each of these two concepts might involve.

a high-profile 9 month program in technology entrepreneurship for talented graduates

The first would be a high-profile 9 month program in technology entrepreneurship for talented graduates. It would start with 10 weeks of evening case study workshops plus supporting lectures and self study introducing the basics of entrepreneurship and commercialisation and an

option to go further.

Stage two would be a very intense 12 week full-time, live-in program

Stage two would be a very intense 12 week full-time, live-in program. The first half would be real-life workshops and supporting lectures conducted in Australia. The second six weeks would be in the United States involving intensive lectures and case study workshops enmeshed in the West Coast entrepreneurial culture.

There are several suitable US West Coast programs that might be used, such as the University of Washington's Centre for Technology Entrepreneurship (CTE). CTE is backed strongly by leading Seattle entrepreneurs and CTE and its backers have agreed in principle to participate in such a program for young Australians.

Finally, 16-weeks part time would be devoted to developing a real-life new venture proposal.

Each student (or small group) would be required to develop a new venture proposal, an investor-ready package, capable of attracting real-world financial backing. Each would select a new product or service technology to exploit, based on existing university or CSIRO intellectual property. Each would negotiate the IP terms and develop a real-life, new venture start-up package including negotiation of the start-up funding terms with real-world early-stage funders cooperating with the program. Throughout this 16-week new venture creation workshop, the students would be guided by experienced mentors assigned to each project, and throughout, a critically important feature of the program would be intensive training in crystallising and presenting the proposal.

The end-result would be a realistic, investor-ready package presenting effectively the case for establishing a viable, technology-driven new venture.

Such a program would present new opportunities for focusing on and exploiting existing university and CSIRO intellectual property. It would deal with all the real-world practicalities of new-venture creation, drawing on experienced mentors, with fully negotiated terms in all the key areas, ready for immediate implementation. Having reached this end-result, the participants then have the choice of taking it into the real world themselves or at the very least, have a quality investor-ready proposal that could attract outside interest.

A three-year professional doctorate in integrative engineering …. using unique new teaching techniques

The second concept is a very demanding 'trial by fire' for only a few of the very best of our young talent to gain a passport to leadership of a substantial technology-driven enterprise. This ‘trial by fire’ - a three-year professional doctorate in integrative engineering. This would not be an academic PhD, but an advanced workplace-based program, developing a new class of unique engineering-trained leaders with the intellect and practical and professional skills to lead a commercial research and product development unit much earlier in their careers. They would also have the training and talent to move more rapidly into the chief executive suite.

This professional doctorate would require a very intensive learning program using unique new teaching techniques tailored specifically to high-talent students. These would cover a full range of relevant professional skills - contract law; intellectual property law; commercial R&D strategy development and budgeting; R&D performance measurement; exploring alternative and related technology strategies; understanding and managing people, including the special skills of managing research and product development specialists; managing the technology-driven global enterprise; understanding markets and marketing, distributors and distribution; financial and currency issues; production and outsourcing; creating and maintaining an innovative

corporate culture; understanding and managing risk; and of course, presenting and selling ideas.

A key feature would be employment during the program in an approved industrial research and/or product development role, and a field report which makes an original contribution to managing product development in a technology-driven global enterprise.

The Integrative Engineer.(needs) ..... special skills:

motivating people and suppliers, creating and sustaining innovation, managing outsourced research product development; issues of IP creation management

The resulting highly-developed professional, the *'integrative engineer'*, would have an impressive range of special skills. These would include a well-developed approach to understanding end-product markets, not just the technical issues, but also from the consumer, distribution, service, and competitive strategy viewpoints. There would be special skills in capturing the essentials of new technology research, and the potential such research might offer in the value chain through integrating a range of internal and external research and technologies into commercial products and services. But there would also be special skills in understanding and motivating the company, its people, and its suppliers. For example, the skills of locating and operating the corporate levers creating and sustaining innovation; commissioning and managing outsourced research or product development; and that all-important skill set of identifying and responding to the commercial and legal issues of IP creation and management.

The IP skills would be not just managing patenting programs, but developing integrated research, product and IP strategies that inhibit competitors' options; building sustainable competitive advantage into the basic technology or product design; and developing time to market techniques and setting new product schedules that ensure a technology advantage is achieved or sustained, so that competitors have difficulty keeping up with the rate of change.

Of course, all this needs to be based on understanding and meeting the expectations of each element of the value chain, particularly ensuring that product development is properly integrated into the marketing, financial and competitive environment in which the company operates; and how manufacturing can be used to gain a competitive advantage. And finally, the integrative engineer would have very special skills developed during the program in managing people and commercial issues, and that invaluable talent - presenting and selling ideas convincingly.

These two concepts illustrate how we might approach the task of taking a spectacular leap across the cultural chasm. These are the ways we might attract some of Australia's young super achievers, and develop a whole new breed of technology entrepreneurs. One is a short-term visa for talented graduates to briefly enter the entrepreneurial world. The other is a '*trial by fire'* experience for only a few of the very best, a professional doctorate in *integrative engineering*.

Whether these two concepts are the right ones or not is for debate. What I submit is beyond debate is that if we are to cross the cultural chasm, we need to take a spectacular leap that will attract some Australia's finest young super achievers. We need to develop a whole new breed of technology entrepreneurs with skills to be really effective in the extraordinarily challenging - but immensely satisfying - world of technology entrepreneurship in start-ups or in established companies.

We need to create a new and much-admired elite…. living, breathing and thriving in the world of commercial innovation

We need to create a new and much-admired elite, living, breathing and thriving in the world of commercial innovation, that world that lies **beyond the idea**.

DISCUSSION

MR ROBERT WULFF,
Griffith Hack, Patent Attorneys:

I have been to quite a few presentations recently which have asked the innovation question. I saw Evan Thornley at the Warren Centre Innovation Lecture. Mehrdad Baghai from CSIRO spoke about the importance of innovating for the market, and certainly Wal King and David Miles today emphasised the importance of making sure your innovation is market focussed.

In our area we work with both public and private sectors and certainly it has been my experience that an enormous amount of innovation is not market focussed. An enormous amount of research effort in Australia takes no account of the market in Australia or the global market.

There are some notable exceptions. If you agree with that and I suspect you do, my question is how do we get the market to talk to our R & D powerhouses, such as the CSIRO, such as ANSTO, such as the various CRC's in the universities.

In other words, how do we turn it around?

MR ROGER ALLEN:
Well, firstly, right at the moment there are these pre-seed funds that have been created so there are a bunch of VC's trawling around the industry right now, trawling around the research houses and the like. Most of the ones you mentioned have a new commercialisation unit so there is a lot more interface going on right now than there ever has been. I think a lot more understanding about what it takes, a lot more people being brought in, like at CSIRO, with experience from outside. The issue about innovation being market focussed, that is absolutely right. That is the same the world over, even in the US. You often hear that complaint from VC's. I was certainly talking about the ones you actually do fund, so you certainly see an awful lot that are not.

I had four professors in my room one day and had papers about that thick. Until I could get them to stop they spent all their time telling me why they had the best technology in the world. I basically said politely that when they came back with as much information about how they are getting it to market then we might be interested. The only way people learn that is they get knocked back—people after a while figure out that there is no point going to investors with a bunch of technology and no concept of how you are getting into the market, no management team and the other things. So as I said there is a lot of progress being made. It is slow and it is pretty shallow but I think we are heading in the right direction.

MR DAVID MILES:
I think the same thing. The message gets across pretty quick. In our experience in 2 ½ years in Queensland and Melbourne, the message is out there that unless you have got something that is going out in the market somewhere, then do not go and ask for money.

DR PETER FARRELL:
Roger, you can jump in if you like but I wanted to quibble with David on one of the points you made and also Wal. Maybe I should start with Wal because he is not here to defend himself, but it was concerning the issue of risk. I have to say that maybe I am a bad Aussie, but I do not go to the races, I think I have been once in my life, I hate gambling, it has no appeal whatsoever. So I think the issue of seizing risk is not really the right way to put the whole thing. It is really seizing opportunities as opposed to risk. I do not know anybody that likes risk. It is risk management. As John was saying in the introductory part of the session, you see a little bit further over the horizon and it is maybe something that other people do not see, but what you want to do is minimise the damn risk but seize the opportunity. I think that is what it is about and, stating the obvious, there has to be a market, otherwise it just does not work.

MR. ROSS MCINNES,
RHOM Intellectual Property Group:
A question for our VC. Is there a need for standards to be put in place for VC's in terms of documentation, like an actual approach to invest in new technologies?

MR ROGER ALLEN:
Well there are quasi standards, what I was saying before, term sheets for investing from a VC to an investee company. Certainly we adopt, most Australian VC's adopt, US style term sheets, which are really now international. So to that extent—I mean it is not something anyone is going to become a regular of, it is just a whole thing of efficiency. In an early stage company putting in a relatively small amount of money, you cannot be spending your life negotiating. So it is pretty standard and you as an investor, as a VC, you figure out the key terms to you and then you have got a number of tools you use, depending on the deal and issues and other things like that. So that is really up to the VC's in many ways. The issue is that the founders, if you like, and their

representatives, are the ones that usually get the shock and have not got much experience because they are doing it for the first time.

On the other side of the fence between the investors and the funds, the superannuation funds if you like or the major sources of capital, and the VC funds, on the latest VCLP structure the industry has got together and has negotiated a standard document which will not doubt, every fund will have a few minor things. In Australia, guess what, there are only about ten super funds that have invested in this area and it was very efficient for essentially everybody to get together and say, "Let us have a standard agreement which we can vary around the edges." That has actually happened with VCLP. There are plenty of other areas too, just focussing on the investment agreements but we, for instance, have developed best practices for all these sorts of agreements the company will need - a stock option agreement, employment agreements, miles and miles of things that these companies are going to need. You cannot actually afford to go out and do these things, one off, every time in these early companies.

PROFESSOR JANE MARCEAU: *Australian* Expert Group in Industry Studies.

Creating more entrepreneurs is not just whether people are psychologically entrepreneurial, it is also the organisational structures that they come from. How many people have left (a company) and set up their own companies? That is the biggest source of entrepreneurship.

Next, Backing Australia's Ability and other government programmes are very important but they tend to be too small because it is public finance. We need $1.3 billion for scientific equipment alone over the next 3 years to get to the forefront of scientific activity. From research we have found that most innovative firms do not use government programmes. They do things quite differently.

The third thing is to have the public sector think laterally and have coherent public policies. For example, to encourage innovation in the medical centre, do not focus all attempts on cost cutting, instead create opportunities for people through a central activity where there is always a great deal of funding. Likewise, the market will provide opportunities. You can link government programmes to those and that is better than to have innovation programmes per se.

MR DAVID MILES:
I think what you have to accept—and we have a political environment—is that whilst there is a lot of talk about innovation at the moment I do not necessarily believe that all government in Australia recognises that what is currently being invested is, in the end, going to pay off anyway.

Therefore I think that what is incumbent upon the community that you are in, and the community that a number of other people are in, is that we have to demonstrate some results from these programmes. Whilst the current thing within the Federal cabinet room is that innovation is currently leading, there are many people sitting around that table that do not believe government should do anything in this area and that it should be left to the market.

It is the demonstrating of results and I think one of the real problems is that too many parts of the research community say, "You haven't given us enough money, give us some more money and we'll deliver for you," instead of concentrating on delivering with the money they are already getting.

PROF ARCHIE JOHNSTON, Dean of Engineering, UTS

.My question really is to where the real innovation is happening with the bright young students we have got.

MR DAVID MILES:
That is fantastic and if that is what you are doing in your institution then I commend you for it. But there is not enough of it and we have to keep the impetus up to take that forward.

In terms of talking to students, I probably have not been and spoken to a

I just wonder how many of the panel has talked to some students lately because the student population has changed greatly. Fourth year students—final year students—20 per cent of them now have commercial arrangements around their thesis topics.

The most innovative students are students that are doing double degree programmes in, for example, engineering and bachelor of arts in international studies where they are successfully marrying both the technology and the culture awareness that you have touched on earlier.

DR TREVOR BIRD: CSIRO.

Roger Allen did not paint a very good picture of spinning out an ICT in Australia. What would work in Australia in terms of spinning out?

group of students for about a month. I have done a number of seminars with students and with people doing doctorates and the like in two or three of our major institutions and got the feedback from them.

I must say I do not know what the experience is that you have but a good deal of what came through there was what Roger referred to in terms of there is still a very high propensity of those people that do not have the inclination to go and give it a go, but are looking for a secure job, whatever that commercial arrangement may be.

Indeed, some stood up and said, "I've spent years getting to this point in my education, where is my guarantee of employment until I retire?" I still think that mentality is there. So, if you have your programme running and you are going to push them out there then talk to your other 37 colleague universities around Australia and get them all to do the same thing.

MR ROGER ALLEN:

I hope I did not leave that impression. I was talking about the human capital that was required to build these companies and I was making the point of a sort of global model as one example. I can talk about a couple of companies right now in our portfolio. One that spun out at the University of New South Wales, by a professor who left the university and moved to silicone valley. He has built a company that now is clearly the market leader in its niche and has just attracted a very significant investment from a top tier USVS et cetera.

He is doing well, it has taken 3 years probably and his whole research team came with him and they are based in Ryde. All the R & D is done in Australia. He has customers in Japan, he is in the automotive industry, he does design verification of microprocessor design and the like, very complex software. We have no companies in Australia that could possibly be his partners and we see this quite a bit. If you look at the ASX 200 we always worry about why the commercial companies do not get closer to R & D or the like in this industry and in the ASX 200 there are about three companies that are actually based on technology.

In ICT there are almost none. In the medical area and Peter's company and others there are a few, but almost none. Look at the top 20, it is banks, insurance companies, retailers and property. So we should not be that surprised that we do not have those companies. So the actual R & D —in some senses R & D does not have to be directly connected to an Australian industry. What I was saying though is that a lot of that technology absolutely has to go global, day one, and in the case of someone like that professor who was able to make the transition from public sector to private section to the US.

It was high risk when you look at that double sort of thing but he has been able to do that. Another case with another company that Peter Jones here knows very well, he was the previous chairman, 50 or 60 engineers down at Chippendale and customers all around the world. No customers in Australia, no partners in Australia, but major distribution deals with IBM and other people all around the world. So there are things happening and there are companies that are actually grinding away and being successful.

I was really talking about the whole issue of the human capital and what it takes. David has made the point I think several times. There are stellar examples but we need more of them and it is really a lack of depth and lack of size that we are focussed on. We desperately need more of these case studies and examples of these companies and individuals that have done it

To answer the other question what makes entrepreneurs in many way role models and people working for companies and seeing it happen and saying, *"I think I could do that too, I am going out to have a go."* So the wheel is starting to turn, we need to whirl it and make it turn faster and get some successes out there, more and more successes and celebrate those successes.

MS FIONA PAK POY, Innovation Capital:
Thanks very much Phil. I enjoyed your talk very much, I found it inspirational and if I did not have an MBA I would be applying to INSEAD tomorrow, so that is a good thing.

I was just curious. The approach that you have presented is to train up more general managers to put around the founders, which I think is a good thing, but you also said that typically engineers do not have the skills to start a company and mostly associate with their own engineering buddies, which I think is also true.

How then do you propose to train those founders of companies? What is the best approach for them? Is it just through that apprenticeship programme or those people that really have that aspiration to be a founder, they do not want to be the right hand man forever, they want to be leading the company.

PROFESSOR PHIL ANDERSON:
You have a couple or three things. Suppose I want to found a company, what should I do here? In my humble opinion what I should do here is ultimately walk into the Australian Technology Park and take advantage of the expertise and company building that people have in doing that sort of thing.

I think there is more help than you could even know what to do with, just here in New South Wales, in terms of people advising you how to start a company. I think the Comet programme is particularly clever. There is no substitute for being mentored by those kinds of people, but at the end of the day if I were a young engineer the thing I would most want to do is find a way to attract an experience CEO.

I read a case about a very interesting company called El Air Corporation, it makes a software product called Cold Fusion that a lot of people use to write fancy websites—dynamic stuff. J J El Air was a young man who started that company straight out of Carlton College in Minnesota and he was funded by Polaris Ventures in Cambridge. The venture capitalist sat down with him and said, "JJ you have a great technology, you are 22 years old, I am going to tell you now I will fund your company if we both agree that you are not the guy to take this company to the end zone. Here is what I will do. I will hire you a world class veteran CEO and I will tell that CEO one of the three or four things I most expect out of you is I want you to educate JJ. He is not ready to be the CEO of this venture but I want him ready to be the CEO of the next venture because I intend to back him three or four times during his career." Polaris made a fair amount of money when El Air was sold but Polaris believes it will make $1 billion over JJ's lifetime backing him in his various ventures. Somebody with that kind of commitment, who will say, *"I will give you that apprenticeship,"* that is what that young engineer should be looking for I think.

PROFESSOR MARCEAU:
Incredibly sensible and very useful talk. I just hope we can find some way to get INSEAD linked to various schools in Australia because I think it would be wonderful.

It also happens I wrote a book on INSEAD some years ago called Masters of Business and I can see why it is still Masters of business everywhere.

PROFESSOR PHIL ANDERSON:
Thank you very much. We are now your neighbours; it is not a matter of coming from France. Peter, you have seen lots of people who were from business schools and were not from business schools. Think about the time when Resmed was going through this entrepreneurial transformation. What in your view would it take to train some young Australians to come into Resmed at that moment, hit the ground running, contribute, learn how to be an entrepreneur?

DR PETER FARRELL:
You described it. Building a business is a team sport, like the rugby team where you have to have the right guys in the right positions and so forth. But it is not just that. It is like watching the recent Bledisloe Cup match where our guys kept kicking down the throats of the New Zealanders. That is not what you want your team to do.

But you are absolutely spot-on. The best message there was what you ideally want is one of two people - an engineer scientifically talented. Technology is the turbo charger of the future, it always has been and it always will be. We do not necessarily go looking for accountants or lawyers or whatever because as David himself says it does not tend to be where creativity resides. It is generally not in universities in a business sense because they are not used to, as you pointed out, the market driven thing. It is the technology product driven kind of mentality.

The guys we look for are guys that have an appropriate technical background, have worked in a big organisation, got thoroughly dissatisfied. The best guys for us in the life sciences worked for J & J, worked for Baxter, worked for Abbott and they have seen how not to do things. They then go and get an MBA and they are ready to hit the road running but they come in and they do not expect to run anything, they come to learn, and that is fantastic. So, you put them with a little SWOT team with a guy who has been there and done that.

The other person we look for is the person that did the MBA and then went to the Baxters, the J & J's, or whatever, and after 5, 6 or 7 years has built up - and these companies do a great job of training people. We are not into total quality management stuff, but the person who has already been there and done that, and is now looking for some real action - he then becomes part of the team

PROFESSOR PHIL ANDERSON:
The question I have been asked by journalists in the last 2 years more than every other question added together is *"Why doesn't anybody take entrepreneurial courses now that the dot.com companies have crashed?"* The answer is very simple. We are not training people to found dot.coms. I make the simplest pitch in the world to all our students in the second period. I said, *"Look, do you honest to God think you are going to spend the rest of your life being able to work for Siemens or an HSBC? Do you really believe in lifetime employment? If you have that little nagging doubt, would you not like to have the option of going to a growth venture, just as a back stop if nothing else, just in case your whole career will not be in the Fortune 500?"* I am overwhelmed by student demand.

DR PETER FARRELL: One more quick anecdote. I could not let this go since you were talking about 'dot.bomb dot.gone'. I was sitting in my office one day in Santiago and these guys called up. They were two rather freshly minted Stanford MBAs. One was an orthopaedic surgeon and the other guy was from Cambridge. They met at Stanford and they had set up something, and they came down to me and said, *"Listen we've got an idea, it's this E commerce stuff and we would like you to fund it."* I said, *"Come down—where is your business plan? What is the value proposition here."* The guy said, *"Business plan? Forget it, this is the new economy. You've got to get out there buddy, you get your idea out there and get it funded."* I said, *"Sorry guys I'm too old for this. Sorry I'm the wrong guy, have a nice rest of your life."*

Although I think we did invest later on. They came back, and we put half a million bucks in rather than the $5 million, and that went down the toilet, but at least we had a business plan to follow it down the toilet.

MR CHRISTOPHER GOLIS:
Nanyang Ventures.

I think the best programmes in this country for commercialising innovation was the Innovation Investment Fund. One was done by Roger, and they did a great trail-blazing job. The single most important thing the government can do in BAA2 is say they will have a third round of innovation fund licenses.

We do not need another education programme, but we certainly do need that confluence of commercialisation capital. That programme was designed with the help of the venture capital

MR PETER NORTH: One of the things that people from most other countries do not understand and even our treasury people do not understand very readily, is that if you live in a country driven by resources, in a currency that is driven by resources where employment prospects in value adding industries are damaged by success in resources exports, the need for technology driven commercial enterprise is so much greater.

The fact that it is doubled, it is still painfully way below what this country needs if my children and their children and their children are going to have satisfying careers and not be dependant upon mineral resources.

(Mr Golis submitted a post-seminar written discussion that is attached at the end of this section. Ed.)

community. I am speaking against myself but I think there should be a third. In fact the government should look at a licensing round every couple of years. .

MR BRETT ALEXANDER: Student, University of NSW

I have heard lots of things about entrepreneurs doing this and we need to train entrepreneurs to do that and I have actually had this question answered for me, but what I would like us all to think is—if I was a student or a young person, or this person's grandchild and I wanted to do something with my life and people were telling me "Entrepreneur, entrepreneur," my question would be "What is an entrepreneur?

DR PETER FARRELL:

I think you go back to Jean Baptiste Say who in 1800 said *"An entrepreneur is one"*, and I am paraphrasing what he said, *"that takes under performing resources and turns it into something where the return is much greater than anybody else could have dreamed about"*. Often it is against the odds but it is not taking a huge risk because the guy who gets into that does not think he is taking a risk. He thinks it is there and the other people do not see it. The entrepreneur wants to minimise the risk.

In a way it is a champion. I love the story of Wal King. That was great, he saw that 300 million in wine bottles. Why were we importing wine bottles? It is like we import barramundi from Thailand, did you know that? And bucket loads of it. Anyway, he has turned it around, they went to AMCOR and they are soon going to be producing 600 million wine bottles. An entrepreneur does not have to be working in nano technology, in fact the guys working in nano technology - the last I heard it was a joke, there was a big write down of it.

It is not the sexy stuff necessarily, it is just something that is there good and solid that you can apply your brains to and make it work.

DR JOHN NUTT: ATSE Chair.

Why is it that so much of our innovation is financed by capital raising rather than cashflow within existing companies?

PROFESSOR TREVOR COLE: Well, in fact you raise an interesting point, because there is significant growth if you take examples elsewhere, that the bootstrapping process is, in fact, through cashflow.

My understanding, for example, is that the people coming out of the Comet Programme are from companies that have a turnover of up to several million dollars, and when they reach a stage where they need that capital for growth and they will go out and find it.

In my view, in Australia we have underplayed the whole concept of debt based growth, particularly at the very early stage, and we do not have the vehicles compared with the range and variety of programmes that you find say in Europe, European countries support that debt based approach as opposed to giving away the equity.

David knows my views about the very early stage of pre seed where I think the concept of an equity-based or fund management approach pre-empts the concept of possible sale or licensing is not necessarily the way to go. We need to explore alternative pathways to creating and then growing companies.

DR GEORGE PAUL: CTO of Cap-XX*:*

We manufacture the world's best super capacitors in downtown Lane Cove and we sell all that we can produce in a global market that is valued at about $6 billion, so clearly we have some growth issues.

I would like to get back to the technology half of the technology entrepreneurs and ask Peter and Trevor two questions and I would like to give Cap-XX's side of the story.

The first question is: What is the

DR PETER FARRELL:

I can think of more examples than just Cap-XX. Technology is a living dynamic evolving thing and you start with an idea, and you start drilling down, and then you find where the holes are. So it keeps evolving.

I can think of an example in Seattle where an ex Baxter executive went in to start a nano technology drug type opportunity. He ended up developing a delivery system for Tabromycin, to treat TB and it was morphed into something completely different, an already approved drug, and I think that sold off for $800 million.

So I would say that is very very common. The second thing, the IP. We started with three patents and we now have something like 600. Are they all good? No I am sure a lot of them stink and that is one of our challenges, to make sure they are commercially relevant and I do not think we are doing a very good job of that.

relationship between the technology that you used to raise your original capital and that which finally yielded you revenues? Secondly, how do you make sure you have got commercial intellectual property?

In Cap-XX's case on the first question we got our technology from the CSIRO and it bears some resemblance but none to the technology that we are now commercialising. On the commercialisation aspect, in fact about 6 years ago, my colleague from the CSIRO went around the patent attorneys here in Sydney and found only two who really understood what a small start up needed in terms of trying to generate commercial intellectual property.

Since then we have used a number of attorneys, one here in Sydney and we have also used Peter's attorneys from the US, from Resmed, to generate truly commercial intellectual property, rather than stamp collecting to put on the bottom of your CV.

We are just spending a bucket load of money on this crap, and I am sure it is not all crap, and we have been in court—you know, once you have the IP it gives you an opportunity to spend money on lawyers. We have been in court in the US and we are just totalling it up. It is 8 and a half years, we have landed one punch and that was recently, about 3 or 4 months ago, and we have decided to forget the goddamn lawyers, get out of the goddamn court system.

You get the emotion of out of it and say these people are stealing your ideas and selling it, which in fact they are doing and doing a lousy job of it. But they are marketing very well, better than us in fact in some of the areas, and we have decided to just bite the bullet and last quarter we spent US$1 million on legal fees and that is not very productive stuff.

The commercial IP stuff is a really thorny issue. It is a bit like books on parenting. There are no good books on parenting. You just need to work your way through it and in your particular area gain knowledge and parcel it up as best you can.

The best thing is that the spider web of patents where you have layer upon layer upon layer where people just finally have everything covered, including the kitchen sink.

DR JOHN SLIGAR:
We have heard a lot this afternoon about what we can do with people but in America and in the UK we find that government money is aimed at picking people.

In our country our government's aim is to pick technologies. Which is right I would not argue about but how do we go about changing our government's mind so that it does take into account promoting and helping people rather than technologies?

MR DAVID MILES:
I think you have to have a combination of both of that. I do not think, despite what our friend says from the venture capital industry, that we are mature enough about the innovation potential issue to actually decide what we should pick one way or the other.

I think we have set some technology focuses and that is not something that I was involved in, that is a matter of policy as far as our Federal Government is concerned. At the same time we are looking to cultivate more of a people oriented education system and a system with intermeshes with commercialisation but I really think we are still learning that process.

We have tried in some instances to adopt what has been done in other parts of the world and I think we have to find it in our own way and that sort of input into BAA2 I think is valuable. But I do not know the answer to that and I am not sure the government knows the answer to that. It is a matter of a learning process and it is going to cost some money along the way and inputs from forums like this are very helpful but I do not know that I could directly answer your question.

MR ROGER ALLEN:
The one thing that really is different is if we were sitting in the US the word "government" would not have been mentioned once, or indeed in Israel or various other countries. We spend our life turning to the government and the government is never going to have the answers. In my experience the Australian government programmes are probably as good as anything in the world but government is government and it is never going to come easy. It is going to have lots of red tape and you do not want to fund entrepreneurs or a management team whose competitive advantage is getting the next grant.

DR PETER FARRELL:
If I could add one comment there. All governments do is take your money and pee it down a toilet. Do not expect help from governments, it will not happen. Nor will creativity come from governments because

government is about being representative and creativity has nothing to do with being representative or equal.

PROFESSOR TREVOR COLE:
There is one area of government expenditure that is absolutely critical in this and that is an education. I am talking about school and tertiary education. We have heard good stories about the skill sets and attitudes that we need to actually achieve commercialisation and growth in a commercial context and they are not being produced. I am talking for example about the balance between technologists as opposed to scientists and I am not just talking about the tertiary sector, it goes all the way back down. The Academy for example has been very instrumental in trying to influence the technology education within the school system.

MR MICHAEL MYER*:*
Concentric Asia Pacific.
My question is for Peter North. We are Australia's leading engineering technology solutions provider, so we provide a lot of underground technology for people to do private development.

Peter, you brought up the subject of choosing our best and making them into entrepreneurs as such. Every one of the entrepreneurs I know is pretty much a rough diamond and they are a bit better in a rugby scrum than they were at the front of a university lecture.

I do not think many of them have created what they are until they have been kicked in the teeth a few times. So what you put forward was really an elitist exercise which I do not think works.

MR PETER NORTH:
What I was putting forward was not depending on government but bringing about a culture change of our own so that the leaders of our society of the future have a much better understanding of what entrepreneurship is and how you go about it.

You are also speaking about the founders. Do not forget that in one of the companies like Resmed and Cochlear we have a major problem—we do not have a ready supply of leaders for the future. The companies that are coming up that are being created by the various CEA technologies, electro optics, Rosebank Engineering—there are many of these smaller companies that are going to grow and they are going to require leaders for the future. I do not know where they are going to come from. That is why the integrated engineer is a concept that I think merits some more attention.

PROFESSOR TREVOR COLE:
I am involved in the micro electronics thing where the big problem is to get the people who actually can get access to and facilitate the tools so they can work at the world level within a company to develop the product families and so on. It is not just the founders and I think the other point that Peter was making is what I was trying to stress - sure, there is a stage where we need exactly that people but once you get to the larger and globally present company the issues are somewhat different.

PROFESSOR ARCHIE JOHNSTON*:*
I completely support your two concepts. The first concept is what we at UTS have been doing for 30 years which is practice based education where all undergraduate students, all 3,000 of them, who spend 1 year in industry which is broken into two internships. That is the model you describe, so I totally support that.

The second option on the professional doctorate - we have had a look at that and the market tells us it is too long and too expensive so we have gone back to the drawing board.

DR JOHN NUTT: That brings our discussion to an end. We are recording this—it will be transcribed and by the end of this week we will have a transcript, a verbatim transcript. The Academy will set up a small group and analyse it, distilling the issues that have been brought up by the various speakers. It will group them and develop responses. We will then develop recommendations and put that together with the proceedings.

I thank the speakers for their experiences. Thank you very much—we have had some excellent speakers. There are a number of people who have organised this and I would like to thank them. Trevor Cole has been the convenor of the organising committee but also on it is Tony Lawrance, Keith Daniel, Doreen Clark, Bob Durie, Rolf Prince and Peter Jones. All of them have given generously of their time, but no more so than Trevor Cole who has been meticulous and dedicated.

We are a non-profit organisation, we do need sponsorship. The SRD has given us sponsorship in the form of these venues and the Academy is grateful for that. Finally I would like to thank you, the audience, for contributing to the discussion and I hope you have got something out of it this afternoon and that ultimately it will be to the benefit of us all.

CHRISTOPHER C GOLIS, **Executive Chairman, Nanyang Ventures P/L**, submitted a written discussion post-seminar:

Entrepreneurs are critical to innovation success. However I would contend that the major impediment to their supply was Australia's onerous level of capital gains taxation, which has now been solved with halving of the CGT rate. As someone standing in the venture capital market and who has been a part the industry for over 19 years, more and more technology entrepreneurs are beginning to appear. Yes, they need to learn business principles, but there are more than enough courses in Australia. They also need mentoring but more and more mentor networks are being formed; driven by the CGT changes. The risk-reward ratio for business angels in Australia has become much more favourable. I consider that the major constraint now to innovation success is actually funding. While this will probably go against the grain of many of your members, there is more than enough research done in Australia.

Secondly, once a technology has proven itself and established a successful track record, capital is relatively easy to raise. The problem is that Australia's innovation funding system is like an hourglass, with considerable funding at the top for research and substantial funding available for market expansion but very limited funding for the critical middle section of commercialisation. Numerous Australian studies have made the points that funding has to be equity and not debt, and that demand exceeds supply.

The Innovation Investment Fund (IIF) program was set up explicitly to address this problem and as someone intimately involved in its design, I still believe it is the best structured program in Australia. The first round of the IIF program in 1998 had its teething problems but the 2001 second round went relatively painlessly. As I said in the forum, our $50m fund raising was relatively easy. The institutions are familiar with the IIF structure and indeed they supported the Pre-Seed program as well. This success was achieved in poor climate for VC fund raising world wide.

Australia has about twice the number of VC transactions on a per capita population basis and about one-third the capital invested on a GDP basis. (Ref: PriceWaterhouse Coopers Money Tree data).

If I was asked what would be the single initiative that the Federal Government could to help the ATSE meet its stated corporate objectives, I would recommend a third round of the IIF program and to have a round every 3 years with only new fund managers being appointed. As one of the speakers correctly pointed out, what Australia needs are more 'stars' such as Cochlear and ResMed. I speak as a current IIF licence holder which is the largest IIF at $50m. In one sense I am speaking against my own self interest in that the fewer IIF licence holders the less competition for our own fund. We did not apply for a Pre-Seed fund licence. I believe the critical mass of the Pre-Seed funds is too small and the program will unfortunately go the way of the BITS scheme where too little has been dispersed among too many. For a new VC fund to get started you need around $40m. The IIF program allows new managers to achieve this critical mass.

Many commentators regard the SBIC program as the incubator of the US VC industry. There is interesting information on its history on the SBIC website: The SBIC program started in 1958 some 45 years ago yet still continues to flourish.