# *Maintaining Australia's advantage: Institutions & Innovation*

*The Australian Council of Learned Academies*

*July 2014*

Policy paper

pwc

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# 1 Introduction

## 1.1 Overview

PricewaterhouseCoopers (PwC) has been engaged by the Australian Council of Learned Academies (ACOLA) to compile a research report on Australia's institutions and innovation. Specifically, the objective of this report is to examine the role of Intellectual Property (IP) as a key linking factor between institutions and innovation, and how the strength of this linkage can improve Australia's comparative advantage.


The case of IP has been chosen to illustrate the complexity of the innovation system, and how institutions can either help to alleviate or exacerbate the problems of poor innovation outcomes.

A major aim of the report is to examine the link between IP institutions and systems, and assess whether the existing situation facilitates the commercialisation of inventions efficiently and effectively for the benefit of Australia, and what is then required to provide Australia with a comparative advantage in this area.

This report is structured as follows to accomplish this objective.

- Section 2 provides a description of institutions, their importance and characteristics in contributing to the overall wellbeing and prosperity of nations, and how strong institutions can facilitate innovation. It also includes an assessment of how Australia's institutions benchmark internationally.

- Section 3 examines the role and importance of the innovation system in contributing to economic growth, and the conditions for this to occur. An assessment is provided on how Australia benchmarks internationally in an evolving innovation context.

- Section 4 introduces IP as an important, but complex, link between institutions and innovation, and examines how IP supports the role and characteristics of institutions. It is important to note that IP covers a range of instruments (outlined in Appendix A), but this report focuses specifically on patents as these are aimed at protecting inventions as part of the innovation process. As indicated by McDonald, 'the patent is the instrument of the intellectual property system best known and most closely associated with innovation'.[1] Both conventional and opposing views on IP issues are presented including on the objectives and effectiveness of the existing IP system and areas where reform is proposed, such as the excessive cost to Small and Medium Enterprises (SMEs) in protecting and defending their patents. The state of IP in Australia including an assessment against international benchmarking is also discussed.

- Section 5 presents a number of important IP issues in an Australian and international context, including existing and emerging IP issues and trends as well as an IP scenario and its implications for Australia.

- Sections 6 and 6.1 aggregate the information within the report and contain an analysis of Australia's comparative advantage and key findings.

- Section 8 concludes the report by using the findings to suggest certain policy solutions to improve and/or maintain Australia's position.

[1] McDonald (1).

# 2 Institutions and governance

## 2.1 Role and importance of institutions

Institutions are 'the rules of the game in a society or, the humanely devised constraints that shape human interaction.'[2] North defines institutions as 'the humanly devised constraints that structure political, economic and social interaction. They consist of both informal constraints (sanctions, taboos, customs, traditions, and codes of conduct), and formal rules (constitutions, laws, property rights).'[3] The notion of an institution embodies several elements: governance such as formal and informal rules of behaviour, ways and means of enforcing these rules, procedures for mediation of conflicts, sanctions in the case of breach of the rules, and organizations supporting market transactions.[4] There are various types of institutions such as economic, legal and social.[5]

The quality of institutions is important in contributing to growth and innovation in an economy. Over the past 25 years there has been debate and research among economists and policymakers about different factors and their relative importance in creating the conditions for sustainable growth and economic performance of countries. This debate includes institutions, macroeconomic stability, education, the quality of governance, and the increasingly important role of technology and innovation, among others.[6]

North[7] and Hodgson[8] describe the role of institutions as:

- creating order and stability, and reducing uncertainty
- reducing transaction costs
- opening up new possibilities for change.

Institutions are developed depending on how well these different features operate. They can create or destroy incentives for individuals to engage in trade, invest in human and physical

2 Acemoglu (2)

3 North (3)

4 World Trade Organisation (4)

5 Hodgson (5)

6 European Business School (6)

7 North (3)

8 Hodgson (5)

capital, and can bring about the incentives to engage in research and development (R&D) and work effort.[9]

Market activities involve the interaction of human beings, and institutions exist to reduce the uncertainties that arise from incomplete information concerning the behaviour of other individuals in this process of human interaction. Institutions can act through a number of channels as shown in Figure 1.

**Figure 1: Channels available to institutions[10]**


9 World Trade Organisation (4)

10 World Trade Organisation (4)

Institutions require governance which determines the rules by which they operate. The World Bank indicates that 'good governance is epitomised by predictable, open and enlightened policy making, a bureaucracy imbued with a professional ethos, an executive arm of government accountable for its actions, a strong civil society participating in public affairs, and all behaving under the rule of law'.[11] The hallmarks of good governance are transparency, effectiveness, rule of law, lack of corruption, voice and participation. Effective and efficient innovation systems and IP institutions need to meet these roles, which is elaborated on later in the report.

Economic, political, legal and social institutions can support economic growth and innovation by:

- creating incentives for investment in physical or human capital or adopting more efficient technologies. An example could be the structure of property rights[12] as owners of land, corporate shares or IP, are unwilling to invest in the improvement and upkeep of their property if their rights as owners are not protected[13]

- creating incentives for politicians to work towards creating a growth enhancing environment, as opposed to (for example) encouraging corruption and pursuance of personal gain at great cost to the rest of society[14]

- facilitating the coordinated activities of private and public institutions leading to high-technology industrialisation. An example is the East Asian success in knowledge intensive industries based on the ability to develop mechanisms for 'collective competence acquisition' by managing technology diffusion.[15]

However, the role of institutions goes beyond the legal framework. Government attitudes toward markets, freedoms and the efficiency of its operations are also very important. Excessive bureaucracy and red tape, overregulation, corruption, dishonesty in dealing with public contracts, lack of transparency and trustworthiness, inability to provide appropriate services for the business sector, and political dependence of the judicial system all impose significant economic costs to businesses and slow the process of economic development.[16]

## 2.2 Benchmarking Australian institutions

In general, Australia benchmarks well in institutions and governance compared to all countries globally (see Appendix B).

The World Economic Forum (WEF) rated Australia out of 148 countries in institutions in 2012.[17] Australia is grouped among the 37 most developed and wealthiest countries which are

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11 North (7)

12 MacDonald (1), North (3)

13 World Economic Forum (9)

14 North (7)

15 Department of Industry (10)

16 World Economic Forum (9)

17 World Economic Forum (11)

characterized as 'innovation-driven' at more than $17,000 gross domestic product (GDP) per capita. In the 'innovation-driven' stage, 'wages will have risen by so much that they are able to sustain those higher wages and the associated standard of living only if their businesses are able to compete with new and unique products. At this stage, companies must compete by producing new and different goods using the most sophisticated production processes and by innovating new ones'.

Among all 148 countries, Australia is rated 23rd in institutions and is in the top 15 per cent. However, among the 37 'innovation-driven' countries, Australia performs only averagely with the top 10 being Finland, New Zealand, Singapore, Sweden, Norway, Switzerland, Netherlands, Hong Kong, Luxembourg, and the UK.

Table 1 highlights that Australia is rated highly in areas such as judicial independence, flexibility of police services, ethical behaviour of firms, strength of auditing and reporting standards, and efficacy of corporate boards. Out of the top 50 however, Australia is rated low in burden of government regulation, wastefulness of government spending, and transparency of government policymaking.

**Table 1: WEF global competitiveness ranking of institutions in Australia in 2012**

| INDICATOR | RANK |
|---|---|
| Property rights | 30 |
| Irregular payments and bribes | 20 |
| Judicial independence | 16 |
| Favouritism in decisions of government officials | 27 |
| Wastefulness of government spending | 56 |
| Burden of government regulation | 128 |
| Efficiency of legal framework in settling disputes | 30 |
| Efficiency of legal framework in challenging regulations | 30 |
| Transparency of government policymaking | 51 |
| Business costs of terrorism | 46 |
| Business costs of crime and violence | 37 |
| Organised crime | 27 |
| Flexibility of police services | 16 |
| Ethical behaviour of firms | 19 |
| Strength of auditing and reporting standards | 14 |
| Efficacy of corporate boards | 7 |
| **Total institutions** | **23** |

Transparency International's Corruption Perceptions Index ranked Australia as 9th out of 177 countries in 2013.[18] Further, Cornell University and Insead ranked Australia 11th out of 142 countries for institutions in 2013 (shown in Table 2).[19] The top 10 are all wealthy and developed countries.

**Table 2: Global Innovation Index 2013 ranking Australia in institutions**

| INDICATOR | RANK |
|---|---|
| Political environment | 14 |
| Regulatory environment | 14 |
| Business environment | 11 |
| **Total institutions** | **11** |

Australia's worst ranking is the 'burden of government regulation' (128th in the WEF benchmarks). A number of reports have been released on this topic in Australia. Some of the reasons for this low ranking (according to the Chairman of the Productivity Commission) are that:

- rising income levels have brought increased expectations or demands on governments to meet a range of social and environmental goals that may previously have not been seen as priorities (or considered unaffordable). Examples of this include the expansion of regulatory controls in areas such as industrial relations, public health and safety and pollution
- as a community Australia has a much lower tolerance of risk than even 30 years ago.[20]

[18] Transparency International (12)

[19] Cornell University and Insead (33)

[20] Banks (14)

# 3 Innovation

## 3.1 The role and characteristics of innovation

The Australian Innovation System Report 2013 indicates that Australia generates only 3 per cent of the world's knowledge, so the economy relies on innovations generated elsewhere.[21] The majority of Australian firms are modifiers and adopters of innovation and technology.

In order for Australia to have an effective innovation system, it requires a number of necessary conditions including 'creating and changing institutions (such as patent laws, tax laws, environment and safety regulations, R&D investment routines, cultural norms) that influence innovating organisations and innovation processes by providing incentives for and removing obstacles to innovation'.[22] Other necessary conditions are shown in Figure 2.

**Figure 2: Necessary conditions of an effective innovation system**


[21] Department of Industry (15)

[22] Department of Industry (15)

For the OECD innovation 'is about the successful exploitation of new ideas and the invention, development and commercialisation of new technologies, services, business models and operational methods. Innovation is thus related to a process connecting knowledge and technology with the exploitation of market opportunities for new or improved products, services and business processes compared to those already available on the market'.[23] In most instances, innovation will involve a rise in factor productivity and, all other things being equal, a rise in living standards. Innovation is thus about creating, using and exploiting new knowledge and is an essential element in economic development of a country.

Excellent innovation and strong institutional environments are increasingly influencing economies' competitiveness, according to the WEF's Global Competitiveness Report 2013-2014.[24] 'Particularly important will be the ability of economies to create new value-added products, processes, and business models through innovation. Going forward, this means that the traditional distinction between countries being 'developed' or 'developing' will become less relevant and we will instead differentiate among countries based on whether they are innovation rich or innovation poor.' Although substantial gains can be obtained by improving institutions, in the long run, standards of living can be largely enhanced by technological innovation. Technological breakthroughs have been the basis of many of the productivity gains that economies have historically experienced.

An analysis of the relationship between total factor productivity (TFP) and innovation related variables confirms the heterogeneous relationship between innovation variables (domestic stock of knowledge, imports of knowledge, and human capital) and productivity.[25] Results reveal the extent to which observed differences in technology adoption patterns and the levels of endowment of such resources can explain differences in TFP dynamics across countries. A finding that may have important implications for innovation policies is that the higher the level of investment in human capital, the higher the level of investment in domestic innovation, and the higher the response of TFP.

As indicated, innovation is a central driver of economic growth and development. It enables firms to compete in the global marketplace, and is the process by which solutions are found to social and economic challenges.[26]

If countries and firms are to take advantage of innovation, it is important to understand how innovation has changed and continues to evolve. Over the past 50 years, the understanding of innovation has moved from a science-based linear model (Figure 3) to a complex process 'from idea to commercial product' (Figure 4). As innovation has become more complex and focused on knowledge and the development of intellectual assets, the role of protecting and commercialising this IP has become more important.

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23 OCED (16)

24 WEF (11)

25 Cubel (16)

26 World Intellectual Property Organisation (17)

**Figure 3: Linear model of innovation**


**Figure 4: 'Idea to market' model of innovation**

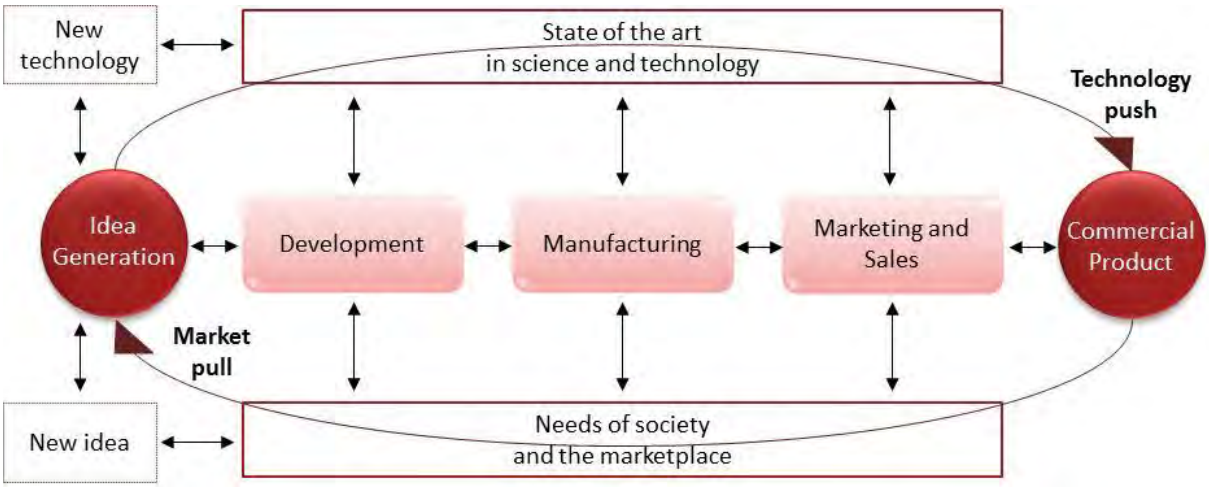


Table 3 summarises the changes that have occurred in the innovation process from first and second generation (technology push and market pull) to models (third to sixth generation) which emphasise: interaction between elements and the feedback between them, links to society and the market place, accumulation of knowledge, creating collaborative networks and linkages.[27] The EU indicates that 'open innovation is now used as a synonym for modern, highly dynamic and interactive processes. Linear and sequential mindsets are slowly changing to be more opportunistic, more daring and more action-oriented. We need to move from having 'perfect plans for yesterday' to an innovation culture which fosters experimentation and prototyping in real-world settings. This new innovation culture leads to simultaneous technological and societal innovation and encouragement. We need to be daring and also experiment with disruptive approaches as gradual improvement does not properly reflect the potential that the omnipresent, fast-developing ICT provides for parallel innovations. Real-world settings with experimental approaches turn the user into a co-creator in the innovation process, instead of just being a recipient of the services or products'.[28]

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[27] Rothwell (18)

[28] EU (19)

**Table 3: Development of innovation models (adapted from Rothwell)[29]**

| Model | Generation | Characteristic |
|---|---|---|
| **Technology push** | First | Simple linear sequential process<br>Emphasis on R&D and science |
| **Market pull** | Second | Simple linear sequential process<br>Emphasis on marketing as the market is the source of new ideas for R&D |
| **Coupling model** | Third | Recognizing interaction between different elements and feedback loops between them<br>Emphasis on integrating R&D and marketing |
| **Interactive model** | Fourth | Combinations of push and pull models and integration within the firm<br>Emphasis on external linkages |
| **Network model** | Fifth | Emphasis on knowledge accumulation and external linkages, systems integration and extensive networking |
| **Open innovation** | Sixth | Internal and external ideas as well as internal and external paths to market can be combined to advance the development of new technologies |

## 3.2 Benchmarking Australian innovation

In general, Australia performs well in the front end of the innovation process (such as the quality of scientific institutions), but less so in outputs (such as commercialisation) and the requirements for contemporary innovation (such as collaboration and partnerships). Details can be found in Appendix B.

The WEF rated Australia 22nd amongst 148 countries in innovation in 2012 as shown in Table 4.[30] Similarly as for institutions, Australia is average among 'innovation-driven' countries.

[29] Rothwell (18)

[30] WEF (11)

### Table 4: WEF global competitiveness ranking of innovation in Australia in 2012

| INDICATOR | RANK |
|---|---|
| Capacity for innovation | 23 |
| Quality of scientific research institutions | 8 |
| Company spending on R&D | 30 |
| University-industry collaboration in R&D | 15 |
| Government procurement of advanced technology products | 57 |
| Availability of scientists and engineers | 34 |
| PCT patents, applications per million population | 19 |
| **Total innovation** | **22** |

Cornell University and Insead ranked Australia out of 142 countries for innovation in 2013 with the results shown in Table 5.[31]

### Table 5: Total Global Innovation Index 2013 ranking Australia in innovation

| INDICATOR | RANK |
|---|---|
| Research and development | 7 |
| Innovation linkages | 36 |
| Knowledge workers | 3 |
| Knowledge absorption | 43 |
| Knowledge creation | 28 |
| Knowledge impact | 66 |
| Knowledge diffusion | 63 |
| Intangible assets | 65 |

[31] Cornell University and Insead (13)

The 'idea to market' contemporary model of innovation indicates that the purpose of invention is to support the innovation process, but innovation also requires collaboration, R&D, managerial capability, market understanding, and financial support to result in commercialisation. An area where Australia ranks poorly is in company spending on R&D and innovation linkages.

Many of these issues are constraints for Small and Medium Enterprises (SMEs) as highlighted by Withers and Gupta.[32] A constraint includes access to funding for SMEs 'as their size effectively precludes them from the funding sources more reliably available to their larger, more well-established counterparts. For example, capital (equity or debt) markets are ruled out to a significant extent due to their size. Nor do such firms have the organisational, financial, and legal expertise to negotiate or execute these deals'.

As previously indicated, one of the roles of institutions is to open up new possibilities for change which is a major purpose of innovation.[33] The international benchmarking has serious implications for Australia's productivity and growth.

- Countries with better institutions tend to have more intense R&D than Australia, which is essential for higher growth.[34]

- The institutional conditions of countries and sectors can be judged according to whether they facilitate or impede innovations. Recent studies also stress the developmental potential of technologies, the size of markets, the possibility to finance and acquire ownership rights of innovations, the structure of the respective sector, and investments in publicly available knowledge as most important factors which trigger and structure innovations.[35] This is a concern for SMEs in Australia which face a number of obstacles including access to funding.

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32 Withers and Gupta (20)

33 North (3)

34 Wang (21)

35 Bauer (22)

# 4 Intellectual Property

## 4.1 The role of IP institutions

This section deals with the role and importance of patents drawing on the 'conventional' view of IP. To ensure a balanced approach, an opposing view is discussed in Section 4.2.

A common view by all proponents of the IP system is most probably encapsulated by "an efficient and accessible intellectual property system that provides benefits to all" as proposed by WIPO. IP Australia's purpose is providing an intellectual property system that promotes innovation, investment and international competitiveness for the benefit of all Australians.

These objectives imply the following:

- Costs and regulations should facilitate access to all (including SMEs)
- Benefits should not only be to inventors and companies who patent, but the system should facilitate exploitation of inventions via commercialisation that increases a country's development and competitiveness

There are a number of views of whether Australia's existing IP institutions and system meets this objective.

McDonald describes the conventional view of the patent system as 'the outcome of a bargain between the inventor and society by which society grants the inventor certain rights to his invention in return for the inventor's disclosure of whatever it is he has invented. Without these rights, it is conventionally argued, the inventor would be unable to reveal his invention for fear that others would steal it. Consequently, the inventor would have little incentive to invent, and society would forego the invention and all its benefits. Thus, the patent system neatly offers the inventor the opportunity to reap some reward from his invention, and provides society with an invention it would not otherwise have had'.[36] In this conventional view, the patent system bestows its benefits by giving intangible resources - the information of invention – the legal status of tangible property.

The importance of IP institutions and systems in promoting productivity, economic growth, and innovation is emphasised by World Intellectual Property Organisation (WIPO) and IP Australia. IP is the link between institutions and innovation in that it allows for the protection and exploitation of knowledge and intellectual assets which are an important ingredient for Australia to access and utilise new and emerging technologies.

IP Australia indicates that IP remains important for innovation and Australian inventors.[37] As investment in ideas grows across Australia and the world, IP rights and the intangible assets they protect are becoming more important over time. IP rights exist to provide an incentive to invest in innovation. 'A well-functioning IP system can foster innovation and

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[36] McDonald (1)

[37] IP Australia (23)

encourage the flow of ideas. It can benefit innovators, investors, and consumers alike, as well as the broader community in incentivising investment in innovation while encouraging the public dissemination of new ideas. It has been estimated that between 1995 and 2006, intangible investment contributed more than 20% of productivity growth in EU countries and the US. A similar exercise for Australia showed that intangible investment represented 20% of labour productivity growth between 2003-04 and 2007-08'.

WIPO points out that economic research has come to recognise the crucial role played by patent institutions in shaping innovation incentives.[38] Patent institutions perform the essential tasks of ensuring the quality of patents granted and providing balanced dispute resolution. The choices patent offices' face can have far-reaching consequences on incentives to innovate. These choices include the amount of fees to charge, how to involve third parties in the patenting process, how best to make use of ICT and the level and type of international cooperation to pursue.

Therefore, there is a strong link between the effectiveness of innovation and IP. The Review of Australia's National Innovation System in 2008 emphasised that IP 'is critical to the creation and successful use of new knowledge, particularly the cumulative use of new knowledge as an input to further, better knowledge'.[39] IP Australia indicates that 'the fundamental role of an IP system is to provide an incentive to invest in innovation. This is achieved by granting temporary exclusive commercial control to the inventor in exchange for public disclosure of information about their invention. A well-functioning IP system gives innovators and investors the confidence that their innovations will be protected from imitation while permitting public disclosure of those new ideas'.[40]

As indicated in section 3, the nature of innovation has evolved in the last 20 years. This has resulted in the increasing importance of IP which provides protection for creativity and innovation in the marketplace and allows the owner to potentially benefit from the practical applications of their ideas. Table 6 illustrates some of these changes and the effect on IP rights and systems which need to be considered in strengthening the IP regime in countries. These changes include increased importance of investing in intangible assets, increased collaboration as innovation becomes more 'open' and moves from a sequential internal company process to a complex multidisciplinary effort with a balance between incremental and more disruptive innovation.

### Table 6: Changes in innovation and the effect on IP

| Changes in innovation | Effect on IP |
|---|---|
| Investment of historically unprecedented amounts in the creation of intangible assets – new ideas, technologies, designs, | This has increased demand for protection of IP, and relevant questions are whether the design of the current IP system is fit for this new innovation landscape, and how best to cope with the growing demand to protect |

38 WIPO (17)

39 Department of Industry (24)

40 IP Australia (23)

| | |
|---|---|
| brands, organisational know-how and business models[41] | and trade ideas.[42] |
| Increased collaboration[43] | IP attracts industry partners to work cooperatively with publicly funded research organisations (PFROs), and assists PFROs in obtaining additional research revenue; IP helps to transfer certain types of knowledge between PFROs and industry, and to translate that knowledge into new technologies, products and services. However, concerns have been expressed in Australia and internationally that IP may be inhibiting the formation of collaborations.[44]<br><br>Economists have long recognized that innovation seldom happens in isolation; one firm's solution to a problem typically relies on insights gained from previous innovation. Similarly, in competitive markets, firms innovate simultaneously and develop technologies that may complement each other. The rapid increase in the number of patent filings has, in turn, raised concerns about patents hindering cumulative innovation.<br><br>Some governments promote collaboration among firms through fiscal incentives and related innovation policy instruments. In addition, there are incentive mechanisms for sharing patent rights – for example, discounts on renewal fees if patent holders make available their patents for licensing. However, as greater technological complexity and more fragmented patent landscapes have increased the need for collaboration, there arguably is scope for creative policy thinking on how best to incentivise the licensing or sharing of patent rights.[45] |
| Increasing importance of brands in commercialising goods and services.<br><br>Branding generally complements innovation. In particular, evidence has shown that branding is one of the most important mechanisms for firms to secure returns on investments in R&D. Accordingly, firms that invest | Companies rely on brands when they commercialise their goods and services. Trademarks are by far the most widely used form of registered IP. The demand for trademarks has intensified to unprecedented levels due to the shift towards services, and the emergence of the internet. It has spearheaded the creation of new firms, business models and services; the digital marketplace has increased the importance of brand reputation, as consumers engage in transactions at a distance. At the same time, brand owners face online sales of counterfeit |

41 WIPO (17)

42 WIPO (17)

43 Advisory Council on Intellectual Property (26)

44 Advisory Council on Intellectual Property (26)

45 WIPO (17)

more in innovation also invest more in branding. Similarly, innovative firms that most frequently rely on patents, industrial designs and copyright also most frequently rely on trademarks.[46]

goods and other forms of misuse of their trademarks, increasing their need for legal protection.[47]

A further important area for IP is in international trade which is described in the Trade Related Aspects of Intellectual Property Rights Agreement (TRIPS). International trade is of topical interest in Australia with the on-going negotiations to conclude Free Trade Agreements with Japan and South Korea, and the importance to Australia of the US Free Trade Agreement. In April 2014 the new Japan-Australia Economic Partnership Agreement, as well as the new Korea-Australia Free Trade Agreement were announced. Japan and South Korea are Australia's second and third largest export markets behind China. Collectively these three East Asian nations account for half of Australia's entire export trade. Australia is continuing to negotiate bilateral Free Trade Agreements with China, India and Indonesia. The South Korean agreement includes a chapter on IP, and has the objective of providing appropriate protection and enforcement of IP rights.

The importance of trade in innovations such as new technologies is within the following context: 'Australia produces about 2% of the world's research and Australians have been responsible for notable innovations including the pacemaker, Gardasil (the innovative vaccine for cervical cancer), and the international standard for Wi-Fi communications but Australia needs the other 98% of the world's research in order to grow. So, how do better ideas diffuse throughout the world and how do they come to be applied in places far from their origin? It might appear that the place to begin is with universities, research centres and patent licensing but, in fact, the most common way that businesses acquire ideas is by buying goods'.[48]

The main objective of TRIPS is to introduce a measure of compulsion (enforceable by sanctions) into the international arena, and in particular to improve Intellectual Property Rights (IPR) protection in developing countries, where most of the IPR infringing activities tend to occur. Most of the relevant provisions of TRIPS were already incorporated into Australian law and enforcement practices before the adoption of the agreement. The most significant legislative change brought about by TRIPS in Australia was the increase in the patent protection term from 16 to 20 years. All current Australian IPR laws are compatible with the minimum standards required by TRIPS.[49]

The benefits of including an IP Charter in the Australia-USA Free Trade Agreement has been summarised as the recognition of the importance of a strong IP regime to economic growth through trade and investment. 'Closer alignment in intellectual property laws and practices provides Australian exporters with a more familiar and certain legal environment for the export of value-added goods to the US. Likewise, the ability of Australian innovators to

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46 WIPO (27)

47 WIPO (27)

48 Tabarrok (28)

49 Productivity Commission (29)

attract investment from the US will be enhanced through greater familiarity and confidence of those investors with our legal system.'[50]

In this new setting, the role of IP has fundamentally changed. The increased focus on knowledge, the rise of new innovating countries and the desire to protect inventions abroad have prompted a growing demand for IP protection. IP has moved from being a technical topic within small, specialised communities to playing a central role in firm strategies and innovation policies. Understanding these innovation trends and the associated role of IP is important in order for public policy to support new growth opportunities. The essential questions to ask are whether the design of the current IP system is fit for this new innovation landscape, and how best to cope with the growing demand to protect and trade ideas.[51]

## 4.2 Alternative views on the IP system and institutions

In general, patents are viewed as having many advantages such as protection of inventions and designs. However, patents and the patent system are controversial with opposing views describing the potentially negative consequences of the existing system. Some indicate, for example, that patent protection should be abolished, that patents are too expensive for some SMEs, and that patents have become a license for litigation. This debate between the benefits and concerns about the effect of IP on society is described as 'an unfortunate tension regarding modern intellectual property. On the one hand, intellectual property has never been of more importance to a wide range of actors, both public and private, within society. On the other hand, intellectual property has become more or less complex in its substance and regulation by the law. As a result there is a non-trivial 'knowledge gap' in significant sections of the community about intellectual property'.[52]

A 2013 report by the Grattan Institute indicates that the number of patent lawsuits (particularly in the US) has increased dramatically because in the software, semiconductor and biotech sectors, a new product may use hundreds or even thousands of patented ideas.[53] This means that each patent owner has a license and an incentive to sue for a greater share of the pie. Overall, the cost of defending against patent lawsuits are in the order of $40-$80 billion and most of these costs are not transfers from alleged infringers to alleged innovators but instead are net costs of wasted effort, energy and time. In the view of the author, many firms like Google, Microsoft and Apple have bought large patent portfolios to gain access to new technologies, and to threaten to counter-sue any firm trying to veto their innovation. This includes small firms who are often the source of radical and disruptive innovation.

In their 2008 book, Against Intellectual Monopoly, Michele Boldrin and David Levine conclude that patents are not necessary to provide protection for either innovation or creative expression and should be eliminated.[54] The authors note the many flaws of the US

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50 DFAT (30)

51 WIPO (17)

52 University of Wollongong (31)

53 Grattan Institute (28)

54 Gilbert (32), Boldrin (33)

system of IP protection and argue that other means are available to appropriate the benefits of invention and creative expression. 'The intent of a patent is to allow an inventor to profit by reducing competition from imitation for a period of time. The limitation on competition typically raises the price and lowers the use of an invention. This limitation of competition makes consumers worse off and, absent perfect price discrimination, incurs a deadweight loss. In return, society is supposed to get greater investment in innovative effort; i.e., promotion of the progress of science and the useful arts, which can ultimately benefit consumers'.[55] High costs for intellectual inputs or restrictions on the availability of these inputs make future innovation and creative expression more difficult and costly. Boldrin and Levine point out that the costs of IP should be weighed against the benefits from the extra innovation that IP brings about. There is a fundamental tension in patent policy – that the incentive to invent is provided in the form of an impediment to the diffusion of new technology. Boldrin and Levine's main point is that time in market for a lead inventor may be sufficient to obtain good returns to R&D expenditure, and hence patents are frequently entirely unnecessary - the key issue is speed of copying. Protection in the patent system means suppression of competition even where inventions are independently invented.

Drahos points out that IP rights are paradoxical in that the way they create an incentive to generate new information, the distribution of which is in the public interest, is by restricting access to the information created.[56] It is thus essential to strike a fine balance between the incentive function and the distributive function of IP laws, and between the public and the private interest. Within a competitive market, where Drahos equates competition with imitation, naturally self-interested actors are attracted to strategies which will enable them to restrict imitation.

Barton believes that the patent system needs to be reformed to decrease costs.[57] Legal costs in the IP system are growing. In the USA, lawyer's costs alone are about $10,000 to obtain a patent, and $1.5 million to litigate a patent. Three reforms are proposed to respond to this issue:

1 *Raising the standards for patentability*. By reducing the number of patents for minor inventions, the total cost of the system can be reduced. It is often possible to obtain a patent on almost any new product, although it may be a relatively narrow patent drafted around previous patents. Reducing the number of patents would also help to solve the problem of defensive patent portfolios. Many firms attempt to protect themselves by acquiring patent portfolios (many of which are minor inventions) on their own so that they can deter litigation through the threat of reciprocal suit.

2 *Decreasing use of patents to bar research*. There is a risk that broad basic patents on fundamental research processes may deter and complicate follow on research. However, it is crucial to balance incentives to initial innovators against incentives to follow on innovators. The author's view is that the balance is being weighted too heavily in favour of the initial innovator.

3 *Easing legal attack on invalid patents*. Many patents are issued erroneously. The best way to improve patent validity is to issue better decisions in the first place.

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[55] Boldrin (33)

[56] Drahos (34)

[57] Barton (35)

Improvement also depends on having good databases. A possible reform is to weaken the presumption of validity and to have a patent declared invalid.

MacDonald indicates that the patent system is open to abuse.[58] Examples of this include:

- the patent affords protection only when the patentee can afford to enforce his rights, which may mean that the poor have no protection at all
- the inventor only discloses the information required by the patent system, not the information required by society to replicate and develop the invention
- the delay between the filing of an application and the publication of a specification may be far greater than the pace of change in some industries. In high technology the passage of time rapidly erodes the value of information
- the criteria by which patents are granted do not correspond to the contribution patent information might make to innovation. Details of inventions which can make no conceivable contribution are frequently published, as are those of patents designed to mislead or obstruct.

## 4.3 State of IP in Australia

Investment in IP products as a share of GDP in Australia was 2.6 per cent in 2013. This compares unfavourably to the US where the share in 2013 was 4.7 per cent. Australia's place in the global value chain of ideas is one where the value of IP imports exceeds IP exports, and Australia runs an IP trade deficit. In 2013, Australian entities paid nearly $4 billion to foreign entities and received $748 million from foreign entities in charges for the use of IP. 'An IP trade deficit does not necessarily indicate a poor economic outcome as long as imported technology helps to improve productivity of Australian entities. It is interesting to note that Australia's IP deficit is with developed countries, namely traditional technology partners such as the US and Europe, and an IP surplus with most countries in non-OECD Asia, South America and the Middle East. Looking in more detail at the categories of IP trade in 2012, the leading IP exports are computer services and research and development'.[59]

In Australia there are 24,000 to 28,000 patent applications every year, of which about half are granted. However, only about 10 per cent of these applications originate in Australia and of these only five to six per cent are from public sector research organisations. Of the patents granted, about a third each are in civil engineering/building, mining, and consumer goods/equipment, with only 15 per cent in IT.[60]

The Australian Intellectual Property Report 2014 indicates that the vast majority of applications were from non-residents, who have consistently made 90 per cent of filings in Australia for the last decade.[61] This is similar to the situation in Canada, where non-Canadians filed 86 per cent of applications. In Australia, applicants from the US remain

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58 MacDonald (1)

59 IP Australia (23)

60 Department of Industry (36)

61 IP Australia (23)

the single largest source of non-resident applications followed by Japan, Germany and Switzerland.

The preponderance of non-resident patent applications in Australia is confirmed by an analysis of patent data applications between 1991 and 2001.[62] Of 100 companies with the most patents in Australia, only one is Australian. Major holders of patents are selective in the technologies they patent in Australia—few semi-conductor companies take out Australian patents, while pharmaceuticals and chemicals have a larger share than in the USA.

On average over the past ten years, Australian residents have filed three times as many patents overseas as they have in Australia. The top three filing destinations for Australians are the US (43 per cent of the total in 2012), the European Patent Office and China. These three received 60.7 per cent of Australian patent applications filed abroad from 2010 to 2012.[63]

The revealed technological advantage index (RTA) assesses in which technologies Australia has a comparative advantage relative to the rest of the world. 'Australia's technological strengths for patenting in Australia are: civil engineering, building, mining; consumer goods and equipment; transport; handling; printing; agriculture and food machinery; consumer goods, and equipment'. The highest RTA indexes are: civil engineering, building, mining, agriculture and food machinery.[64] These areas reflect Australia's historical focus on agriculture and mining, while newer technology areas such as IT are relatively low.

Internationally, patents granted to Australians by the US Patent and Trademark Office was 0.6 per cent of all patents granted,[65] and Australia was 24th out of 124 countries for total patents (national and abroad).[66] It is interesting (and concerning) to note that Australia's patent activity was higher 120 years ago where Australia accounted for 2.4 per cent of patent applications in the USA.[67] 'Australia's contribution to the international market for technological ideas in the early 1890s was unlike that of other neo-European societies of the time (with the exception of Canada), palpable and diversified enough to include non-resource-related fields. Although these findings betoken no glorious efflorescence of technological ingenuity in nineteenth-century Australia, they do suggest that, when placed in a proper comparative perspective, Australia's technological performance was perfectly respectable'.

### *4.3.1 The cost of patenting in Australia and internationally*

A concern about the patent system in Australia is that there are a number of factors which potentially inhibit patent applications, particularly by SMEs. A survey by IP Research Institute of Australia (University of Melbourne) in 2005 indicated that the most important

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62 Moir (37)

63 IP Australia (23)

64 Department of Industry (36)

65 North (7)

66 World Intellectual Property Organisation (38)

67 Magee (39)

factors were cost related: cost of enforcement, and cost of the application.[68] The major issues were the costs of legal professionals associated with applying for IP protection, rather than the application cost itself. SMEs were also reluctant to enforce rights through litigation due to costs and the uncertainty of the outcome.

The average estimated cost of an Australian standard patent, including legal costs, is between $8,000 and $12,000, depending on the complexity of the application.[69] The Productivity Commission in 2013 reported that in 2010, the cost of an Australian patent over 20 years was estimated at about US $20,000.[70] Of the total cost, renewal fees accounted for about 60 per cent, patent legal fees about 35 per cent, while application fees accounted for less than 5 per cent. Among key comparable markets relative to Australia, total costs were about 50 per cent higher in Germany and Japan and between 10 and 20 per cent lower in Canada, China, the UK and the USA.

WTO information on PCT international applications (PCT is the Patent Cooperation Treaty, and allows an applicant to seek simultaneous application in 148 countries) indicates that International filing fee is about US$1450 and a search fee is US$410 to US$2400.[71] However, the major costs are pre-grant national fees, which include translation of application, filing fees, acquiring services of local patent agents or attorneys. In addition, there are maintenance costs to keep the patents alive. Obtaining and maintaining patents on a single invention in the 50+ major countries of the world is reported to cost more than US$500,000 over the 20-year life of the patent.[72]

The 2011 Hargreaves review of IP in the UK highlighted the difficulties faced by SMEs in accessing the UK patent system.[73] A major issue from this review was the 'cost of IP management' by SMEs. Measures announced in the UK since this review for SMEs include:

- increase in small firms R&D tax relief to 200 per cent in 2011 and 225 per cent in 2012
- the introduction of a Patent Box provision which will provide a reduced 10% corporate tax rate for profits from patents
- the launch of a new Seed Enterprise Investment Scheme.

IP institutions ideally should support the role of institutions to reduce transaction costs, and provide stability. A concern about the patent system in Australia is that there are a number of factors which potentially inhibit patent applications, particularly for SMEs, which includes the high cost of patent protection and defence of the patent. A review of the effectiveness of the innovation patent system is currently underway by the Advisory Council on Intellectual

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68 IP Research Institute of Australia (40)

69 IP Australia (41)

70 Productivity Commission (42)

71 WTO (43)

72 WIPO (44)

73 IP Office UK (45)

Property.[74] The review, which is expected in 2014, will assess whether the innovation patent system stimulates innovation by Australian SMEs.

## 4.4 Benchmarking Australia in IP

Table 7 below benchmarks Australian IP activity compared to selected countries and regions. This indicates that Australia lags behind Canada, the USA, and the UK for invention disclosures and patents from research expenditure.[75]

**Table 7: Patent activity in Australia versus selected countries/regions (2010/11)**

| | Australia | Canada | Europe (excl UK) | UK | USA |
|---|---|---|---|---|---|
| **Invention disclosures** per US$100m in research expenditure (number) | 28.8 | 41.6 | 28.4 | 43.7 | 35.8 |
| **US patents issues** per US$100m in research expenditure (number) | 2.0 | 4.1 | 3.5 | 7.8 | 7.7 |

## 4.5 International comparisons

Internationally, countries patent systems share many commonalities as many countries are signatories to the TRIPS agreement which sets down minimum standards for many forms of IP regulation. However, this section provides examples of where there are differences and how the Australian patent system compares to countries such as USA, Europe, UK, Canada, Japan, South Korea, and China.[76]

### Patentable subject matter

Table 8 summarises how a selected group of countries which are comparable to Australia define what can be patented.

**Table 8: Patentable subject matter definitions**

| Country | Patentable subject matter |
|---|---|

[74] Advisory Council on Intellectual Property (46)

[75] Department of Industry (47)

[76] Productivity Commission (42)

| | |
|---|---|
| **Australia** | '[An] invention is a patentable invention ... if the invention ... is a manner of manufacture ... is novel ... involves an inventive step ... is useful ... [and] was not secretly used [in the past]' |
| **Canada** | '[An invention means] any new and useful art, process, machine, manufacture or composition of matter, or any new and useful improvement in any art, process, machine, manufacture or composition of matter' |
| **China** | '[An invention means] any new technical solution relating to a product, a process or improvement thereof' |
| **European Patent Convention** | 'European patents shall be granted for any inventions, in all fields of technology, provided that they are new, involve an inventive step and are susceptible of industrial application' |
| **Japan** | '[An invention means] a highly advanced creation of technical ideas by which a law of nature is utilised' |
| **South Korea** | '[An invention means] the highly advanced creation of a technical idea using the law of nature' |
| **UK** | 'A patent may be granted only for an invention ... [if] the invention is new ... involves an inventive step ... [and] it is capable of industrial application [and not subject to exclusions]' |
| **USA** | 'Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent ...' |

### Application processes

Processes are similar for patents in comparable markets to Australia. All comparable markets have a 'first-to-file' system, like Australia. Until recently, the US was the exception as it had a 'first-to-invent' system, but moved to a first-to-file system in March 2013.

### Provisional applications

In some comparable markets (for example, New Zealand and the US) provisional applications are available. Grace periods (where an applicant can apply for a patent when the invention has already been disclosed subject to conditions) apply in many countries including the US, Japan and Canada. Grace periods do not apply in most European countries.

### Deferred exam system

Unlike the US or UK, Australia operates a deferred exam system, where applicants have up to five years to file a request for examination after filing their application. This difference in systems could explain the longer pendency period in Australia, although applicants can request expedited exams.

## Comparison to China

With the rapid development of bilateral trade in the last decade, China has become Australia's largest trading partner. It is important to compare some key issues between the Australian and Chinese patent laws and practices.[77]

An Australian standard patent is very similar to a Chinese invention patent. Both have a maximum term of 20 years however, one significant difference is that Australian standard patents for pharmaceuticals can be extended by 5 years to a maximum term of 25 years, whereas the patent term is not extendable in China.

In general, a patentable invention in Australia must be new, inventive or innovative. Almost all products, processes and methods that meet these requirements are patentable in Australia, including the diagnosis and treatment of diseases, computer software (which can be industrially applied) and business methods (except pure business methods that do not have a physical element). In China medical treatments and business methods are not patentable.

[77] Wu (48)

# 5 IP issues and trends

## 5.1 IP scenarios

In the past thirty years the pace of innovation has been relentless and this is expected to continue. Underpinning these scientific and technological advancements is the patent system. It allows for the granting of territorial exclusive rights in return for public disclosure to enable others to build upon the innovation of their predecessors. However, the globally interconnected information world of today brings with it complex and dynamic pressures which are already impacting on the ability of the existing patent system to cope, and changes will inevitably have to be made.

The European Patent Office (EPO) developed a set of "challenging, relevant and plausible" scenario stories which describe four possible future worlds at the global level.[78] The EPO scenarios have been described as 'a uniquely detailed and creative evaluation, based on extensive research and a wide range of viewpoints on the options facing society and their potentially fateful consequences. Future scenario planning projects relating to IP will benefit greatly from the pioneering effort reflected in the EPO report'.[79]

The focal questions these scenarios seek to answer are: How might IP regimes evolve by 2025? What global legitimacy might such regimes have?

The EPO identified the five most important driving forces that will create the greatest uncertainty causing the system to become increasingly complex and unpredictable.

- *Power*. Traditionally, power has been concentrated in the hands of established authority such as governments. However, globalisation has redefined this power structure with established sources of authority challenged by multinational corporations (MNCs), civil society organisations, international bodies, emerging economies and regional trade blocs, as well as other players such as private equity investors.

- *Globalisation*. National economic systems have been integrated through international trade, investment and capital flows as well as increased social, cultural and technological interaction.

- *Rate of change*. There is a growing tension between the pace of global economic markets, the rate of change in technology and short-term political cycles on the one hand; and, on the other, the long-term cycles of political and legal institutions such as the IP system, as well as human psychology and the environment.

- *Systemic risks*. International flows of finance, people, goods and ideas have created unprecedented global interdependence. There are also major risks created by dependency on the complex natural and man-made systems that support humanity. The nature of these risks is changing from traditional ones (such as natural hazards) to complex

[78] EPO (49)

[79] Gollin (25)

systemic risks. These have been created by the many stresses and uncertainties that together could threaten the integrity of interconnected systems whether they're economic, social or environmental.

- *Knowledge*. The nature and availability of knowledge is changing and society is increasingly questioning the monopoly ownership conferred by patents. At the same time, the speed of technological obsolescence and the clogged IP system make it harder to derive value from traditional patent usage. Technology now makes information more accessible and counterfeiting simpler, eroding the control a patent holder once exerted. As such, heavy-handed IPR enforcement is also likely to alienate the public.

### 5.1.1 EPO Scenarios for the Future

The EPO developed four scenarios of which are briefly discussed in turn below and are summarised in Figure 5.

**Market Rules:** New forms of subject matter – inevitably including further types of services – become patentable and more players enter the system. The balance of power is held by MNCs with the resources to build powerful patent portfolios, enforce their rights in an increasingly litigious world and drive the patent agenda. They operate with the key goal of the growth of shareholder value and patents are widely used as a financial tool to achieve that end. In the face of ever-increasing volumes of patent applications, various forms of rationalisation of the system occur and it moves to mutual recognition of harmonised patent rights.

**Who's Game?** The developed world increasingly fails to use IP to maintain technological superiority. New entrants try to catch up so they can improve their citizens' living standards but many developing world countries are excluded from the process, and work instead within a 'communal knowledge' paradigm. Nations and cultures compete and IP has become a powerful weapon in this battle. The new entrants become increasingly successful at shaping the evolution of the system, using it to establish economic advantage, and adapting the existing rules as their geopolitical influence grows. Enforcement becomes increasingly difficult and the IP world becomes more fragmented.

**Trees of Knowledge**: Diminishing societal trust and growing criticism of the IP system result in its gradual erosion. The key players are popular movements – often coalitions of civil society, businesses, concerned governments and individuals – seeking to challenge existing norms. Multiple voices and multiple world views feed popular attention and interest, with the media playing an active role in encouraging debate. The main issue is how to ensure that knowledge remains a common good while acknowledging the legitimacy of reward for innovation.

**Blue Skies:** There is a split in the patent system. Societal reliance on technology and growing systemic risks force this change; the key players are technocrats and politicians responding to global crises. Complex new technologies based on a highly cumulative innovation process are seen as the key to solving systemic problems such as climate change, and diffusion of technology in these fields is of paramount importance. The IP needs of these new technologies come increasingly into conflict with the needs of classic, discrete technologies. In the end, the patent system responds to the speed, interdisciplinarity and complex nature of the new technologies by abandoning the one-size-fits-all model: the former patent regime still applies to classic technologies while the new ones use other forms of IP protection, such as the licence of rights. The patent system increasingly relies on technology, and new forms of knowledge search and classification emerge.

**Figure 5: Summary of European Patent Office IP scenarios**

| | Market rules | Whose game | Trees of knowledge | Blue skies |
|---|---|---|---|---|
| Scenario | Business as dominant driver.<br>The story of consolidation in the face of a system that has been so successful that it is collapsing under its own weight. | Geo-politics as dominant driver.<br>The story of conflict in the face of a boomerang effect that strikes the dominant players as geopolitical balances shift and competing ambitions emerge. | Society as dominant driver.<br>The story of erosion in the face of diminishing societal trust and growing criticism of the patent system. | Technology as dominant driver.<br>The story of differentiation of the patent system in the face of global crises, societal reliance on technology and the threat of systemic risks. |
| Key Questions | Could ever-increasing volumes overwhelm the patent system?<br>Will the desire for patent rights increase, or will there be new forms of IP protection?<br>How might issues of enforcement impact the further development of patent rights as a financial asset?<br>Does the patent system offer business protection in the face of ever-increasing competition? | What are the main drivers for future geopolitical change? How might they steer globalisation?<br>What impact might this have on existing structures and institutions?<br>How might this impact the IP system globally and regionally?<br>Does the patent system serve the world's various interests fairly? | How can public and private interest in IP be reconciled for the benefit of society?<br>How are the ethical and moral dilemmas raised by technology reflected by the patent system?<br>Where should the limits to patentability be drawn and by whom?<br>Does the patent system benefit society? | How can technical expertise be identified and measured?<br>How can valuable knowledge be protected in emerging and complex technological fields?<br>Should the one-size-fits-all system be abolished to meet the needs of different technological sectors, where will the boundaries be drawn?<br>Can system adapt to changing nature/pace of technology? |
| Testing & Legitimacy | ...and a way to test this is to see whether business maintains its use of patent protection in the era of globalisation.<br>Business says 'yes' to IP; other views are irrelevant. | ...and a way to test this is to look at least developed countries and other developing countries.<br>No global legitimacy; competing national and regional IP systems. | ...and a way to test this is to examine whether it achieves a balance between rewarding innovation and providing goods and knowledge to the public.<br>No legitimacy for classic monopoly rights; legitimacy for open and collaborative innovation. | ...and a way to test this is to check whether a bifurcated patent system can better respond to the needs of technology and society.<br>IP reform restores global legitimacy. |

### 5.1.2 *Looking ahead and implications for Australia*

Australia is part of the global IP regulation system and is subject to global trends like comparable countries, including those in Europe. The potential futures for IP as described in the EPO scenarios are relevant for Australia to consider as part of the ongoing review of the IP system by IP Australia and the Australian Advisory Council on Intellectual Policy.

Scenarios describe possible futures and it is impossible to predict which scenario (or combination) may occur. However, based on the previous analysis and trends, the following highlights some important issues for Australia to consider in a future IP system.

Traditionally, the world of patents has been viewed through the familiar lens of the **Market Rules** scenario. The patent system, which evolved over centuries to support an industrialised world, now has to adjust to meet the needs of tomorrow's post-industrial era. Globalisation accelerates global competition, which in turn encourages more innovation as new products are marketed and sold worldwide. This also leads to more exchanges of ideas and technology. The implications of this scenario are that there will be more players and patents, with the balance of power held by large companies who also have the power to enforce their rights with increasing litigation. The challenges for Australia in this scenario will be to:

- ensure that the system allows all players to participate fully which requires removing obstacles for SMEs such as the high cost of protection and litigation
- ensure that IP Australia is structured to ensure low cost and efficient handling of IP issues under large increases in patent applications
- ensure that the IP system in Australia adapts to the changing innovation process which will see large investments in the creation of intangible assets and a large increase in IP.

The **Whose Game** scenario describes a system that must also accommodate the multiple players and stakeholders from different cultures and with different worldviews and aspirations who are working towards different goals within a global environment. The implications of this scenario are that the power of WIPO and developed countries and large companies weakens, and developing countries (such as China and India) start to shape the system as their geopolitical influence grows. The challenge for Australia will be to find a way of meeting the specific developmental requirements of disparate nations at global level because a system that blocks the access of poor people to essential drugs or food will eventually lose its credibility. The importance of Free Trade Agreements with adequate IP provisions between Australia and developing countries will increase.

The world of **Trees of Knowledge** will result in civil society becoming increasingly engaged in the IP debate, and this interest is likely to significantly shape the agenda of the 'commons' debate. The implication for Australia is that the importance of effective engagement and collaboration with non-State organisations to increase trust between government and people will become increasingly important.

The **Blue Skies** world will result in innovation and technologies become increasingly complex, fast, and interdisciplinary and with different models emerging and being used simultaneously, increasing the tensions on the patent system. The implications for Australia are that the IP system and institutions need to create and adapt to new forms of IP, and use new technologies to improve the IP system such as new forms of knowledge search and classification.

## 5.2 Emerging IP trends and issues

The Australian Intellectual Property Report 2014 summarises some important emerging trends for patents. Firstly, patent applications are increasing globally as well as in Australia. WIPO reported in 2013 that global demand for IP rights increased across all types of IP and that patent applications had reached "unprecedented levels". This trend is mirrored in Australia with patents increasing by 13 per cent in 2013. Studies indicate this global increase is related to subsequent patent filings or additional filings of the same invention in multiple countries, rather than increased research productivity. Inventors are now more likely to seek protection in multiple countries than in the past, which reflects, in part, the increasingly global nature of commerce.

Secondly, the major increase in patent applications is in Asia. In 1995, Asia's share of international patent applications was 8 per cent and by 2013 this had increased to 40 per cent, with China the biggest source. The number of resident patent applications per million people in China was eight in 1995 compared to 396 in 2012. The comparable figure for Australia was 99 in 1995 and 116 in 2012. Australian entities are following this trend and are filing more patents in Asia now compared to the 1990s.[80]

IP issues are receiving international attention at government and general public levels. Several trends – globalisation of technology and skill, emergence of new technologies, and the rapid development of emerging economies – have jointly elevated the importance of IP, both politically and commercially. It is attracting significant interest from governments in the context of trade agreements, competition, and innovation. Topics such as copyright and patent law have become the focus of general public concerns about their tendency to restrict, block and inhibit creativity.[81]

Even though Australia has a well established IP regime, both Australian[82] and international[83] researchers have identified emerging IP issues and challenges which need to be addressed. These include:

- IP, especially copyright, in the digital economy
- patenting and innovation, particularly research
- dealing adequately and effectively with indigenous IP
- complex relationship between copyright and freedom of expression, such as the impact of copyright on the creative arts
- complexity of trademark law such as the apparent shift from a harm-based approach to a rights-based approach

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80 IP Australia (23)

81 Bowrey (50), Carnegie Endowment for Asia Business Council (51)

82 Bowrey (50)

83 Carnegie Endowment for Asia Business Council (51)

- IP issues regarding plants such as the patenting of gene sequences, access to plants for research and the role of Plant Breeders Rights
- IP and commercialisation
- counterfeiting, including risks to public safety and health
- emergence of new technologies.

### *5.2.1 Key Issues*

This section provides additional detail and examples on some of the IP issues that are of significant importance to Australia.

#### IP in the digital economy

The Australian Government has identified the importance of the emerging digital economy and of ensuring that copyright law provides incentives for investment in innovation and content while also allowing appropriate access to that content so that Australia's needs in the internet age are met, both domestically and internationally.

The 'digital economy' includes conducting communications, financial transactions, education, entertainment and business using computers, phones and other devices. This is a broad definition and covers many areas and an example is discussed further below (the case of libraries, archives and digitisation).[84] Australia has competitors in the digital economy — comparable countries that have also adopted a focus on promoting a local digital economy.

The digital environment is changing the way in which libraries, archives and cultural institutions approach fulfilling their public missions to preserve and provide access to cultural heritage and knowledge. In particular, there is growing expectation that institutions will be able to provide public access to works held in their collections in digital formats, for example, via websites, online databases or online repositories.

Digitisation may also offer benefits to copyright owners. For example, out-of-print works may now be able to generate returns that were not possible before. On the other hand, it may also result in a loss of control as to how works may be used, and may be detrimental to the owner's economic interests.

Promoting fair access and wide dissemination of copyright works is an ongoing aim of copyright policy in Australia with the aim to 'ensure that cultural and educational institutions can access, and promote access to, copyright material in the online environment on reasonable terms', having regard to the 'provision of adequate remuneration to creators and investors'. A critical question asked by the Australian Law Reform Commission is 'whether the *Copyright Act* needs to be amended to permit greater digitisation of, and wider access to, works held by libraries and archives.'[85]

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[84] Hudson (52), ALRC (53)

[85] ALRC (53)

## IP and publicly-funded research

It is increasingly important for universities and research institutes to commercialise research and protect IP. This is driven by financial considerations and the objective of transferring research to make an impact in the broader community.[86] However, a 'balance is needed when considering the role of public support for commercialisation activities in universities, public research agencies and businesses. Placing undue emphasis on commercialisation for financial gains may have unintended effects'.[87] There is also a view that 'if you allow commercial considerations to drive research and development at universities you ignore the fact that most real groundbreaking research is curiosity driven. It's the groundbreaking research that actually does most to alter our quality of life'.[88]

It is important to ensure that there are national guidelines for how IP should be managed in a balanced way for publicly funded research, and that these should be effectively implemented by publicly funded research organisations which include universities and research institutes with majority or total public funding.

The Productivity Commission identified a range of potential impediments to commercialisation and diffusion, particularly in universities, that may merit action. These include the following points below.

- There appears to be an excessive variety of arrangements for transferring IP to firms, often within the same university, which increases the costs for firms seeking to commercialise university research.
- Some universities appear to have poor governance structures and incentives for commercialising IP, such as insufficient sharing of the benefit among the relevant parties.
- Only the largest research universities are likely to be able to develop dedicated commercialisation arms of sufficient scale and expertise to operate effectively. More flexible arrangements, including the use of private sector intermediaries, may allow universities to draw on the commercial expertise they need in a more efficient and cost-effective way.
- Universities can sometimes find it difficult to sell marketable IP to business because the concepts have not been adequately demonstrated ('proof-of-concept').[89]

The Australian Government has developed National Principles of Intellectual Property Management for Publicly Funded Research which aim 'to provide guidance for the ownership, promotion, dissemination, exploitation and, where appropriate, protection of IP generated through Australian Government funded research by public sector institutions'. The principals 'were formed taking into account the need to encourage a culture of collaboration within the research sector and between researchers and industry; and to allow for more

[86] Reid (54)

[87] Productivity Commission (55)

[88] Patten (74)

[89] Productivity Commission (55)

effective dissemination of new technologies, processes and ideas, especially to small and medium sized enterprises'.[90] Principles and policies include the following.

- Australian research institutes will make every reasonable effort to gain benefit for Australia from IP. This may involve protection or making the IP publicly available in a timely manner.

- Ownership and the associated rights of all IP generated as a result of Australian Government competitively funded research will initially be vested in the research institutions receiving and administering the grants as a way of recognising the inventive contribution made by the research institutions. IP generated as a result of collaborative endeavours between research institutions will vest as agreed between those institutions.

- Research institutions must have policies relating to the ownership and availability for exploitation of IP generated as a result of Australian Government competitive funding. These policies will foster the most valuable use of this IP by industry and commercial ventures, governments, and the research sector. Means of fostering this value may include: making the IP openly accessible through licensing and accessibility arrangements which allow for its use and re-use, including potentially for commercial exploitation and; protecting the IP through licensing and accessibility arrangements which provide exclusive opportunities to undertake commercial exploitation.

- The policies must meet certain conditions including: upholding the academic right to publish; having ways of addressing cases where IP impinges, or potentially impinges, on the cultural, spiritual or other aspects of indigenous peoples; and, providing guidance on the licensing of copyright.

- The policies must meet the criteria for publishing under the terms of open access licences. This is explored in the below case study on the case of open access publishing.

The Australian Academy of Science pointed out in 2012 that:

- the Academy recognises that a set of National Principles can help guide research institutions, research managers, researchers to maximise the benefits of publicly funded research, provided there is no marked increase in cost in terms of time and finance

- given that the resources required to pursue IPRs are limited, institutions should be encouraged to focus only on pursuing IPRs and patents that are most likely to bring commercial benefits

- protecting IP where there is no commercial advantage of development should be avoided to save valuable resources and to encourage further research

- it must be recognised that the choice between the protection of IP and the rapid release of research findings into the public domain may at times be in conflict; each case should be considered individually, and needs to recognise the importance of acting in the national interest

[90] Drahos (34)

- the principles do not apply to research being conducted by or for government departments and agencies (e.g. by CSIRO). There might be real benefit in the research community taking a consistent approach and adopting the National Principles for all government funding where IP may be generated.[91]

## The case of open access publishing

Open access means unrestricted online access to peer reviewed scholarly journals. This can occur via authors self archiving their articles in an open access repository or by publishing in an open access journal.

Open access is supported by a number of influential organisations in Australia. The ARC (Australian Research Council) and NHMRC (National Health and Medical Research Council) indicate that 'the Australian Government makes a major investment in research to support its essential role in improving the wellbeing of the Australian society. To maximise the benefits from research, publications resulting from research activities must be disseminated as broadly as possible to allow access by other researchers and the wider community'.[92]

The Australian Academy of Science's mission 'is to promote scientific excellence and disseminate scientific knowledge. The Academy supports recent efforts towards disseminating research through open access publishing'.[93]

Open access publishing is controversial and raises IP (particularly copyright) issues which need to be dealt with. This contrasts with the traditional academic journals in which the copyright has to be transferred from the author(s) to the journal publisher. Open access journals will either let authors retain copyright or ask authors to transfer copyright to the publisher. In either case, the copyright holder will consent to open access for the published work. When the publisher holds the copyright, it will consent to open access directly. When authors hold the copyright, they will insure open access by signing a license to the publisher authorising open access.[94]

There are many benefits to open access publishing. This is reflected in the ARC's policy to ensure that the findings of publicly funded research are made available to the wider public as soon as possible. Both the research community and the public gain from knowledge derived from ARC funded research, and both wish to derive maximum benefit from these outputs.[95]

The Association of Learned and Professional Society Publishers indicates the following benefits of open access publishing:

- free access for all to research information (i.e. journal articles)
- access is immediate and no restrictions on re-use

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91 Australian Academy of Science (57)

92 ARC and NHMRC (58)

93 Australian Academy of Science (59)

94 WHO (60)

95 ARC and NHMRC (58)

- research is often funded by the taxpayer, therefore the taxpayer has a right to read it
- effectiveness of research will be maximised if access is maximised.[96]

However, there are some challenges and controversial issues. Curtin University has raised IP issues which academics need to be aware of when placing articles/papers in online repositories.

- When articles/papers are placed in online repositories that are accessible to the wider community, the University needs to be mindful of copyright and other considerations. Before placing articles, conference papers etc. into an online repository or personal web page, academic staff should take care that the article/paper does not contain materials (such as graphics, artwork, diagrams, etc.) in which the copyright is held by a third-party. If the article/paper does contain such copyright-protected material, the academic will normally need to obtain permission from the copyright owner to publish it online.
- Many publishers stipulate that they will only accept material that has not been published or accepted for publication elsewhere. This may pose problems if academics deposit an early working paper in an online repository, because in doing so the working paper is effectively being 'published'. If the working paper is assigned an International Standard Serial Number (ISSN) it is even more likely that it will be regarded as having been published. If the academic subsequently submits the paper in substantially unchanged form to a journal publisher, the publisher may not be willing to accept it because it has already been published. If the academic fails to declare the previous form this may also have copyright consequences.[97]

The Australian Academy of Science warns that managing the transition to open access publishing will be complicated, as existing publication arrangements are the product of many models developed in many countries over many years.[98] In transitioning to different models of publishing it is vital that high quality peer review and the on-going publication of scientific knowledge should not be impeded.

The Association of Learned and Professional Society Publishers raises the following concerns:

- very few 'general public' access specialist journals, for example the readership of the British Medical Journal is only 2 per cent patients and 4 per cent general public
- publishing costs money, including online systems
- self-archiving may threaten subscriptions and some journals may close down

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96 Association of Learned and Professional Society Publishers (61)

97 Curtain University (62)

98 Australian Academy of Science (59)

- open access can cause confusion as to which is the definitive, citeable version of an article.[99]

### *Examples of what Australian organisations are doing*

The ARC and NHMRC have introduced an open access policy, where 'it is expected that any material published in respect of an ARC-funded research activity will be included in the institutional repository'.

The University of Queensland 'supports the underlying principles of open access by making publications freely available online as soon as possible or within 12 months of publication'. The policy is based on the ARC Open Access Policy and the NHMRC Dissemination of Research Findings. In addition, the University of Queensland recommends that transfer of copyright to the publisher be avoided.[100]

### *What is required going into the future?*

The Australian Academy of Science believes the transition to an open access publishing environment will require government, funding councils, research councils, learned societies, universities, researchers, librarians and publishers to work together to develop a sustainable, transparent, cost-effective and high quality open access publishing environment.[101] The Academy offers the following general principles to inform consideration about the transition to open access publishing:

- the government, other researchers, and the wider community should not have to pay to access the research findings of publically funded research
- making the findings of publically funded research freely available through open access publishing should be encouraged
- publically funded research findings should be disseminated as broadly as possible, and as soon as possible after their publication
- publishing, financial, copyright and other barriers that sometimes prevent researchers from making their research freely available through open access publishing should not inhibit and/or delay the publication of research findings
- a flexible and planned approach from funding providers will be necessary to help researchers transition to an open access publishing environment
- the decision on where to publish work should always rest with researchers who should develop a publication strategy cooperatively with those responsible for managing publication expenditure budgets

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99 Association of Learned and Professional Society Publishers (61)

100 University of Queensland (63)

101 Australian Academy of Science (59)

- the quality and integrity of scholarly publishing must be maintained through the continued use of the peer review process.

## New and emerging technologies to support advanced manufacturing

A major opportunity for Australia to compete with low-cost, high-volume production is through advanced manufacturing technologies. As stated in a recently released report by CEDA in April 2014, 'advanced manufacturing is often associated with niche products such as biopharmaceuticals or defence technology but that is only one part of the picture. Economies that have had the most success in advanced manufacturing are those that recognise it is not just about products – advanced manufacturing includes the full suite of activities from the concept, research and development and design stages all the way through to post sales services. With the digitisation of the product development process, we are seeing design, production planning, engineering, manufacturing and services merging into one unit, instead of being sequential. Production operations will be more efficient and flexible with rapid innovation cycles'.[102]

The role of technology is also highlighted as playing a significant role in equipping manufacturers to produce flexible, complex and responsive solutions to enhance their international competitiveness. There is a need to consider IP issues related to these new and emerging technologies to support advanced manufacturing, such as CAD and 3D printing as design and prototyping tools.

## The case of 3D printing

3D printing makes it possible to create an object by creating a digital file and printing by laying down thin layers of plastic or other substances until the three-dimensional object is built up.[103] 3D printing has the following advantages over traditional cast or mould manufacturing:

- complex structures traditionally manufactured in multiple parts can be produced in one shot
- 3D printed items can be lighter and stronger requiring less maintenance than traditionally crafted products
- rapid validation of new designs speeds up product development and commercialisation
- customisation is easy
- on-site production simplifies the supply chain and can reduce warehousing and transport costs
- 3D printing uses fewer raw materials, generates less waste and is more energy efficient.

There are many existing and potential applications for 3D printing including jewellery, dental products (crowns, bridges and implants), medical devices (hearing aids and prostheses), and spare parts (for aircraft and automotive).

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[102] CEDA (64)

[103] Modaq (65), IPO UK (66), Jewell (67), WIPO (68), Bradshaw (69), Rimmer (70), Taylor Wessing (71)

3D technology is developing rapidly with the worldwide dataset for published 3D printing patents equating to over 4,000 patent families in 2013. It is interesting that Australia rates highly as a country where innovation in this technology is taking place. The Relative Specialisation Index (RSI) for each applicant country has been calculated by the Intellectual Property Office of the UK to give an indication of the level of invention in 3D printing for each country compared to the overall level of invention in that country. Australia has the highest RSI value which shows a high degree of specialisation in this technology.

As a rapidly emerging technology, 3D printing has major IP challenges and implications for patents and trademarks, such as safeguarding against unauthorised copying and transmission of digital files.

### *Infringing acts and infringers*

Although many patents are for complex products with a number of constituent parts, there are some simple patented products that are capable of being produced by 3D printing. For instance, simple items where the invention is the combination of a number of features, e.g. plastic laboratory equipment with patented 'twist to lock' sealing mechanism between parts, could be produced by 3D printing. 3D printing can produce some more complex items with moving parts which could have patent protection for instance certain medical devices. In addition, small parts could be 3D printed and then assembled to form a patented product or used to replace broken parts from a larger patented product.[104]

Unauthorised commercial production of patented products by 3D printing may constitute an act of patent infringement by the user of the printer. In addition, the keeping, using, offering for disposal or disposing of the resulting infringing product can amount to infringing acts. There is a defence where otherwise infringing acts have been carried out for private, non-commercial purposes. This defence is likely to apply to many of the patented products that are produced by users at home for personal use.

Whilst it seems clear that the manufacture of a whole patented product, for instance the plastic laboratory equipment described above, will constitute patent infringement, the position regarding the manufacture of spare parts and their incorporation into patented products (regardless of whether they were produced by 3D printing or by traditional manufacturing methods) is not as clear-cut.

In some cases, the replacement of a part of a product protected by a patent will constitute a non-infringing "repair" rather than an infringing "making" of the patented article. In a recent case, the Supreme Court found that the making of replacement bottles for placement in large metal cages was non-infringing.

[104] Taylor Wessing (71)

# 6 Australia's comparative advantage

Appendix B provides benchmarking information for Australia in both an international and an Asia-Pacific context. Issues benchmarked include institutions, governance, innovation, and IP. Conclusions emanating from this benchmarking are as follows.

- Australia's ranking for institutions is in the top 10-16 per cent of all countries assessed, although for 'high income' countries Australia is about average.
- Australia is perceived as a 'low corruption' country and ranked in the top 6 per cent by Transparency International. This is reinforced in rankings where Australia is ranked in the top 20 countries for: irregular payments and bribes, judicial independence, flexibility of police services, ethical behaviour of firms, strength of auditing and reporting standards, and efficacy of corporate boards.
- Australia ranks about average among high income countries in innovation, and in the top 20 per cent among all countries. Australia is relatively stronger at science/research and weaker at the commercialisation end of the innovation process. This is a consequence of relatively stronger government involvement and weaker rankings for business involvement in R&D and commercialisation (such as IP creation).[105]
- Among the 23 countries in the Asia Pacific region, Australia is generally amongst the top ranked countries. Australia in only outranked by Singapore for the 'Corruption Perceptions Index'; by Japan and Korea for industrial designs; by New Zealand, Japan, Singapore and Hong Kong for institutions; by Japan, Singapore, Korea and Taiwan for innovation and; by Japan, China, India, and Korea for patents and trademarks.

The benchmarking analysis indicates that Australia does have a comparative advantage internationally in institutions and governance, but less so in IP. However, Australia is only average when benchmarked internationally among high income countries in institutions, governance or IP. In the Asia-Pacific region, Australia's comparative advantage in these areas is stronger.

However, Australia's comparative advantage in Asia needs to be put into context as major countries and regions (such as the USA and Europe) also view Asia as a priority and will be competing against Australia. Australia thus needs to increase its comparative advantage in Asia not only against Asian countries, but against all countries. Asialink and the Australian Industry Group surveyed 380 businesses in 2011 to understand their leaders' views on the factors that most support or are an impediment to Australia's success in Asia ("Engaging Asia: Getting it right for Australian business", Australian Industry Group, and Asialink survey, March 2011).

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[105] Cornell University, INSEAD, and WIPO (72)

The survey highlighted many impediments to Australian businesses engaging optimally in Asia. The absence or underdevelopment of critical individual and organisational capabilities- more than half of Australian businesses currently operating in Asia have little board and senior management experience of Asia and/or Asia skills or languages. The higher the proportion of senior leaders who have cultural training, speak an Asian language or have lived and worked in Asia for more than 3 months, the more likely business performance will exceed expectations. The survey respondents also nominated individual and organisational capabilities, including partnerships and networks, cultural and management understanding and legal and tax knowledge, as important to business success in and with Asia.

Figure 6 illustrates the areas where Australia compares favourably compared to the rest of the world as well as the areas that are of major concern (for further information regarding the below figure please refer to Appendix B).

**Figure 6: Australia's areas of strengths and concerns**

**Australia is particularly strong internationally in:**

- low levels of corruption
- judicial independence
- flexibility of police service
- ethical behaviour of firms
- strength of auditing and reporting standards
- efficacy of corporate boards
- firm level technology absorption
- quality of scientific research institutions
- university-industry collaboration links
- patenting in certain technology areas, particularly infrastructure (civil engineering, building), mining, and agriculture.

**However, there are major concerns in institutions, and innovation. These concerns are:**

- wastefulness of government spending
- burden of government regulation
- transparency of government policymaking
- strength of investor protection
- commercialisation of innovations
- investment in R&D by the business sector.

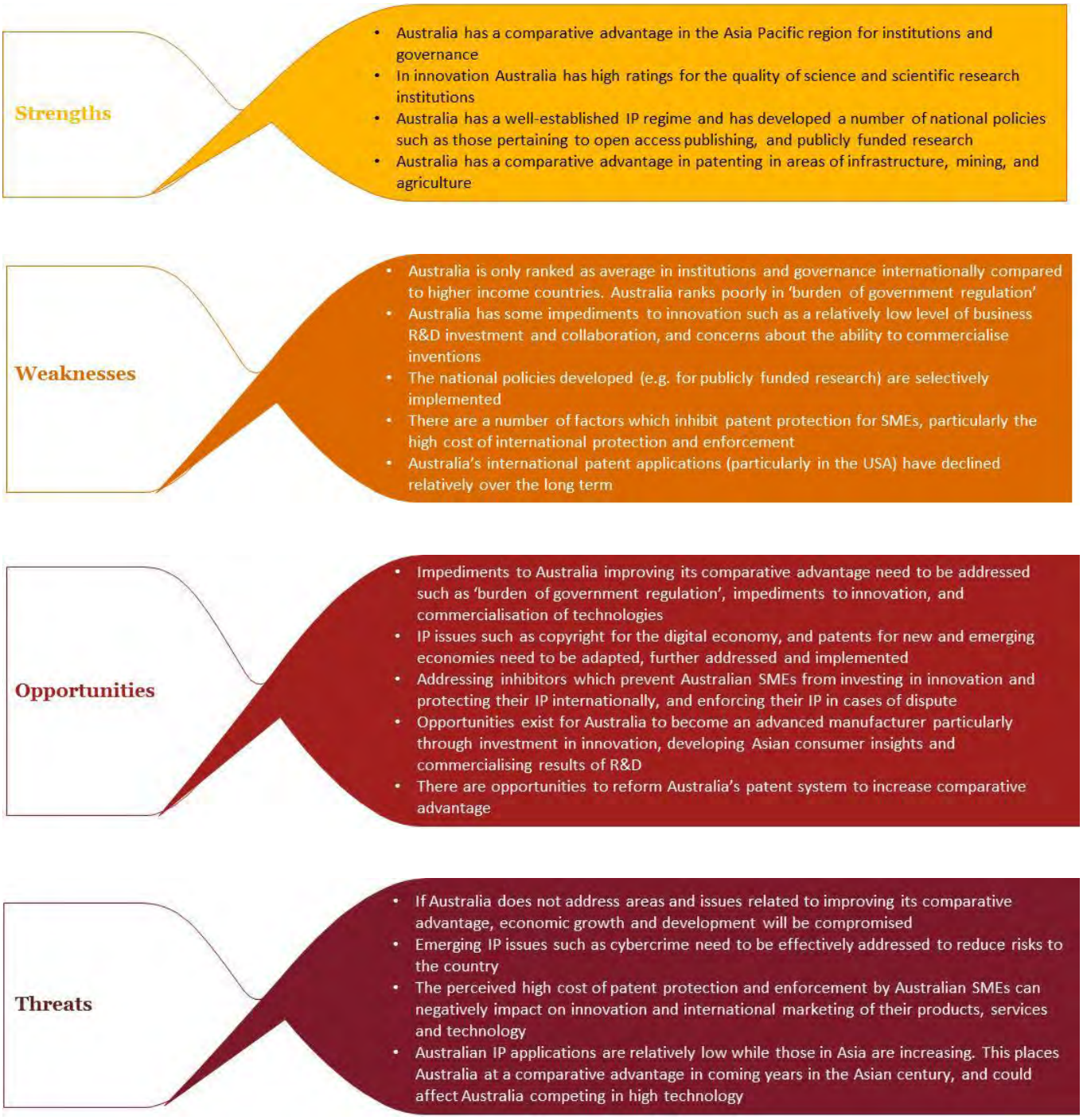
The view of the OECD in 2013 is that Australia's 'innovation performance is weakened by the limited collaboration between firms and universities'.[106]

[106] Cornell University, INSEAD, and WIPO (72)

## 6.1 SWOT analysis of Australia

Australia has both a number of strengths and faces a number of challenges in order to strengthen its comparative advantage internationally. The information in this report can be summarised as a SWOT analysis (Strengths, Weaknesses, Opportunities, and Threats) as shown in Figure 7. This analysis is influenced by an assessment of the state of innovation and IP in Australia.

**Figure 7: Australian institutions and governance SWOT analysis**



# 7 Findings

Key findings from the analysis contained within this report of institutions, governance and innovation (including IP) internationally and in Australia are discussed below.

## The strength of institutions, governance and innovation (including IP) are critical to Australia, but there a number of concerns that need to be addressed

Institutions and governance and the link to innovation are critical to Australia's economic growth and development. Innovation is evolving and trends include the increasing importance of collaboration, development and branding of services and intangible assets which require countries to assess and strengthen their IP regimes.

Australia's international benchmarking internationally in institutions, governance, innovation and IP is average compared to 'higher income' countries, but is well placed with countries such as Japan in the Asia Pacific region. The major issue affecting Australia's ranking is the 'burden of government regulation' where Australia is ranked 128th of 144 countries.

Improvement is required in innovation (particularly the investment in R&D by business, commercialisation, and the IP patents and trademarks areas), and areas such as the burden of government regulation, and transparency in government policymaking among others.

## Australia needs to review and reform its IP institutions

The reform of the IP system and institutions need to consider factors such as the following:

- the nature of innovation is changing, becoming more complex, more collaborative and open, within an economy where knowledge (including intangible assets) are a key to competitive advantage
- excessive costs in the protection and defence of patents as well as other barriers to SMEs protecting patents (such as their access to financing) need to be addressed to increase access to all potential participants in the patent system
- areas of abuse of the IP system, including issues such as the high degree of unimportant and irrelevant patents
- assessment of the value of the patent information to contribute to the innovation and commercialisation process

There is a strong link between the effectiveness of innovation in influencing an economy's competitiveness, and the strength of IP institutions and the IP system. The purpose of innovation is to successfully exploit new ideas and the invention, development and commercialisation of new technologies, services, business models and operational methods.

On this basis, the success of the IP system in a country is not only to produce outputs such as a high level of patents which can be protected effectively, but to also result in outcomes where patents can and are commercialised within costs and regulations which are accessible to Australian companies (particularly to SMEs).

The findings of this report indicate the following:

- Australia has a high level of patents filed annually which is increasing

- The vast majority of patents in Australia are filed by foreign companies
- Australian companies file a relatively low level of patents in the USA, and the share of Australian companies has decreased over the years
- The cost of patenting and protection of IP is very high for Australian companies, particularly for SMEs and in many cases inhibits the use of the IP system
- International benchmarking of Australia indicates that outcomes such as commercialisation of inventions rates relatively poorly, and the 'burden of government regulation' is perceived to be excessively high

In order for Australia to gain a comparative advantage, Australia needs a new IP paradigm that focuses on linking IP more closely with the innovation process and makes it easier for companies (particularly SMEs) to access the system. An enhanced IP system and IP institutions needs to facilitate outcomes rather than outputs through a focus on commercialisable patents at a low cost, with lower levels of regulation.

If the IP system in Australia remains largely unchanged, the EPO scenarios indicate that the familiar **'Market Rules'** world will continue. This scenario implies that the balance of power is held by large companies who also have the power to enforce their rights with increasing litigation. This means that Australia will face challenges to ensure that the IP system in Australia: allows all players to participate fully which requires removing obstacles for SMEs such as the high cost of protection and litigation; is structured, via IP Australia, to ensure low cost and efficient handling of IP issues under large increases in patent applications; ensures that the IP system in Australia adapts to the changing innovation process which will see large investments in the creation of intangible assets and a large increase in IP. In addition, existing concerns with the commercialisation of patents for the economic benefit of Australia and the high levels of regulation will continue.

Australia also needs to consider and respond to the implications of scenarios such as those produced by the EPO. This includes issues such as: ensuring that all players participate in the patent system; ensuring that the IP institutions operate efficiently at low cost and use new technologies to handle a large potential increase in patents; and effectively engaging with non-State organisations to increase trust in the patent system and institutions.

### Major opportunities exist for Australia if institutions, innovation and IP are strengthened

An example of a major opportunity is that of advanced manufacturing. Every Australian manufacturer has the chance to become an advanced manufacturer in theory. In practice, however, not everyone will succeed and those who do succeed at advanced manufacturing tend to have common characteristics, including a focus on innovation, exports and customers. 'Successful advanced manufacturers innovate, constantly invest in research and development and understand the role of technology as a competitive edge. They also innovate in non-technological areas and focus on simultaneously innovating to create value and innovating to appropriate value'.[107]

Australia's proximity to Asian demand and innovation will be crucial to these opportunities and, as a result, so will the rate and extent to which Australia develops capabilities and connections in Asia. 'Australia has a strong foundation to work from, and has steadily deepened its financial, political and cultural ties with Asia, but these foundations need to be

[107] CEDA (64)

reinforced. Australia needs to better capture Asian consumer insights and develop capabilities to innovate and commercialise these insights. In addition, Australia needs to establish linkages with innovative Asian companies and institutions, as Asia is developing new knowledge at a rapid rate and is fast emerging as a world centre of innovation and technological development.'[108]

### SMEs face funding issues which need to be addressed

SMEs face particular issues in innovation and protecting IP. The current investigation and review into IP needs to look at how the cost of protecting IP internationally and in Australia can be made more affordable for SMEs. The access to finance problems for SMEs described in section 4 'are a significant failure, and create an imperative for effective and determined intervention by the Government. A reconsideration of government policies must therefore involve an evaluation of the extent and effectiveness of policy instruments intended to aid the innovation performance of all firms generally, but smaller firms in particular, given their widespread significance, proliferation in the economy and the particular problems they face in supporting innovation efforts. But it can also involve thought about new policies for example policy innovation for innovation.'[109]

### Issues are not only important but also urgent

The review of innovation and the EPO scenarios indicate that the nature of both innovation and IP is evolving quickly driven by changes such as:

- globalisation accelerating global competition, which in turn encourages more innovation as new products are marketed and sold worldwide and also leads to more exchanges of ideas and technology
- accommodating the views of multiple players and stakeholders from different cultures and with different worldviews and aspirations who are working towards different goals within a global environment
- increasing engagement and interest of civil society in the IP debate which could change the IP agenda
- innovation and technologies becoming increasingly fast, interdisciplinary and cumulative.

[108] CEDA (64)

[109] University of Queensland (63)

# 8 Policy Solutions

Australia's capacity to innovate and maintain its global comparative advantages through the development and use of IP depends critically on an effective and efficient IP system. While there is no automatic policy lever or mechanism that can be pulled or altered by government to improve innovation or IP competitiveness, there are tangible policy steps that can and should be taken to improve policy settings, shift burdens and improve conditions for institutions to fully utilise innovative processes and practices.

There are limitations however, as to the extent of policy amendments that can be made due to the restrictions or conventions required of Australia from the World Intellectual Property Organisation (WIPO). As a World Trade Organisation (WTO) member state, Australia must afford other member states at least the minimum protections stated in the Trade-Related Aspects of Intellectual Property Rights (TRIPS) Agreement of the WTO. It is critical Australia continues to meet these requirements as to remain a member of the WTO. However, this does act as a barrier to too much deregulation.

In considering the information contained within this report, the following sections identify three core areas where Government could tangibly support Australia's level of innovation through the workings of the IP system. These policy areas impact upon certain critical dimensions of the IP system and have been thus ordered accordingly:

1. Organisation of IP systems
    a. Policies concerning the legal provisions; operations and procedures of the IP system; international agreements regarding IP; and IP skills on both the public administration and user side. It also regards how national IP systems are governed and other relevant governance dimensions.
2. Markets and diffusion
    a. Policies regarding a range of market or framework conditions that critically shape IP impacts such as conditions for licensing; state of competition; and the diffusion of IP and innovation processes and products throughout the economy.
3. IP participants
    a. Policies regarding the actors in the IP space such as policies that impact the behaviour or choices of leading 'frontier' firms, those trying to 'catch-up', or SMEs and their ability to participate in IP development and use.

Potential policy ideas are now discussed in turn.

## 8.1 Organisation of IP systems

Policies regarded in this section are largely concerning the operation of the IP system, international agreements concerning IP and the governance or government administration side of the IP system.

### *8.1.1 Operation of the IP system*

#### Avoiding 'patent thickets'

Excessive protection can act as a barrier to new innovative ideas and valuable IP. 'Patent thickets' can form where there are many related or overlapping pieces of IP rights. This maze of existing rights can make it difficult for a new player to enter the market, or to access the right piece of unprotected information that is obstructed by the other IP. Additionally, protecting a piece of IP with little commercial value can act as a barrier to the creation of a new piece of IP which may be similar but with higher commercial worth and thus value to Australia's level of innovation.

To avoid these issues with other protection, an assessment of the value of each patent should be conducted to avoid enabling creators the ability to patent unimportant or irrelevant concepts, processes or items. This assessment should also take in to account the existing landscape of patents to ensure that a prohibitive system is not being created.

**Solution: Government should consider evaluating some types of patents for value both individually and as a part of the stock of IP.**

#### Global issues - avoiding protectionist actions

As discussed above, Australia must maintain a certain level of IP protection to uphold our obligations as a WTO member. However, against the benchmark of these obligations, Australia appears to have a heavier system than required, more aligned with the US than WTO standards.

Further, it appears that incorporating IP and copyright issues in to free trade agreements (FTAs) has been taken as an incremental exercise, with each previous agreement forming a basis of which the next agreement will step up from. This progressive approach has led to IP barriers being ramped up.

Value could be gained by reviewing Australia's international commitments to IP to examine consistency and the rationale for higher protections. In an environment where commerce is increasing global, working towards mutual recognition of patent approvals could lower the cost of broader protection (over repetitive processes) and allow faster diffusion of overseas innovations in Australia.

**Solution: Government should consider a review of existing IP requirements against TRIPS and WIPO requirements to examine if Australia is more 'heavy handed' than international obligations require, and if we are, to examine the reasons and justify the current policy.**

#### The legal environment

Legal proceedings over IP issues can be very lengthy, not in small part due to the complexity of the technical issues that can arise. This delay, and the expense that comes with long and technical legal proceedings, can act as an obstacle to obtaining or enforcing IP rights.

A specialised court or tribunal would be able to centralise the expertise required to preside over these cases and remove them from hampering speed of proceedings in generalist courts. It could also develop its own rules and processes adapted to the particular kind of evidence required in these cases and possibly speed up the length of proceedings.

In a specialised court it would also be possible to not only deal more effectively with the complex and long running cases, but also establish a procedure for high volume, small value

cases. These could be less formal and costly, and provide a proper avenue for SMEs to gain or enforce IP rights.

**Solution: Government could investigate the establishment of a specialist dispute resolution process.**

It should also be noted that the IP system is not just affected by the specific laws and institutions that are set up within it. More generalist policies can also impact the creation and diffusion of innovation within Australia. These can include free trade agreements, global agreements, the actions of the Foreign Investment Review Board with its impact on foreign direct investment, corporate tax rates and their impact on capital investment, competition policy and education policy. If Australia wishes to maintain its comparative advantage in innovation, it should be a consideration in every policy decision.

### *8.1.2 IP institutions*

As noted as one of the key findings, Australia needs to review and reform its IP institutions. To ensure an efficient use of government resources and alignment between IP policies with copyright and trademark policies, the government should consider the consolidation of the two areas of government that currently govern these spaces yet sit in different policy areas: IP Australia as a prescribed agency within the Department of Industry and copyright as a responsibility in the Attorney Generals portfolio (the Attorney General also appoints the Copyright Agency Limited to collect and distribute copyright fees and royalties). This would help IP and copyright to be regarded as issues in innovation and commercialisation, and align the two (similar) arrangements, rather than a legal issue that is the purview of lawyers in the Attorney Generals Department.

Further, IP governing bodies themselves should instigate innovative solutions and new technologies to streamline processes and lower operating costs. The use of appropriate technology and/or innovative processes would enable government bodies to handle and process the growing number of patents and relevant activities in the most efficient way.

**Solution: merge responsibility for all IP policy areas (including copyright) in to IP Australia. IP Australia could also take the role of oversight of the Copyright Agency Limited.**

## *8.2 Markets and diffusion*

Australia accounts for around 3 per cent of the world's patents and as discussed in the body of this report is a net importer of IP. However, this must be considered in in relation to our size whereby Australia only accounts for around 1.5 per cent of global GDP. In fact, in the context of our size, Australia has a relatively large amount of IP activity. As such, lifting our share of the number of patents is unlikely to be an easy task and we are likely to remain an importer of innovation.

As an importer of innovation, success can be measure by the speed with which we adopt and adapt that innovation to our purposes. Diffusing this imported innovation through the economy is critical to our economic growth and may have more impact than changes in home grown innovation or knowledge generation.

This diffusion requires knowledge of, and easy access to, foreign IP. In essence, Australia needs to take a 'fast follower and early adopter' role with regards to innovation. But this requires that as an economy, we have no inhibitors to the speed of diffusion.

Regarding innovation and the diffusion of innovative processes/ideas, it is important to remember that innovation is more than just new technology and the fast paced digital world. Innovation can be organisational or social too. It can be concerned with the way that work and research is organised, how markets form, and the efficient connection between business processes and activities.

### *8.2.1 Access*

An effective IP system is not only one in which creates incentives for innovators, but also one where patents can be - and are - commercialised to enable easy access to innovative solutions for Australian companies. Currently, this access to patents can be quite costly, particularly for SMEs, halting their ability to draw on innovative ideas and improve their business practices and processes. A consequence is the inhibition of the potential for the Australian economy. Restrictions on access can arise absent of any real policy need or policy direction. For example, 'region' restrictions on DVDs and games are a technological protection that restricts access but is neither directed nor restricted by government action.

Access is about creating the right environment where all organisations that could enhance existing IP are able to do so. Access can be restricted by cost, the level of information available about existing IP, and the quality of IP advice (legal and technical) available to those who may need access.

**Solution: Government should examine the cost of access, particularly for SMEs, and consider the policy behind any access restrictions that are in place.**

### *8.2.2 Protection*

The inverse of access and information is the need for protection when IP rights are being infringed upon. One key area of concern is free access to protected works on the internet. Understandably, there is a clear disconnect between the person infringing IP rights and the beneficiaries of that IP. That is, it is very difficult for governments or individual IP owners to monitor the use of their IP and enforce rights against those who use it given the availability of works and dissemination tools available; particularly through the internet.

A policy consideration could be to involve the party that *does* have the ability to monitor that activity. In Australia, that would be the internet service providers (ISPs). However, while the ISPs have more access, they do not have the incentive to enforce IP rights that other parties may have. In fact, a moral hazard arises in that the use of the internet to infringe upon IP rights (for example through the illegal download of a movie) actually benefits ISPs as it 'costs' the infringer through the cost of downloads.

To negate this moral hazard, either regulation needs to be instigated or an incentive created for ISPs. In this vein, a concept that should be considered by government is negotiating a cost sharing arrangement between ISPs and IP owners as cost sharing may help prevent a moral hazard issue arise. That is, if ISPs are to bear the burden of enforcing anti-piracy activities, government should consider a cost sharing arrangement in which industry beneficiaries (ie IP creators or owners) help bear the cost of ISPs undertaking enforcement activities.

The consideration of any cost sharing arrangement should take in to account the cost of piracy to Australia, the impact of the cost sharing arrangement on ISPs monitoring and governing activity and the appetite for the cost sharing from both parties.

**Solution: Government should consider a review to determine the validity of, and appetite for, the implementation of a cost sharing arrangement between ISPs and IP owners.**

## 8.3 IP participants

### 8.3.1 SME policies

In order to support innovation, it is important all groups have opportunities to effectively benefit from the national IP system whether it is through access to existing IP or the creation of new. The report highlighted in numerous sections however, the high cost in the protection and defence of patents. This is particularly relevant for SMEs who often have a smaller funding pool – or availability of capital - to draw from when attempting to go through the process of protecting their ideas. Consequently, SMEs may forgo the creation of IP and hide their innovative processes or products thus impinging upon Australia's level of IP content and innovative solutions available to the market.

**Solution: Government should consider (or review) SMEs current level of access to finance and the consequent impact this has upon their ability to protect their IP.**

# Appendix A Background to IP

The following has been adapted from IP Australia's Business Briefing Series '20 Issues on Intellectual Property'.[110]

IP is a broad term that describes the application of the mind to create something new or original. Collectively defined as patents, trademarks, industrial designs, plant breeder's rights, copyright and/or trade secrets, IP is an important asset in today's global knowledge economy and should be strategically managed.

Patents: A patent is a right granted by the government within a country in relation to an invention. This right allows you to exclude competitors from copying, exploiting, or benefiting commercially from the invention in that country.

Trade Marks: A registered trade mark can protect elements of your brand such as a product name, tag line or logo. In this way, a trade mark helps to distinguish a specific product or service from a competitor's product or service.

Registered Design: A registered design protects the appearance and visual features of a product, but not how it works. It protects the shape, configuration, pattern or ornamentation which gives a product its unique appearance. If you have created a three dimensional design for industrial purposes such as product packaging, you will usually need to register it as a design in order to receive protection. Items typically registered as a design include items of clothing, jewellery, furniture and household goods.

Plant Breeder's Rights: Plants have been selectively bred for thousands of years, culminating in the incredible yields, quality and resistance that we see in our modern day crops. Plant Breeder's Rights (PBR) are a form of IP that protects breeders of new plant varieties by granting them exclusive commercial rights to produce, reproduce, condition, sell, import, export and stock their variety.

## Non Registrable Intellectual Property

Both registered and unregistered IP can be owned, sold and transferred, leased or given away, just like physical property. There are two common forms of non-registrable IP: copyright and confidential information/trade secrets.

Copyright: Copyright comes into existence as soon as work is recorded in some way. This may be by writing, keyboard entry and storage on a computer's hard disk, or making an audio or video recording. In most countries, copyright is an unregistered right. This means you don't need to file an application for copyright protection. Copyright exists in the work itself, and gives the artist or creator the exclusive right to copy, publish and distribute works, and to enjoy certain other rights, depending on the type of copyright work concerned.

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110 IP Australian (41)

Confidential Information or Trade Secrets: Confidential information is information that you choose not to make publicly available, because it is valuable to your business and gives you a competitive edge. This could include manufacturing know how and trade secrets, databases of customers, databases of suppliers or the functionality of computer programs. In short, confidential information is what you wouldn't want your competitors to know. Trade Secrets are particularly important IP assets. The main benefit of trade secrecy is that it can exist for as long as the information remains confidential. From a technology perspective, confidential information works best when the technology is very difficult to reverse engineer.

# Appendix B International benchmarking of Australia

## Benchmarking Australia internationally

### World Economic Forum (WEF)[111]

Australia is about average among the 37 wealthiest ('innovation driven') countries (out of 148), where GDP per capita is>US$17k per capita). 12 areas measured in 2012, including Institutions, Innovation, Technological readiness. The total Global Competitiveness Index for Australia is 21st of 148 countries with a score of 5.1 (1 to 7).

| INSTITUTIONS | | |
|---|---|---|
| **INDICATOR** | **RANK** | **VALUE (1 to 7)** |
| Property rights | 30 | 5.2 |
| Intellectual property protection | 21 | 5.3 |
| Diversion of public funds | 21 | 5.2 |
| Public trust in politicians | 36 | 3.8 |
| Irregular payments and bribes | 20 | 5.7 |
| Judicial independence | 16 | 5.7 |
| Favouritism in decisions of government officials | 27 | 4.0 |
| Wastefulness of government spending | 56 | 3.4 |
| Burden of government regulation | 128 | 2.8 |
| Efficiency of legal framework in settling disputes | 30 | 4.6 |
| Efficiency of legal framework in challenging regulations | 30 | 4.3 |
| Transparency of government policymaking | 51 | 4.4 |

[111] WEF (11)

| | | |
|---|---|---|
| Business costs of terrorism | 46 | 5.9 |
| Business costs of crime and violence | 37 | 5.4 |
| Organised crime | 27 | 5.9 |
| Flexibility of police services | 16 | 6.0 |
| Ethical behaviour of firms | 19 | 5.5 |
| Strength of auditing and reporting standards | 14 | 5.8 |
| Efficacy of corporate boards | 7 | 5.5 |
| Protection of minority shareholder's interests | 24 | 4.9 |
| Strength of investor protection | 57 | 5.7 |
| **Total institutions** | **23** | **5.0** |
| **TECHNOLOGICAL READINESS** | | |
| **INDICATOR** | **RANK** | **VALUE (1 to 7)** |
| Availability of latest technologies | 23 | 6.1 |
| Firm-level technology absorption | 14 | 5.8 |
| FDI and technology transfer | 17 | 5.2 |
| % Individuals using Internet | 18 | 82.3% |
| % Fixed broadband Internet subscriptions | 23 | 25.1% |
| International Internet bandwidth | 34 | 69.5 kb/s per user |
| % Mobile broadband subscriptions | 6 | 96.2% |
| **Total technological readiness** | **12** | **5.8** |
| **INNOVATION** | | |
| **INDICATOR** | **RANK** | **VALUE (1 to 7)** |
| Capacity for innovation | 23 | 4.5 |
| Quality of scientific research institutions | 8 | 5.7 |
| Company spending on R&D | 30 | 3.8 |
| University-industry collaboration in R&D | 15 | 5.1 |
| Government procurement of advanced technology | 57 | 3.6 |

| | | |
|---|---|---|
| products | | |
| Availability of scientists and engineers | 34 | 4.6 |
| PCT patents, applications per million population | 19 | 81.7 |
| **Total innovation** | **22** | **4.5** |

## Transparency International[112]

The Corruption Perceptions Index 2013 ranks countries and territories (177 in total) based on how corrupt their public sector is perceived to be. This is measured on a scale of 0 to 100 (with 100 as the highest).

Australia's rank is 9th out of 177, with a score of 81 out of 100. The 8 countries ranked higher than Australia are from Europe, with only Singapore outside Europe.

## Insead[113]

Global Innovation Index for 2013, 142 countries. Measure a range of categories including Institutions, and categories directly and indirectly related to innovation (from Research, Knowledge and technology outputs, Creative outputs). Overall, Australia is 19th (53.07 out of 100), and is 19th out of 45 'high income countries.'

| INSTITUTIONS | | |
|---|---|---|
| **INDICATOR** | **RANK** | **VALUE** |
| Political environment | 14 | 86.1 |
| Regulatory environment | 14 | 94.5 |
| Business environment | 11 | 87.5 |
| **Total institutions** | **11** | **89.4** |
| **RELATED TO INNOVATION** | | |
| **INDICATOR** | **RANK** | **VALUE** |
| Research and development | 7 | 69.1 |
| Innovation linkages | 36 | 37.6 |
| Knowledge workers | 3 | 73.5 |

112 Transparency International (12)

113 Cornell University, INSEAD, and WIPO (72)

| | | |
|---|---|---|
| Knowledge absorption | 43 | 33.6 |
| Knowledge creation | 28 | 33.4 |
| Knowledge impact | 66 | 34.5 |
| Knowledge diffusion | 63 | 26.1 |
| Intangible assets | 65 | 43.8 |

## Department of Industry[114]

Summary of selected commercialisation metrics for Australia, USA, Canada, UK and Europe (excluding UK) for 2011, except UK (2010):

| | Australia | Canada | Europe | UK | US |
|---|---|---|---|---|---|
| **Resourcing for commercialisation**: Commercialisation FTE (number) per institution | 11.0 | 9.1 | 7.2 | 25.7 | 10.9 |
| **Intellectual Property activity**: Invention disclosures per US$100m research expenditure | 28.8 | 41.6 | 28.4 | 43.7 | 35.8 |
| **US patents**: Issued per US$100m research expenditure | 2.0 | 4.1 | 3.5 | 7.8 | 7.7 |
| **Licensing activity**: Licences executed per US$100m research expenditure | 8.3 | 13.2 | 10.6 | 52.6 | 9.9 |
| **Licensing financial return**: % of licensing income to total research expenditure | 1.5 | 1.2 | 1.6 | 1.1 | 4.1 |
| **Start-up company activity**: Start-up companies formed per US$100m research expenditure | 0.3 | 1.6 | 3.2 | 2.8 | 1.1 |

[114] Department of Industry (47)

### World Intellectual Property Organisation (WIPO)[115]

Overview of total IP activity (2011) for Australia out of 100 countries:

- Patents: 19th
- Trademarks: 20th
- Industrial designs: 22nd

### Information Technology and Innovation Foundation (ITIF)[116]

Measure innovation and competitiveness; 44 countries, EU plus NAFTA (USA, Mexico, Canada) plus BRICS (Brazil, Russia, India, China, South Africa) plus other key countries such as Singapore, South Korea, Japan, Malaysia, Argentina, and Australia.

Australia: 11th overall; Education 9th; Researchers 12th; Publications 7th; Business R&D 12th; Government R&D 4th; Venture capital 6th; New firms 5th; Productivity 15th

## *Benchmarking Australia in the Asia-Pacific region*

The region consists of 23 countries of which there are 13 'larger economy' countries (Australia, NZ, Singapore, HK, Japan, Korea, China, India, Malaysia, Philippines, Thailand, Taiwan, and Vietnam).

The following table summarises the benchmarking results:

| | Countries ranked above Australia | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | HK | Japan | Singapore | Korea | NZ | Taiwan | China | India |
| WEF Institutions | √ | √ | √ | | √ | | | |
| WEF Innovation | | √ | √ | √ | | √ | | |
| Transparency International | | | √ | | | | | |
| Insead Institutions | √ | | √ | | | | | |
| WIPO Patents | | √ | | √ | | | √ | √ |
| WIPO Trademarks | | √ | | √ | | | | √ |

115 WIPO (58)

116 ITIF (73)

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| WIPO Industrial designs | | √ | | √ | | | | |

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