

The Chairman
Economics and Industry Standing Committee
Legislative Assembly
Parliament House
PERTH WA 6000

**Technological and Service Innovation
Essential for Western Australian Business Competitiveness**

The Technology and Industry Advisory Council (TIAC) appreciates the opportunity to provide a submission to the Economics and Industry Standing Committee Inquiry into Technological and Service Innovation in Western Australia. This inquiry is both timely and highly relevant to WA, given the increasing need to diversify our economy, and to successfully manage the increasing pace and scope of digitally driven disruption that is heading towards us. We consider innovation as perhaps the key factor in meeting these challenges.

TIAC believes that technology development and innovation are core activities that underpin business competitiveness; it is a view that is shared by global business leaders and academics. It is a matter important to company boards, a local example was provided by the WA branch of the Australian Institute of Company Directors, which hosted the event *“Innovate or Be Left Behind”* in July this year. A more substantial local example comes with the fact that the business sector is the largest investor in research and development in the State.

Businesses in Western Australia spent \$3.59 billion on research and development in 2011-12 according to the ABS.

“The enterprise that does not innovate ages and declines. And in a period of rapid change such as the present, the decline will be fast.”

Peter Drucker, management consultant and author

However, TIAC would like to see the WA economy reach its optimum potential, and believes that it cannot achieve this aim by largely relying on the business sector to invest in technology development. Isolation is no longer a protection for our industries, be they resources, manufacturing or services. Businesses across WA are increasingly facing a wave of international competition and, with Australia’s embedded high cost base, local industry cannot seek to compete on price alone. Technology driven differentiation, innovation in production along with novel products and services need to be constantly developed and refined for business to remain competitive and maintain a first mover advantage.

TIAC notes that technology and innovation are not just about business competitiveness, they are also the prime long term drivers of economic growth. Technology and innovation are the basis of resource sector growth in remote locations with small populations and high costs, and have enabled the resource sector to scale up to meet global demand. They have enabled mining companies to remain competitive in the face of declining prices. Importantly, a significant number of these technologies and innovations have been developed and supplied by Western Australian small and medium businesses, and in a report commissioned by TIAC, 71% of Small to Medium Sized Enterprises (SMEs) indicated they supply the resources sector with innovation based products and services.¹

"Innovation is the central issue in economic prosperity."

***Dr Michael Porter, Professor and a management expert in the field of competitive strategy,
Department Head of Harvard Business School***

TIAC believes that to maximise the economic potential of the State, the Western Australian Government needs to take an important catalytic role in encouraging innovation and translation of new technologies into commercial outcomes. While industry invests substantial funds, so does the public through universities and through Commonwealth and State government research activities. Australia is very good at research, but it has a very low ranking in translating research outcomes into commercial benefits. The majority of public funding for research is provided by the Commonwealth Government, however it is the role of State Governments to facilitate the capture , and transfer of publicly funded research outcomes to industry, and to encourage commercialisation of new technologies and innovations for the economic benefit of the State.

Therefore the State Government has a key role in closing this gap and the attached document provides successful examples both internationally and in Australia that are relevant to WA. State Governments have the responsibility to encourage research, to maximise the local benefits to technology and innovation from that research, and to ensure that the required skills will be available to maximise the benefits from new technology and innovation. They also have the responsibility to ensure that regulatory settings are contemporary, effective and efficient, and that potential barriers to the introduction of new technologies are minimised. TIAC believes that both of these responsibilities must be fulfilled to optimise the economic and public good benefits of research, technology and innovation within the State.

A number of the above issues are addressed in the TIAC report Enhancing Opportunities for Small to Medium Enterprises in Major Resource Projects in Western Australia (copy

¹ AECOM: Enhancing Opportunities for Small to Medium Enterprises in Major Resource Projects in Western Australia; 2013

attached). This report highlights the problem of technologies developed and commercialised by SMEs not being sufficiently tested, or at satisfactory levels of maturity and risk for adoption by project proponents. TIAC recommends the State Government considers facilitating an investigation into industry endorsed testing and trial facilities to assist the greater adoption of WA SME innovative products. The test facilities would provide a practical promotional tool to highlight new solutions to the international supply chain.

" Everything interesting in economic growth and changes in the real economy has happened within the last 200 years and technology and knowledge drove all that happened."

"It turns out that despite the importance placed on capital deepening as the source of macroeconomic changes, studies show that it provided only 10% of progress in economic welfare and advances in economic life. The development of technology accounted for almost 90% of economic growth."

Professor Danny Quah, London School of Economics; June 2000

The increasing scope and pace of digital disruption will result in significant challenges and adjustments for the State's economy and workforce. Whilst the shape and form of those changes cannot be predicted with confidence, TIAC considers that Western Australia's capacity to successfully adapt to these challenges, and to strengthen and diversify the economy, will be significantly enhanced by an increased focus, by the State Government, on technology and innovation and on optimising their potential benefits. The attached submission outlines TIAC's views on these key topics and makes nine recommendations for consideration by the Standing Committee. Should the Economics and Industry Standing Committee wish to discuss any aspect of the attached submission with TIAC, please contact the TIAC Secretariat on email: tiac@commerce.wa.gov.au

Yours sincerely



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Att:

SUBMISSION BY TIAC TO THE ECONOMICS AND INDUSTRY STANDING COMMITTEE

Technological and Services Innovation

Essential for Western Australian Business Competitiveness

Background

Technology and innovation (T & I) are the main drivers of economic expansion as articulated by Nobel Prize winning economist Robert Solow. Whilst the exact figure varies, about 80% of economic growth can be traced back to T&I. They enable companies to compete on product and service attributes as well as price, allow business obstacles to be removed, underpin productivity improvements and result in new or improved products and services. Without T&I, company performance will be impacted, employment reduced, State economic growth will diminish and quality of life reduced. Conversely by emphasising T&I we provide the opportunity to diversify and grow Western Australia's economy.

The development and application of T&I to address community issues and generate business opportunities has created the modern and comfortable lifestyles we currently enjoy. T&I address health and safety concerns, allow us to communicate globally in an instant and provide immediate access to enormous amounts of information. They also provide interconnectedness, an ability to communicate and share information, and allow increasing numbers of people to work from home or "on the road". Digital communication is just one technology that has evolved and been integrated into business operation as a result of innovation. There is also a wide range of new T&I from energy generation to business models such as distributed power, 3D printing including on-site manufacturing, automation, data analytics, driverless vehicles, electric cars, drones, smart phones, wearable technologies and GPS systems. Collectively these are creating a wave of disruptive technologies that will generate both opportunities and threats. If WA ignores the quickening and broadening pace of these T&I changes and fails to embrace these new opportunities adequately, our competitive advantages will diminish along with our standard of living. The longer the delays before the State fully responds to this pace of change, the harder it will be to catch up with the leaders.

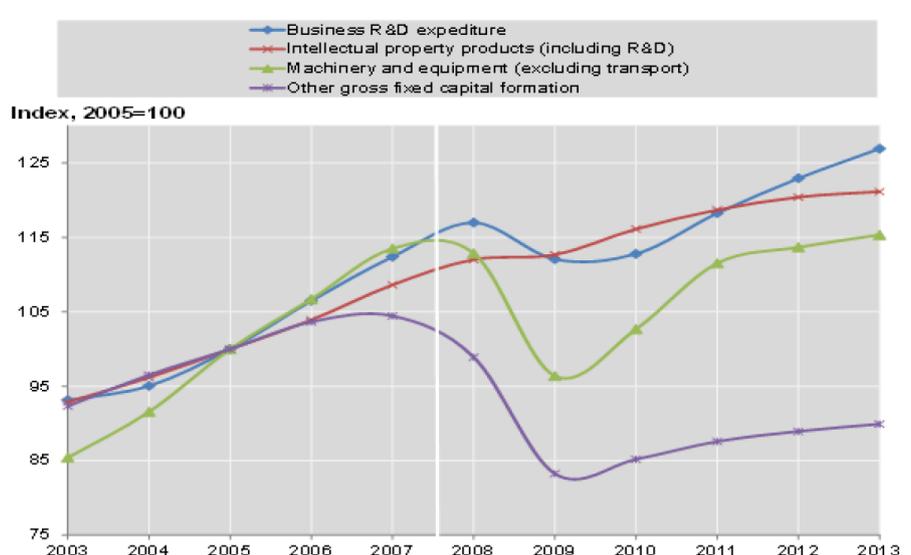
When considering the big picture of future economic development in WA, TIAC believes there is a strategic role for State Government to support an environment where entrepreneurs, innovators and businesses are encouraged to take risks to develop new T&I or to access and adapt T&I developed within and external to WA. Successful examples of such government support occur in both developed and developing countries and other States in Australia (see below). At the heart of a strategic Government role is the celebration of innovation, encouragement of the commercialisation and use of technology,

promoting T&I as core business and not an added extra, encouraging stronger links between industry and academia and building confidence and motivation for investors.

Business now operates in a global environment and more and more businesses understand the role of T&I in driving a competitive business offering to ensure survival and prosperity. The diagram below clearly shows that while capital investment and machinery purchases declined substantially during the Global Financial Crisis (GFC), the OECD chart shows how business investment in technology was hardly impacted, as indicated by intellectual property and business R&D expenditure. The chart shows the almost unabated growth in investment in technology through the GFC.

Figure 1- Investment in Knowledge Based Capital (KBC)

Business investment in knowledge assets weathered the crisis better and recovered earlier (Index, 2005=100)



Source: OECD (2015a), Main Science and Technology Indicators, January 2015, OECD National Accounts Database, March 2015, based on OECD (2014e), OECD STI Outlook 2014, Paris (www.oecd.org/sti/outlook).

The OECD found that investment in KBC helps boost growth and productivity and studies of the European Union and the United States show that business investment in KBC contributed between 20% and 34% of labour productivity growth².

Statistics indicate that Western Australia performs well, when compared to other states, in respect to research and innovation activities, with the total value of all R&D (the statistical measure commonly used to measure technology creation activities in the State) estimated to be \$4.5 billion. WA's R&D performance is underpinned by private sector investment in resource industry technologies valued at \$2.4 billion in 2011-12, with Commonwealth and State government funded R&D of \$873 million.

² Supporting Investment in Knowledge Capital, Growth and Innovation; OECD, 2013

Resource industry R&D is largely commercialised and adopted by the multinational resource companies and tier one suppliers. However, the substantial research effort undertaken outside of the major resource companies by universities, the State Government, CSIRO and SME's needs more support. In this way it will be possible to ensure that new technologies with commercial potential are developed, in the expectation that some of these will result in widely adopted and commercially successful innovations with the potential to deepen and broaden the State's economy. In TIAC's view, State Government support should actively encourage stronger links between industry and the research institutions, encourage the development of innovations from new technologies, facilitate the translation of new innovations into commercial outcomes and actively encourage investors to invest in WA T&I. A global comparison reinforces this need, highlighting that Australia as a whole is poor at turning locally developed technology into commercial outcomes.

The Global Innovation Index 2014, compiled by INSED and Cornell University, ranked Australia high in knowledge, research and creativity but low in converting the ideas into business opportunities.

- Overall Global Innovation Index ranking - 17
- Human Capital and Research ranking – 7
- Creative Outputs ranking – 12
- University – Industry Collaboration ranking – 14
- Venture Capital Deals ranking – 23
- Patent applications – 40
- High and Medium Technology Manufacturing ranking – 54
- Knowledge Diffusion ranking – 78
- Innovation Efficiency Ratio - 81

These innovation indicators show Australia and Western Australia are great at developing ideas, but fall well short at turning those ideas into local business opportunities.

TIAC believes that, as indicated above, the key issue is that technology developed in Western Australia is not adequately captured and translated into business opportunities or applied as solutions for the community and this potential should be a focus for the State Government. There is particular concern at a time when there is rapid technological change and disruptive technologies are changing the economic landscape. Failure to capture technology commercialisation opportunities will result in industry becoming less competitive.

Further, industry likes to understand and manage risk. Industry will invest in new technologies where risk can be better understood or commercialisation de-risked. Unfortunately the short term political cycles in Australia combined with the lack of a united vision on technology creation and commercialisation across State and Federal jurisdictions

have created an uncertain policy environment adding to the risk for businesses investing in this space. Any measures that can reduce risk will encourage investment, but without some risk investment, WA will not have a vibrant T&I sector. A simple first step for the Western Australian Government would be to update legislation to allow for Venture Capital Limited Partnerships as an investment vehicle.

Addressing the Scope of the Inquiry

The following sections address areas highlighted in the inquiry scope.

What drives innovation?

"Frugality drives innovation, just like other constraints do. One of the only ways to get out of a tight box is to invent your way out."

Jeff Bezos, Founder Amazon.com

There are many factors that can drive both organisations and individuals to innovate. A culture in the community that encourages innovation, an innovation focussed corporate environment, supportive management and skills base are all essential ingredients that encourage innovators. Some of the drivers of innovation include:

- Need for a solution to a wicked problem
- The human desire to do things better
- Entrepreneurs wanting to succeed, create wealth or make an impact
- Market competition forces change to remain competitive
- Businesses seeking a competitive advantage and new products
- Productivity improvement and cost reduction to improve margins
- The quest to remove or reduce barriers, obstacles or impediments
- A desire for improved operations and safety (worker safety, reduced stoppages, reduced insurance premiums)
- A need for better social outcomes

" If all you're trying to do is essentially the same thing as your rivals, then it's unlikely that you'll be very successful."

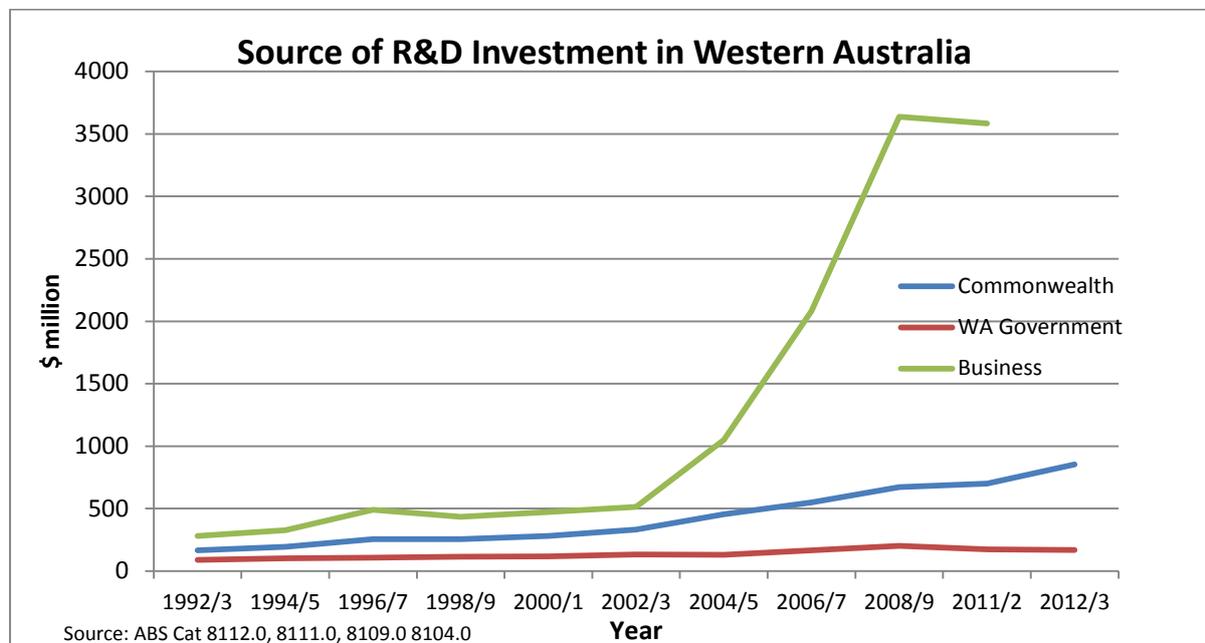
*Dr Michael Porter, Professor and a management expert in the field of competitive strategy,
Department Head of Harvard Business School*

Whilst business survival and economic necessity are important drivers of innovation, strategic opportunity and individual initiative are also key factors. Each one of these factors is reflected in Figure 2, which illustrates their lesser importance in Government, particularly in WA.

Businesses in Western Australia spent \$3.59 billion on research and development in 2011-12 according to the ABS, or nearly \$1,500 for each West Australian. The cumulative value of business research and development investment in the State from 2005-06 to 2011-12 was

\$19.8 billion, that is nearly \$8,200 for each West Australian. Business would not invest this level of funds if it was not important to financial success and company sustainability.

Figure 2 – Source of R&D Investment Funds in WA



Innovation does not just happen, some essential foundations are needed to maximise innovation levels and underpin a technologically driven economy

- A strong Science, Technology, Engineering and Maths (STEM) skills base in both tertiary and Vocational Education and Training (VET) graduates
 - This skills base determines our capacity to research, to create new technologies and processes, and to generate the innovations which lead to increased productivity, economic diversification and first mover advantage.
 - However, it depends on a strong STEM education system in our schools which WA currently lacks³.
- A focused and engaged government policy environment at the Commonwealth and State level that supports STEM
- A business environment that widely encourages and celebrates T&I.

³ TIAC has identified this as a major constraint on T&I in WA and in 2012 it commissioned the substantial report "*Optimising STEM Education in WA Schools*" which was completed in 2014. This report http://www.tiac.wa.gov.au/Files/STEM_Report_Part-1_20022014.aspx and its recommendations has had a substantial influence on the development of the STEM-WA initiative which aims to establish a \$45M, five year program to strengthen STEM education in WA schools, subject to \$8M in funding from the Australian Government. STEM-WA is designed as a not for profit organisation which brings together the school education sectors, employers of STEM tertiary and VET graduates, STEM education service providers, and STEM professional organisations.

TIAC Recommendation 1: That the State Government takes a leading role in strengthening STEM education in WA schools and actively contributes to a policy environment that supports STEM education.

Collaboration between government, universities and business

Industry and government are both end-users of T&I and must be consulted from the beginning, so that there is a focus on the business and operational objectives of these important sectors. However, their responses and needs should not result in the prescription of narrowly focussed research and innovation solutions. Instead, the aim should be on translation of these needs into principles and identification of the opportunities they may provide, if successfully addressed.

For example, if consumers were asked about what they wanted developed for their personal music requirements in the late 1990's the response would have been a cassette tape that could hold more music. In reality people wanted more music in a compact format and the iPod was the innovative solution released in 2001.

Government can play a catalytic role in industry – academia collaboration and technology transfer through funding incentives. However, any funding should be conditional and applied to specific functions, in contrast with the current silent investor model. This model does not imply that the Government should interfere with the research itself.

For example rather than the State Government providing a lump sum grant to a research group that is applying for, and subsequently awarded, a substantial Commonwealth grant, the State government could direct funds to specific support activities such as:

- Pre-application funding and practical support for the Business case preparation
 - Access to Government information
 - Support to engage with industry
 - Identification of end-user priority research areas
 - Intellectual Property strategy
- Research organisation operational support
 - Funding for a business development manager
 - IP protection support funding
- Technology Transfer
 - Promotion of opportunities through investor networks

This approach would enable the State to better capture the potential benefits that flow from the Commonwealth's investment in research in Western Australia.

TIAC Recommendation 2: In instances where the State Government provides funding to support research, a portion of the research grant should be specifically directed to industry engagement, commercialisation and technology transfer.

The culture encouraging publication over industry engagement in the Australian public research sector can pit academia against industry, rather than encourage them to work together as natural partners. In Australia there is a common view that if an academic works closely with industry then the research is being compromised. The view tends to be reinforced through the Commonwealth grant application processes and university funding models. Academic journal publications are central to research standing and successful grant applications, and industry liaison or collaboration has not historically been considered as a measure of quality. Therefore the current reward systems for researchers generally exclude industry collaboration – and implicitly encourage its exclusion. This situation contrasts with countries such as the USA and Israel, where research is seen as a clear and beneficial pathway to working in industry. The State Government could focus its leveraged research support to bridging the industry-university technology transfer gap and could provide support for paid industry internships as well as Industry Fellowships to establish joint appointments between industry and academe.

Whilst high level researchers may not structure their research on the basis of possible commercial outcomes, it is important that they are operating within an environment with a heightened awareness of the possible technologies that could arise from basic research. Furthermore, if certain technological outcomes are achieved, an environment should exist to encourage awareness of opportunities for innovation, and of any available incentives to pursue those possibilities, including early stage technology investors.

Industry and university collaboration has recently shown signs of improvement in Australia with the Global Innovation Index rising from 19th for collaboration in 2013 to 14th in 2014. However this once-off increase in a single attribute does not measure the level of commitment of the parties to that collaboration and it is not yet reflected in Australia's ranking for the translation of research into commercial outcomes. Specific State actions could greatly improve the depth of the collaboration and the flow of technology.

TIAC believes that business and the community do not receive full value from the public investment in research undertaken by universities, research institutes and within government. This does not suggest the research is of a low standard, rather that the value embedded in the research is not fully realised, because of failure to develop its full economic potential locally. TIAC consider this reflects the absence of sufficient incentives for both basic and applied researchers to work closely with business or to transfer technology to local companies. Nothing short of a cultural change is required, however it is unlikely to occur without strong incentives and sustained leadership and commitment from

the State Government. Targeted support to achieve this is possible and necessary at a State level.

TIAC Recommendation 3: That the State Government provides the leadership and incentives required to achieve a cultural change that will enable the State to optimise the potential commercial and public good benefits from the substantial research output within the State.

How research can lead to the development of new products, services and jobs?

Basic research by its nature creates new knowledge and concepts which may, or may not have commercial potential. Applied research involves the application of the outcomes of basic research to particular real world problems and challenges, and its outcomes include both new knowledge to be applied by companies and other organisations, and possible technologies and techniques which are of commercial relevance. Harnessing the value of applied research is the first step in the translation process. If a cost effective technology is then developed, the second translational step is to convert the technology into a cost effective commercial innovation with the potential for widespread adoption.

The process may require incorporation of other technologies and even development of new technologies (as occurred with development of the iPhone), and therefore is the highest risk stage of the translation process. The precompetitive nature of much of the work in this stage automatically leads to the need for institutional and/or government funding support until the commercial potential is evident and venture capital can be attracted. If the innovation is successful and has market value, capital is raised, new products and services are created, and new jobs and economic diversification result.

To optimise the potential opportunities from public investment in research, it is necessary to achieve a balance between basic research that can lead to the creation of disruptive technologies, or new health cures, and applied research which provides a more direct route to new technologies and innovation. The balance then needs to be complemented by Government incentives which encourage development of new technologies and innovations and foster closer relationships between researchers and industry, especially SME's. The State Government can also assist by optimising the environment for venture and risk capital investment; by encouraging engagement with key end-users; by assisting to highlight opportunities; and by addressing some of the cost issues that impact on successful commercialisation.

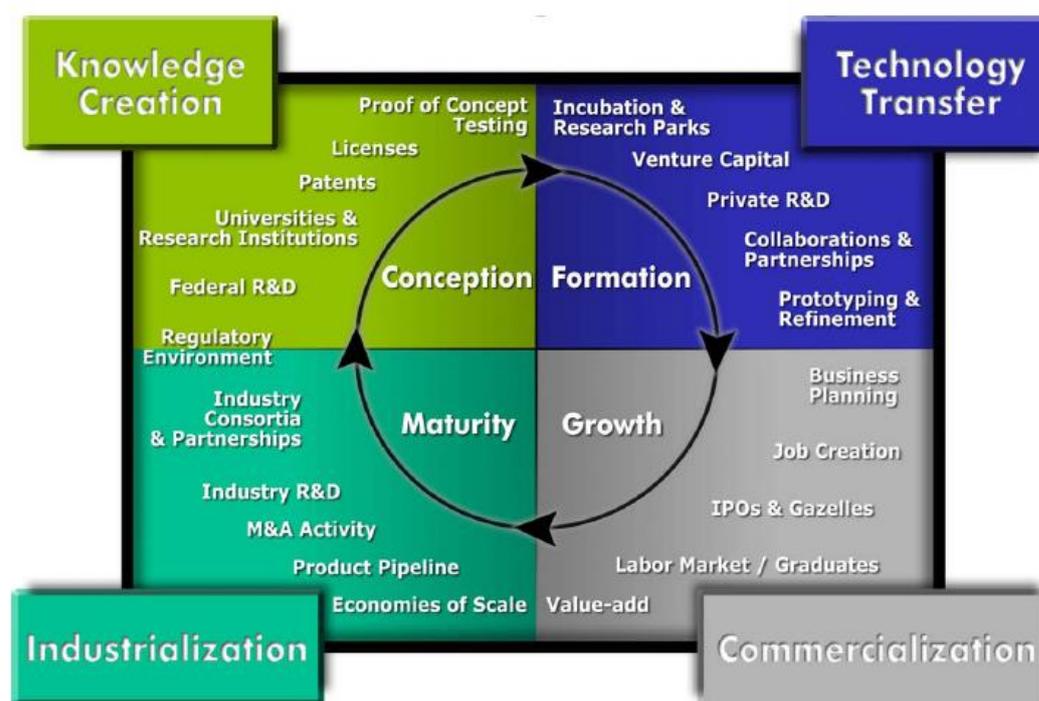
TIAC Recommendation 4: That the State Government acts to optimise the potential opportunities for WA from public investment in research by: providing incentives and encouragement for the development of new technologies; assisting their translation into innovations; and by providing a favourable environment for the commercialisation of successful innovations into successful enterprises that will diversify the State's economy and generate new jobs.

" The industrial landscape is already littered with remains of once successful companies that could not adapt their strategic vision to altered conditions of competition."

Abernathy, Clark & Kantrow, Harvard Business School

Figure 3 below indicates how research is integral to the business cycle, creating new products and services that in turn drive the economy.

Figure 3 – The innovation cycle



Source: New Economy Strategies, 2009

The challenges associated with financing and commercialising new technologies, products and services

Australia has a large corporate finance sector that is risk averse and not structured to finance, support and encourage research commercialisation. The situation is further hampered in Western Australia by a weak venture capital culture and a poor angel investor network. Therefore currently in Australia, to finance an innovation, the entrepreneur often needs to put a house ownership and family security on the line. Is this realistic and optimum, or does it scare entrepreneurs away and reinforce the negative image of failure? The State Government, as previously indicated, can support changes to Venture Capital Limited Partnership legislation and assist with angel investor networks.

Failure is treated very negatively in Australia, whereas in technology driven economies, such as Israel, the USA, South Korea, Canada and Singapore, failure is considered to be part of the learning experience. Australia has changed from a country of risk takers to a culture of risk avoidance and Government regulation has a role to play in changing the way risk is viewed.

"If you find it difficult to accept failure then you simply won't get any innovation because employees will be too frightened."

Sir Terry Leahy, Tesco

Not all sectors are risk averse. One opportunity in Western Australia is the junior mining companies that are risk takers and have capital reserves. While many listings are focussed on the resources sector, with the downturn in commodity prices and over-supply of some commodities, junior miners are looking for alternative investments. Such companies have several attributes: a propensity for risk, understanding of the corporate capital raising sector and an existing structure.

The junior miners do lack commercialisation skills and technical knowledge of other industries. There could be a role for the State Government to facilitate access to specialised knowledge and skills to improve outcomes and one example is the industry association, Ausbiotech, which has been promoting changes to encourage greater interaction of technology developers with the junior miner sector.

Further, all investors, including junior miners, need to be able to find the best opportunities. There is a role for State Government to assist technology developers to promote their good news stories to potential investors and end-users.

It is also important to have the right investment vehicle available to maximise tax benefits and minimise risk when a technology commercialisation fails. One specialised vehicle to do this is Venture Capital Limited Partnership (VCLP) company structures. Currently the VCLP structure is not available to investors operating in Western Australia, forcing potential investors to establish in other States. TIAC is aware the State Government has been

addressing this issue and considers it an important initiative to unlock both small and large investors.

TIAC Recommendation 5: That the State Government introduce the Venture Capital Limited Partnership legislation to Parliament at the earliest possible opportunity and widely advertise its implementation and consequences, once the legislation is approved.

The largest source of investment funds at present in Australia are the superannuation funds, banking sector and insurance companies. There is a need to understand the market failures that restrict major superannuation funds, insurance companies and banks from investing in the venture capital sector and to develop targeted low cost solutions to catalyse the investment sector, particularly once the VCLP structure is available.

Although large corporate entities do not want failure on their books, they need to better understand that failure in a portfolio of venture investments is acceptable. However, fast failure is better. Successful investment in high growth start-ups will help drive portfolio growth over the longer term.

"Innovation is a risky business, but not innovating is even riskier."

Anonymous

The Medical Research Commercialisation Fund is one example. The Commonwealth provides substantial research funding to health research, which is further supported by community donations and philanthropy. Despite the substantial research investment, commercialisation of health discoveries can take a very long time and be an expensive process. There is little risk capital to support health research commercialisation, and several attempts to unlock large venture funds were discontinued. Eventually Brandon Capital developed a model to address risk factors, scale and access to sufficient discoveries that were issues for the superannuation funds. Multiple jurisdictions were approached to contribute funds to offset some costs and risks leading to a substantial venture capital fund that commenced in 2007. Stage three of this venture commenced in 2015 having been expanded further with support from AustralianSuper, Statewide Super, HESTA, HOSTPLUS that have provided access to \$200 million in investment capital over 7 years.

Innovative investment models that focus on WA strengths and consider factors that impact major financial organisation can be developed to help commercialise research.

Not only is it important to engage with the large financial institutions and have the appropriate corporate structures to facilitate investment, there also needs to be access to mentors, entrepreneurial skills training and patient capital. There is a need to encourage angel or philanthropic investors. This may require a supportive environment for an angel

investors' network. Even with angel investors, they need access to a wide variety of research outcomes and innovation potential to be able to identify opportunities.

Given that very few inventions or advances are commercialised successfully and only a few receive venture funding there is a requirement for a significant pipeline of research outcomes, technology developments and innovation opportunities to flow to the market for consideration. The State Government has a role in getting opportunities beyond the laboratories and promoting them to the market.

When commercialising a new technology, access to funds is limited. One way to address this is to reduce costs. In the research sector, up-front costs are high and initial returns low. The Government should consider how up-front research and IP protection costs can be minimised to reduce innovation system costs at the very early stage, and encourage greater protection of new technologies. The State Government should work with university commercialisation offices to consider options to address this issue.

TIAC Recommendation 6: That the State Government takes a leading role in promoting new technological developments within the State, particularly in sectors which may generate investment interest, provided that the Government first addresses potential cost impediments associated with IP protection.

Often, but not always, it is not a single invention or advance that changes a market and creates a commercial opportunity. A major change through disruptive technology (derived from basic research) sometimes requires a whole series of related technologies and innovations to develop products and services that are reliable and consumer ready. The early computers were invented in the 1940's and 1950's. However, to reach the potential of the current disruptive technology required the invention of transistors, integrated circuits, microchips, memory reading devices, miniaturisation, rechargeable batteries, LED screens, touch screens, sensors, GPS and much more. The integration of other technologies, or further development of a technology to satisfy a market niche, can take significant time and therefore money invested in new commercial opportunities needs to be patient and up-front costs minimised.

When a technology is initially presented for commercialisation, regardless of it being an industrial or consumer product, the product is often not market ready and requires further development to complete with the final design adjustments critical to market acceptance. Design on its own should not be considered innovation, but it needs to be an integral component of the commercialisation process. The EU, China, India, Korea and Singapore have initiatives that focus on design support.

Models of development by which technological and service innovation could be encouraged in Western Australia.

As previously discussed, there is substantial research undertaken in Australia. The central issue is to have the resulting technologies flow to local business and to support the technology and innovation process so that the commercial benefits of the research investments are captured, and optimised, here in WA. This will require important cultural change within the research community and it is here that Government must take the lead. The State that most efficiently uses limited resources to facilitate the transition of T&I through to a commercial outcome will benefit most from the substantial Commonwealth investment in research.

Non-monetary approaches include: changing the grant system for applied research to require stronger industry end-user involvement, and establishing a local business engagement vehicle to facilitate industry access to new technologies. State Government agencies have an important role assisting industry engagement strategies as they work more closely with individual businesses within their jurisdiction by comparison to the Commonwealth.

Therefore TIAC considers that in instances where the State Government provides funding to support research, a portion of the research grant should be specifically directed to industry engagement, commercialisation and technology transfer.

TIAC also believes that where the Government is directly involved in research through its agencies, there should be encouragement of the commercialisation of that government-funded research by ensuring outcomes can be readily accessed by industry. The State Governments Intellectual Property Policy provides the framework for this to occur.

TIAC Recommendation 7: That the State Government actively encourages the commercialisation of government funded research by ensuring outcomes can be readily accessed by industry.

An example of Government support for technology transfer can be found in South Korea. In 2000, the Korea Technology Transfer Centre (KTTC) was established to bring together technology users and suppliers. The KTTC has been absorbed into the Korean Institute for the Advancement of Technology (KIAT) which plays a role as a manager of technology transfer and commercialisation measures. A similar model could be set up to support promotion and transfer of technology developed with public funds or within government.

There also needs to be a wide array of environments where researchers and industry can interact on a daily basis, including a wide spectrum of technology precincts integrating

industry and university in an environment that supports creativity – not just green leafy parks.

To minimise costs to innovation intensive industry and get better return on research investments there could be the creation of technology infrastructure common user facilities.

Regulations often capture and endorse the 'here and now', and therefore sometimes stifle better solutions developed through future innovation and research. TIAC believes that these constraints could be minimised if regulations are adjusted to manage, rather than avoid, risk, and to provide for a blanket concept of equal or better outcomes based on new technologies overriding any prescriptive requirements.

The business regulatory environment should be less punishing on technology commercialisation failure. It should be noted that failure through commercialisation and/or technology adoption must be viewed quite differently from that due to poor business management or fraudulent activity. Many regulations are implemented at a State level and should be considered for their impact on commercialisation of innovative solutions, legislation should not unduly increase risks or cost.

TIAC Recommendation 8: That the Government review existing regulations to ensure that they will not impede the development of innovative solutions to higher productivity, more cost effective administration, and the development of a vibrant T&I culture and industry in WA.

Large corporate investors should be encouraged, through government regulatory requirements, to develop approaches where opportunities are approached in a portfolio model so success offsets failure and minimises risk, rather than focussing on an individual failure.

Substantial State Government investment in technology and innovation can be justified on the basis of strategic economic benefit and diversification. For example Victoria, New South Wales and Queensland have active start-up scenes supported by their respective governments. Queensland has recently announced \$180 million in support to encourage innovation and Victoria has committed \$60 million. Similar incentives are urgently needed in Western Australia.

TIAC Recommendation 9: That the State Government, at the earliest possible opportunity, develop a substantial, five year T&I fund to signal its leadership and commitment to vigorously encouraging the development of a vibrant T&I sector in WA.

Other important considerations

Failure and Risk

The old Australian culture of “have a go mate” seems to be disappearing, influenced by government and large corporations that are risk averse, leading to a culture of risk avoidance and hence an allergy to failure.

Strangely, in situations where failure is likely and it would be wise to fail quickly, Governments may commit resources to avoid failure at almost any cost – a situation that has bad outcomes and is costly.

"It's fine to celebrate success, but it is more important to heed the lessons of failure."

Bill Gates, Co-founder Microsoft, entrepreneur and philanthropist

"Success is a lousy teacher. It seduces smart people into thinking they can't lose."

Bill Gates, Co-founder Microsoft, entrepreneur and philanthropist

Failure is a risk, but needs to be managed not avoided. Those countries that encourage innovation and the development of technologically based industries, such as Israel and USA:

- Manage and understand risk and failure
- See failure as a necessary learning experience
- Encourage quick failure for long term success

Risk avoidance does not necessarily mean mistakes won't happen, however the potential for economic growth and business competitive will be dampened.

" People who don't take risks generally make about two big mistakes a year. People who do take risks generally make about two big mistakes a year."

Peter Drucker, management consultant and author

WA Case Study that has had International Impact

Opposition to change is a major barrier to technology adoption, even for new ideas that do not require commercialisation. New knowledge that requires acceptance and utilisation can face opposition to change and Professor Barry Marshall AC, TIAC member, is a good example. While he and Dr Robin Warren AC, joint Nobel Laureates for 2005, identified the bacteria that cause a range of ulcers in 1984, the medical fraternity did not widely adopt the solution of an antibiotic regime to cure ulcers until 15 years later, even though there was

clear scientific evidence. The adoption of this research has resulted in a savings to the US health system estimated at US\$12 billion per annum. It has been estimated that this discovery saves the Western Australian health system about \$35 million per annum. Opposition to change can have even greater impact on a commercialisation activity that requires substantial funding.

In Western Australia at present, opposition to change is characterising discussion around electricity networks and taxi services. What will on-demand car services (taxis) look like when fleet suppliers sell virtual access to transport as required via driverless cars. Change needs to be embraced and encouraged.

Success in commercialising new technology should be celebrated and supported and the State Government can provide that leadership.

Western Australian Start-up Successes

Western Australia is a long way from major global markets, but according to many IT entrepreneurs, the distance and vibe in the Perth IT scene gives them the freedom to experiment. Some of the notable start-up successes that were created in Perth include:

Kanopy – Olivia Humphrey moved to Perth and established Kanopy Streaming, a streaming platform for students to watch documentaries. Originally based on a DVD sales model, the streaming service was developed in 2010 and now has 24 million students studying at over 2,500 institutions world-wide using the streaming service.

While the company has gone global it retains an office in Perth, with its headquarters now established in San Francisco. Kanopy, in order to expand, did have to establish operations closer to its market in the USA.

Canva – Canva is a graphic design platform allowing non-technical people to design publications and artworks. Launched in September 2013 the company now has over 4 million users for its free on-line service. The company had to secure funding by travelling overseas. Now well established, it is launching a more powerful fee-based service aimed at more sophisticated business users and already has 200,000 pre-registrations. For further insight go to www.canva.com.

High Technology Defence Suppliers

Austal – Western Australian company Austal, a designer and builder of aluminium fast ferries has established operations in the US to manufacture and supply the advance Litterol Combat Ships and the Joint High Speed Vessel for the US navy based on its technologically

advanced designs. Austal continues to operate in Perth and the global operation has strengthened its operations.

Poseidon Scientific Instruments – established 25 years ago on Sapphire loaded oscillator technology developed by the Managing Director Jesse Searles at the University of Western Australia. Poseidon invested at least 15% of its annual turnover into a Research and Development program that improved the technology into world leading defence radar technology increasing accuracy. It was 300% better than its nearest competitor. Poseidon oscillators allow radar signal clarity that gives astonishing accuracy for land, sea and airborne radar. The company was bought by multinational defence technology company Ratheon in 2010, but continues to operate facilities in Perth.

Further Information

Should the Economics and Industry Standing Committee wish to discuss this paper further with TIAC please contact the TIAC Secretariat on email tiac@commerce.wa.gov.au