



ACADEMY OF
THE SOCIAL SCIENCES
IN AUSTRALIA

The Digital Economy: opening up the conversation

SUBMISSION BY
THE ACADEMY OF THE
SOCIAL SCIENCES IN AUSTRALIA

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Digital Economy Strategy Team
Department of Industry, Innovation and Science
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The Digital Economy: opening up the conversation

Thank you for the opportunity to make a submission on the Digital Economy: opening up the conversation.

The Academy of the Social Sciences in Australia (ASSA) promotes excellence in the social sciences in Australia and in their contribution to public policy. It coordinates the promotion of research, teaching and advice in the social sciences, promotes national and international scholarly cooperation across disciplines and sectors and provides advice to government on issues of national importance.

The Academy is an independent, interdisciplinary body of leading social scientists recognised for their distinguished contributions to the nation. Our vision is to enhance the quality, relevance and impact of social science research in Australia.

This submission focusses on the questions posed in the discussion paper. It has been informed by Fellows of the Academy, reports prepared by the Academy and by Securing Australia's Future reports prepared by the Australian Council of Learned Academies (ACOLA) for Australia's Chief Scientist as part of the Securing Australia's Future Program. They can be found at <https://acola.org.au/wp/securing-australia-s-future/>.

The Academy recognizes that:

- the digital economy affects all industries but not equally and that dealing with impacts will require multidisciplinary research responses. However, to take best advantage of opportunities presented by the digital economy requires getting the fundamentals (including generic and specific skills and education, data and collaboration) right.
- to maximize the advantages of the digital economy, it will require policy settings and regulation that let innovators flourish but, more importantly, support slower adopters of technology to catch up. Greatest economic gain can be had from bringing everyone up to speed.
- technology in the digital economy should be a force for good. It should improve access for remote communities, it should improve environmental protection, it should lead to an inclusive and cohesive society and it should generate a flexible and resilient citizenry.

The Academy believes that separate specific initiatives would assist with these general goals are:

- The establishment of an integrated HASS Data Platform to drive transformations in the way researchers discover, access,, curate and analyse social and cultural data; and

- The introduction of Income Contingent Loans for Research and Development that will be a significant contributor to advancing Australia's international competitiveness

The Academy and Fellows of the Academy are available for more detailed follow up if required, including developing case study narratives on particular subjects.

To further discuss this proposal please contact Murray Radcliffe of the Academy Secretariat on 02 6249 1788 or murray.radcliffe@assa.edu.au.

Yours sincerely,

A handwritten signature in black ink that reads "Glenn Withers". The signature is written in a cursive, flowing style.

Professor Glenn Withers AO
Chair

The Digital Economy: Opening up the conversation

Our Digital Readiness

1 How are advances in digital technology changing the way you work, your industry and your community?

We are responding in terms of the community as a whole rather than our own organisation. The digital economy affects all industries but not equally. Technological change is a major driver of social change and the dominant source of economic growth. It encompasses the processes of invention, innovation and diffusion of technology. While often used, linear models of technological change (e.g. basic research leads to technological development which then leads to product commercialisation and diffusion), are rarely accurate. Technologies change through a complex web of factors with many feedback and feed-forward mechanisms. Interventions intended to enhance technological innovation are likely to be of little benefit if they are based on simplistic models.

For these reasons, predicting future technologies and their impacts is uncertain. Within certain constraints and sufficiently short timescales, it might be possible to predict narrow technological improvements, but one cannot accurately predict the long-term impact of a particular technology. Given the strengths and limits of prediction, it is valuable to identify the problems that need to be solved and allow technological innovators to find solutions, rather than attempting to forecast the impact of particular technologies.

“Half of all UK business leaders (50%) fear that their industries face significant digital disruption within the next two years, according to new research published by Microsoft today. The financial services sector, which employs 2.2 million people and contributes £66bn in taxes to the UK economy, is demonstrating the highest level of anxiety, with two-thirds (65%) of respondents fearing the impact of disruption on their markets over the course of the next 24 months. The report, the most extensive of its kind, finds that whilst disruption is imminent for a wide range of industries, the shelf life of current business models is also extremely limited – nearly half of UK business leaders (44%) say their existing business models will cease to exist within the next five years” (TMT News 19 November 2017)

One thing that is more certain is that technologies for data will transform many industries, and be central in solving societal and technological problems. Data is becoming increasingly available in digital form where they can be analysed including big data sets. Data analytics is already transforming industries such as agriculture and mining. This pervasive transformative trend will continue. For example, a combination of data on energy use by purpose, linked with climatic data and energy supply data will allow for much better management of a mixture of renewable and non-renewable data sources. Consequently, technologies for making sense of data (data analytics) are likely to have the one of the greatest impacts. Data scientists are one in the most in demand occupations in US. This is happening in Australia as well and we should be prepared for that. The

ABS Survey on Business Use of IT confirms the importance that businesses associate with data analytics to their industries.

The following is an example of how Data Analytics are translating industry.

The *Sense-T Sensing Tourist Travel Project* tracked the precise movements of almost 500 visitors to Tasmania between January and May this year, as they travelled around the state between 4 – 14 day timeframes. Tourists were approached at two local airports and on board the Spirit of Tasmania to take part in the study. They were handed smart phones which recorded accurate, real-time data of their travel patterns through a purpose built app replaying GPS location information. The app also generated pop-up surveys to capture the personal insights of participants at different locations. Already we have identified areas where there are accommodation shortages and infrastructure bottlenecks and the data we have gathered during the first phase of the project will guide future infrastructure investment."

Beyond highlighting the future infrastructure needs the tracking data can be used for a wide range of industry applications.

<http://www.utas.edu.au/research-admin/research-news/tasmania-leading-the-world-in-visitor-research-through-innovative-tourist-tracking-study2>

Data Analytics are one example of the required changes in our skill base. There are many others. Some are obvious such as IT skills but other less obvious but are required for the translation of research into actual practice, commercialisation, marketing, understanding the human elements, etc

Australia is slipping significantly in research translation including IT. We have traditionally been strong at IT and regarded as an early adaptor. This is no longer the case. According to OECD Innovation/research translation we are now 23rd on the innovation scale despite our world class education. In particular, the strength of the relationship between the research and business sectors is quite weak. There are faults on both sides. In areas where we are weak, such as commercialisation of innovation and research-industry collaboration, we should learn from world leaders. Moreover, our businesses need to be graduate ready and open to developing the industry specific skills needed, just as graduates need to be work ready.

2 What is your vision for an Australia that thrives in a digital economy? Where would you like to see Australia in five, 10 and 20 years' time?

The Academy of the Social Sciences in Australia (ASSA) believes that social science research has a major role to play in advancing the digital economy, and suggests the strengthening and enhancement of that contribution within policy and regulation as it evolves. A prosperous future is more than just technological advancement. Achievement will entail economic, social and cultural changes, facilitated by visionary leadership and by targeted investments in skill, infrastructure and innovation. One important aspect is a major investment in an integrated national data infrastructure. This includes the collection, analysis, curation, and the utilisation of Australian data. It should be an integral component of a Strategic Plan. This is addressed in more detail in our response to Question 5.

An effective Innovation Strategy will mean pursuit of both: institutional reforms in political, legal and market institutions, ranging from federalism, through intellectual property to trade, taxation, workplace relations and competition policy; and also investments in infrastructure, education,

research and development, innovation, labour participation and immigration. An Innovation Strategy is not of itself the sole answer to enhancing the level of innovation in Australia. The Innovation Strategy must be explicitly seen as part of much wider reform process that complements and enhances the impact of each component. An Innovation Strategy that does not address the whole context for innovation, including such factors as regulation and taxation, management culture and more, and improve these settings and behaviours using analytic insight, will be sub-optimal.

Australia needs to have world class infrastructure, not just in physical terms, but also digital infrastructure that supports large data transfers and high speeds. Modelling has shown that upgraded infrastructure brings significant economic benefits.

We envisage a more effective use of social sciences in future innovation strategies. For example, the process, structure and organisation of learning, effective ways of funding education and training, are all rich fields of research knowledge where social science contributions can be sourced to improve outcomes. The transformation of learning under a National Innovation Strategy must include such contributions if Australia wants to be a leader in the future.

A national Innovation Strategy must support the continuation and enhancement of the exchange of ideas, and the policy settings needed for that to happen. Dealing with the impacts of the digital economy will require multidisciplinary research responses. All disciplines of knowledge know this and increasingly seek to work together to ensure Australian knowledge engagement with the world is at its best. Knowledge is one of the best ways of transcending the “tyranny of distance” for those in the Antipodes.

Technology that uses open platforms, including cloud computing, are more likely to be sustained over the longer term.

Technology should be a force for good through,

- Improving access for remote communities
- Environmental protection
- Assisting to develop an inclusive, cohesive society
- Supporting a flexible and resilient society.

It should not be forgotten that the services sectors employ more Australians than other sectors and are responsible for much of the recent employment growth. However, their potential to benefit from the digital economy is less well-recognised. These industries should be better tapped to extend benefits to more Australians. For example, areas such as health and education and professional services are capable of much future development.

According to a McKinsey report, there is huge potential for improving the use of technology in service industries especially now that we are in the cognitive era of computing. However, it will require redesign of the way we go about our work (business process redesign). Australia is not always good at this aspect on management practice.

Applications of machine learning are a very important aspect of the cognitive era of computing. This requires strong knowledge of statistical techniques and strengths in statistical science are a pre-requisite for taking advantage of developments in machine learning.

As a concluding comment, society must be brought along on this exciting journey. It should not be seen as only relevant to a more technically adept sub-set of society.

3 What is the role of government in achieving this vision?

Given the underlying importance of technological progress for Australia's future, governments clearly have a role in facilitating technological change. Specifically, Governments should play a facilitative role in technological change by creating an economy, a culture, and a society where new technology is encouraged through multiple experiments.

Governments are inherently risk averse and find it difficult to deal with the unpredictability of new technologies, the risks of failure and the need for experimentation. Consequently, governments should avoid the temptation to become directly involved in the development of specific technologies by picking technology winners. It is better to focus on building the foundations well.

One exception is where the economies of scale have led to governments becoming the monopoly provider or purchaser of a technology, such as in electricity, telecommunications or defence. In these few instances governments have to invest in particular technologies, which subsequently may have flow-on effects for other technologies and businesses.

With respect to facilitation, Governments can:

- Ensure Australia has an educated and skilled population able to embrace and adapt to the opportunities that new technologies provide.
- Invest in a strong research and development base and require research institutions to be more open with the intellectual property they generate.
- Seek solutions that appreciate the interrelationships between technology and humanity.
- Regulate the effects due to the use of a technology rather than regulate the technology itself. Technologies regulated in terms of the technology itself can stifle technological progress.
- Mitigate any negative social impacts of technology; for example by regulation or by assisting with the transition to alternative employment opportunities through reskilling.
- Require that technology evaluation is open, transparent and independent.
- Facilitate interoperability; technologies, systems and organisations can implement standards that allow the assembly of different parts. This can encourage innovation and help to avoid the negative effects of technological lock-in.
- Implement mechanisms that allow for explicit, efficient and adaptive experiments and trials, which will help deal with uncertainty and unforeseen (and unforeseeable) impacts.
- Develop the education system to help facilitate the above.
- Develop arrangements for the governance data that obtains an appropriate balance between accessibility, transparency, security and privacy.

It is important that the focus include human outcomes not just economic outcomes. Indeed the former are a pre-requisite of the latter. A progressive and interesting world lies ahead and this is the key message that needs to be disseminated.

In 1989 the Australian Government had the foresight to introduce an innovative new model to support higher education enrolments. That was the now familiar Higher Education Contribution Scheme (HECS). HECS, an Income Contingent Loan (ICL), has been a notable success, and in combination with other government higher education initiatives has paved the way for Australia to produce the highly skilled and trained workforce needed in the 21st Century. It has enabled more students to study at university while shifting the financial burden from all taxpayers to the beneficiary. Since the introduction of HECS, higher education domestic enrolments in Australia have more than doubled and the scheme recoups over \$2 billion annually to the Australian

Government.

The Academy sees strong reasons why the same model (ICLs) can be applied to the research and development that is needed to increase productivity and economic growth in Australia. Just as they have expanded higher education enrolments, ICLs could rapidly expand research and development investment by Australian companies.

There are two very important features of ICLs. First the operation of ICLs entail great administrative efficiency, with less than 4% of the revenues of HECS being spent in administrative costs. Second, the instrument provides significant insurance benefits to participants, meaning that if applied to industry activities such as R&D expenditure, companies will be protected in the event that investments are not highly profitable.

4 What key disruptive technologies of business models do you see? What do you predict is on the horizon in five, 10, 20 years' time?

Rather than predict disruptive technologies, it is better to be ready to react and experiment with emerging technologies especially those that are disruptive. Flexibility and resilience are extremely important. In most cases, it will be necessary to adapt existing business models to take full advantage of these technologies. These will cut across traditional government/institutional safeguards and therefore challenge them.

The Government could provide a useful facilitation role. It also has a role of monitoring potential adverse effects of emerging technologies so that appropriate arrangements for consumer protection can be put in place.

Business, in turn, needs to be deeply committed to improving their performance including forward thinking of the kind that can be reflected for example in scenario planning. This leads to better practice from all firms including those that have fallen behind.

Digital Infrastructure

5 What communication services, and underlying data, platforms and protocols, does Australia need to maximise the opportunities of the digital economy?

Our response only deals with the 'underlying data' aspect to the question. Humanities, Arts and Social Science (HASS) research enhances our understanding of humanity, and its history, ideas, cultures, economies, languages and social structures. It is a central part of a knowledge-based economy, and in developing interdisciplinary solutions to complex challenges such as climate change, social cohesion, new technological development, future workforce solutions, resource management, health and welfare. Developing the 'science' is not sufficient – it requires a strong knowledge of the human interactions.

The 2016 National Research Infrastructure Roadmap (the Roadmap) identified the need for national-scale infrastructure to support Humanities, Arts and Social Sciences (HASS) research to

drive transformations in the way researchers discover, access, curate and analyse social and cultural data.

The Australian HASS research sector is large and diverse comprising 41 per cent of the university-based research system and more than 50 disciplines at the four-digit field of research level, with fields ranging from economics, political science, management studies, geography and demography, to languages, archaeology, history, arts and media studies.

Australia's HASS researchers draw on an array of data to underpin their work on Australian society, culture and economy. The data needed for advanced research is dispersed across public sector organisations, collecting institutions, and individual researchers and projects. Much of this information is 'hidden' from view, or in a variety of 'unstructured' formats – such as texts, maps, artefacts, and audio-visual documents – or semi-structured formats in the case of research and field records. Only a fraction of these research data is in digital form where it can easily be accessed. Data employed in HASS research is often culturally sensitive, and/or has ethical, security and privacy considerations and those aspects have to be protected.

While there are some National Collaborative Research Infrastructure Strategy (NCRIS) funded facilities which provide some services to the HASS domain, and significant investment in major (non-NCRIS) enabling infrastructure across public sector organisations and cultural and collecting institutions, these assets are only available to support HASS research in fragile and disconnected ways. Furthermore, security and privacy constraints can severely restrict access.

Australian HASS infrastructure is largely operating at an institutional or project-based level. Limited investment and fragmented funding means much of the existing effort has been developed according to individual researcher and institution priorities, leading to uncoordinated activity, generally small-scale effort, limited integration across research infrastructure, and with an ad hoc approach to skills and workforce development.

A number of countries (particularly the US and many European nations) have invested in coordinated and well-resourced HASS data infrastructures, generally provided via coordinated publicly funded national centres. Australian HASS research infrastructure is rapidly falling behind internationally, and there is no national contact point for international collaboration and leverage. A national strategic approach to coordination, planning and collaboration is urgently needed.

The case for Australian National Research Infrastructure (NRI) investment for HASS are strong. The limited investment to date has delivered value and demonstrates the merit of further investment. There are existing models of nascent institutional NRI being effectively scaled up to operate as 'non-NCRIS estate' NRI. Shared interests in HASS research and data creation, reuse, curation and preservation are leading to collaborative working relationships, within and across jurisdictions and domains (notably between the NCRIS eResearch capabilities and other NRI operators). National and international trends in NRI can inform investment in HASS NRI capability.

The Integrated Platforms for HASS infrastructure proposed here aim to create strong social benefits by supporting HASS research needs and priorities at a national-scale, collaboratively and strategically. An Integrated Platform for HASS agenda will:

- transform data discovery, access, mining, curation, retention, re-use, analysis and interpretation through platform interoperability, integration, collaboration, and coordination of tools;
- leverage existing investment and build towards networked platforms and facilities through a staged process;

- drive efficiency, productivity, and quality across disciplines by enabling data comparability and a coordinated approach to metadata standards, data management standards, and shared protocols (including licences);
- promote innovation in research practice across HASS and into other domains through skills and workforce development;
- build strategic connections with other areas of the 2016 NCRIS Roadmap;
- support research outputs that are FAIR (findable, accessible, interoperable and reusable);
- ensure accessibility of data, with open data where possible but with strong protocols for data protection and security where required; and
- provide a coordinated approach to international engagement to optimise the benefits of international memberships and partnerships.

The infrastructure should enable data linkage under agreed conditions that provide appropriate protections to the individuals involved. There are ways of doing this technically. The ABS does this with its Census linkage project and there are applications with health data. The ABS and AIHW should be consulted if you want more detail.

Within an integrated HASS data research infrastructure, there will be elements that are both common and distinct to the humanities, arts and social science research communities. Coordination will be key, with a strong governance and advisory structure to ensure sector buy-in, establishment of common policy frameworks, priority-setting, planning and collaboration across research domains (including provision of digitisation technology and digital content management), and planning for integration across the HASS Platform from the outset.

In establishing an Integrated HASS Platform, it will be vital to learn from existing research infrastructure initiatives and operational principles regarding approaches to sustainability/future proofing, reducing duplication, common services, and consolidating and clustering efforts. There are several applicable models for development, including selected NCRIS-funded facilities and platforms, international infrastructures, and existing HASS platforms with NRI capability and potential.

An Integrated HASS Platform will maximise the value of existing Commonwealth investments in data, the digital transformation agenda and the benefits of the big data revolution. Users and beneficiaries of Platforms for HASS will include academic researchers, government, business, industry (including creative industries, ICT, life sciences and health), NFPs, community organisations, and the wider public.

On the basis of a preliminary assessment undertaken for this exercise, the investment scenarios outlined in this strategy reflect staged research infrastructure development for Platforms for HASS. Key elements include:

- Formal facilitation processes for the integrated HASS Platform, and for the three constituent elements:
 - an Integrated Research Infrastructure for the Social Sciences (IRISS),
 - Integrated Research Infrastructure for the Humanities and Arts (IRIHA), and
 - Indigenous Platforms. The facilitation process for the Indigenous Platforms will require additional consultation with the Indigenous community.
- Establishment of a HASS Research Infrastructure Governance Board
- Capability audit and needs analysis
- A cross-sector engagement program

- Development of protocols around researcher access and their responsibilities.

6 What opportunities do we have to accelerate the development of technologies that will underpin Australia's digital economy?

The successful development and use of new technologies is very dependent on the skills base. This should start at the 'bottom' and not just focus on those with greater capability. Countries that have been successful in technology (eg Finland) have put considerable effort into skilling or reskilling those that are less capable. This is important to adaptation. It is also important for the employability of those who are displaced because of technology change.

Education is crucial. It should provide for all children to participate in digital economy education in schools. It should also provide 'second chance' options for adults. Indeed, skilful use of technology can enhance the ability to learn.

Improved research translation is also extremely important to the acceleration of technology development. Australia currently performs poorly compared with other developing countries.

Standards and Regulation

7 What opportunities do we have in standards development and regulation to:

- Enable digital entrepreneurship, innovation and trade?
- Mitigate the risks associated with digital disruption?

8 What digital standards do we need to enable Australian businesses to participate in global supply chains and maximise the opportunities of the digital economy?

This response relates to questions 7 and 8

Roundtables of experts can be a useful way of identifying risks, their importance and how they might be mitigated. They will have access to international developments. ASSA and the other research academies are generally well placed to set up these roundtables in collaboration with government.

There should be a focus on outcome based regulatory frameworks (as has been done for Health and Safety) rather than trying to be over-prescriptive. At any rate, it will be difficult to predict all the likely risks and their causes. The Government's best practice regulatory guidelines might provide some useful direction.

Changes in institutional arrangements may be one of the considerations for determining appropriate standards and regulations.

Trust, Confidence and Security

9 What opportunities do we have to build trust and community confidence through resilience to cyber threats, online safety and privacy?

10 What roles should government, business and individuals play in protecting the community in a digital economy?

11 What integrity and privacy measures do we need to ensure consumers can protect their data?

12 What are barriers for business, particularly small business, in adopting cyber security and privacy practices?

13 What integrity measures do the Australian Government and the private sector need to take to ensure business- consumer transactions are secure?

This response relates to questions 9-13.

There is a need for balance. Trust, confidence and security are essential but there is also a public interest in utilising digital data. With the appropriate protections, it should be possible to obtain a balance. This will require a:

- An underlying legislative framework that builds on existing protective measures.
- Allows access to data for approved and worthwhile purposes under conditions that protect privacy.
- Financial security requires special consideration. It is probably the area of most concern to Australians.
- However, the nature of the protections should be informed by a good knowledge of what is concerning the public. There is some evidence that the Australian population is becoming more cautious about providing more personal details on digital data bases.
- There is some irrationality about concerns. Some members of the public about providing their name on the Census questionnaire where there are very strong protections but are happy to provide information to Facebook, participate in Flybys and competitions where it is necessary to provide name, address and personal details. The private sector provides much greater risk to security and privacy than the public sector.

ACCC should have a role in any institutional framework given their responsibility for consumer protection.

It goes without saying that cyber security should be a high priority area for consumer protection. The loss of productivity because of cyber security issues is likely to be substantial. International collaboration is essential and international standards may emerge.

Algorithmically mediated data is taking all Australians into a new world: a world in which more companies will know more about each of us than we might ever imagine and in which cyber threats to our privacy, finances and safety will be real.

Two ways in which we could build trust and community confidence in this challenging new world include open banking, and a new model for use of consumer data.

Open Banking – With open banking control over the data about customers that currently sits in their banks, will be returned to the customer. When a FinTech offers a new service to a customer of a bank, that customer will be able to direct their bank to share the relevant data with the new company. Likewise, the customer will be able to direct the sharing of their data with another bank to which the customer may consider switching. This is done through APIs – application programming interfaces – and should promote competition throughout the sector. APIs will also enable customers to check and verify the data held on them. Rising levels of trust in data would be a natural outcome of returning control over the data to customers in his way.

Consent Model for Data Use – Presently, consumers consent to a service provider using data about them, when they tick a box agreeing to the provider's privacy policy, or are taken to have consented merely by proceeding to use the service on offer. This model for providing consent made sense in a world in which a consumer had a real choice and if the consumer didn't like what was going to be done with the data about them, they could choose another provider. That world ceased to exist long ago. Today for a young person to not be on Facebook means not learning about parties and social events in their life. For late teenagers and people in their 20s, to not be on Facebook is typically to be socially isolated. Likewise, to exist without enabling the geo-locate function on the Google search engine or Google maps is difficult today. Yet our laws still apply a consent model in these situations where people have no real option but to consent.

We need a new model for the authorisation of the use of data about us. The EU is making sizable steps in this direction with its GDPR, which comes into effect in May 2018, and of which a useful summary can be found at: <https://ico.org.uk/for-organisations/data-protection-reform/overview-of-the-gdpr/individuals-rights/the-right-to-restrict-processing/>

We need more realistic, and nuanced, approaches to the authorisation of data, and more sophisticated limitations on what companies can do with what they know about us. Such approaches and limitations would go a long way to promoting trust and consumer confidence.

Building on our Areas of Competitive Strength

14 What is holding Australian businesses back in terms of benefiting from digital technologies?

15 What would help Australian businesses to embrace digital technologies?

16 What efforts are you or your organisation making to respond to digital transformation? Why?

17 What opportunities do we have to use digital technologies to improve linkages into export markets and global supply chains?

18 What opportunities do small and medium-sized businesses have to embrace digital innovation to drive customer value, improve their services and unlock their potential?

19 What are the key new growth industries that Australia should be tapping into? In what technologies and sectors should Australian business take the lead and where should we be a 'fast follower' of international trends?

This response relates to questions 14-19.

The ABS has conducted surveys that are relevant to this question – *Business Use of IT (catalogue 8129.0)*, and *Summary of IT Use and Innovation in Australian Business (8166.0)*.

Some of the key findings are:

- A large number of businesses experienced internet security incidents.
- Cloud computing is starting to be used extensively (and perhaps more than many businesses realise.) They also note that insufficient knowledge of cloud computing and concerns about security are limiting further application.
- Enhanced digital skills and capabilities are very important.
- Cyber attacks and spam are affecting productivity.
- Data analytics are increasingly being recognised for their importance to certain industries.

As noted above, significant opportunities exist in the service industries. They are a major employer as well as being the sector that provides the skills to use digital technologies.

Universities are making significant efforts to create open data resources. As these are a major source of research data, more funding and stronger leadership may be needed if the full benefits are to be achieved.

While the services sectors employ most Australians, they are a less well-recognised source of potential which should be better tapped to extend benefits to more Australians. Great gains can

emerge from created advantage based on the skills of Australians in these fields. Areas such as health and education and professional services are capable of much future development. The strength of past employment growth in Australia in the services sector demonstrates the potential to tap this distinctive feature of the long-term evolution of the Australian economy. The challenge for such growth will be accommodating automation-driven productivity improvements without reducing employment. The historical record is that this can be done, especially as demand shifts to these services as average incomes grow.

Empowering all Australians through Digital Skills and Inclusion

20 What opportunities do we have to equip Australians with the skills they need for the digital economy, today's jobs, and jobs of the future?

21 What opportunities do we have to bridge the 'digital divide' and make the most of the benefits that digital technologies present for social inclusion?

22 What opportunities do we have to ensure digital technology has a positive impact on the cultural practices and social relationships of Australia?

This response relates to questions 20-22.

All sectors of the Australian economy, society and environment can substantially benefit from a firm foundation of excellence in the nation's intellectual and skill capital complemented by a culture of knowledge transfer. For an advanced industrial economy such as Australia facing structural transition and a range of national and global challenges, knowledge ideas, and their application are the real key to creation of sustainable comparative advantage.

While Australia has been considered an innovative nation in many ways, reform is needed to ensure that the national capacity for utilising that innovation is increased. In order to remain a competitive and prosperous nation, the understanding of innovation needs to be broadened from a focus on research and development to one that encompasses both non-scientific innovations as well as the application of appropriate new research.

While Australia has a workforce whose skills are widely and internationally respected, it must be able to operate in an environment of global integration of trade and fragmentation of production. Furthermore there are some concerns that the Australian education system may not be fully imparting the skills required for a competitive knowledge economy. A multi-dimensional approach is needed where STEM (science, technology, engineering and mathematics) skills are built strongly, but are properly complemented by capability in areas such as humanities and social sciences (HASS) in order to understand the culture and societies in which Australia seeks to operate or engage.

Ideas and the sharing of information is also an area that is underdeveloped. The cooperation between industry and universities has been found to be inadequate. There are also fewer

institutions or think tanks to enable the fostering and exchange of ideas outside of government than in other similar nations such as the US, UK or Northern Europe.

The labour market is always changing. There is no evidence that overall unemployment rises because of digital disruption although inequality has an opportunity to increase if displaced workers are not transitioned into good jobs. It is important to devote special effort into reskilling displaced workers.

There is an ASSA Workshop that may be relevant.

<http://www.assa.edu.au/event/robotics-artificial-intelligence-and-the-future-of-employment/>

There could be better development of reciprocal responsibilities – tertiary and secondary education to teach generic skills, industry to provide on-the-job skills. Employers are increasingly wanting graduates to be ‘job ready’ but some of their expectations are unrealistic and show unawareness of the role of tertiary institutions in education.