

Stakeholder Consultation Summary Report

Health and Agriculture Sectors Summary Report





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1. Background

The Critical Technologies Policy Coordination Office (CTPCO) was established in the Department of the Prime Minister and Cabinet to provide coordinated, whole-of-government advice on technology developments, opportunities and risks, and to recommend actions to promote and protect critical technologies.

The Australian Government defines critical technologies as:

"current and emerging technologies with the capacity to significantly enhance or pose risk to Australia's national interest, including our economic prosperity, social cohesion and national security."

As a coordination policy office, the CTPCO takes a balanced, national interest approach to critical technologies assessment, considering national security risks, opportunities for economic prosperity and impact on social cohesion objectives. The CTPCO aims to:

- Ensure Australians have access to cost-effective, safe, secure and inclusive technologies;
- Promote Australia as a trusted partner for investment, research, innovation and collaboration;
- Support regional resilience and competitive, trusted and diverse technology innovation and international markets; and
- Maintain the integrity of our research and capabilities, enable Australian industries to thrive and maximise our sovereign IP.

Purpose of the consultation

The CTPCO is working with a broad range of stakeholders across key sectors to understand the impact of current and emerging critical technologies to Australia's future prosperity and stability.

The agriculture and health sectors were identified as initial focus areas for CTPCO consultation during March and April 2021. The purpose of the consultation was to identify key critical technology developments, barriers and opportunities in, Australia's national interest, and to better understand the uses of critical technologies in the agriculture and health sectors to help shape future government policy. The consultation also focused on how government, industry, academia and end-users can work together to develop, assess and enable critical technologies.

As part of the consultation, the Defence Science and Technology (DST) Group provided a short list of priority critical technologies within each sector for inclusion in the consultation discussion papers. The consultation focused, primarily, on the following key questions:

- What are the priority critical technologies, current and emerging, in this sector over the next 10 years? Are these reflected in the list provided in the discussion paper?
- Have you identified or experienced any supply chain issues associated with critical technologies?
- How fast are critical technologies taken up in this sector? What are the barriers to uptake?
- Which critical technologies present the best opportunity for commercialisation in Australia?
- What will happen if we do not adopt critical technologies in this sector?
- What impact do you think critical technologies will have in the future in this sector? For example, on national security, economic prosperity and social cohesion.
- How should government, industry, academia and end-users work together to assess the impact of critical technologies in Australia?
- Is there anything else you want to say about the approach to critical technologies in Australia?

This consultation was just one activity undertaken by the CTPCO. Further stakeholder engagement and analysis of critical technologies is still being undertaken as part of the ongoing work of the CTPCO.

Stakeholders consulted

The CTPCO sought input from various stakeholders across Australian and State and Territory governments, academia and industry. Academia stakeholders included research groups, peak bodies and individual academics. Industry stakeholders included non-government organisations such as peak bodies, advocacy groups, venture capitalists and individual companies and professionals. Stakeholders were able to submit their feedback via written submission, completion of an online survey or via face-to-face meetings. The CTPCO conducted meetings with key stakeholders from each sector.

A total of 101 stakeholders participated in the agriculture and health consultation activities. The below tables summarise the total number of stakeholder organisations consulted over March and April 2021.

Table 1: Agriculture

Response mechanism	Commonwealth Government	State & Territory Government	Academia	Industry	Total
Submission	0	3	3	8	14
Survey	0	0	5	6	11
Meeting	4	2	2	6	14
Tota	4	5	10	20	39

Table 2: Health

Response mechanism	Commonwealth Government	State & Territory Government	Academia	Industry	Total
Submission	2	2	5	13	22
Survey	0	0	8	7	15
Meeting	3	2	4	6	15
Tota	al 5	4	17	26	52

Table 3: Overlapping

Response mechanism		Commonwealth Government	State & Territory Government	Academia	Industry	Total
Submission		2	0	4	1	7
Survey		0	0	0	0	0
Meeting		1	0	2	0	3
	Total	3	0	6	1	10

9

The face-to-face meetings captured a wide variety of stakeholder views. 76 individual people participated in the health sector meetings and 64 in the agriculture sector meetings.

33

47

101

2. Key findings across the sectors

12

Total

Throughout the consultation, stakeholders were asked which critical technologies they believe present the best opportunities for their sector. Agriculture and health stakeholders both regularly identified artificial intelligence (AI) and genomics/gene technologies as key opportunities for their sectors. However, stakeholders did not agree on a specific application of AI or gene technology that would be a pivotal critical technology in their sector.

A common theme raised during the consultations was that critical technologies will have the greatest transformational and productivity impact, and present the best opportunity for commercialisation, when integrated together. For example an integrated AI, machine learning, autonomous equipment and sensors technology solution, such as an irrigation system that delivers water when and where it is required without human intervention.

Five key overarching themes also emerged across the agriculture and health sector consultations, and these are detailed below.

1. Data

Data, particularly big data, was identified as a key issue to enable technology in the agriculture and health sectors. The specific issues identified include:

- Adequate infrastructure to manage, securely store, access, and process large volumes of data.
- Barriers to utilisation including:
 - Governance gaps and lack of standardisation.
 - Access and sharing of data for research and analysis purposes. For example, approval processes to acquire access to data sets required for decision-making can be time consuming.
 - Modelling capability within Australia to enable meaningful interrogation and utility
 - Ownership of data depending on who collects it and where it is stored (cloud sovereignty) and IP implications.
- Lack of public understanding of data collection, privacy and sharing.

2. Infrastructure

In addition to data infrastructure, a lack of local manufacturing infrastructure for agriculture and health technology in Australia was also frequently raised during consultation with both sectors.

The health sector specifically highlighted the need for Good Manufacturing Practice (GMP) certified facilities to ensure regulatory compliance in Australia. In particular, there is a lack of facilities that allow small run manufacturing for proof of concept or clinical trial volumes of technology to support translation of research to commercialisation. Several stakeholders suggested that these facilities should be capable of pivoting to manufacture various different products. It was variously suggested that enabling this type of shared infrastructure will have flow on impacts to the establishment of a robust and resilient pharmaceutical and medical technology industry in Australia.

Connectivity infrastructure was also identified as essential for emerging autonomous vehicles, in particular the need for robust, extensive and reliable internet and mobile network connectivity for the full benefit of these technologies to be realised. Similarly, the emergence of telehealth and remote medicine, also relies on connectivity infrastructure. Beyond just convenience and production efficiency, connectivity is also vital for equity of access to healthcare and services for rural and remote populations.

3. Commercialisation

Stakeholders were of the view that Australians are predominately regarded as adopters of technology and that while a lot of great research and clinical trials are conducted in Australia, the technology/product is often commercialised overseas then brought back to Australia, or does not return. Stakeholders identified that the most significant challenges are faced at the translation of research to commercialisation phase. Stakeholders expressed concern around limited support, investment and incentives available from government for this phase.

The common barriers and challenges raised by stakeholders can be mapped to various stages during the lifecycle of a new technology – Research, Development, Commercialisation and Scaling.

The Research phase refers to the early stages of translational research. The key barriers identified by stakeholders at this stage include:

- Obtaining support and funding for early-stage translational research. Some stakeholders mentioned that the coordination and communication of private and government funded grant programs available for early stage research could be improved.
- Industry stakeholders also commonly raised that the requirement of matched funding is difficult for small to medium enterprises to obtain, therefore creating disadvantage.

• Protection of intellectual property (IP) was identified as a challenge due to the cost, inconsistency of approaches, and difficulties coordinating intellectual property (IP) agreements across sectors or institutions (i.e. between industry and academia).

The Development phase involves the planning, design and proof of concept stages, including prototyping. These stages are often referred to as the "valley of death". Key barriers identified by stakeholders include:

- Sourcing appropriate resourcing and funding without yielding significant equity or return on investment.
- Availability and access to production infrastructure that support design and prototyping.
- Lack of incentives for conducting translation stages within Australia, particularly for academia.
- Lack of entrepreneurial education, support and guidance to move the next stage of commercialisation.

Commercialisation refers to the process of bringing a new product or service to market. The key barriers include:

- Moving from prototype to final product in an incorporated company.
- Proximity to customers.
- In highly regulated fields there is a need for significant upfront capital to meet regulatory requirements. For example, conducting clinical trials with new health technologies / therapies.
- Access to both capital market and deep tech capital expertise.
- Having the right marketing and business strategy, setting up appropriate quality management systems and sourcing the right manufacturing capabilities.
- Lack of incentive for local manufacturing and a lack of manufacturing capability within Australia generally.

Lack of 'pull through' following the research phase was a common issue raised by various stakeholders. Key barriers raised included innovator's business knowledge to incorporate a company, obtaining seed funding and determining the market size within Australia. Many stakeholders raised the risk of losing local skills and jobs when companies relocate their operations to other countries to be closer to their customer base or suitable manufacturing facilities. Further to this, some issues were raised around market size, geographical location, labour costs and various other factors. Exceptions were noted by some stakeholders, for example COVID-19 swabs developed for Victoria by a local 3D printing company, which showed that there is potential for manufacturing capability to pivot and scale to meet demands for certain products.

4. Supply Chains

Supply chains are fundamental for ensuring that Australians have access to the technologies they want or need, and also for providing a platform generating sovereign IP and an export base for tangible and intangible goods. COVID-19 highlighted risks associated with an over-reliance on narrow supply chains, and stakeholders were conscious that local businesses needed the adaptability and capability to fill supply chain gaps during disruptions, and create opportunities for lost exports. Solutions mentioned during consultation included understanding the whole of supply chains to identify areas of risk and opportunities for efficiency, as well as the establishment of greater domestic capability.

5. Coordination

The complexity of government agencies with touchpoints throughout the research to manufacturing lifecycle was a common issue raised by stakeholders. Many external industry and academia stakeholders find it difficult to navigate the government landscape and many mentioned that access to specific networks and contacts is required to get traction for projects. A stakeholder from a state government embedded in the United States noted that international companies find it difficult to break into the Australian market due to the complexity of the Australian political and regulatory landscape. The central coordination point that the CTPCO offers was a welcome solution to the frustrations experienced by many of the stakeholders.

The need to facilitate better collaboration across government, academia and industry was raised by almost all stakeholders. Leveraging industry knowledge and actively involving industry experts in the early stages of research planning and priority setting was regularly raised as an opportunity to develop and implement effective forward plans and strategies that address common problems across industry. The process for establishing Medical Research Future Fund (MRFF) priorities was held up as an example of where this collaborative approach is working well.

The lack of national standardisation, and inconsistencies between individual jurisdictions, was frequently raised as an issue by government, academia and industry stakeholders. A common example was the lack of consistent standards and frameworks for data collection, storage, management, access, sharing and utilisation in both the agriculture and health sectors. Standards and requirements set by individual jurisdictions may be inconsistent and thus stifle the utility of the data collected. The need for standardisation in the international context was also raised. For example, Australia is an active participant in developing international standards in various technologies such as AI and autonomous vehicles, and stakeholders' views were that more could be done in other areas, such as gene technology and computational chemistry, to increase engagement.

Government and academia stakeholders raised that government horizon scanning activities could be conducted more effectively. Many commented that the existing horizon scanning activities generally produce a long list of items to be aware of but lack a practical element. The common solution provided was to apply a practical implementation lens after conducting horizon scanning to ensure the new or emerging technology solves a problem, has the appropriate impact and includes a roadmap to implementation.

3. Agriculture Sector Summary

Feedback on the lists of critical technologies

Most stakeholders expressed agreement with the majority of the listed technologies, and many suggested additional individual technologies that were perceived to be missing or equally as 'critical'. Additional aspects of AI and automation/autonomous vehicles were the most commonly mentioned technologies missing from the list.

Many academic and industry stakeholders emphasised the importance of foundational/enabling technologies and existing critical technologies. Academics advised that many of these existing critical technologies will form the basis of significant technological advances.

Opportunities and Benefits

The general consensus amongst agriculture stakeholders was that the following technologies present the most opportunities for the sector:

- Al
- Autonomous vehicles
- Genomics/gene technologies

Other commonly mentioned technologies included blockchain (for traceability), sensors, Internet of Things (IoT), digitalisation, robotics and remote monitoring.

Many stakeholders commented that the uptake of critical technologies can offer great benefits to Australia's economic outputs, resilience and job security within the agriculture sector, and food security more generally.

Barriers

The quantitative data from the survey suggests that the agriculture sector is 'relatively slow' with the uptake of new technologies. However, the majority of stakeholders argued that the agriculture industry and Australian farmers are willing to take up technology quickly when there is a clear cost-benefit and particularly if it solves a known problem. Stakeholders identified that Australian farmers are always looking to increase productivity, sustainability and cost effectiveness within their businesses.

Stakeholders identified a range of barriers to the uptake of technology within the agriculture sector. The most commonly mentioned barriers included:

- Cost of technology vs. the benefit of its application, particularly when the value proposition is unclear. Investing and installing new technology is an expensive and time consuming process that often takes time to realise benefits or see a return. Many noted that farmers are time poor and often sole-traders resulting in limited capacity outside of daily operations.
- Connectivity issues due to unreliable or incomplete internet coverage and communication infrastructure in rural areas.
- Management of data. Many expressed concerns regarding data ownership, storage, sharing and cybersecurity including privacy concerns and the risk of misinformation.
- Inconsistent or outdated legal and regulatory frameworks were also identified as barriers as frameworks may differ across jurisdictions thereby increasing cost and complexity of compliance and resulting in duplicated effort. For example, operators require a different 'Remote Aerial Spraying with Drone' license for each jurisdiction. Some also commented that legislation change is required to accommodate for digitalisation as federal legislation still includes requirements for paper-based documents.

The issue of cost versus benefit of technologies was consistently raised by industry stakeholders. Some noted that trusted, non-biased advice about which system is fit for a particular purpose is lacking. The impact of this may be an investment in technology that is not fit for purpose or not fully utilised. Increased local and independent support for building understanding of technology in this sector could overcome these barriers.

Other barriers raised by stakeholders included:

- Cultural barriers between traditional industry and high-level/tech industry (not based regionally). Many commented that there can be a lot of cynicism around technology at the farmer level, particularly when the technology does not deliver outcomes from day one or significant and ongoing technical issues are experienced.
- Lack of incentives for early adopters of technologies.
- Public apprehension regarding GMOs and genomics.
- Commercialisation of new technologies within Australia takes too long and is extremely difficult. Some noted that poor commercialisation results are not just about lack of capital but also lack of support to help companies find their market. Other commented that there is complexity at the federal government level as no one department is solely responsible for commercialisation it is thus difficult to engage effectively.

Solutions

Targeted funding and encouraging collaborative research and consultation were the most common answers to how academia, government, industry and end-users could work better together. Many mentioned that is important that government incentivises and promotes collaboration between the private and research sectors. Industry and academic stakeholders also commented that end-users (Australian farmers) should be engaged as early as possible to ensure research and development is fit for purpose and solves a common problem.

Academic and government stakeholders mentioned that education, training and upskilling of the agricultural workforce to use the new technologies, and provide advice, will be essential. Many industry stakeholders commented that governments could do more to combat misinformation and improve communication and further suggested that government establish and facilitate multi-sector, multi-stakeholder forums to assess and promote convergent critical technologies.

As the agriculture sector progresses with digitalisation, data management issues will continue to increase. Stakeholders suggested the development of national standards to manage data will be beneficial in ensuring consistency and alignment. This will also include education of the sector about the standards including the expectations and the benefits.

Stakeholders also mentioned that technologies with a strong existing base should be prioritised as they are more likely to create a 'pull effect' on other technologies. For example, genomics and genomic-based precision breeding.

4. Health Sector Summary

Feedback on the lists of critical technologies

Similar to agriculture stakeholders, most stakeholders expressed agreement with the majority of the listed technologies and some organisations listed additional individual and niche technologies that were perceived to be missing or equally as 'critical' to their fields.

Artificial intelligence (AI) and diagnostic technologies, such as real-time measurements of molecules were the most commonly mentioned technologies missing from the list.

Opportunities and Benefits

Al and genomics/gene technologies were consistently identified as the key technologies that present the most opportunity within the health sector. Other regularly mentioned technologies included precision medicine, big data and biomaterials. Consistent with agriculture stakeholders, health stakeholders did not agree on a specific application of Al or gene technology that would be a pivotal critical technology in the sector.

Again, many mentioned that the convergence of technologies to deliver one single application would offer the most benefit and impact to the Australian healthcare system.

The adoption of new technologies within Australia offers a range of benefits, such as increased productivity, employment growth and upskilling the workforce to support economic prosperity. Medical interventions and personalised healthcare can potentially reduce the overall burden on healthcare system, reduce work absenteeism, and reduce reliance on the welfare system.

Barriers

The majority of survey respondents stated that the health sector is 'relatively slow' in the uptake of new technologies and this was echoed throughout the consultation. Many argued that the major issue to the uptake of new technology is not necessarily a lack of desire to adopt it, but rather whether it can be accessed within Australia. This issue is due to the highly regulated nature of the sector. Australia relies heavily on companies to bring in new technologies to Australia for consumer use, however before it can be accessed by consumers, the technology must obtain regulatory approval, and in many cases, positive recommendation for reimbursement.

Regulatory approval involves the technology undergoing rigorous assessment by the appropriate regulator(s) to ensure it meets Australian requirements. Once it is regulator approved, and if the company desires to do so, clinical efficacy and cost-effectiveness compared to other treatments already available must be demonstrated. This process enables Australians affordable access to new health technologies via government reimbursement schemes, such as the Pharmaceutical Benefits Scheme (PBS) or the Medical Benefits Scheme (MBS). These assessments are primarily based on value-for-money, rather than innovation or holistic outcomes.

Stakeholders identified a range of other barriers to the adoption of new technology within the health sector. The most commonly mentioned barriers included:

- Data management and utilisation of data. Stakeholders raised concerns with privacy, storage, cybersecurity and inconsistent approaches to data collection, use and standards across States and Territories.
- Challenges accessing and navigating the government system. Many stakeholders raised that navigating the government landscape was complex and locating the correct contact for a particular issue or matter was difficult.
- Lack of entrepreneurial education specific enough to meet the needs of the very complex health technology sector.
- Australia's geographical location creates isolation and increased risks to supply chains. For example, there is significant differences in delivery timeframes to Australia when compared to the USA, Europe or the UK.
- Software is not generally recognised as a medical intervention or innovation.
- Complexity of the regulatory system, and perceived lack of flexibility in the regulation for new and emerging products. It should be noted that during consultation, the Therapeutic Goods Administration (TGA) reiterated that adaptive

regulation¹ works best when the regulator is engaged early in the development of a new technology, and they are available and willing to work with applicants.

- Lack of professionals within the field who possess the relevant training and expertise to use and maintain new technologies within Australia.
- Social cohesion, particularly social licence and equity concerns regarding the use of new technologies, with particular emphasis on gene technologies.

Solutions

Stakeholders unanimously agreed that better collaboration across government, academia, industry and end-users is required to develop and implement effective forward plans, strategies for the future and define research priorities. Many academia and government stakeholders mentioned social cohesion issues and the need for better and ongoing communication with the broader public to inform the value of medical interventions, cybersecurity and mechanisms in place to protect health data. Many also mentioned the need for better collaboration with international counterparts to build strong relationships and attract international investment.

Another common suggestion was the need to enhance horizon scanning activities and processes to ensure they are meaningful and practical. Many agreed that joint approaches across academia, industry and government should be conducted wherever possible.

5. Outcomes from this consultation

This stakeholder consultation has provided the CTPCO with a better understanding of the critical technology landscapes for health and agriculture.

Information from this consultation will feed in to the ongoing work of the CTPCO to assess, prioritise and provide advice to government on critical technologies of national interest.

¹ Adaptive regulation, as used by the TGA, consists of legislated broad principles supported by detailed guidelines that are readily updated as new technology emerges for regulatory consideration.

CTPCO CRITICAL TECHNOLOGIES POLICY COORDINATION OFFICE