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CSIRO Submission 19/691

Financial Technology and Regulatory Technology

Senate Select Committee on Financial Technology and Regulatory Technology

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Introduction

CSIRO welcomes the opportunity to provide input to the Senate Select Committee on Financial Technology and Regulatory Technology inquiry into the current state of Australia's FinTech and RegTech industries.

CSIRO has been asked by the Committee to submit its perspective on the questions raised in the Committee's Issues Paper and also to provide some additional information about our recent research and development in this area and our role in the Consumer Data Right.

The Issues Paper identified FinTech and RegTech as part of broader opportunity for "X-tech" across sectors, underlying job creation and innovation in small and large business. CSIRO carries out deep technology research in FinTech and RegTech and also in AgTech, EnergyTech, MedTech, and GreenTech.

The Issues paper noted that Australia's strong regulatory environment is a source of national competitive advantage. However, dealing with regulation can be costly and time-consuming for government, business, and individuals. Productivity can also be impacted by the difficulty and complexity of changing regulatory controls within organisations, which can lead to risk-aversion and dampen innovation.

A 2014 report by Deloitte[1] identified various dimensions in the cost of compliance, including:

- $250 billion – the annual cost nationally of administering and complying with the rules set by both governments and businesses. This includes $155 billion for the private sector to administer and comply with self-imposed rules.
- 8 weeks – time spent each year by the average employee to administer and comply with rules.
- 1 million people, or 1 in 11 are employed in 'the compliance sector', and this is growing.
- 10% saving of these costs (without a net loss of matching benefits) would equal 1.6% of national income, which would be one of Australia's largest impact reforms.

The opportunity is not just for improved efficiency and business agility. A 2018 report[2] by AlphaBeta and CSIRO identifies digital innovation export opportunities, for example a $25-40 billion 2028 global market revenue for Legal Informatics.

In this submission, we address selected questions posed in the Issues Paper where CSIRO has expertise and knowledge, highlight our most relevant work, and provide perspectives from our technology experts.

We also provide information requested by the Committee, including:

- CSIRO's role in the Consumer Data Right (see *CSIRO's Role in the CDR* on page 13)
- Current examples of CSIRO's work in RegTech and FinTech (see examples throughout the text)
- The impact of new technology on jobs growth and skills development within the economy (see *The Future of Jobs, Skills and Industry Transitions* starting page 15)
- CSIRO's recent technology research and application in AgTech (see *CSIRO's work in AgTech* starting page 16) and X-Tech (see *Overview of X-tech capabilities in CSIRO* starting page 20).

[1] https://www2.deloitte.com/au/en/pages/media-releases/articles/rules-eat-up-250-billion-a-year-271014.html
[2] https://www.alphabeta.com/our-research/digital-innovation/

We hope that these insights will assist the Committee's investigations into the opportunities for government to promote effective and sustainable growth in these sectors so that Australia's economic competitiveness may be enhanced.

CSIRO is available to discuss this submission further with the Committee. Please refer to the contact details on the cover page.

Responses to Selected Questions in the Issues Paper

What area of technological innovation does your company specialise in?

CSIRO is Australia's national science agency. We solve Australia's greatest challenges through innovative science and technology. We are one of the world's largest mission-driven multidisciplinary science and research organisations.

Through our science we have created healthier Australians, a more sustainable environment, entire new industries and new jobs, and grown the wealth of the nation.

We are an innovation catalyst, collaborating with industry, government, academia and the community to turn science into solutions, to secure our future national prosperity. We are one of the world's few publicly-funded research organisations that focuses on every aspect of science, engineering and technology, enabling us to bring the benefit of our science to every Australian.

Through research and development, we focus our science on solving the greatest challenges: Food security and quality; Health and wellbeing; Resilient and valuable environments; Sustainable energy and resources; Future industries; and a secure Australia and region.

Today CSIRO is delivering Australia's biggest ideas – energy (hydrogen), health, artificial intelligence, and space. We manage some of Australia's largest, state-of-the-art research facilities for the nation and we develop national science talent through programs for primary and secondary school students, reaching over 150,000 last year.

CSIRO Data61 is the data and digital research unit of CSIRO and works across domain areas within CSIRO and externally with Government, industry and academic sectors with a focus on technology is in areas of:

- software and computational systems
- data analytics and decision sciences
- cyber-physical systems

Data61 works in technology domains such as FinTech, RegTech, but also in industry sectors such as Legal Services, Financial Services, Agriculture, Mining, Manufacturing, and Government IT (see *Overview of X-tech capabilities in CSIRO* to illustrate the breadth of Data61's "X-Tech").

CSIRO's work in RegTech and FinTech

CSIRO's areas of technology research relevant to FinTech and RegTech include:

- machine learning
- privacy and private computing
- blockchain
- financial risk modelling
- legal informatics.

The opportunity for RegTech is to make red tape radically cheaper and easier to deal with. In the same way that GPS has made our roads easier to navigate, we imagine a world where RegTech can help Australians, businesses and governments, navigate their obligations more easily and with confidence.

This could improve the quality and timeliness of compliance and help to prioritise areas of high risk in society.

To illustrate, we describe below two areas of Data61's research: investigative analytics using machine learning on network graphs, and legal informatics using logics to represent legal texts.

Investigative Analytics

The goal of the Investigative Analytics program is to enable government departments to effectively make use of their diverse data assets to detect, prevent, and disrupt illegal activities within the Australian community. The program has developed and delivered advanced analytics and machine learning technology to Australian Government agencies to help improve efficiencies and outcomes for the Australian Public Service.

Across the Australian Public Service, particularly in law enforcement and national security, analysts and investigators must work with increasing volumes of data that often form complex and connected networks. Depending on the agency and task, these networks could be transaction networks, social networks, or criminal networks for example. The Investigative Analytics program develops software for network graph analytics, which is designed to process, analyse and visualise this complex network data.

The program is funded through the Australian Government Modernisation Fund, and the departments partnered with the program include AUSTRAC, Home Affairs, Australian Criminal Intelligence Commission, and the Australian Federal Police.

The primary goals of the Investigative Analytics program are:

- To develop of a system for integration and transformation of highly diverse data sources into a unified graph or network that can be deployed into multiple departments;
- To develop of a graph machine learning and visualisation platform;
- To provide support and assistance to enhance the greater skills and capabilities within the Australian Public Service in the areas of production engineering, data analytics, machine learning and specific tool development in the area of investigative data analysis.

In Australia, $8 billion per annum is lost in financial crime and sophisticated fraud. AUSTRAC regulates 14,000 reporting entities to detect and investigate financial crimes such as anti-money laundering and counter terrorism financing. Financial crime are becoming increasingly sophisticated, and require more data-driven approaches and domain expertise. In addition, regulatory breaches for anti-money laundering indicate a wide-spread challenge in both international and Australian financial institutions.

The Investigative Analytics technology is designed to be highly adaptable to both government and industry for investigative use-cases in the financial space. In particular, financial crime involves highly connected network data, risk detection and must deal with large volumes of data from multiple sources. The technology developed in the Investigative Analytics program can be applied across all these areas by using scalable graph machine learning technology to financial transaction data to highlight risk and patterns of behaviour to investigators and intelligence analysts.

We see three main areas of application and continued development of the Investigative Analytics technology in the financial crime space:

- **Entity Resolution:** Methods for determining whether two entities (people, companies, etc) are in fact the same. This can be applied across multiple databases, or to determine duplicates in a single data store. In particular, how can you determine identity when information is missing, or a person provides deliberately misleading information.

- **Risk Identification:** Methods to allow a risk score to be attributed to an entity in a network. Here we can use graph machine learning techniques to propagate risk through a network, to enable risk to be understood in cases with missing information, and to incorporate context and behaviour in how risk is calculated.
- **Pattern Detection:** The ability to search for typologies of known behaviour inside a network. Complex fraud and sophisticated crime such as anti-money laundering involves sequences of connected transactions and patterns of behaviour. Graph machine learning can utilise network structure to detect patterns of behaviour inside the network that may indicate illegal or suspicious behaviour.

The Investigative Analytics technology has both open source components to provide technology to the wider public service and global community, and also closed source components to be provided as a sovereign capability for Australian law enforcement.

Legal Informatics

A CSIRO research team has for more than a decade been world-leading researchers in an area called legal informatics, or computational law. The team designs special kinds of logics to capture the intent of legal texts such as legislation, regulation, policy, and contracts.

The goal is that computer-assisted reasoning using these logics should give the same answers as judges and lawyers doing legal reasoning about the black-letter law. This vision is not just machine-readable web pages or PDF documents, but rather, machine-interpretable legislation, so computers can help to automate compliance - to reduce the cost of red tape and improve the quality of risk management in society. This vision is sometimes called “Rules as Code”. When legal texts can be represented in this way, it enables the potential to build digital tools to help people to interact with the law. This could help to address the cost burdens and inefficiencies described above.

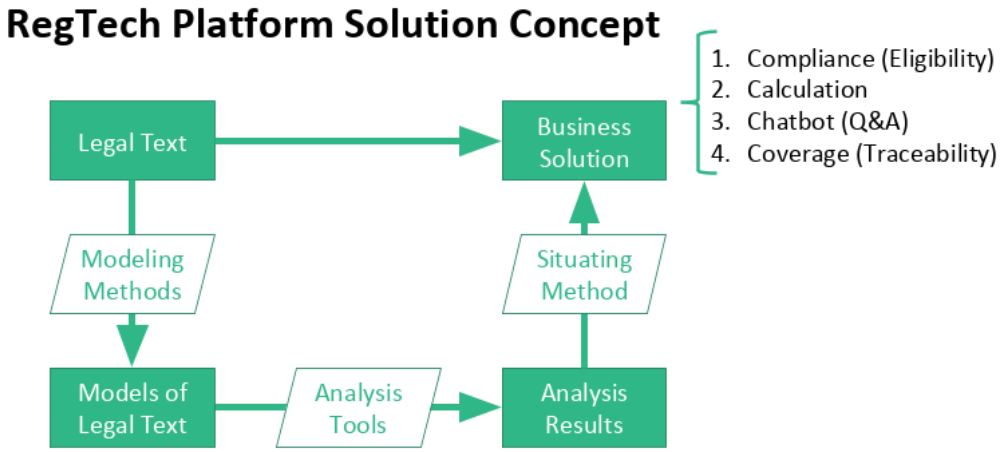
CSIRO has carried out a variety of research and development projects with government and industry in this area. The most commercially-advanced activity is a collaborative joint venture with PwC, called PaidRight. This uses a Rules as Code approach to check employees’ entitlements under Enterprise Bargaining Agreements against what they have actually been paid.

Current discussions with government and industry are exploring other potential areas of use:

- In building and construction there are potential opportunities to automatically check Computer Aided Design (CAD) models of buildings against the many building and construction regulations from the federal and state governments. There is widespread interest from the building and construction industry in pursuing a collaborative approach to more efficient and effective ways of managing regulatory compliance.
- In agriculture there are opportunities to assess the eligibility of farmers to access carbon capture schemes run by the Clean Energy Regulator (CER) [see *CSIRO’s Digiscape future science platform* on page 19]. CSIRO are exploring whether a Rules as Code approach may be effective to support this purpose.

In exploring opportunities like these, CSIRO’s Data61 works with many Australian regulators and agencies, and can act as a neutral expert facilitator between regulators and the regulated. Data61 maintains excellent relationships with agencies such as ASIC, RBA, ACCC, AUSTRAC, and Treasury. We have also been working closely with a government interdepartmental working group, the Digital Legislation Working Group. This has been led by the Department of Human Services and involves participation from many agencies and departments. This working group is also exploring the opportunities and pathways to realise benefits for Australia from Digital Legislation and the Rules as Code vision.

Below is a graphical representation of our general approach for converting legal texts to computer-based models of the legal texts, and using those models to solve a variety of business problems. These models do not replace the law, but instead can be used to automate compliance assessments, calculate entitlements, navigate through the law using chatbots or similar technologies, or ensure that regulatory systems address regulatory requirements.



Other Recent Examples in Regtech / Fintech

Smart Money (Blockchain) – CSIRO Data61 and Commonwealth Bank (CBA) developed a lab-based mobile app and blockchain infrastructure to research the potential for programmable 'smart money'. This kind of technology might support conditional payments of many kinds but was motivated by the highly personalised payment conditions arising in National Disability Insurance Scheme (NDIS).

Smart Money is enabled by a blockchain token solution that could in principle integrate with Australia's New Payments Platform, and is accessed through a user-friendly app. By attaching conditions to money as it flows through the economy, this 'smart money' knows what it can be spent on, who it can be spent by, and when it can be spent. The prototype app provided lab-based functionality designed to help participants manage their plans by enabling them to find, book and pay for services from NDIS service providers without the need for paperwork or receipts.

RiskLab - RiskLab is a multi-disciplinary R&D centre in CSIRO Data61 for developing methodologies and technologies in actuarial sciences, econometrics, applied mathematics and statistics, and financial mathematics. One project in the centre looks at forecasting future economic outcomes and managing the uncertainty of superannuation.

Climate Science Analytics - This research project focuses on developing digitally-based and integrated technologies to meet the climate change data and information needs of the financial services sector, as a first step towards a nationally coordinated framework for delivery of climate information. This work showcases an analytics and visualisation platform designed to make climate data industry-relevant.

In general terms, how would you describe the operating environment for FinTech and RegTech start-ups in Australia?

There is an active FinTech and RegTech ecosystem in Australia. Our sophisticated legal and regulatory system when coupled with our emerging digital capabilities and expertise could be a source of competitive advantage globally for RegTech. The presence of large financial services institutions in banking and superannuation provides great potential as a market for FinTech start-ups, and also for RegTech start-ups targeting this highly-regulated sector. Industry associations such as the RegTech Association of Australia are collectively promoting the interests of these start-ups.

In Australia's sophisticated commercial legal services sector, there is growing interest in RegTech and LawTech (also known as LegalTech) as a source of innovation and efficiency. Large accounting/consulting firms have been active in promoting this, as part of the ongoing push for digital transformation in industry. Industry associations such as the Australian Legal Technology Association are active in facilitating awareness and adoption of legal technology.

Initiatives such as Australia's Consumer Data Right are establishing a data sharing regime which will provide an enabling infrastructure for many FinTech and X-Tech startups. This is world-leading because it is a multi-sector regime, not just for Open Banking, but also potentially providing a new right for consumers in Energy and other sectors.

Do you have any suggestions on how the Australian Government can best facilitate the continuing growth of the FinTech and RegTech industries in Australia?

Government plays several roles for the FinTech and RegTech industries, including as a regulator, as a purchaser, and as a platform for society and the economy.

Government as a regulator, and the authoritative source of legislation, regulation, and regulatory guidance.

A key opportunity we would recommend government could consider is to publish machine-interpretable rules alongside the text of legislation and regulation, to enable the Rules as Code vision. This could provide critical support for the RegTech industry and potentially significant productivity benefits for regulated industries in Australia. Another opportunity for government as a regulatory supervisor could be to explore increasing the breadth and depth of regulatory "sandboxes" (testing areas) to facilitate the exploration and adjustment of businesses in their provision of new technologies and services in regulated industries.

Government as a purchaser of FinTech and RegTech technologies, implemented to support service delivery.

An opportunity for government to consider is to be a lead adopter of X-tech for their own use, not just for established conventional technologies, but also in deeper trials, pilots and proofs-of-concept of new technologies. In the FinTech industries, government is a major user of technologies for social service payments, purchasing payments and financial management of its own business. In RegTech sectors, government is a major user of technologies for data collection, analysis, investigation, and supervision in regulated industries such as financial services, trade, health, building and construction, and agriculture and water.

Government is the natural authority for many kinds of data and services, such as government registers and licenses, or the New Payments Platform. In this role Government acts as a kind of platform for the economy and society. The role of Government as a platform is not just to collect data from each separate individual and business, but to provide an authoritative foundation for individuals, businesses, and government to work together in a trustworthy and efficient way. Government does not necessarily need to provide end-user applications, but instead could provide APIs (Application Programming Interfaces) for government data and services, to allow X-tech companies to develop innovative user experiences for individuals and businesses to work with government. Government could also consider exploring the use of blockchain and distributed ledger technologies in cases when data and services cannot be delivered by a single central authority, but instead must be delivered from a federation of multiple jurisdictions each retaining their own authority in a collective.

How can technology be used to improve access to financial and other services for geographically isolated or other marginalised groups in Australia?

The Rules as Code approach has the potential to support new technology solutions that could reduce the cost and complexity for individuals and businesses in understanding, navigating, and working with legislation and regulation. This could help to improve access to justice, which can be particularly important for marginalised citizens.

There are a broad range of other technology solutions which support marginalised and isolated citizens. Examples of work carried out by CSIRO include:

- **Coviu (MedTech)**: remote web-based interactive healthcare assessments to remote patients.
- **Ceres Tag (AgTech)**: smart ear tags for livestock, to give producers greater control over grazing management, allow them to locate livestock remotely and alert them to stock theft, illness or if an animal is giving birth. The aim is to reduce operating costs, increase operational efficiency and additional financing opportunities through better management of livestock through data.
- **Gamification to facilitate mental health diagnoses (MedTech):** Using a simple computer game and artificial intelligence techniques, clinicians were able to identify behavioural patterns in subjects with depression and bipolar disorder, down to subtle individual differences in each group.

CSIRO's Australian e-Health Research Centre develops and trials a range of telehealth solutions. The solutions aim to address health service inequity by connecting patients with clinical care teams regardless of location. A sample of the solutions Include:

- **Smafter, Safer Homes:** A sustainable health and aged care system to enable older Australians to remain in their own homes longer through their ageing journey with access to health and care support at affordable cost. Using Internet of Things and Artificial Intelligence the SSH platform aims to support older populations and aged care industry through smart home technology.
- **M♡THer:** A mobile app for women with gestational diabetes record information in the app such as blood sugar levels, blood pressure, weight, diet and exercise. This information is viewed, on a clinician portal to help these women by their treating clinicians to better monitor and track their condition and intervene if required – such as calling a woman to give specific, immediate advice.
- **Activate TKR**- A mobile app with wearable activity tracker and clinical portal to support patients undergoing Total Knee Replacement and their care teams. Similar to M♡THer, patients collect data including self-reported and sensor gathered data to share with clinicians. In addition, media rich physiotherapy programs, educational content and support tools are delivered at time sensitive points.
- **Baby Monitoring App** - Allowing parents to monitor their prematurely born babies. Babies born prematurely often have complex care needs and may need to remain in a hospital's neonatal intensive care unit. Some parents live too far away to visit the hospital frequently, and the separation can affect their ability to bond with their newborn. To assist, CSIRO developed and trialled a new private, secure and affordable app to give parents access to live video of their babies.
- **MoTER-COPD**: This project is a randomised controlled trial of using mobile health technologies to deliver self-management tools to patients, for enhanced management of chronic phulmonary obstructive disease (COPD). People with COPD utilise a mobile App to educate and self-manage their symptoms and inhaler technique through evidence-based action plan of their condition. There is also a clinical portal that enables the clinician to intervene in need of clinical or medication intervention.

- **Remote-I: tele-ophthalmology platfor**m using satellite broadband to help prevent blindness in remote communities. Remote-I works by capturing high-resolution images of a patient's retina with a low-cost retinal camera, which are then uploaded over satellite broadband by a local health worker. Once the health worker uploads the patient's image, an ophthalmologist can access it anywhere at any time. It takes about five minutes to read the images, create the report, and then send it back to the health worker

The Australian e-Health Research Centre has also investigated the customisation of a variety of our technologies to make them culturally relevant and suitable for delivery to Indigenous Australians living in remote communities.

How can public sector data be made more accessible and useful for FinTech and RegTech companies seeking to deliver innovative products and services?

There are different types of public sector data, including open data, personal data collected by government, and data which is sensitive for commercial or security reasons. The ability or means by which data can be made accessible varies and depends on these characteristics.

Data which can be released as Open Data is accessible for use by everyone. Australia has an Open Data portal called **data.gov.au**, developed partly by CSIRO. CSIRO has also developed a tool called **National Map** which can be used to visualise geographic data, including the geographic open data released by state and federal governments through data.gov.au. We would encourage all government agencies to release public sector data as Open Data where possible, for use by X-tech companies in Australia.

Personal or sensitive data collected by the government cannot be released as Open Data. It is difficult to safely anonymise or de-identify personally-identifying data for general release. There have been many reports of people being re-identified in supposedly anonymized datasets. CSIRO is carrying out research on quantifying the re-identification risk for datasets.

Another approach to using personal information held by government would be to seek consent for sharing it, in a similar way that consent is obtained under the Consumer Data Right. One option for government to consider would be to create a Data Right for individuals to direct government to share data to specific third parties. Government is the natural authoritative holder of some kinds of data, for example data in official registers. It would be possible for government to act as a data platform for the economy, providing authoritative information to facilitate trustworthy economic and societal interactions. For example, business owners might be able to use such a regime to securely share critical information from government business registers with their suppliers and customers.

Instead of releasing data, it would also be possible to try to provide the benefits of data analytics, without sharing the data itself. This could be done by government providing a controlled analytics service over public service data, or by using new technologies for Privacy Preserving Computation. These are also active areas of research within CSIRO.

How should Australia take a prominent role in supporting and developing international blockchain standards?

Australia already has a prominent role leading the development of international blockchain standards through the ISO/TC307 committee on Blockchain and Distributed Ledger Technology. Australia through Standards Australia leads that committee and is supported in that leadership by the Australian government. Australian experts, including CSIRO personnel, have been active in all meetings of ISO/TC307.

There are many other standards bodies internationally which are also defining blockchain standards. These are usually blockchain standards for specific industries, or for integration with other specific technologies. Australians are active in some of these standards bodies.

In general, a barrier to participation in many international standards bodies is the time and expense of traveling to standards meetings.

What learnings and opportunities can Australia glean from international FinTech and RegTech industries?

Co-designing new legislative instruments with those who need to comply, can result in better outcomes for the policy partner, implementing agency and industry. Governments around the world are beginning to experiment with machine readable data and making this available. The Rules as Code approach is being actively investigated and experimented with in the following jurisdictions:

- **New Zealand** - Better Rules is an initiative that examines the way government develops and implements regulations to ensure that it can be more easily consumed by digital channels. It involves re-imagining regulation as an open platform based on logic, decision-models and rules, which is also referred to as 'legislation as code'[3]. CSIRO has established contact with this New Zealand initiative, and is interested in opportunities for collaboration.
- **United Kingdom** - the Financial Conduct Authority (FCA) and the Bank of England held a two-week challenge to examine how technology can make the current system of regulatory reporting more accurate, efficient and consistent. Participants successfully developed a 'proof of concept' which could make regulatory reporting requirements machine-readable and executable. This means that firms could map the reporting requirements directly to the data that they hold, creating the potential for automated, straight-through processing of regulatory returns[4]. CSIRO has established contact with the FCA and is interested in opportunities for collaboration.
- **United States** - The Office of the Federal Chief Information Officer (OFCIO) launched a project using machine readable schema to cross-analyse requirements within all existing policies, in order to identify targets for rescission and revision to reduce burden, particularly in cases where requirements are duplicative, outdated or impede innovation[5].
- **United States -** Washington DC took the innovative step of publishing all of its laws on GitHub in open, machine-readable form, as the authoritative source of its legal code. GitHub is a software development platform which enables people to collaboratively code and interact with one other.

Australian regulators are among the most collaborative globally. Australian financial regulators maintain bilateral agreements with most of the major financial centres in the world[6]. This should continue to be encouraged to learn and lead best practice and foster international business connections and co-regulatory frameworks. Other nations can also learn from Australia, as demonstrated by the increasing global interest in Australia's multi-sector Consumer Data Right regime.

Key success factors for FinTech ecosystem development in the United States include:

- the country's position as a leading global financial centre

[3] https://www.mbie.govt.nz/business-and-employment/business/support-for-business/better-for-business/better-rules-better-outcomes/
4 https://www.fca.org.uk/news/press-releases/fca-launches-call-input-use-technology-achieve-smarter-regulatory-reporting
5 OECD Embracing Innovation in Government, Global Trends, February 2019 at pg 95
6 ey.com/Publication/vwLUAssets/EY-fintech-ecosystem-playbook/$FILE/EY-fintech-ecosystem-playbook.pdf

- financial services firms that increasingly understand the benefits of domestic FinTech capability
- a large existing financial technology workforce
- a large venture capital ecosystem

Although Australia is a smaller market than the United States, the sophistication, size, and structure of our financial services sector could provide similar advantages and make Australia a proving ground for the development of FinTech for export.

CSIRO's Role in the CDR

CSIRO has been appointed by the Treasurer, the Hon Josh Frydenberg MP, as the Data Standards Body (DSB). Separately, Mr Andrew Stevens has been appointed as the Data Standards Chair. The role of the DSB is to assist the Chair in the development of data standards for the Consumer Data Right (CDR). The Chair has the authority under the Competition and Consumer Act to make binding data standards, when required to by rules and designation instruments defined by the Australian Competition and Consumer Commission (ACCC), Treasury, and the Government.

The CDR data standards define technical data formats, secure data sharing protocols, and consumer experience constraints to allow Australians to access data held about them by businesses and direct its safe transfer to others. A number of working groups have been established to support the DSB in designing and testing the data standards. Input provided by Advisory Committees and working groups, alongside draft guidance materials, API specifications and implementation materials are being shared on public websites[7]. The work of standards development is conducted in close collaboration with the ACCC as lead regulator of the CDR, the Office of the Australian Information Commissioner (OAIC) as the lead privacy regulator, and The Department of the Treasury.

Are there any impediments to ensuring that the benefits Open Banking offers for consumers and FinTech firms are maximised?

The CDR regime arose in response to a Productivity Commission report about the economic productivity benefits of greater access to data. FinTech companies are expected to take advantage of this new digital infrastructure to provide new automated financial services for consumers and small businesses.

Banking ("open banking") is the first sector designated under the CDR. The CDR regime leads globally in being able to work across multiple sectors. Energy is expected to be the second designated sector. Maximising the benefits of the CDR regime requires expanding it to multiple sectors. The benefits will increase not just by increasing data access within multiple sectors, but also by increasing data analysis across sectors.

CDR Cost Issues

The CDR regime creates a safe closed environment for consumers to direct data holders (e.g. banks) to share data about themselves with data recipients (e.g. FinTechs), and for consumers to consent for those data recipients to use that data. Under the ACCC rules, data recipients must be individually accredited. The costs of accreditation arise from establishing secure and trustworthy systems, and from providing evidence about that to the ACCC. Confidence in the whole CDR regime may be jeopardized if data recipients are not trustworthy.

'Write-access' for CDR data in Open Banking

Open Banking in Europe and the UK emerged from payment systems directives, and naturally focus on payments, which are the "write" transactions in banking. But Open Banking in Europe and the UK is restricted to the banking sector. The CDR emerged from a different policy direction, from the Productivity Commission report on productivity opportunities from more and better use of data in the

[7] https://consumerdatastandards.org.au/about/

economy. So the focus of CDR is on enabling read access to data, and the regime is planned to span multiple sectors, not just banking.

In Australia, the New Payments Platform already enables 24-by-7 real-time account-to-account payments. The New Payments Platform has an overlay services architecture to enable the development of innovative new services. Two services are in the market: PayID and Osko, and no doubt further services will emerge in time and the RBA is keen to encourage that.

It would be a significant change to the CDR regime for the Government to add legislation and regulation to require support for payment initiation or other kinds of write access in banking, or to add other kinds of write access in other sectors. However, such a change might facilitate capabilities for consumers such as account transfer, customer service management, or management of recurring payments.

One area in which a form of "write access" might be introduced into the CDR regime by possible future changes to the data standards is for the management of consumer consents. This might provide mechanisms providing more powerful support of existing regulatory principles, allow consumers to more easily update, query, and manage consents and authorisations.

Following the implementation of the CDR in the banking sector, how quickly should government seek to implement CDR reforms in related financial sectors such as superannuation? What specific considerations need to be given to the implementation of CDR in the superannuation sector?

Expanding the CDR beyond banking will open new opportunities within each new sector, and also additional opportunities across sectors. For example, if CDR was active across both banking and superannuation, FinTechs would be able to more easily offer wealth management services and retirement planning services to consumers. Ultimately the choice of designation of new sectors for the CDR is a matter for government.

Each sector has a different industry structure and different requirements. Sectors also often use pre-existing technology standards. For the CDR, data standards need to be tailored for each sector, to be able to represent the product information and other consumer data, to integrate with existing standards where appropriate, and to enable workable authentication and authorisation in those sectors.

Information requested by the Committee

The Future of Jobs, Skills and Industry Transitions

The Insight team is a multidisciplinary team of researchers and consultants in CSIRO Data61. They translate data and research for government, industry and community organisations to inform long-term strategic and policy decisions. They prepare research reports, conduct stakeholder consultations and workshops, deliver training in strategic foresight and present at government and industry forums around Australia and internationally. The Insight team draws on a broad range of qualitative and quantitative forecasting techniques to build evidence-based views of the future and provide independent input into digital strategy and policy challenges.

What we know about the future of work

Research into the future of work has generated much interest and discussion over the past 5-10 years, with various perspectives put forward around what that future could look like. Seminal work published by Carl Frey and Michael Osborne in 2013 estimated that up to 47% of jobs in the US would be substituted by technology in the next 10-15 years, but this likely reflects an extreme scenario of future automation impacts. More recent research from the OECD has suggested that closer to 9-14% of occupations in OECD countries would be at high risk of automation, with a larger share of occupations (32%) likely to experience significant changes in skill requirements due to the **automation of some, but not all, tasks**. These findings emphasise the need to strengthen reskilling pathways to prepare the workforce for these changes.

In 2016, Data61 released the *Tomorrow's Digitally Enabled Workforce*[8] report in collaboration with the Australian Government and industry partners, which highlighted the major shifts that could impact the future of jobs and employment in Australia over the next 20 years. These included the rapid growth in digital technologies; the emergence of new platform models of employment and education; the supportive conditions for entrepreneurs; the changing demographic profile of the Australian workforce; the growing demand for highly skilled workers; and the value of knowledge, data and other intangible assets in the modern economy. This work has informed the development of the Jobs and Education Data Infrastructure project – a project led by the Department of Employment, Skills, Small and Family Business that is focused on developing a new tool for tertiary education providers to design courses that respond to emerging skill demands.

CSIRO has since expanded its future of work research into specific industry and education sectors to provide more nuanced views around the specific trends impacting future employment and skill requirements. For example, *The VET Era*[9] report explored the types of skills and ways of working that will likely be needed in the future, and how the VET sector could adapt to meet this demand. Other work has examined the effects of future economic transitions and automation on employment in the Queensland economy (*The Innovation Imperative* report[10]), the key trends and uncertainties shaping the future agriculture workforce in Australia and its related services (*The Future of Australia's Agricultural Workforce* report[11]) and the impacts of technology on Queensland's public sector workforce over the

[8] https://www.data61.csiro.au/en/Our-Research/Our-Work/Future-Cities/Planning-sustainable-infrastructure/Tomorrows-Digitally-Enabled-Workforce
[9] https://tafeqld.edu.au/assets/oneweb/PDF/about-us/reports-submissions-applied-research/vet-era.pdf
[10] https://www.data61.csiro.au/~/media/D61/Files/Q-ForeSight.pdf?la=en&hash=1AB7A41A5168D069CB0A20770BD465E53FBB1BB7
[11] https://data61.csiro.au/~/media/D61/Files/19-00351_DATA61_REPORT_AgricultureWorkforce_WEB_191031.pdf?la=en&hash=3427E88C09FA139934AC03E6B74D74835D7EC3BB

coming decade, identifying occupations that are highest priority for reskilling and workforce transitions (internal report delivered for the Queensland Government).

Opportunities for industry transitions and job creation

Understanding future industry creation and transition opportunities is a key component for understanding the types of jobs that could be created in the future and the skills and capabilities that will be required in these roles. In the *Sunrise Industries* report[12], Data61 took a regional perspective, identifying seven industries that could emerge in countries in the Association of Southeast Asian Nations. Among these industries were the **FinTech and RegTech** sectors, enabled by the growing demand for innovative financial services in the region and supporting digital technologies. Other industries touched upon opportunities for artificial intelligence applications, high-value nutrition, energy storage and distribution, cyber-physical security, personalised health and digital infrastructure.

Data61 has also identified eight 'knowledge-intensive industries' for Queensland that point to industry creation opportunities, drawing upon existing industry strengths and enabling scientific and technological capabilities (internal report delivered for the Queensland Government). These industries present opportunities to transition Queensland's existing industries to be more knowledge- and technology-intensive, whilst also seeding new high-value industries. Applications for blockchain technologies also present novel opportunities for industry and job creation in Australia. These are explored in Data61's *Blockchain 2030* report[13], which highlights the emerging trends and uncertainties impacting applications of blockchain technologies and profiles the current blockchain workforce. While there is strong demand for blockchain-related skills in Australia, the supply of skilled workers with these capabilities is currently lacking.

CSIRO's work in AgTech

Several reports have been published in recent years concerning the digital agriculture ecosystem in Australia and these will be useful references for the Committee while conducting its inquiry. Some highlights are extracted below followed by some selected examples of CSIRO AgTech projects. The challenges, issues and recommendations are broadly analogous to RegTech and FinTech identifying similar themes and avenues for actions.

Digital Innovation: Australia's $315B Opportunity (By AlphaBeta Advisors - commissioned by Data61)[14]

Key messages

- Forward market projections to 2028 highlight the size of the export opportunity for Australian Agtech. Global market revenue is projected to reach $25-60 billion in value while Asia-Pacific is projected to reach $10-25 billion.
- Digital agriculture is harnessing mobile sensors, robotics and machine learning techniques to improve resource planning and use in agricultural production.
- This will be needed to feed the world in 2050, global food production will need to increase by 50%. The combination of population growth and climate change is raising concerns about food security. While such increases have been achieved before, conditions today are more challenging. Yield

[12] https://data61.csiro.au/~/media/D61/Files/SunriseIndustriesReport.pdf?la=en&hash=39C3762F1B4A5B3023377A3BE4CE82A3016F37CC

[13] https://data61.csiro.au/~/media/D61/Files/ACS-Data61-Blockchain-2030-Report.pdf?la=en&hash=3706BB2A9619FB4A87318991B8A197732BDFD966

[14] Digital Innovation: Australia's $315B Opportunity is available at https://data61.csiro.au/en/Our-Research/Our-Work/Future-Cities/Planning-sustainable-infrastructure/Digital-Innovation

growth in most major crops has slowed in the last few decades, and climate change is predicted to threaten 10-25% of global crop yields. The availability of new agricultural land has also declined, and much existing farmland is degraded from overuse.

- Digital agriculture can lift productivity by improving the use of scarce resources. Data-driven solutions, utilising remote sensors, robotics and machine learning techniques to monitor and improve production and decision making, can improve productivity. For example, data from regular monitoring of plant and soil conditions can be used to make planting decisions and more accurately manage water inputs. Vertical farming techniques enable low resource intensive food production and can use up to 95% less water; 90% less land; increase yields by 80%.
- **Why Australia?** Australia's harsh climate and historically higher labour costs have led Australian scientists to be at the forefront of research into agricultural innovations, such as automated systems and drought-resistant crops. Our reputation for sustained innovation in agricultural technology, our experience dealing with a resource-constrained environment and proximity to rapidly urbanising Asian countries put Australia in an ideal position to tap into markets with growing demand for digital agriculture products and services.
- **Potential challenges:** While Australia has a strong pedigree in the development of agricultural technologies, our climatic conditions and crop mix are markedly different from those in most parts of Asia, reducing the compatibility of some domestically developed innovations.
- **Benefits of digital agriculture:** Digital agriculture can improve the resource efficiency of agricultural production, reducing the environmental cost of our food, and improve food security through supporting stronger yields.

Seeds of Success: Advancing Digital Agriculture From Point Solutions To Platforms[15]

Key messages

- Currently known as the world's least digitised industry, agriculture is experiencing a digital revolution driven by global trends that are laying the foundations for new agricultural production systems and supply chains.
- Agriculture is a critical sector for Australia's economy, with exports to markets in the Asia-Pacific region expected to grow significantly in coming decades.
- Implementing digital technologies in agriculture will be critical for Australia's ability to meet growing global demands and remain competitive in global markets.
- Awareness of the digital agriculture opportunity is emerging in Australia, with interest growing amongst entrepreneurs and investors, and strong support from government.
- Digital agriculture technology maturity culminates in the development and deployment of predictive and prescriptive data analytics platforms, and the United States is leading.
- In Australia, the current state of both development and adoption of digital agriculture technology is less mature than the United States; centred on single use-case solutions, enabled by descriptive and diagnostic analytics.
- **Barriers** exist in Australia that are limiting the development and the widespread diffusion of digital agriculture technologies, and therefore the maturation of the sector.
    - A key structural barrier constraining the maturity of digital agriculture is the lack of access to critical telecommunications and internet infrastructure in rural Australia.
    - The lack of key datasets is also a barrier in some countries, including Australia. Foundational datasets for soil and climatic data have been critical to fostering the development of digital

[15] https://www.ussc.edu.au/analysis/advancing-agtech-and-digital-agriculture-in-australia

technologies in the United States. However, similar national datasets do not exist in Australia. Technology developers and researchers are at a significant disadvantage without these datasets.

- Low levels of digital literacy prevent farmers from adopting digital technologies, no matter how useful they may be.
- Farmers are keen on technology: one in five Australian farmers are generally positive about digital technologies and report looking to focus their investment in farm technology and innovation in the next 12 months. However, the reality is only around one in 20 make that investment. In some cases, the value proposition of digital technologies hasn't outweighed the current, trusted options. A lack of a strong value proposition for farmers is a critical barrier to the adoption of currently available digital technologies, as well as to the maturation of the digital agriculture technologies sector.

- Overcoming these barriers by bridging the disconnect of expectations between Australian farmers and the technology community, and creating solutions with strong value propositions, requires investors and entrepreneurs to understand the many complexities faced by Australian farmers.

Australian Agtech: Opportunities and Challenges as seen from a US Venture Capital Perspective[16]

Key messages

- Unprecedented global investment in AgTech reflects this growth, having quintupled from US$309M in 2013 to US$1.5b in 2017. The implications of these changes for Australia are immense. While Australia's venture capital market has expanded substantially in recent years — having doubled in total size from 2016 to 2017 alone — it invests dramatically less in AgTech on a per capita basis than most developed nations like the United States, where per capita investment in AgTech is nearly 50 times the size of Australia's.
- Australia's AgTech investment market is small, at an early stage and not keeping pace with global peers.
- Australia has a breadth of AgTech segments of interest and increasing investment opportunities.
- Australia has strengths to draw upon and challenges to overcome, for example;
  - The venture capital ecosystem in the United States is mature enough to allow for the emergence of highly specialised AgTech VC firms. The lack of AgTech VC firms in Australia means this combination of extensive experience in agriculture, in tech start-ups and venture capital is missing.
  - Australia's agricultural public R&D infrastructure is seen, both locally and internationally, as indispensable for the development of a strong Australian AgTech sector. Furthermore, AgTech venture capital firms in the United States see immense value in the Australian agricultural environment as an AgTech testbed.
- There are far fewer science-based technology companies than digital tech companies being funded in Australia. In contrast to the United States, where the commercialisation of university research has long been a feature of the US innovation ecosystem, in Australia commercialisation of IP is challenging. CSIRO, however, is seen as a key asset in Australia's innovation ecosystem and was mentioned in all the case study interviews. The shift in focus of the CSIRO in recent times and the role their investment fund, Main Sequence Ventures, will play in providing access to research with commercial potential is critical.
- **Policy implications include:**

[16] https://www.ussc.edu.au/analysis/australian-agtech-opportunities-and-challenges-as-seen-from-a-us-venture-capital-perspective

- Research and development: Create incentives for multinational agricultural corporations to establish major R&D operations in Australia.
- Investors: Create incentives for sophisticated investors from overseas to open offices in Australia, particularly venture capital firms with domain experience in AgTech.
- Technology investment hubs: Stimulate the establishment of technology-specific incubators and accelerators to create tight-knit, globally-connected investment communities around technology-specific expertise.

Powering Growth: Realising the potential of AgTech for Australia[17]

Key Recommendations

- Establish an independently administered fund designed to make AgTech more affordable to industry.
- Increase funding for the Accelerating Commercialisation component of the Entrepreneurs' Programme.
- Increase the R&D Tax Incentive and pay it quarterly.
- Host a summit to broaden the angel pool for AgTech investment.
- Develop a digital marketplace for AgTech products.
- Establish a network of AgTech hubs.
- Establish joint R&D funds with leading global AgTech players.
- Ensure rural Australia gets connected to state-of-the-art national IT infrastructure.
- Develop a nation-wide AgTech strategy
- Provide direction to university and RDC research via commercialisation KPIs and shorter grant periods.
- Build technology skills and entrepreneurship into existing agriculture courses
- Increase the frequency of the agricultural census to yearly.

CSIRO's Digiscape future science platform (harnessing the digital revolution for Australian farmers and land managers).

Digiscape will solve multiple real-life knowledge shortfalls in the land sector simultaneously. Digiscape is building a common big data infrastructure that will support next generation decision making and transform agricultural industries and environmental action

X-Tech type	Name	Description
AgTech	Digiscape Future Science Platform: LOOC-C	Project Leader: Peter Fitch in Land and Water LOOC-C allows farmers and carbon aggregators to assess the potential greenhouse gas abatement from management actions on their land. It will be officially launched on 11th December 2019 in Canberra. The Clean Energy Regulator is in discussions with Data61 about a partnership. https://looc-c.farm/introduction

[17] https://startupaus.org/document/agtech-australia-realising-the-potential/

X-Tech type	Name	Description
AgTech	Digiscape Future Science Platform: Graincast	Project Leader: Roger Lawes in Agriculture and Food Graincast uses weather and soils information to forecast soil moisture and yield for grain crops. Graincast has 225 registered users and is in negotiations for acquisition by an agricultural SME.
AgTech	Digiscape Future Science Platform: 1622	Project Leader: Peter Thorburn in Agriculture and Food 1622 is helping local farming initiatives monitor the nitrogen run off in their local catchment areas that feed into the Great Barrier Reef. It will be officially launched on 16 January in Cairns by Larry Marshall and the CEO of Canegrowers.
AgTech	Digiscape Future Science Platform: Waterwise	Project Leaders: Mike Bange and Rose Brodrick WaterWise advises farmers when to irrigate, using a plant stress prediction model from infrared sensors and weather forecasts. WaterWise is being used to validate the science with farmers and to demonstrate capability to potential partners.

Overview of X-tech capabilities in CSIRO

The below table is a list of exhibitors from the recent D61+ LIVE showcase event.

X-Tech type	Name	Description
GreenTech	Marine Visual Technologies	CSIRO is developing new technologies that could revolutionise the wild-caught fishing industry – making it safer and more sustainable. Accurate reporting of fish caught in the ocean is needed to manage stocks. Fish substitutes are a serious global problem which means that consumers cannot always be certain they are getting what they are sold. With high resolution video, increased data storage capacity and machine learning technology CSIRO is designing systems that can revolutionise fish stock management and track fish from boat to plate. This booth displays technologies that could change the way we track fish, increase consumer confidence and improve global sustainability.
GreenTech	Underwater Communication Technology	This technology offers an ability to monitor a cohort of fish in the wild or in an enclosed environment providing the means to monitor behaviour and respond to stressors on varying time scales.
FoodTech	Food Supply Chain Planning	Food production is booming, although it is also increasingly constrained by scarcer resources and unpredictable commercial and economic environments. Quantitative analyses can be employed to reduce food loss and increase the efficiency of the industry. This project displays a programming model for reducing food loss in a broccoli supply chain.

X-Tech type	Name	Description
GreenTech	CORYCAEUS – New technologies for monitoring marine environments	Coral reefs are unique, beautiful, mysterious, and home to numerous marine animal species. Over the last few decades, global climate change has put these ecosystems under considerable stress. CORYCAEUS is a part of CSIRO's Coral Reef Monitoring & Response Test Bed. This test-bed is developing new technologies for monitoring marine environments at fine scales and new devices to augment the existing marine observation infrastructure.
AgTech/GreenTech	Environmental and Agricultural Analytics	Analytics for biosecurity risk and surveillance, digital agriculture, water quality dynamics for aquaculture, mineral exploration, population dynamics in natural systems, genetic control of malaria vectors, and cumulative risk assessments for complex systems.
General Projects	Industry Growth Centres	The Industry Growth Centres initiative aims to drive innovation, productivity and competitiveness. Six Growth Centres exist in sectors of competitive strength and strategic priority including Advanced Manufacturing, Cyber Security, Food and Agribusiness, Medical Technologies and Pharmaceuticals, Mining Equipment, Technology and Services and Oil, Gas and Energy Resources.
AgTech	Senaps	Through an advanced cloud-based platform with open APIs, Senaps provides the foundations to manage complex analysis alongside IoT and spatial data helping you get your data-driven product to market. Senaps is being used by researchers and industry to manage a number of applications. Some examples include: yield prediction for grain growers, water management modelling, tracking of livestock and wildlife.
GeneralTech	Visual Analytics	Visual (Hybrid) Analytics display area is showcasing the science of analytical reasoning facilitated by interactive visual interfaces, deployed through effective use of multi-modal XR systems interconnected to Computational and AI-driven platforms. Various use cases are presented, including Interactive Massive Networks, ASKAP VR, Visual Microscope on Big Data, 3D Reconstruction.
SpaceTech	Square Kilometre Array ASKAP Satallite	Australia will co-host the Square Kilometre Array (SKA) radio telescope, designed to revolutionise our understanding of the Universe and the laws of fundamental physics; in the process, the SKA will create one of the world's biggest data challenges.
FoodTech	Fusemate	A software development and application project on situational awareness for industrial operations. Fusemate, has been developed originally for factory floor monitoring and is currently being extended and validated for food supply chain application.

X-Tech type	Name	Description
GeneralTech	Active Integrated Matter	Active Integrated Matter (AIM) is one of CSIRO's Future Science Platforms. AIM is a new technology platform combining materials, robotics, and autonomous science, underpinned by processing and sensing technologies. Current projects include AIM research test-beds such as autonomous chemical processing and autonomous design.
MaterialsTech	Digital Design of Advanced Materials	Developing new materials is a crucial step in advancing science and technology however, this process is often slow and expensive. By creating advanced computational models of materials we deepen our understanding of the material world and accelerate practical outcomes. Current projects include different levels of molecular simulation including quantum, molecular dynamics and granular materials
Cyber Security	Data Airlock	DataAirlock is an innovative solution to enable analytics of harmful, illegal-to-possess and sensitive datasets for the mutual benefit of data custodians, analysts and ultimately the society.
Cyber Security	CertainID	CertainID aims to make it safer for users to supply their biometric information and for organisations to build user-friendly solutions composed of strong biometrics-based security.
Cyber Security	Privacy Enhancing Technologies	Access to data is a strong enabler of research and economic growth. In the past, privacy has been a significant barrier to accessing that data. This booth showcases work that aims to lower that barrier without compromising privacy including understanding privacy risk in datasets and developing data transformation algorithms with proven levels of privacy.
GeneralTech	Queensland Functional Programming Lab	Functional programming is a programming paradigm that makes reasoning about code more modular. The Queensland Functional Programming Lab challenges current software engineering practices to improve software quality, time to market by exploiting mathematical principles of computation, all the way up to taking them to the market.
PrivacyTech	Applications of Provable Privacy	Privacy-preserving mechanisms are usually applied to data sets at central points after collection. This research team focuses on mechanisms that can be deployed along the data collection paths. This approach applies privacy-preserving mechanisms closer to the data source, and thus potentially unlocks higher utility benefit for similar or lower privacy budget.

X-Tech type	Name	Description
Cyber Security	Trustworthy and Secure Software	Trustworthy and secure systems software based on formal verification and the seL4 microkernel. seL4 is the world's fastest and most secure microkernel. It is the most complex software program to be rigorously verified and demonstrates that formal methods can be applied at scale and deployed in real world systems. It will also showcase both research work on trustworthiness through formal verification, and the practical results achieved through engagement with various industry partners.
PrivacyTech	Privacy Enhancing Technologies – Confidential Computing	A number of projects whose common aim is to expand the use of data without increasing risk and has culminated in the integration of several technologies into a nascent federated data insights platform.
HealthTech	AI for Health	The role of artificial intelligence in medicine and health is very broad and ranges from robot-assisted surgery to computer-aided diagnostics to health management systems. The application of modern sophisticated algorithms to achieve rapid and accurate interpretation of medical images.
HealthTech	Bionic Vision Technology - Computer Vision for Health	3D vision is the core of technologies for understanding the visual scene to support blind individuals, as well as to reconstruct 3D models of environments to map images to a 3D space, such as for supporting large area mapping or maps for an endoscopy to improve clinical outcomes. Computer vision to improve the human health experience.
EnviroTech	CSIRO's Data61 bushfire modelling technology - Emergency Disaster Planning	This research project provides science-based analysis and decision support to the assessment of risk from emergency events and the planning, implementation and evaluation of emergency evacuation strategies.
GreenTech	Climate Science Analytics	This research project focuses on developing digitally-based and integrated technologies to meet the climate change data and information needs of the financial services sector, as a first step towards a nationally coordinated framework for delivery of climate information. An analytics and visualisation platform that makes climate data industry-relevant.
EngineeringTech	Keeping Bridges Up and Congestion Down	Predictive analytics for energy forecasting and asset management; techniques used to monitor the structural health of the jack-arches in the Sydney Harbour Bridge and to predict water pipe failure.

X-Tech type	Name	Description
IoT	Open IoT-Mashup	IoT devices are being deployed around our living and working environments, enabling close interactions between people and ambient world. An IoT Mashup platform that aims to establish IoT devices into an autonomous network organised to best serve users for their particular situations. Without needing much IT knowledge, IoT mashup allow users to control accessible devices and build complex control logic among IoT devices for satisfying their personalised IoT applications.
GeneralTech	Mixed Reality Services	CSIRO researchers have developed software systems that combine interactive computer graphics, collaborative systems, image analysis, and computational photography to enhance the connections between data, people, places and things. The project aims to ensure the digital holographic overlays of the physical world include the right data being attached at the right time – regardless of the data source.
GeneralTech	Immersive Analytics	The emergence of new display and input technologies profoundly changes the way we interact with data. This project has designed virtual and augmented reality systems for interactive exploration of complex data for a range of sciences. It focuses on mobile solutions that allow the end user to conduct their analysis in-situ in a real world context, relevant for scientists who perform their work in the field, such as in geosciences, marine sciences, and environmental sciences.
RoboTech	Robotics and Autonomous Systems	CSIRO's Data61 Robotics and Autonomous Systems Group partners with small and large companies, government and industry in Australia and around the world to develop and mature robotic technologies from concept to commercialisation. Robotics and Autonomous Systems
SpatialTech	Terria.io Digital Twins	Terria maps provide access to larger number of spatial data services directly from custodians and allow users to search, explore and share. More recently there is a need for national collaboration to transform current 2D spatial data held back by each jurisdiction into a digital 3D-4D representation of the country – the digital twin.
GeneralTech	Magda.io Federated Data Sharing	Magda is an open-source software platform designed to assist in all areas of the data ecosystem. From collecting and authoring, internal discovery and use, sharing data between organisations or publishing on an open data portal. Magda powers data.gov.au and is working with Government Agencies to improve data management and sharing processes.

X-Tech type	Name	Description
General Projects	Innovation Catalyst Global - Facilitating the innovation ecosystem	In Australia, finding and engaging research expertise is a challenge for business and a significant barrier to innovation. Powered by CSIRO, the Innovation Catalyst Global platform – developed in collaboration with over 70 partners across industry, research and government – has addressed this challenge by creating an online innovation hub that facilitates capability discovery, problem solving, and geospatial visualisation. The IC Global suite comprises three key platforms: • Expert Connect: Connecting industry with research expertise: https://expertconnect.global/ • Innovation Challenges: Harnessing expertise to solve complex challenges: http://innovationcatalyst.global • InnovationMap: Visualising global innovation data: https://innovationmap.global Developed to further drive Australia's innovation ecosystem, the IC Global platform will continue to evolve, to support the activity of existing innovation facilitators, and to unlock the knowledge contained within Australia's premier research institutions for the benefit of industry and the Australian public.
HRTech	Ribit	Ribit is Australia's leading job and internship matching platform for university and VET students. We focus on connecting dynamic student talent to startups and innovative companies for meaningful, skill-building work. Students on Ribit span skills-shortage fields including tech, engineering, data, business, marketing, design and more. Our platform is developed on a machine-learning algorithm that matches students to roles which align with their skills and studies, and recommends suitable student candidates to employers.
SecurityTech	WIFI Localisation Tracking	With the development of consumer electronics and Internet-of-Things (IOT) technology, WiFi-enabled devices are extensively used our daily life (e.g., smartphone, laptop). This project develops a system for tracking standard WiFi devices, where each WiFi device can be located whenever it is actively transmitting (e.g., when someone is surfing the internet on his/her Ipad). The system can be used to track personals and equipment, enabling situational awareness in environments where cameras cannot be used or cannot reach. Its applications include surveillance, security monitoring, and smart city/building