

information and market design

In examining the enabling role of government, we consider two primary issues. First, when **designing** regulations, defining property rights, promoting standards and, indeed the terms of market interactions, governments can encourage innovation by ensuring that pioneer firms and entrepreneurs can receive the appropriate reward in the market-place from their innovative efforts. Second, **good information** is crucial to the efficiency of markets and to the ability of discerning consumers to drive innovation by providers. Governments can promote good information flows both by finessing the ‘rules of the game’ in markets and by ensuring that the information and other content that they fund is widely and freely available to be used by consumers, and to be re-used and transformed into new value-added products by firms further down the production chain.

Market formation

Markets in which people compete for private gain can only come into existence against a backdrop of shared practices and expectations. Because these ‘rules of the game’ are a public good, governments are unsurprisingly involved in their provision and enforcement. Often the most efficient and innovative solution to an emerging problem is to develop a market – as we are doing with emissions trading.

Governments may actively create new markets, as the Australian Government is seeking to do through the establishment of an emissions trading scheme. As the Garnaut Climate Change Review draft report identifies¹, clear, credible and consistent policy frameworks that provide investors with long-term signals are important for giving investors the confidence and incentives they

¹ Garnaut Climate Change Review, Draft Report, p. 424. 2008.

need to invest appropriately. However, there is also the tension that these new technologies can bring significant change that may require those frameworks to be modified again, perhaps repeatedly.

In forming new markets, governments can play an active role in focussing the direction of innovative activity. For instance, by making carbon emissions a 'scarce resource,' governments raise the return to activities that economize on those emissions. When developing new technologies innovators will look to the future carbon price and the ability to economise on carbon expenditures. Consequently, care, expertise and commitments are guiding principles of the effective formation of markets to drive innovation.

In this regard, governments can play a role in facilitating industry-led movements to identify problems and effectively price them. It is often the case that those who understand the nature of innovations they would like to adopt lack the technical expertise to come up with the information themselves. Consequently, the two sides of the innovation coin may not be effectively matched and opportunities might be missed. As noted by Professor Joshua Gans:

There is a role for government in promoting the use of industry bodies to gather firms together and agree upon problems that they have a common interest in resolving. The bodies could articulate these problems and also enable market-based mechanisms to generate innovative solutions: for instance, by offering prizes and advanced purchased commitments. Where government and industry have common interests, a sharing arrangement could be entered into that funds these mechanisms.

*In this way, **the government could act as an honest broker in the marketplace for ideas; bringing together those with problems and those with technical know-how and the ability to find solutions.***¹

This highlights the potential role of governments in the formation of markets both on their own terms and also by industry participants. Prizes, which were an important arm of innovation policy in previous centuries have fallen into disuse, and are only now being reconsidered. This is an untapped opportunity for systematic policy consideration and the Australian Government should run some modest experiments to get some experience with prizes as a means of promoting innovation.

¹ Gans, Joshua – Submission no. 70, p. 23 (emphasis in original).

Recommendation 7.1: The Australian Government should experiment with the use of prizes to stimulate innovation. Funding should be modest – say \$5 million over two years with an external evaluation after three years.

Intellectual property

As discussed in Chapter 4, markets do not generate ideal incentives for the creation and dissemination of information and know-how. Firms may not invest sufficiently in the production of new information and know-how because, once discovered, it is difficult to prevent those who have not paid for the creation of information or know-how from benefiting from it. As a result some investment in information and know-how which it would be socially beneficial to generate goes ungenerated for lack of sufficient incentive to generate it.

One response to this has been to create property-like rights such as copyright and patents. This can help in creating incentives to invest in the generation of intellectual property, but at the same time, the monopoly rights instilled in the owners of the intellectual property (IP) generally allow them to price it at above the marginal costs of its provision, which is often near zero.

Though we can recognise such a solution as ‘second best’ in some sense, if patents and copyright increase the production of IP, this will generally be better than the alternative of not having the IP. As the Productivity Commission has compellingly argued with regard to infrastructure pricing, given the regulator’s inevitable ignorance of the exact point at which price is optimal, it is important to err on the side of too high a price than too low a one.¹ The consequences of a somewhat too high a price will be some (usually relatively small) reduction in demand. The consequence of too low a price will be inadequate incentives to invest in new facilities. Where these facilities are facilities of national significance like airport runways, the absence of such investment can lead to huge congestion costs.

Similar logic can be applied to IP. But there is a caveat which is increasingly important: The development of intellectual property is *cumulative*. In the words of Sir Isaac Newton, we stand on the shoulders of giants. Because new knowledge always builds on old knowledge, the property rights we have erected to encourage innovation can actually obstruct it.

¹ See eg. Productivity Commission, *Review of National Competition Policy Reforms*, p. 295-302, 2005.

This is particularly so where intellectual property rights are too easily granted, and where they are ambiguously defined, so that innovators are uncertain as to what innovations might be subject to the prior claims of patent holders. There have been some worrying trends in this regard in recent years. In the last three decades judges have overturned important ‘gatekeeping’ principles of the patent system that existed until the early 1980s. Thus it had been held that software and business methods could not be the subject of patents. But this has been overturned. Likewise the tests of non-obviousness and ‘analogous use’ have become much less stringent – as some have argued, to the point of vacuity.

There is mounting evidence that this is impeding rather than stimulating innovation. There is widespread anxiety about whether a ‘patent thicket’ has developed in software as a result of software patenting with many large firms consciously developing ‘patent pools’ with which to defend themselves against others’ patent claims. Alas a patent pool does not defend against ‘patent trolls’ who may be relatively small companies with little to lose and much to gain in threatening large firms with patent infringement suits. A recent study found that the more patents held in a market, the less likely new firms were to enter and the greater the delays they faced in obtaining finance.¹

Software patents and patents on business methods – particularly methods of finance – each of which has burgeoned in the wake of judicial reinterpretation of previous taboos on such patents, are unusually liable to litigation. Intellectual property scholars James Bessen and Michael J Meurer conclude from their extensive research that:

software patents are four times more likely to be litigated than are chemical patents; business methods patents are twelve times more likely to be litigated; finance patents are 49 times more likely.²

Though these results are for the US, they raise important concerns. Indeed as IP Australia stated in its submission:

The Australian High Court has recognised that the level of invention required to obtain a patent in Australia is lower than elsewhere.³

1 See Cockburn, I. M., and MacGarvie, M. J., *Patents, Thickets and the Financing of Early-Stage Firms: Evidence from the Software Industry*. Boston University and National Bureau of Economic Research, http://people.bu.edu/mmacgarv/fin_nov07.pdf and commentary at <http://www.researchoninnovation.org/WordPress/?p=92>.

2 Bessen, J., and Meurer, M. J., *Patent Failure: How Judges, Bureaucrats, and Lawyers put Innovators at Risk*, Princeton University Press, March 2008.

3 IP Australia – Submission no. 537 p. 52, citing *Lockwood Security Products Pty Ltd v Doric Security Products Pty Ltd (No. 2)* [2007] HCA 21 and *Aktiebolaget Hassle v Alphapharm Pty Ltd* [2002] HCA 59.

At the very least in the interests both of harmonisation¹ and better public policy the hurdle for registering a patent in Australia should be as stringent as other countries.

The issue of patentable subject matter is currently before the Advisory Council on Intellectual Property. However it is not clear that a revision of patentable subject matter can address the fundamental problems. Our international obligations under the Trade Related Aspects of Intellectual Property Rights (TRIPs) code and Australia-United States Free Trade Agreement (AUSFTA) constrain the options available to us as Australia has agreed under these instruments not to excise specific areas of technology from the patent system. Hazel Moir's submission proposes that we could:

*add codification proportions and development cost minima as new threshold tests for patentability. While far more complex and thus riskier (who knows what the courts would read into such limitations), this would be a TRIPS-compliant approach to limiting the scope of patents to those areas of innovation where patent policy is likely to enhance rather than reduce welfare.*²

As Moir points out, one of the major problems here is that intellectual property policy is being managed as a legal issue, whereas although this area like any other must operate through the legal system, intellectual property policy is most fundamentally an aspect of economic policy. Before the economic reforms of the last two decades what we now know as competition policy – which was then known as 'trade practices' policy fell within the portfolio of the Attorney General's Department. Given its economic significance it is now located within the Treasury portfolio. Today copyright policy is handled within the Attorney General's Department whilst patents are handled within the Innovation portfolio. Nevertheless the consideration of policy with regard to both is dominated by IP practitioners and by the beneficiaries of the IP system. We need the expertise of lawyers in this as in many other areas of policy but it is imperative that IP policy make the transition that competition policy made over a decade ago now, from a specialist policy area dominated by lawyers, to an important front of micro-economic reform.

Finding: Currently, the ease with which patents are being granted in areas such as software and business methods is very likely hampering innovation.

¹ *Ibid* p. 43.

² Moir, Hazel – Submission no. 513, p. 18

Recommendation 7.2: Patent law should be reviewed to ensure that the inventive steps required to qualify for patents are considerable, and that the resulting patents are well defined, so as to minimise litigation and maximise the scope for subsequent innovators.

Recommendation 7.3: Professional practitioners and beneficiaries of the IP system should be closely involved in IP policy making. However IP policy is economic policy. It should make the same transition as competition policy did in the 1980s and 90s to being managed as such.

The costs of enforcing IP rights

A further important problem in our intellectual property regime is the high and rising cost of enforcing intellectual property rights. In the words of the Attorney General Robert McClelland, in some areas the adversarialism of court procedure has been ‘a disaster’.

It is becoming increasingly evident that modern litigation is no longer an efficient model of dispute resolution when confronting complex business transactions.¹

Many Australian innovators feel an acute lack of access to cost effective dispute resolution in the Australian system. Thus for instance the IP Australia submission reports that:

One of the main issues associated with IP rights enforcement is the costs associated with taking enforcement action. There is also a view within the small business community that litigation is about who has the greater financial resources rather than whether the IP right is valid or infringed. Such practices can lower confidence in the IP system and limit the benefits of IP protection to those who have large financial resources.²

The panel endorses the initiatives discussed in IP Australia’s submission to use IP Australia’s resources to help encourage litigants to make less use of litigation and be more responsible in its use. However such moves will only have limited affect where larger firms are using IP litigation in a strategic way to take advantage of their size in disputes with smaller firms. It is important that legal procedure more fully internalise the principle that legal costs should be proportionate to the amounts at issue in specific legal disputes.

¹ McClelland, R, Australian Financial Review Legal Conference, 17th June 2008, available at http://www.attorneygeneral.gov.au/www/ministers/RobertMc.nsf/Page/Speeches_2008_17June2008-AustralianFinancialReviewLegalConference.

² IP Australia – Submission no. 537, p. 40

It is to be hoped that the Attorney-General's initiatives will substantially streamline civil procedure. There are also initiatives within some states and territories to do likewise. It will be important for those interested in innovation to make the case for such streamlining strongly. However there is a long history of modest outcomes from reviews of legal procedure. It is to be hoped that at least in some specialised areas more radical experiments might be tried, for instance stronger steps towards the level of case management typical of some of Europe's more efficient civil law systems. It would be very much in keeping with the spirit of innovation if some experiments of this kind could be undertaken in the area of IP litigation.

In the meantime there is a simple procedural rule that could be introduced into intellectual property litigation that would 'level the playing field' somewhat between large and small firms and so lead to a fairer and more efficient IP system. A right to opt out of 'appellate double jeopardy' would give each party to a dispute the right to elect not to appeal the finding of the court of first instance, except where the appellant funded the costs of both itself and its opponent. Wherever either side had exercised such a right, both parties would be bound by it; that is neither party could appeal the decision of the court of first instance without meeting all their opponents' costs.

Recommendation 7.4: Firms asserting or defending intellectual property should have a right to opt out of 'appellate double jeopardy'.

Improving information flows

Information is central to the functioning of the economic system. As Friedrich Hayek pointed out, markets have the advantage that they use information wherever it exists in an economy, whereas governments with their central decision making find this difficult if not impossible. On the other hand as Joseph Stiglitz points out, ‘information economics does not agree with Hayek’s assertion that markets act efficiently’.¹

With neither markets nor governments being ideal institutions for optimising the generation and handling of information, the best outcome is likely to be produced by some appropriate hybrid of the two.

One of the perennial problems of markets is ‘asymmetric information’ where one party to a transaction knows more than another. For this reason all developed countries regulate minimum levels of disclosure in a range of transactions, for instance in the case of consumers and investors. Such regulation has nevertheless often had disappointing results, not least because of the complexity of disclosure that has been mandated and its tendency to swamp people with information.

Amid a range of relatively disappointing results from mandatory disclosure regulation there have been some important and suggestive success stories – see Box 3.

¹ *Information*, by Joseph E. Stiglitz at <http://www.econlib.org/library/Enc/Information.html>.

Box 3: Some examples and principles of targeted transparency

In their book *Full disclosure: the perils and promise of transparency* American scholars Archon Fung, Mary Graham and David Weil outline a range of regimes that mandate disclosure to consumers which were designed to improve information flows. The two most successful examples of what they call ‘targeted transparency’ demonstrate the link between good information flows, demanding customers and innovation.

Los Angeles required restaurants to display prominently on their front window the rating they had received for hygiene from the government regulatory regime. Importantly the rating was to be displayed as a simple ‘A’, ‘B’ or ‘C’ classification which was easily understood by consumers. With this information so prominently available to consumers, consumers were more easily able to demonstrate their preferences. Virtue in such matters became its own reward; and perhaps more pointedly, vice became its own punishment. The public’s unsurprising distaste for bad hygiene kicked off a vigorous race to the top with restaurants striving to move up the ladder, particularly from a ‘C’ grading with a range of beneficial impacts, not least lower admissions to hospitals for food poisoning.

Regulations identifying sports utility vehicles’ (SUVs) stability at speed also struck an important blow for road safety with the less stable SUVs suffering a sharp fall in demand and car makers responding with improved product safety.

In addition to these examples, the authors also show how such disclosure regimes can fail, for instance because of their complexity, as in the case of pollution reporting.

Fung et al’s conclusions about transparency might be summarised as follows:

- Targeted transparency must be user centred.
- Successful policies focus on the needs and interests of users. They should also be focused on the capacities and inclinations of disclosing organizations. They should seek to embed new information in the decision making routines of users and to embed user responses into the decision making of disclosers.
- The policies must be politically sustainable.
- Sustainability is a function of the respective powers of users and disclosers, particularly at the time when the regulation is introduced (often at some time of perceived crisis). Powerful, well organized users help establish transparency regimes just as powerful well organised disclosers have the best chance of resisting them.
- To be sustainable, the regulation should generate good information about its own efficacy and it should be updated and improved as such information emerges.

The success stories however illustrate an important point: where a demand for better information is met, consumers of goods and services will become more discriminating and this will produce premiums for those goods and service providers (newly) discovered

to be of superior quality. As Michael Porter points out, demanding customers often drive a culture of innovation and excellence within the industry servicing such customers. And the industries which learn from the most demanding consumers often become world leaders.

Governments can drive this through mandatory disclosure requirements. For example, the draft report of the Garnaut review proposes mandatory energy efficiency labelling of refrigerators and probably the fuel efficiency or emissions intensity of cars¹. Greater mandatory disclosure is often attractive to policy makers aware of some problem or other but wary of the pitfalls of too heavy-handed regulation. Requiring greater mandatory disclosure in such circumstances can meet the need for something to be done about some perceived problem or other without risking any major policy error.² But as we have seen, for instance, with disclosure on investments, it is not without its pitfalls.

There may be scope to make substantial progress in improving information flows in markets without compulsion. Note that the examples of mandatory disclosure above, such as the energy efficiency of fridges and vehicles, all involve the reporting against an auditable standard which provides a means by which people can compare the relative performance of different products.

In other areas one might ask what information flows might be facilitated by the emergence of an auditable standard according to which results might be reported voluntarily. And what might be required to have an auditable standard emerge? Here no firm in an industry may have sufficient incentive to establish the standard. This is because any firm adopting the standard would have to promote it heavily to bring it to the market's attention. Firms that did not perform as well, but which were disadvantaged by the first mover's promotion of its own results, would retain the option to report their own results against some other standard which produced more favourable results for it.

In such circumstances, a standard might emerge from some leadership if it were possible to get 'buy in' from a sufficient number of market participants. This might be possible if governments acted as the catalyst. Thus for instance a government might invite the best firms in an industry to develop an auditable standard against which to report. These firms have an incentive to facilitate the emergence of such a standard as it will help them demonstrate their high performance to the market.

1 Garnaut Climate Change Review (2008), Draft Report, p. 454.

2 See Gruen, Nicholas, *Life in the Farce Lane: The steady creep of regulatory burdens*. IPA Review, pp. 11-12. April 2006

This idea was developed not with regard to consumers but with regard to employee satisfaction in one recommendation of the 2020 Summit:

Windows on workplaces: *Empower employees to choose their preferred workplaces by facilitating the dissemination of information about employment experience, for example work-life-balance and family friendliness.*

Such a scheme might be commenced in the manner outlined above, with governments doing no more than initiating a process by which high performing employers were drawn together, either publicly or privately, with a view to their developing an auditable standard against which to report. Governments could also use their own influence in markets to help the standard emerge, both by mandating that, where relevant, their own agencies report against the standard and by encouraging or requiring those firms with which it does business to report against the standard.

A potential problem is that even if the group of firms establishing the standard were of well above average standard, those firms ending up at the bottom of the list of high performers could be invidiously interpreted to be poor performers.

To guard against this problem it may be appropriate to commission the ABS to determine average performance with a randomized survey of firms more generally. Firms' performance could then be reported against the backdrop of appropriate Australian or industry wide averages.

The appeal of this approach is that, while it does not cover the whole market, it is entirely consensual and so can be done at minimal risk of imposing substantial costs. And despite its absence of coercion, it may nevertheless sufficiently improve the flow of information in markets to generate strong rewards for the best performers and so spur the most innovative and excellent firms to renew their efforts to further excel.

Recommendation 7.5: Explore the potential of facilitating the emergence of auditable standards to encourage better comparative voluntary reporting of the quality of firm performance.

Areas where substantial gains seem likely include:

- *the quality of workplaces as proposed at the 2020 Summit;*
- *the quality of clinical units in hospitals that wish to participate; and*
- *the performance of educational institutions at all levels in raising students' academic scores.*

Governments can also play an important role in enhancing information flows to encourage the formation of new markets that can facilitate the development and use of new emerging and enabling technologies.

Enabling technologies have widespread applications in many fields of science, industry, environment, agriculture and social outcomes like health. Their responsible use and management involves an uncommon degree of complexity and uncertainty and because they don't fit into existing industry categories, there is a lack of statistics and other metrics. Current examples of enabling technologies are ICT, nanotechnology, and biotechnology but other technologies can emerge in the future with similar or greater potential.

Governments need to be informed about enabling technologies and aware of potential issues and problems to develop appropriate policies and regulation. Regulation plays an important role in contributing to the community's confidence in a new technology, therefore facilitating acceptance and diffusion into the broader economy and society. Regulation based on sound scientific evidence can stimulate, not hinder, innovation.

The community also needs to have access to balanced and objective information from trusted sources so that they can make informed choices. Where the risks and opportunities are not clear, views can become polarised, regulation can be risk-adverse and the community can develop unrealistic expectations about opportunities.

There is a role for Government in:

- providing support where there are information asymmetries and large spillovers;
- providing the community with balanced and factual information;

- supporting the science and metrology essential to underpin effective regulation; and
- ensuring regulation supports the adoption of innovative services and products.

Recommendation 7.6: Facilitate favourable conditions for the development and use of new and emerging technologies by establishing appropriately funded enabling technologies strategies that:

- *adapt or build regulatory frameworks to support the responsible and safe use of innovative services and products;*
- *support the science and metrology required to underpin effective regulation and capitalise on opportunities;*
- *foster public awareness and community engagement; and*
- *collect data and develop metrics to support evidence based policy development, monitoring and evaluation.*

Unlocking public information and content

Governments and public agencies are centrally involved in the provision of research, information and content across a very broad range of activities. For some years now, both commercial and policy focus has turned towards the economic and social benefits flowing from open access to these resources, and by contrast, the potential costs and ‘value damming’ that can be involved in ‘business as usual’ models where content is more tightly held.

Much work has been done by other national governments and international organisations on the development of policies and systems to enable public sector information access and reuse.¹

Open access requirements are increasingly being introduced by research funding organisations and research institutions worldwide.² To date progress in Australia has been patchy and lacking the comprehensiveness and boldness of leading countries such as the UK. Australian activities aimed at enabling information access and reuse have largely focused on two key areas: spatial

¹ Houghton, J., Steele, C. and Sheehan, P., *Research Communication Costs in Australia: Emerging Opportunities and Benefits*. DEST, 2006, at http://www.dest.gov.au/NR/rdonlyres/0ACB271F-EA7D-4FAFB3F7-0381F441B175/13935/DEST_Research_Communications_Cost_Report_Sept2006.pdf. Houghton, Steele and Sheehan concluded in their 2006 report that open access models of scholarly communication have the potential to increase the economic and social returns from public investment in R&D

² For an international listing of open access mandates, see ROARMAP at <http://www.eprints.org/openaccess/policy/signup/>. Some of the most significant initiatives have occurred in the European Union and in the United Kingdom

data and publicly funded research outputs (whether in the form of publications or data). Much of the impetus for access to public sector materials has come from the spatial community. The most advanced policy on data access is the *Spatial Data Access and Pricing Policy* (2001) developed by the Office of Spatial Data Management¹ which forms the basis of the free data download services offered by Geoscience Australia.²

Along with the rise in support for access to information has come a growing recognition of the need for users to be able to search and interact with data and content. Legal frameworks must also be developed to facilitate access and reuse. This points to the need for an Australian National Information Policy (or Strategy) that optimizes the generation and flow of ideas and information in the Australian economy. As the National Competition Policy (NCP) involved systematically scanning Australian institutions to optimize the operation of competition to enhance outcomes so National Information Policy would scan Australian institutions to optimize the generation and dissemination of information for social and economic benefit.³

Support for development and implementation of a National Information Policy was expressed at forums held during the public consultation round table as well as in several written submissions with the spatial information industry being particularly supportive. Further government funded 'content' is generally in the same category as government funded information. Thus for instance, unless it seriously undermines its commercial objectives of sale of product, the ABC should err on the side of making its content available over the internet unless this has large opportunity costs. The presumption against free availability might be overcome where it would involve the foregoing of substantial commercial revenue from the sale of the content or there are large costs of hosting the necessary internet bandwidth (although in this latter case, peer to peer means of distribution should also be explored as should the diversion of funding from other activities and/or additional funding).

Australia is behind many other advanced countries in establishing institutional frameworks to maximise the flow of government generated information and content.

1 See <http://www-ext.osdm.gov.au/osdm/policy/accessPricing/SDAP.pdf> and generally <http://www.osdm.gov.au/OSDM/Policies+and+Guidelines/Spatial+Data+Access+and+Pricing/default.aspx>

2 See https://www.ga.gov.au/products/servlet/controller?event=DEFINE_PRODUCTS

3 See Gans, J., *Caught short: Information controls kill opportunities*, "The Age", 5th August 2008, who argues that information such as the location of public toilets (toiletmap.gov.au), fuel price information, bus and train schedules, and television programming information be available for repackaging using the latest technologies. Led by Cabinet Office Minister Tom Watson MP, the UK has established a 'Power of Information Taskforce' for this purpose. (http://www.cabinetoffice.gov.uk/reports/power_of_information.aspx) In Australia, Hansard information made available has led to re-packaging and dissemination (www.openaustralia.org).

Recommendation 7.7: Australia should establish a National Information Strategy to optimise the flow of information in the Australian economy.

The fundamental aim of a National Information Strategy should be to:

- *utilise the principles of targeted transparency and the development of auditable standards to maximise the flow of information in private markets about product quality; and*
- *maximise the flow of government generated information, research, and content for the benefit of users (including private sector resellers of information).*

Recommendation 7.8: Australian governments should adopt international standards of open publishing as far as possible. Material released for public information by Australian governments should be released under a creative commons licence.

National collections

To drive cumulative knowledge creation researchers and others must have access to high quality data and information on developments not just in their field but beyond. For instance, Jeff Furman and Scott Stern have calculated that Biological Resource Centres that are repositories of biological materials (including cell lines, microorganisms and DNA material) have boosted cumulative scientific knowledge by three times more than alternative institutional structures.¹

Australian physicist Michael Nielsen has stressed the importance of unlocking scientific information in scientific journals to make it more easily discoverable, searchable and useable to enable the cross-disciplinary search for knowledge:

We should aim to create an open scientific culture where as much information as possible is moved out of people's heads and labs, onto the network, and into tools which can help us structure and filter the information. This means everything - data, scientific opinions, questions, ideas, folk knowledge, workflows, and everything else - the works. Information not on the network can't do any good.²

¹ Furman, J. and Stern, S., *Standing Atop the Shoulders of Giants: The Impact of Institutions on Cumulative Research*, National Bureau Economic Research Working Paper, 2004.

² <http://michaelnielsen.org/blog/?p=448>

He goes on to recommend a change in basic infrastructure of science as well as mind-sets and culture:

Ideally, we'll achieve a kind of extreme openness. This means: making many more types of content available than just scientific papers; allowing creative reuse and modification of existing work through more open licensing and community norms; making all information not just human readable but also machine readable; providing open APIs [application programming interfaces] to enable the building of additional services on top of the scientific literature, and possibly even multiple layers of increasingly powerful services. Such extreme openness is the ultimate expression of the idea that others may build upon and extend the work of individual scientists in ways they themselves would never have conceived.

This sense was reflected in the many submissions that emphasised that national collections are a necessary foundation for research and innovation. National collections¹ are essential resources for researchers in all fields, from basic scientific research to the social sciences, humanities and creative arts. They play a vital role for educators (from pre-school to postgraduate) and for the broader community in building scientific, historical and artistic knowledge and literacy and in fostering cultural knowledge, identity and cohesion. Importantly, Australia has a number of unique and valuable assets, including marine, flora and fauna resources and indigenous collections that allow us to draw on the distinctive features of the Aboriginal and Torres Strait Islander traditional knowledge systems.

The Review has examined challenges in the provision, funding and maintenance of national infrastructure facilities and collections and identified the steps required to ensure their ongoing vitality and contribution to the national innovation system over the coming decades.

Recommendation 7.9: Funding models and institutional mandates should recognise the research and innovation role and contributions of cultural agencies and institutions responsible for information repositories, physical collections or creative content and fund them accordingly.

¹ These include cultural, geological, historical and zoological collections. They go under a number of different names, including archives, galleries, research repositories, libraries, museums, Indigenous knowledge and keeping places.

Recommendation 7.10: A specific strategy for ensuring the scientific knowledge produced in Australia is placed in machine searchable repositories be developed and implemented using public funding agencies and universities as drivers.

Recommendation 7.11: Action should be taken to establish an agreed framework for the designation, funding models, and access frameworks for key collections in recognition of the national and international significance of many State and Territory collections (similar to the frameworks and accords developed around Australia's Major Performing Arts Companies).

Recommendation 7.12: Funding agencies should consider eligibility for cultural and collecting agencies in gaining access to contestable research funding programs.

Recommendation 7.13: The role of institutions such as the Australian Institute of Aboriginal and Torres Strait Islander Studies (AIATSIS) should be broadened and strengthened in recognition of the special importance of preserving indigenous collections and the unique value of indigenous traditional knowledge and practices within Australia's innovation system.

Australia, innovation and the global public commons

ABC free to air broadcasts used to be Australian public goods.

Today, digital distribution over the internet makes them global public goods. The same could be said for a good deal of information and other content produced and funded by government agencies.

There can be clear benefits in making such content available to all comers globally. Often it will be impossible to foresee all the ways in which others will find or develop value in that content. And there will be negligible costs in making the content available.

Accordingly, both for its direct and indirect benefits to Australia and for the greater global good, Australia should energetically and proudly maximise the extent to which it makes government funded content available as part of the global digital commons.

Further, it should lead globally by engaging other countries in a similar agenda.

Likewise in the area of prizes, Australia should encourage other countries to join it in funding international prizes for specific innovations. For instance it could be a particularly effective way of addressing aid objectives to initiate a process where many countries funded a prize of substantial value for important technical breakthroughs with medical or other benefits.

Recommendation 7.14: To the maximum extent practicable, information, research and content funded by Australian governments – including national collections – should be made freely available over the internet as part of the global public commons. This should be done whilst the Australian Government encourages other countries to reciprocate by making their own contributions to the global digital public commons.

Recommendation 7.15: In a similar spirit the Australian Government should initiate a process whereby countries come together to fund prizes for innovations of international significance with a particular focus on the needs of the developing world.