



Defence Teaming Centre

Connecting • Developing • Advocating

DEFENCE INDUSTRY LEADERSHIP PROGRAM RESEARCH PAPER

**DSTG/CSIRO INCREASED
COLLABORATION WITH
INDUSTRY**

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Executive Summary

The Australian Defence industry must invest in Research and Development (R&D) and Innovation to enable a globally technological competitive advantage, strengthen and expand Australia's sovereign capabilities, strategically invest in global independence from other nations, and to enable national economic advantages.

R&D investment will enable outcomes which will benefit the Australian warfighter and the national interest of Australia. The Australian Defence force operates within a complex geopolitical environment where there are economic and political challenges to circumnavigate. R&D provides support to Australia in being able to safeguard the nation's security by enhancing its technological capabilities, controlling sovereignty and competing internationally. For these reasons, Defence Industry needs to diversify and embrace innovation to avoid becoming an integration, assembly and sustainment provider.

Collectively there are several Commonwealth research initiatives, programs and organisations that prevail the perception that Government spending is inefficient, and subsequently ineffective. This research project explored the argument that the overall R&D environment is becoming overserviced and subsequently inefficient.

Engagement with over 45 respondents across the Defence and the Defence industry landscape was used to collate and gather insights into the efficiencies, effectiveness, and economical factors relevant to the Commonwealth and Defence industry investing in R&D. The report found several inefficiencies creating complexity within the R&D environment driven by a misalignment across national, state and territory strategies and priorities non-conducive to innovation.

Key findings highlighted the need for current Government R&D organisations to reduce bureaucracy and embrace a positive innovation mindset which includes curiosity, risk averse, openness and collaboration. Other highlights included the need for a national strategy, focused investment into national innovation priorities, an online Defence Industry directory detailing organisational capabilities and areas of research interests, and champions to drive priorities funded technology innovation through to the warfighter to help increase collaboration between DSTG / CSIRO, and Defence Industry.

Critical to the research undertaken and explored in this report included the assessment of the United States Defense Advanced Research Project Agency (DARPA) and the Australian Advanced Strategic Capabilities Accelerator (ASCA) programs. The case studies identified opportunities of success to leverage, model and implement to boost innovation through working collaboratively with research organisation, academia and industry partners.

The recommendations found throughout the research was for the Australian Department of Defence to consider the following actions:

- Undertake an audit into the current Defence innovation and R&D environment to identify economic opportunities for resource optimisation.
- Identify structural opportunities in aligning the ASCA to a similar DARPA-like model.
- Incentivise a collaboration and innovation culture.
- Strengthen the Australian middle-tier, enabling local innovation investment, providing a globally technological competitive advantage for Australia.

Australia requires a consolidated national strategy for Defence innovation, including funding, priorities, risk appetite with an innovative culture to enable the Australian Department of Defence's Speed into Service and Minimum Viable solutions capability goals. It was concluded, to accelerate an asymmetric advantage for the warfighter, Defence's innovation, science and technology ecosystem needs to not reinvent the wheel, but rather realign the spokes.

1 Introduction

1.1 Problem statement – current

The complexity of Australia's R&D environment has created an overserviced and inefficient ecosystem that is non-conducive to innovation.

1.2 Objective

The objectives of this research project are to:

- Gain an understanding of the current state and innovation scope, purpose and areas of R&D where each of the programs and organisations are being funded by the Government.
- Rationalise whether the R&D environment is being over serviced and subsequently inefficient through the measurement of their efficiency, performance and impact. Explore the economic benefits of the Defence industry investing in R&D.
- Gain an understanding of the organisation and structural factors of the R&D environment, programs and organisations.
- Assess the quality and quantity of the programs and organisations.
- Rationalise whether there is a benefit in the CSIRO increasing its involvement with Defence industry R&D and what parallel industries this could support.

1.3 Problem statement – proposed

Australia requires a consolidated national strategy for Defence innovation which includes: funding, priorities, and a risk appetite with an innovative culture to enable Department of Defence's (DoD) capability goals (Speed into Service and Minimum Viable solutions).

2 Background

2.1 Defence Strategic Context

It is important to note that the overview provided below is complex and convoluted, because this is the current state of this ecosystem. Attempts to simplify the view between documentation or department interactions is difficult when simplicity negates the true state of the world.

To understand the current state of Australia's Defence R&D environment, we need to understand the governance frameworks that underlay the multitude of funds, grants, programs, departments and organisations that make up this ecosystem. Figure 1 attempts to provide a high-level overview of these frameworks.

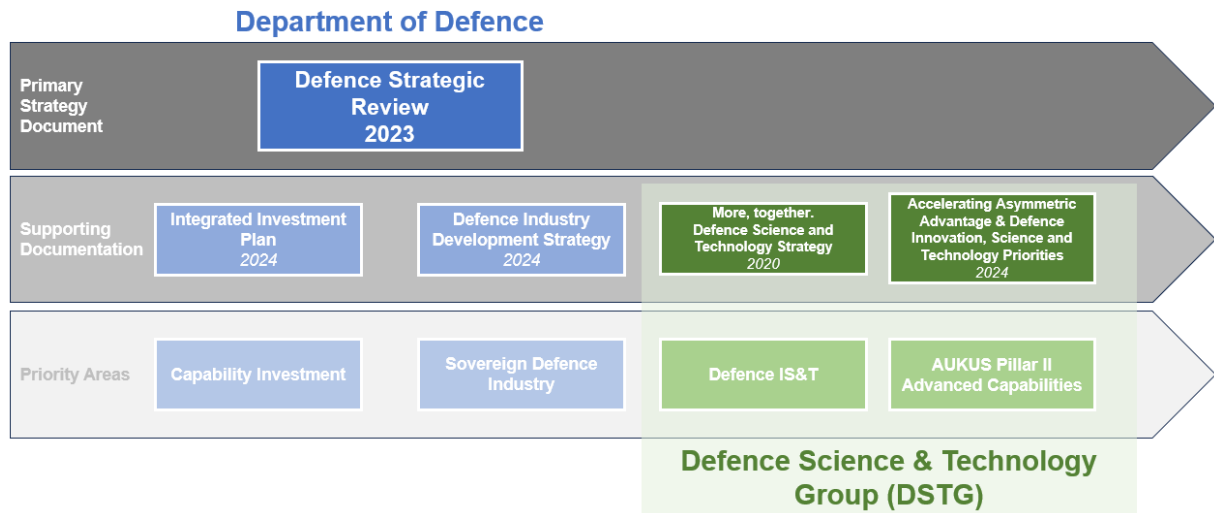


Figure 1 Australian Defence Strategy Hierarchy

2.1.1 Defence Plans and Strategies

Australia’s National Defence Strategy (NDS) [11], released in 2024, builds on the outcomes of the Albanese Government’s 2023 Defence Strategic Review (DSR) [10]. Outlining the integrated force critical capabilities required for Australian security, the review’s recommendations describe the Government’s policy priorities for “our investments in research and development, manufacturing, and supply chains”: understanding that “critical to this whole-of-government *National Defence* approach is to have a national strategy and unity of effort to Australian statecraft” (DoD DSR, 2023 p. 8 and p. 33). The DSR outlines the ten critical capabilities the Australian Defence Force relies upon to ensure operation success.

The DSR provides a “comprehensive outline of Defence policy, planning, capabilities and resourcing, including reprioritisation of the Integrated Investment Program” (IIP) (DoD IIP, 2023, p. 9) [12]. The IIP is a separate Department of Defence developed framework demonstrating the “specific capabilities the Government will invest in to give effect to the National Defence Strategy” (DoD IIP, 2023, p. 6). The IIP has 11 capability investment priorities for the integrated, focused force (DoD IIP, 2023, p. 7).

Separate to the IIP, the *Defence Industry Development Strategy (DIDS)* [13] aims to “directly support the delivery of the [DSR] and underpins the [...] NDS” (DoD DIDS, 2023, p. vi). The DIDS has its own seven Sovereign Defence Industrial Priorities (DoD DIDS, 2023, p. 18-19).

If we narrow our scope to the Australian Defence R&D explicit documentation, two further artefacts are referenced. The *Defence Innovation, Science and Technology Priorities* [14] is the companion document to *Defence Innovation, Science and Technology Strategy: Accelerating Asymmetric Advantage* [14]; these documents “encapsulate Defence’s research and development efforts” (DoD, 2024, p. 6). These documents present six strategic priorities areas for Defence IS&T and the Australian, United Kingdom, United States Alliance (AUKUS) Pillar II Advanced Capabilities: some duplications and some exclusive (DoD, 2024, p. 53).

The idea of a unified strategy, particularly in R&D funding and key focus areas, is contradicted by the number of unaligned priority areas between federal and state government plans, strategies, and departments. Figure 2 demonstrates the unaligned strategic priority areas across the Federal Australian government Defence policies. If we expand this to review the state and territory government defence priorities, further unalignment and disunity is demonstrated (see Figure 3).

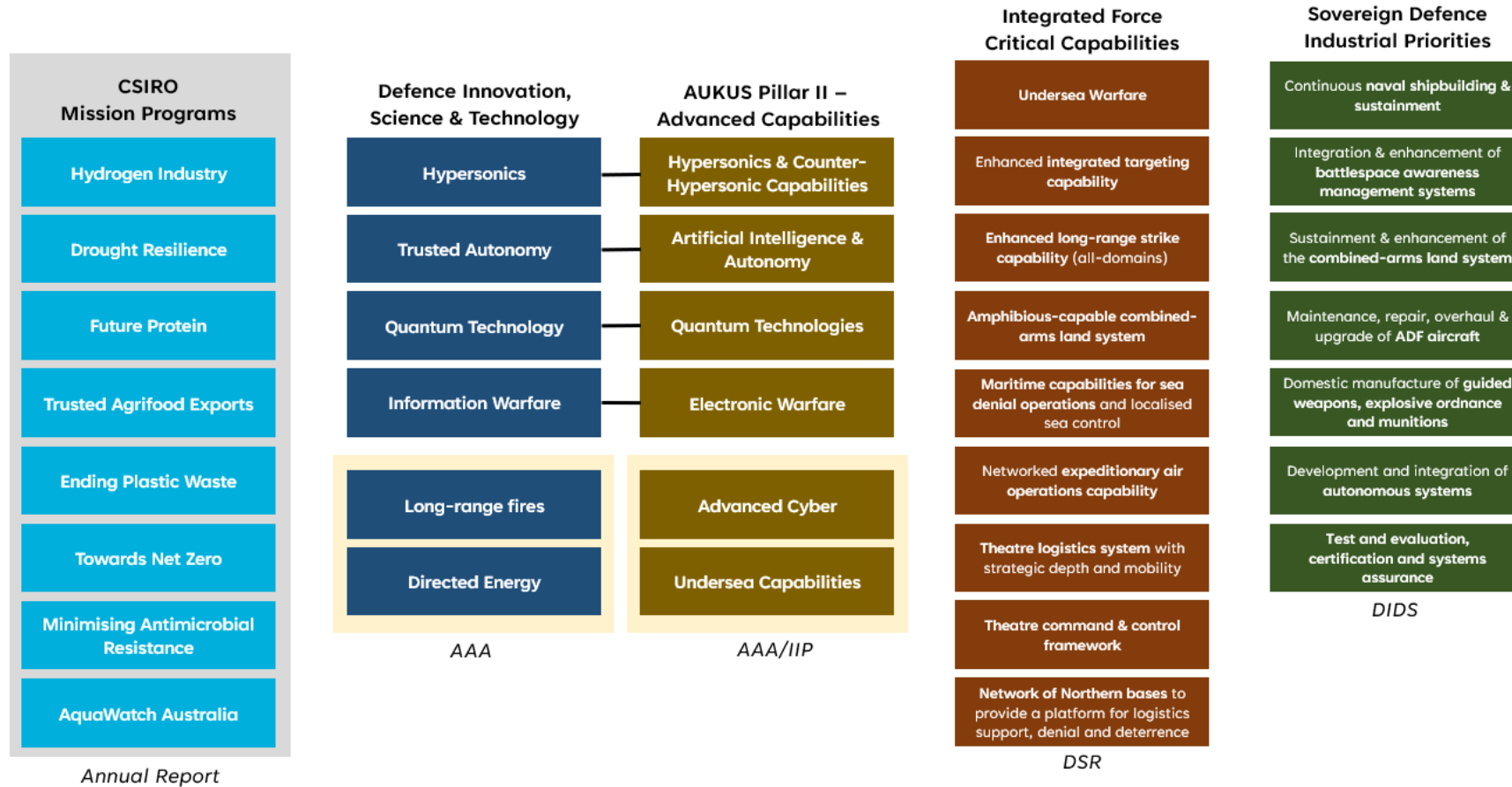


Figure 2 Unaligned Australian Defence Strategic Priorities

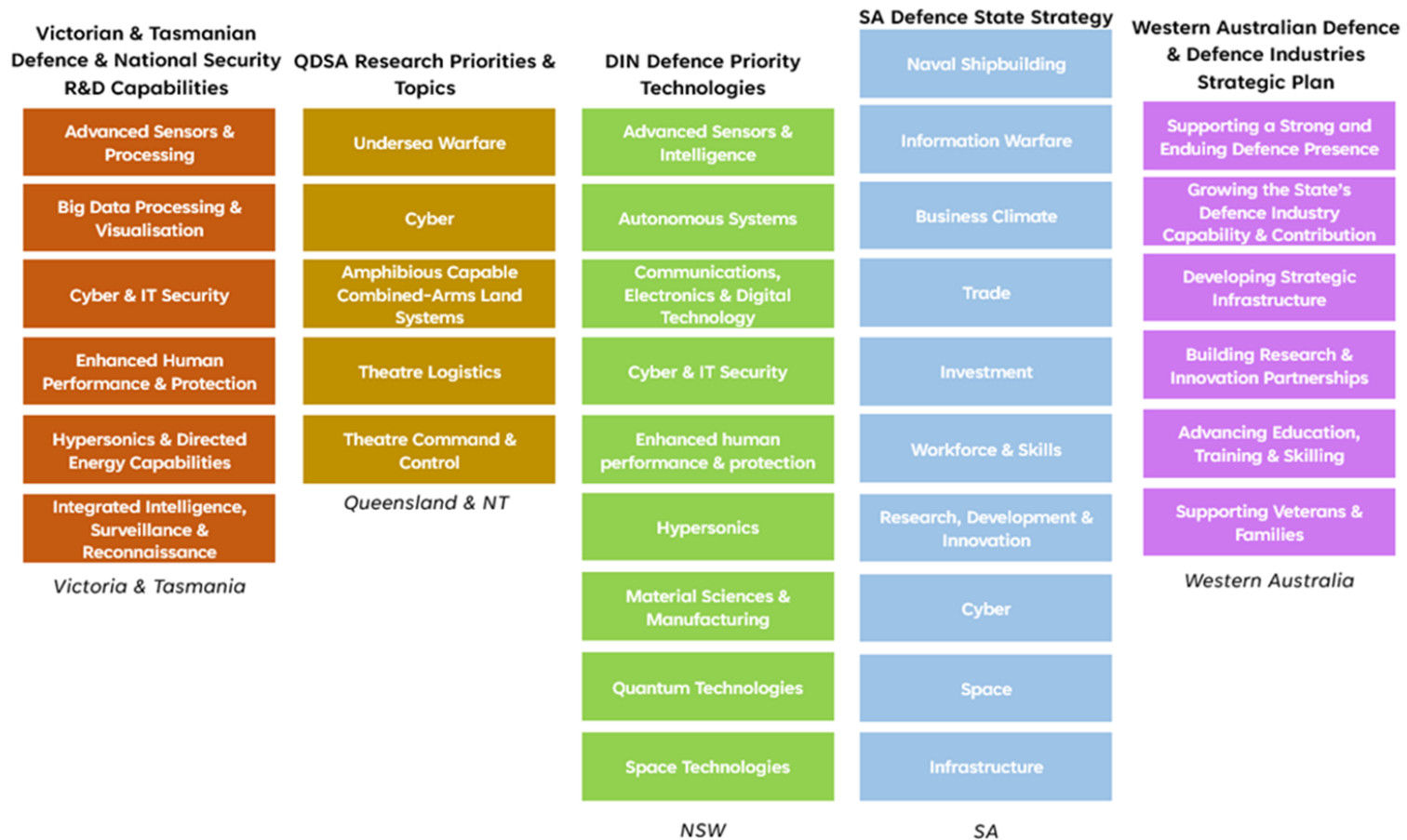


Figure 3 Australian State and Territory Defence Priority Areas

2.1.2 Defence (and Adjacent) Organisations and Departments

The Defence Science and Technology Group (DSTG) is the lead government agency for applying science and technology to safeguard Australia and its national interests, accountable to the Minister of Defence and the Secretary of the Department of Defence. Under the Department of Defence, DSTG and the new Advanced Strategic Capabilities Accelerator (ASCA) “must enable our research and industry sectors to focus their work on the development of advanced and asymmetric capabilities in key technological areas” (DoD DSR, 2023, p.19).

Both DSTG and ASCA are forced to exist within (and despite of) unaligned federal (and even organisational) priority areas (as described in Figure 2), but also in an arguably oversaturated research and development environment. As provided in our research question, additional organisations such as Queensland Defence Science Alliance (QDSA), Defence Trailblazer, and the Defence Innovation Partnership, are all attempting to cover these complex priority areas; noting there are nearly a dozen different versions to choose from. Appendix A.1 demonstrates our research project’s attempt to identify and catalogue all the state and federal government funding, programs and organisations that focus on Defence. Our research paper will demonstrate that Defence-related R&D funding (outside the Department of Defence) was not captured or summarised at the Federal level.

2.2 Specifics to the problem statement

As demonstrated in the previous section, this research paper has purposefully chosen to exclude considering increasing CSIRO’s involvement with Defence and DSTG (question 2 in the original research topic). The research from the initial question has indicated that although increased collaboration and CSIRO involvement may be beneficial, the current Defence-related R&D environment (between state and federal governments) is too oversaturated and opaque to consider adding an additional level of complexity. This research project has therefore elected to focus purely on the DSTG and the Defence-explicit research. Refinement of our topic is further covered in Section 3 .

The following areas (and implications) were also considered, researched, and set aside for our topic in question:

- Workforce planning for innovation programs/organisations.
- Commercialisation of Intellectual Property (IP).
- Prescribing Technical Readiness Levels to government organisations.
- The AUKUS Agreements (unknown) impact on Australian-led innovation.
- Necessity breeds innovation; war vs peacetime research and development.

The complexity of these discussion areas each deserve individual research projects to review the vast policy, literature and stakeholders affected.

3 Scope and Research Methodology

The scope of the research topic and question(s) were broad, it was decided during the project to refine and narrow in on a defined research scope to ensure clear and defined recommendations were provided as part of the final paper (this document). It is acknowledged, further research would be required to take the recommendations from this paper and conduct further analysis across a broader set of stakeholders.

The research used a three-phased approach. This approach enabled a clearly defined set of milestones and phase objectives to achieve before transitioning to the subsequent phase. The outcomes from this approach would establish a distinct set of findings with clearly defined recommendations which addresses the research topic and research questions. Each of the phases are detailed in Figure 4.

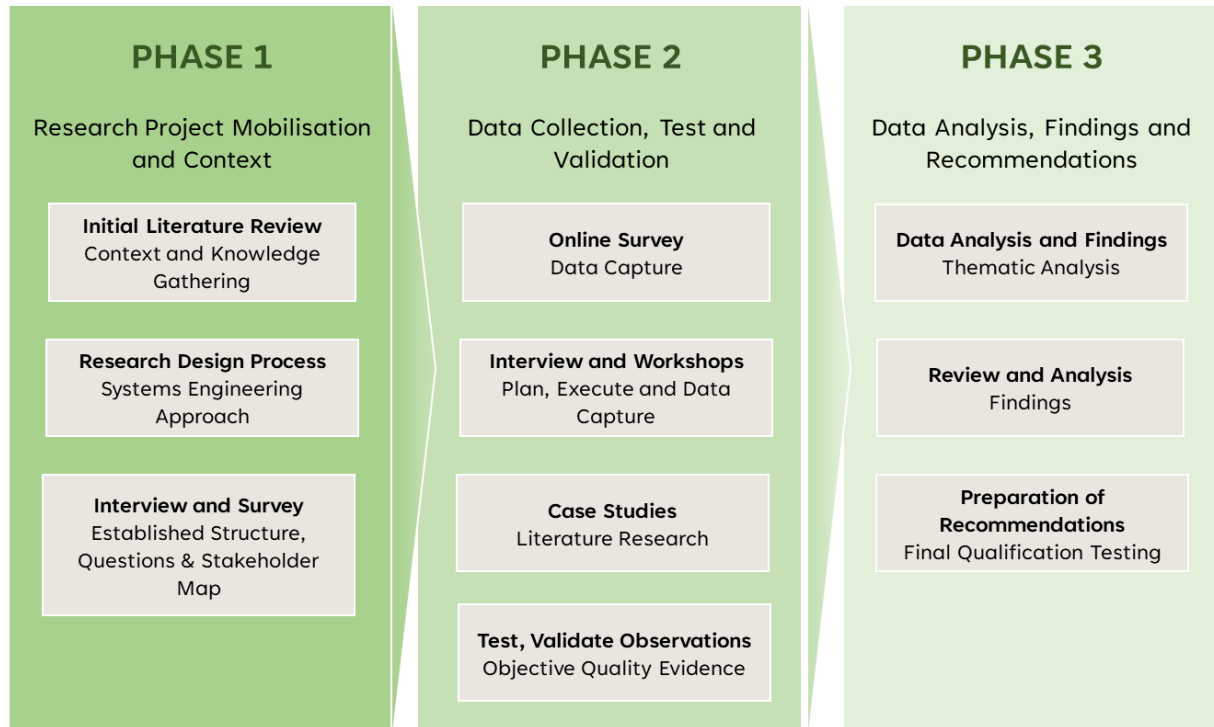


Figure 4 Research Phases

3.1 Phase 1: Research Project Mobilisation and Context

The purpose of this phase was to establish the research context. Key to this was gaining an appreciation of the current R&D environment through an initial literature review. A research design process was established using a lean and Agile systems engineering methodology to define an initial baseline for the following phases. The initial baseline allowed the team to test and validate observations as data was collected throughout the research. This Agile and lean design enabled any changes to be made throughout the research project without having a major impact on the research outcomes. The key milestone to this phase was to complete a structured interview and set of survey questions as an outcome from the research design process. This process is described further in this section.

The research and project mobilisation phase included the following key activities:

- Initial Literature Review – an initial literature review to establish reputable public references, read through Government policies, strategies, including research of each of the Commonwealth funded R&D grant programs and organisations.
- Establishment of a Systems Engineering approach to research to form the research design.
- Established qualitative and quantitative questions to support an online survey and interviews.

- Initial interview and survey stakeholder map identifying the people and their organisation to approach and undertake focuses interviews.

For the purpose of the research topic and questions provided it was decided a mixed methods research-based approach would be the most suited methodology. This approach draws upon two types of research; qualitative and quantitative data. The qualitative research would explore the topic in practice to develop a conceptual understanding of the situation. The quantitative method then provided a means to iteratively test and validate the conceptual understanding empirically by means of observation and experience. Using this mixed methods approach; using qualitative and quantitative research together would develop a higher quality and wholistic picture of the research topic and overall problem space.

Figure 5 outlines the lean and Agile System Engineering design approach. The research topic was accompanied by a number of research questions. These questions were used as the basis of the needs analysis and requirements definition. The research topic and questions were used to derive a set of requirements. These requirements formed the basis of the research objectives. These are detailed in Section 1.2. The objectives were then used to derive a number of Key Performance Indicators (KPIs) (i.e. Technical Performance Measures). Examples of these included the following:

- **Value for Money:** this explores any efficiencies in the R&D funded grants and programs.
- **Time to Market / Speed to Capability:** how quickly the funded innovation was translated to the warfighter.
- **Impact on Customer:** explores the translation of innovation to the warfighter, its fit-for-use, and customer satisfaction of the solution and the outcome in solving their problem(s).

The KPIs were grouped into three (3) categories defining the research project's Measures of Effectiveness (MOE). The MOEs defined are as follows:

- **Effectiveness:** captures the overall R&D impact and its fit-for-purpose.
- **Efficiency:** captures data which references the knowledge gained from the R&D and its translation of speed to capability for the warfighters use.
- **Economical:** captures how well the money which funded the R&D, and how well the associated resources were utilised to get the outcome.

This research engineering design process supported the derivation of the questions for the online survey and interview and provided context and alignment with the literature review and government policies and strategy. All survey and interview questions reference at least one MOE (Table 1, Section A.2 and Table 2, Section A.2), qualifying the question as evidence supporting the research topic. Importantly, and in terms of the agility of this approach, this derived hierarchical structure was used to traverse, test and validate observations gathered through the data collection to ensure the research needs were satisfied.

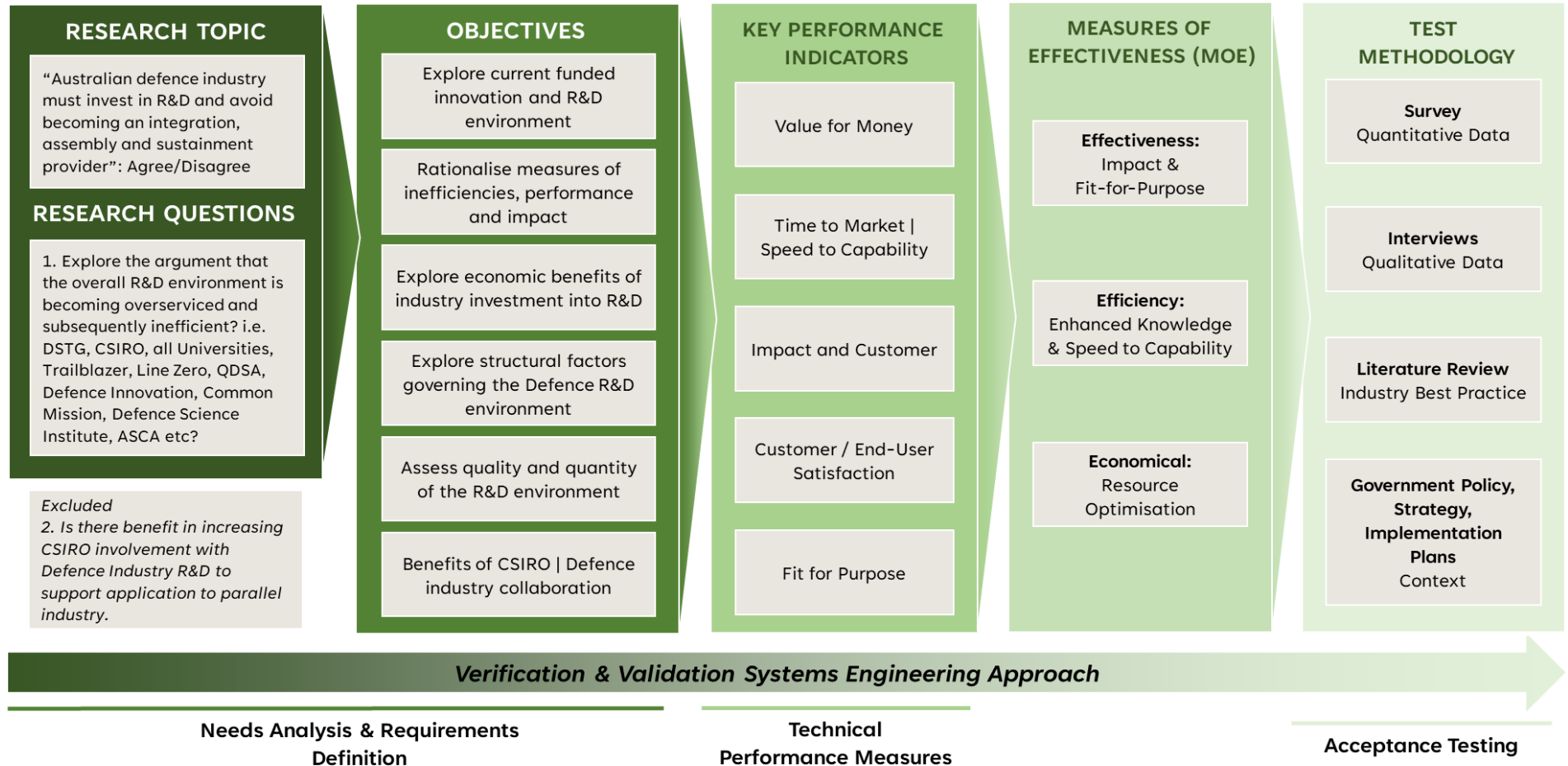


Figure 5 Research Design Process

3.2 Phase 2: Data Collection, Test and Validation

The purpose of this phase was to plan and conduct both qualitative and quantitative data collection activities through the use of an online survey and face-to-face interviews. It was also fundamental at this point in the research to test and validate observations against the research objectives.

The data collection, test and validation phase included the following key activities:

- Connecting with Defence and industry stakeholders defined by the stakeholder map established to undertake interviews and issuing the research survey. Importantly, the stakeholder map was continuously refined as new stakeholder recommendations were identified.
- Qualitative data capture and management to enable analysis and findings identification in Phase 3.
- Initial data analysis to test and validate captured findings to ensure the research is providing relevant outcomes.
- Review a set of relevant case studies identified as part of the literature review.

The primary purpose of the interviews was to collect qualitative data, enabling the team to use the thematic analysis method, given the quantity and size of the data collected to undertake analysis. In total 18 interviews were conducted each with 10 questions. The interview questions gathered insights into the interviewees' opinions across Economical, Effectiveness, and Efficiency factors, including demonstrations of value for money on current Defence spending, effectiveness of collaboration across the R&D environment with Defence and industry, among others. The interview questions and the referenced MOEs are provided in Table 2 Section A.3 .

The following selection criteria was used to identify the Defence and industry stakeholders to interview. The interviewees needed to satisfy a minimum of 2 criterion:

1. Senior executive working within Defence and industry directly or indirectly responsible for acquisition, sustainment and procurement of Defence capability.
2. Thought leaders in research and innovation working in Defence or as part of the CSIRO.
3. Exposure to, or responsible for Government research grants, programs and organisations.
4. Working for the Australian Defence Force as a warfighter or in a capability management role.
5. Suitably qualified personnel with exposure to the R&D and innovation environment.

The interviews included people from the following industry types:

- Defence Primes,
- Defence Small Medium Enterprises (SME)¹,
- Government tertiary research organisations,
- Government grant programs,
- The Defence Science and Technology Group, and
- CSIRO.

¹ [Small Medium Enterprise Definition | ABS](#)

Notable roles of the individuals interviewed included:

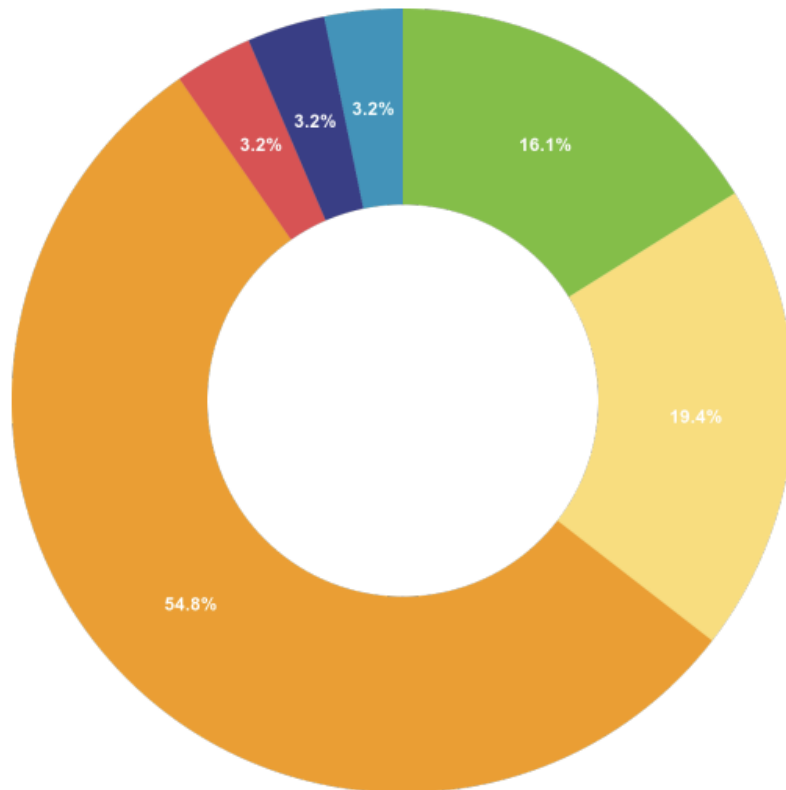
- Business Owners of Defence SMEs,
- Science and Innovation Leaders in Defence and industry,
- Executive and Directors of Defence Industry businesses,
- Research adjuncts, and
- End users of military capability (i.e. the warfighter).

Noteworthy to highlight, opportunities did not present themselves to interview members who either work for or those associated with the CSIRO and ASCA. Therefore, further research can be conducted beyond this paper engaging and investigating CSIRO and ASCA members to collate their view to further refine the findings and recommendations.

The online survey included 23 questions, a total of 31 responses were received from a large pool invited to respond. The survey contained a range of questions to understand general information about the participant – organisation, role, size of the entity (i.e. business or organisation) and entity type. Importantly, the survey gathered information relevant to the employed entities involvement in the Defence innovation and R&D environment, including awareness, funding involvement, industry collaboration among impressions and insights into their opinions of the current Government innovation funding, its effectiveness, economical value and efficiency. The survey questions and the referenced MOEs are provided in Table 1 Section A.2 .

The survey received the following responses:

- 19.4% from a Defence Prime;
- 54.8% from an SME, this being the majority of the participants;
- 16.1% from the Department of Defence; and
- 6.5% from either a public or private research organisations.




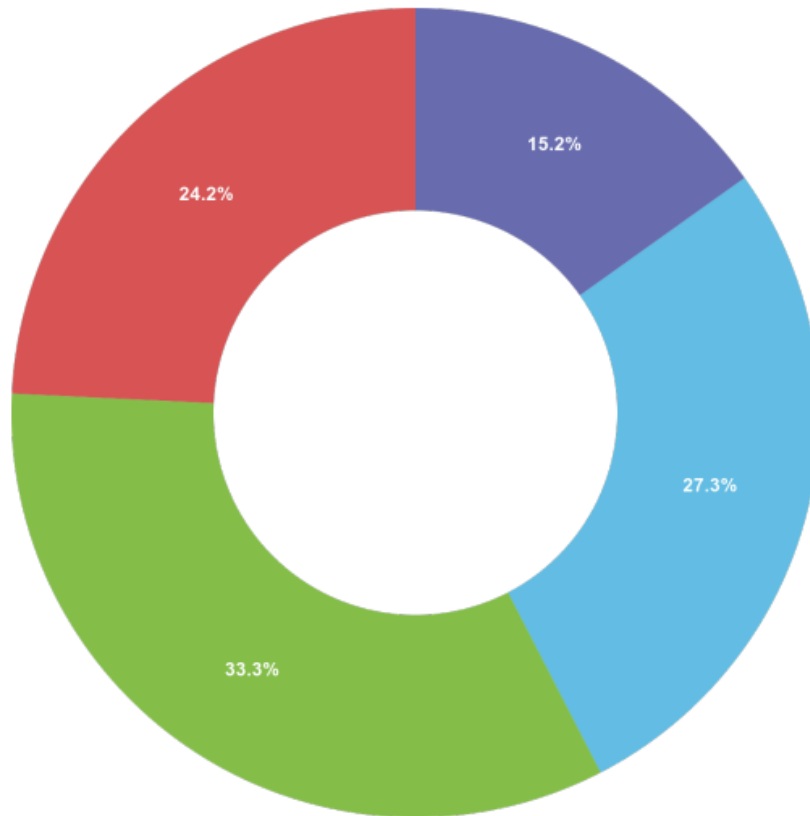
Choice	Total
 State/Federal Government	0
 Australian Defence Force	0
 Department of Defence	5
 Defence Prime (e.g. BAE/Raytheon/Boeing)	6
 Defence-Related SME/Supplier	17
 Research Organisation (Government Owned)	1
 Research Organisation (Privately Owned)	1
 Other	1

Figure 6 Participant Industry Type

Participant roles included an even distribution across all provided role classifications, the survey received the following responses:

- 33.3% were in a senior leadership role,
- 27.3% were either in a project or program management role,
- 15.2% were in a qualified engineering role, and
- 24.2% from a different role classification other than provided.









Choice	Total
 Engineering	5
 Project/Program Management	9
 Senior Leadership	11
 Research/Development	0
 Australian Defence Force (ADF) Member	0
 Other	8

Figure 7 Participant Role Classification

All the results to the survey are presented in the Annex, Section A.1 .

3.3 Phase 3: Data Analysis, Findings and Recommendations

The purpose of this phase was to undertake detailed analysis of the data collected, identify key findings, and present proposed recommendations as part of the overall research. Further to this, the following key activities were undertaken:

- Data analysis using the Thematic Analysis qualitative technique, focusing on the research questions to establish a coding scheme and theme identification. Table 3 (Section A.4) details the thematic analysis coding scheme used. The research findings are presented in Section 5 .
- The proposed recommendations are presented in Section 6 .

4 Case Studies

To underpin the research work, two case studies were conducted where a research agency was formed to boost the innovation through working collaboratively with the research organisation, academia and industry partners. The first case study focused on the long-standing United States of America’s DARPA, the second case study then reviewed the newly formed Australia’s ASCA.

4.1 Defense Advanced Research Project Agency (DARPA)

Over the past 50 years, DARPA has held to a singular and enduring mission, which is “to prevent and create technological surprises” (DARPA, 2024) [7]. Arguably, it has the longest-standing, most consistent record of accomplishment of radical invention in history. DARPA is structured as a flat organisation and invests using a “High Risk, High reward” R&D funding approach, (Engaging DARPA, 2014) [17]. This approach has led to the development of next generation capabilities. To advance its mission, DARPA employ alternative contracting arrangements to take quick advantage of the opportunities. Fostering trust and autonomy using an unconventional innovation approach, allowing a culture of openness, and promoting greater decision-making, has led DARPA to produce unparalleled breakthroughs (Figure 8) in advanced technology.

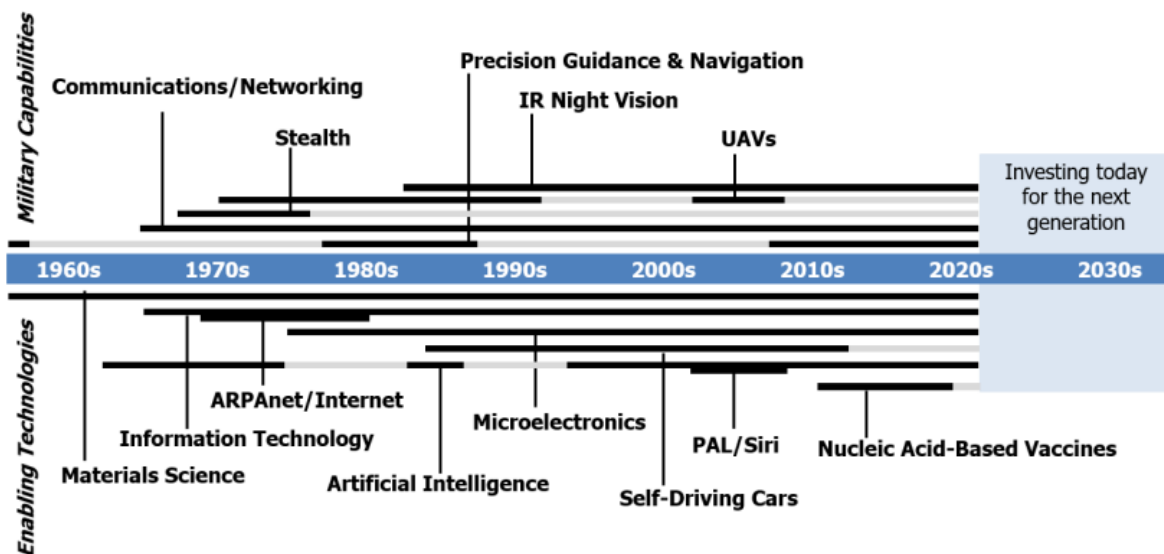


Figure 8 DARPA Breakthrough Capabilities

DARPA has a lean structure with approximately 100 program managers with an inspiring sense of mission, specialised in areas from human resources, finance, industry or academia. DARPA are contracted for only three to five years “*to achieve something new and important*”, are spread across 5 Technical Offices (Figure 9) and focus on innovation in areas that can be applied to both commercial and defence sectors. Traditional defence contractors, corporations, and start-ups are a critical component of DARPA’s innovation ecosystem. DARPA’s Small Business Programs Office (SBPO) helps to expand small-business relationships and training opportunities within the Department of Defence and enable them to create and transition the technologies that benefit the national security and commercial marketplace. DARPA also hosts Proposers Days to provide information on recently released or soon to be released projects/announcements.



Figure 9 Technical Offices of DARPA

DARPA funds approximately 250 projects of which pursue a high-risk model fostering a culture of “*failure*” as a means to learn and adapt safely. DARPA provides initial short-term funding for seed efforts that can scale to significant funding for promising concepts, but with clear willingness to terminate non-performing projects.

DARPA is transparent not only with its organisational structure but also with its detailed budget breakdown (DARPA, Defense-Wide Justification Book, 2024) [8] provided to the public domain (Figure 10). US congress in 1989 granted “*other transactions*” authority, a special agreement to DARPA for accessing resources for R&D efforts with industry and academia. DARPA’s success depends on the vibrant ecosystem of innovation within which the agency operates and is fuelled by partners in multiple sectors, including Universities, industry, small business, and government.

UNCLASSIFIED

Defense Advanced Research Projects Agency
FY 2025 President's Budget
Exhibit R-1 FY 2025 President's Budget
Total Obligational Authority
(Dollars in Thousands)

Appropriation: 0400D Research, Development, Test and Evaluation, Defense-Wide

Line No	Program Element Number	Item	Act	Sec	FY 2023	FY 2024 PB	FY 2025
					Actuals	Request with CR Adjustments*	Request
2	0601101E	Defense Research Sciences	01	U	376,978	311,531	303,830
5	0601117E	Basic Operational Medical Research Science	01	U	73,355	50,430	99,048
		Basic Research			450,333	361,961	402,878
10	0602115E	Biomedical Technology	02	U	104,150	141,081	169,198
15	0602303E	Information & Communications Technology	02	U	365,033	333,029	397,266
16	0602383E	Biological Warfare Defense	02	U	21,717		
21	0602702E	Tactical Technology	02	U	203,644	234,549	117,935
22	0602715E	Materials and Biological Technology	02	U	316,176	344,986	337,772
23	0602716E	Electronics Technology	02	U	527,882	572,662	573,265
		Applied Research			1,538,602	1,626,307	1,595,436
42	0603286E	Advanced Aerospace Systems	03	U	242,369	331,753	269,700
43	0603287E	Space Programs and Technology	03	U	76,900	134,809	225,457
61	0603739E	Advanced Electronics Technologies	03	U	243,110	254,033	257,844
62	0603760E	Command, Control and Communications Systems	03	U	291,580	321,591	336,542
63	0603766E	Network-Centric Warfare Technology	03	U	662,126	885,425	886,511
64	0603767E	Sensor Technology	03	U	292,757	358,580	267,961
		Advanced Technology Development			1,808,842	2,286,191	2,244,015
161	0605001E	Mission Support	06	U	96,637	99,090	113,007
175	0605502E	Small Business Innovative Research	06	U	126,852		

*A full-year FY 2024 appropriation for this account was not enacted at the time the budget was prepared; account is operating under the Further Additional Continuing Appropriations and Other Extensions Act, 2024 (Public Law 118-35). The amounts included for FY 2024 reflect the annualized level provided by the continuing resolution.

Figure 10 DARPA Budget Breakdown

4.2 Advanced Strategic Capabilities Accelerator (ASCA)

In 2022, the Australian Government announced its intent to “Boost Australia’s involvement in technology-sharing and R&D” (Aph.gov.au, 2022) [3] through the establishment of an Advanced Strategic research agency, which is similar to that of DARPA. ASCA, the Australian version of DARPA, was established in July 2023 in order to “Rapidly pull through innovations to Capability to provide ADF an asymmetric advantage” (Missions 2024) [18]. ASCA does not innovate or develop capability on its own, but rather it relies on Defence and industry to develop and innovate.

In response to Defence requirements and priorities, aligned with Defence policy and strategy including the DSR [10], ASCA will release problem statements that facilitate partnering with industry and research organisations to accelerate capability delivery. Details about ASCA’s organisational structure is limited, including, its relationship with DSTG, whose role is to deliver valued scientific advice and innovative solutions for defence and national security. Organisationally, DSTG employs approximately 2200 staff (*The ‘DARPA model’ for Australia*, 2022) [21]. If elements of the DARPA model were to be replicated, it would require a set of arrangements that would challenge organisation structure, procurement and most notably the culture towards appetite for risk – fail fast, learn fast.

Australian Defence would need to demonstrate a higher level of risk tolerance as a cultural change both in outlining its mission requirements to selected partners, and in accepting multiple failures and financial loss at a rapid pace. Encouraging a culture of “*fail fast, learn fast*” would be a challenge. At the time of researching, ASCA is currently working on one mission “Ghost Shark” and two programs under innovation incubation: Pitch Day 2024 and AUKUS Electronic Warfare Innovation Challenge. The only publicly available information on ASCA’s funding plan was that \$3.4 billion has been allocated over the next 10 years (ASCA 2023) [2]. Currently, there is no transparency of ASCA’s performance, in terms of funding secured, and progress to evaluate the organisations operational effectiveness.

ASCA follows the conventional hiring and Commonwealth procurement arrangements, which currently act as a barrier for SMEs from entering the Defence industry due to the length and cost of procurement processes. As an initiative to increase collaboration with industry, ASCA intend to develop industry participants through both education activities and by providing support to access relevant grant funding to address capability gaps. ASCA wherever possible should take initiatives to breakdown the silos between SMEs, SMEs and Primes, and between SMEs and Government Research organisations like DSTG and CSIRO, and connect the various participants of the defence ecosystem. These services will improve and increase the industry partnership and collaboration with DSTG. Currently, ASCA’s limited transparency and procurement process is acting as a barrier for rapidly transitioning innovations into capabilities.

As an outcome from the review of these case studies, proposed research recommendations are detailed in Section 6 beyond what is available in the public forum, further research is recommended beyond this paper by engaging with ASCA to gather additional information on its structure, processes and performance to gain a wholistic understanding.

5 Research Findings

This section details the research findings collated from the qualitative and quantitative data analysis. Given the quantity of data collected, thematic analysis was used to undertake the analysis. This method reported identifiable, common and repeated themes within the interview transcripts and survey data. Most themes derived from the thematic analysis can be seen in Appendix A.4 . The reported and identifiable themes included **funding, collaboration and culture**. There were a couple of sub-themes also identified, these being *strategy* and *commercialisation* of which were merged into the main themes. The theme of **champion**, relevant to collaboration was another prevalent theme, all themes translated back to the topic and research question.

Some of the key findings which were identified by collating the survey data with the literature review and interviews are as follows:

- Majority of participants agreed with the statement ‘there is benefit to increasing CSIRO’s involvement with Defence industry innovation to support application in parallel industries’.
- Majority of survey participants and their organisations saw that there is some level of collaboration with other Defence organisations and there is opportunity to further increase the collaboration either through option like co-location or organising topic-based networks to share knowledge and promote opportunities to networking.
- Approximately 66% of people strongly agree that CSIRO and/or DSTG should have increased collaboration with industries.
- Majority of interviewees would like to see closer alignment between warfighter needs, R&D institutions, Australian Defence Industry and the Capability Acquisition and Sustainment Group (CASG) to increase delivery speed of new and innovative capabilities. Currently the

interviewees think there is lack of strategic focus and differing motivations of research institutes and SMEs to collaborate.

- When barriers for collaboration were investigated through our interview process and survey questions, it showed that key themes were around managing expectations, limited funding, working with Universities and Research Institutes (URIs) and their bureaucracy, concerns about IP, uncertainty about the value of involvement, and differing motivations to collaborate.
- Majority of the individuals from SMEs and their organisations agreed the current pathways and collaborative research agreements in areas of research-industry IP and patent arrangements are limited and inefficient for a successful outcome of industry-research institute (DSTG/CSIRO and Universities) partnerships.
- Majority recognised the importance in the development of the mid-tier industry.
- Majority of interviewees highlighted that a networking culture enables a synergy between organisations to increase collaboration.

It is acknowledged there is a bias in the data collected. All the recipients interviewed and who participated in the survey were from Defence industry.

Figure 11 shows a word-cloud used from the research to highlight the frequently used words taken from the interviewees transcripts relevant to the increasing the collaboration between DSTG and industries. Therefore, further research can be conducted beyond this paper engaging and investigating CSIRO and ASCA members to collate their view to further support the findings and associated recommendations.



Figure 11 Word-cloud of Research Findings from Interviews

5.1 Establish a Defence Industry Capability Manager/Champion

Collaboration between Industry partners and Research Institutes propel innovation, competitiveness, productivity and internationalisation (Verreynne et al., 2021) [22]. A key linkage must exist to ensure there is frequent, and ongoing, personal involvement between university researchers and industry managers. Collaboration only works well when there are cross organisational team members who have a deep knowledge of the two cultures, thereby the use of Champions (Marinho et al., 2020) [19]. Successful defence industry development requires alignment of several distinct activities in government: overall policy frameworks, monitoring of the industrial base, support to industry, testing, and R&D programs.

A case study conducted by Ai Group, “Rethinking the future of Australian defence industry policy, 2023” (Ai Group, 2023) [15] recommends the establishment of a Defence Industry Capability Manager responsible to bring Defence, wider government and industry together for the achievement of strategic industrial outcomes.

The following responses and key quotes from the interviews highlight the need for and importance of having a champion:

- *“Champion is also really useful. I know something that we don't do well in the R&D world is bringing a champion from defence to support the program”.*
- *“Instead of telling that the wrong proposal was submitted because we did not understand the question. Talk to us about your needs, share with us, we've got the clearances, tell us what the problem is and we'll think about the solution. So I guess I'd go back to Champions that are actually out there and are willing to communicate their needs and work with us. This would make a huge difference”.*
- *“Have a capability manager for R&D projects, and who are responsible for delivering better outcome”.*

5.2 Funding

Defence provides a range of grants and programs to support industry and university in expanding to meet Defence capability needs. The 2024-25 budget sees Defence funding increase to \$764.6 billion over the decade to support a more capable and self-reliant Defence Force (Australian Government, 2024) [5]. Even though sufficient funding is available for SMEs and University to translate asymmetric technologies into defence capability, a lack of cohesion and coordination between innovation incentive programs both across and within state and federal government levels results in dilution of resources, reduction in competition, and an overall reduction in the likelihood of commercial success (Industry Innovation and Science Australia, 2023) [18].

The most significant theme, and outcomes from the majority of interviews was the fragmented funding, lack of clear national Science and Technology goals, and lack of an overarching national strategy in terms of government funding. To support this theme, an extract from the interviews are as follows:

- *Grants help. There are not too many Grants currently, which help. Should it all be consolidated somehow? and the answer is yes it should be.*
- *ASCA delivered more than \$200m in innovation contracts over at least 160 projects with 94% of our industry contracts being with SMEs (ASCA, 2024) [1].*
- *ASCA has about 160 projects, \$200M funding for FY 2024. The funding is split into small funds and scattered among many projects, which is in no way sufficient to undertake some good research work. Australian R&D funding is not as high as other developed country.*

- *Depends on where you're looking. There are places where money is available, Australia's Economic Accelerator (AEA), Trailblazer. But, with Next Generation Technologies Fund (NGTF) and Defence Innovation Hub (DIH) drying up, ASCA doesn't have enough.*
- *If you are a small business – there is not a lot of research you can do for \$1m. I think that increase of tax incentives can promote SMEs to undertake and invest in R&D.*
- *Australia's industry structure is dominated by small businesses (93% of Australian businesses) with low levels of free cash flow and human resourcing. These characteristics limit the capacity to invest in creating and developing innovation (Industry Innovation and Science Australia, 2023) [18]. Therefore, Mid-tier industry is to be developed/supported.*
- *Research that aligns to national priorities should be incentivised by either financial or eligibility mechanism.*

5.3 Collaboration and Innovation Culture

The Australian Bureau of Statistics (ABS, 2022-23) [4] reports that 46% of businesses innovate, and of the innovation-active businesses, only 33% collaborated. Verreynne et al., (2021) [22] identified lack of information, financial costs, lack of contacts and differences in goals, cultures and ways of operation as most common barriers to initiating collaboration between Research institutes and industries.

Defence Connects 2023, Australian Defence Industry Report revealed that of the survey respondents, 36% and 11% respectively, described doing business in Australia's defence industry as 'difficult' and 'extremely difficult' respectively. Only 20% of respondents considered it 'easy', while 3% considered it 'extremely easy'. Such results may reflect Defence's expectation that businesses 'get battle fit' instead of cultivating a more collaborative ecosystem (Coyne, 2024) [6]. Defence is investing significant effort into industry engagement with research institutes. Programs such as ASCA, AUKUS Pillar II, Australian Defence Science and Universities Network (ADSUN), and DSTG's Science, Technology and Research (STaR) Shots are initiated to improve and evolve the ways of engagement and collaboration between defence, academia and industry in Australia and to build an integrated ecosystem (Collaborate Magazine, 2024) [16].

Together with CSIRO, industry, university partners and DSTG, Data61 is an example for a successful partnership program focused on helping to accelerate a change of trajectory for the country from within cyber where the partnership has strengthened research depth in critical areas and filled gaps in individual expertise (Data61, 2019) [9].

The following are a few interview responses to the question related to collaboration between Industries and research institutes:

- *There is at times a lack of alignment in terms of the priorities among the various entities, where they decide to focus their efforts on and therefore the capability and outcomes and outputs that are delivered back to Defence. So there's definitely room for improvement in terms of that sort of common understanding, so that everyone's on the same page.*
- *There needs to be better education, programs for researchers around intellectual property, its protection and commercialisation for better collaboration arrangements.*
- *The establishment of collaborative research precincts to foster closer relationships with industry, research institutes and academia to bind together, spurring further innovative culture.*
- *Fostering a culture of collaboration over competition and increase ability to tolerate risk.*
- *The mobility of talent between universities, industry and Government is crucial to ensure the appropriate skills and knowledge are available.*

- *You end up with this kind of culture, where they're all competing with each other for the same pot of money and therefore it's just not conducive to building genuine relationships.*
- *Collaboration culture within organisations should be developed. Capital unity supported by Government will enhance collaboration.*
- *Culture of networking for synergy for collaboration should be emphasised. Co-funding can also be achieved through collaboration/merging the national strength areas like agriculture, Defence etc. which are complimentary to each other areas to drive investment.*

6 Recommendations

Through research, interviews and analysis, the following recommendations have been proposed in support of the research findings. The four main recommendations are based on the themes of a Defence innovation R&D audit, alignment of ASCA to a DARPA-like model, culture of collaboration and innovation, and strengthening the middle-tier supply chain.

6.1 Audit the current Defence Innovation and R&D environment

The recommendation proposed is to undertake an audit into the current Defence innovation and R&D environment to identify economic opportunities for resource optimisation.

A better understanding and view of funding being spent on Defence innovation R&D across the different departments is required before a clear understanding of how much Australia is currently spending on Defence R&D to determine an accurate measure of efficiency and effectiveness. To date there is no known single source of truth of Defence R&D spend in Australia with no single body or department having oversight or management of Defence R&D spend.

Top-line metrics and indicators should be readily available, and participants should have the option to delve deeper on topics of interest as needed for specific innovation centres or efforts. The risk this poses is a level of duplicity or duplication of efforts across the various funding streams or grants where the same kind of research is conducted and funded in multiple places. The outcome of the audit would be a centralised repository for all current Defence R&D spend which would allow for better decision making and a review of spend to reduce the risk of duplicity, leading to a more efficient use of resources. Addressing and removing any duplicity would free up funding and allow for more dedicated resources on focused R&D efforts aligned to critical defence priorities. This will accelerate technological competitive advantage, strengthen and expand Australia's sovereign capabilities.

6.2 Aligning ASCA to a similar DARPA-like Model

The recommendation proposed is to identify structural opportunities in aligning ASCA to a similar DARPA-like model.

Complex innovation partnerships require objective, transparent and flexible governance structures. This proposal aims to establish a scaled down DARPA-like model which is fit-for-purpose and suits the economic scale of Australia to replicate the innovation success DARPA has achieved. This would generate an asymmetric advantage through:

- Re-aligning key defence priorities.
- Being more cost effective and efficient with the current budget of R&D funding available.
- Agility for rapid innovation through process improvement.
- Encouraging a 'fail fast, learn fast' approach.

The proposed model would replicate a similar approach to the Reserve Bank of Australia (RBA), to include the necessary authority and responsibility to play a regulatory function, provide stability and oversight, foster collaboration, operate independently while reporting to Parliament. Key to this is the independence of the model from political cycles and free of bureaucracies, having the autonomy required and still being fully accountable. It would need to be empowered to take on high-risk, high-reward projects, having the dedicated funding and resources to do so.

Most importantly, proactive buy-in from innovation champions who are embedded end-users will need to be incorporated into every stage of the R&D process. This will ensure alignment with Defence priorities, but also the innovative products developed would be tailored to solve the user needs ensuing its fit-for-use.

Additionally, there is a need for a single accountable party that is well supported with a clearly defined operating model with all the right decision makers and access to escalation paths to ensure Defence R&D in Australia is managed effectively, efficiently and economically. The aim is to empower this organisation to enable a single and integrated effort across collaborators that isn't constrained by near-term budget cycles which could affect the production of disruptive technology innovations.

6.3 Collaboration and Innovation Culture

The recommendation proposed is to incentivise a Collaboration and Innovation Culture.

Cultural change is one of the most challenging and difficult changes to realise in any organisation. Once the ideal cultural elements are in place, it is also the most impactful. The current R&D ecosystem is viewed as being too risk averse, fragmented, and siloed in many of the research organisations. Creating a culture that embraces risk enables an explicit expectation that in some cases projects will fail from time-to-time. Importantly, tailoring, introducing new innovative processes through leadership to encourage early and regular questioning and testing ideas supports and fosters a learning culture. Ensure that performance reviews, promotions, and other incentives reward innovative behaviour with an expectation and a bias for risk taking.

Encouraging and implementing shared goals and metrics through the introduction of cross-functional or cross-organisational KPIs encourages collaboration. Move away from top-line KPI metrics to those that will cascade to every level of the organisation. One such example would be the successful completion of a milestone that involves multiple teams collaborating.

Communication is key in collaboration. Enhancing communication channels within and between organisations is crucial for increasing awareness, fostering collaboration and driving mutual growth. By sharing information transparently and regularly with the help of commercial agreements, organisations can better understand each other's goals, challenges and opportunities, leading to a more effective partnership and innovative solutions outcome. Such communications can be facilitated through the creation of open forums and environments like the Australian Defence Science, Technology and Research (ADSTAR) summit that brings together thought leaders, researchers, professionals from Defence, government, industry and academia to discuss advancements in the various fields that make up Defence R&D.

Publicly acknowledging and rewarding innovative ideas through social media platforms, award nights and other industry events is another means of fostering a culture of collaboration and innovation. By celebrating contributions openly, organisations are not only motivated to share their insights but are also encouraged to form a collective effort towards common goals. These events build and instil a sense of community to further innovation, strengthen bonds, and build trust within the R&D ecosystem.

While cultural change is often difficult to achieve due to deeply ingrained beliefs and practices, it is also the most impactful. Transforming a culture requires persistence, open mindedness and a willingness to change. Culture does not change on its own— it requires the intentional efforts of leadership to drive change.

6.4 Strengthen the Australian Middle-tier

The recommendation proposed is to strengthen the Australian middle-tier, enabling local innovation investment, providing a globally technological competitive advantage for Australia.

Small and medium enterprises (SMEs) are the engine room of innovation in most economies. Australia's industry is dominated by small businesses (93% of Australian businesses [18]) with a very low number of medium sized businesses, leading to "the missing middle". This means that the scaling of innovation and realisation of commercial benefits either fails or is taken offshore, 'Barriers to collaboration and commercialisation', p. 11 [18]. There is a need to support businesses with the risk appetite to innovate to deliver novel products and/or services. Support could come in the form of policy reforms or incentive programs that will cater to and target businesses that are most in need of the financial support to grow local capabilities and infrastructure. Australia currently has an R&D Tax Incentive program that is designed to encourage companies to engage in R&D activities that will benefit the Australian economy. The program aims to support innovation and growth by providing financial incentives for companies to invest in R&D by means of tax offsets. There is a need for the Government to re-evaluate the R&D financial incentives for SMEs, considering a more cost-effective tax rate or additional forms of tax incentives or grants that would provide a level of financial support, encouraging more R&D investment in the middle-tier.

In addition, a reduction of the administrative burden in the application process should be considered, specifically the eligibility requirements, simplifying the application process, compliance and reporting. A more streamlined process in applying for these financial incentives would provide relief, and uptake for middle-tier businesses to engage in and invest in R&D.

Apart from direct financial incentives, an increased focus on workforce development through training and development initiatives, the provision of infrastructure, advanced manufacturing facilities, or testing ranges. Having such resources made available either by means of a loan or general access to such equipment would be another means for supporting the middle-tier companies.

To assist in providing a globally technological competitive advantage, more can be done to enhance collaboration and lowering barriers by allowing middle-tier companies to leverage more established partners such as Primes or academic institutions who would have the expertise or knowledge and know-how to scale or transition product through to commercialisation, not only locally but diversifying into global markets. Such partnerships can be encouraged through trade missions, export grants or assistance in drafting favourable trade agreements. By strengthening the middle-tier, this would also affect and benefit smaller businesses by providing opportunities by integrating them into the middle-tiers core supply chain.

7 Conclusion

Australia requires a consolidated national strategy for Defence innovation which includes funding, priorities, and a risk appetite with an innovative culture to enable the speed into service and minimum viable solution goals. This will provide an effective and efficient utilisation of the Defence R&D ecosystem while avoiding the R&D environment from becoming overserviced and inefficient. Investment in R&D and innovation will enable a technological competitive advantage globally. It will strengthen and expand Australia's sovereign capabilities and invest in global independence, while enabling national economic advantages.

The Australian Defence Force operates within a complex geopolitical environment where there are economic and political challenges to circumnavigate. Investment into R&D will enable beneficial outcomes for the Australian warfighter. This will support Australia in being able to safeguard the nation's security by enhancing its technological capabilities, controlling sovereignty and competing internationally. Defence Industry needs to diversify and embrace innovation to avoid becoming an integration, assembly and sustainment provider. Parallel industry applications, through dual use technology can also provide efficiencies through collaboration between CSIRO and DSTG. Research depth will be strengthened through and knowledge sharing and collaboration to fulfill knowledge gaps between organisations. Data61 is a proven and successful partnership program between these two organisations who operate using different business models and cultures.

The research recommendations presented for consideration included; the government undertaking an audit into the current Defence innovation and R&D environment to identify economic opportunities for resource optimisation, identify structural opportunities in aligning ASCA to a similar DARPA-like model, incentivise a collaboration and innovation culture; and strengthen the Australian middle-tier to enable local innovation investment, providing a globally technological competitive advantage for Australia.

In order to accelerate an asymmetric advantage for the warfighter, Defence's innovation, science and technology ecosystem needs to not reinvent the wheel, but rather realign the spokes.

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9 Acronyms

Acronym	Definition
AAA	Accelerating Asymmetric Advantage (strategy document) (Figure 2)
ABS	Australian Bureau of Statistics
ADF	Australian Defence Force
ADSTAR	Australian Defence Science, Technology and Research
ADSUN	Australian Defence Science and Universities Network
AEA	Australia's Economic Accelerator
ARPAnet	Advanced Research Projects Agency Network (Figure 8)
ASCA	Advanced Strategic Capabilities Accelerator
AUKUS	Australian, United Kingdom, United States Alliance
BMC2	Battle Management Command and Control (Figure 9)
CASG	Capability Acquisition and Sustainment Group
CoA	Commonwealth of Australia
CSIRO	Commonwealth Scientific & industrial Organisation
DARPA	Defense Advanced Research Project Agency
DIDS	Defence Industry Development Strategy (Figure 2)
DIH	Defence Innovation Hub
DILP	Defence Industry Leadership Program
DIN	Defence Innovation Network (Figure 3)
DoD	Department of Defence
DSR	Defence Strategic Review
DSTG	Defence Science Technology Group
EW	Electronic Warfare (Figure 9)
FY	Financial Year (Figure 10)
IIP	Integrated Investment Plan
IP	Intellectual Property
IR	Infrared (Figure 8)
IS&T	Defence Innovation, Science and Technology (Figure 1)
IT	Information Technology (Figure 3)
ITAR	International Traffic in Arms Regulations
KPI	Key Performance Indicator
MOE	Measures of Effectiveness
NDS	National Defence Strategy
NGTF	Next Generation Technologies Fund
PAL	Personal Assistant that Learns (Figure 8)
PNT	Positioning, Navigation and Timing (Figure 9)

Acronym	Definition
QDSA	Queensland Defence Science Alliance
R&D	Research & Development
RBA	Reserve Bank of Australia
SBPO	Small Business Programs Office
SDIP	Sovereign Defence Industrial Priorities
SME	Small Medium Enterprise
STaR	Science, Technology and Research
TPM	Technical Performance Measure
TRL	Technology Readiness Level
UAVs	Unmanned Aerial Vehicles
UNSW	University of New South Wales
URI	Universities and Research Institutes

10 Definitions

Term	Definition
Measures of Effectiveness	A measure of the ability of a system to meet its specified needs (or requirements) from a particular viewpoint. This measure may be quantitative or qualitative and it allows comparable systems to be ranked. These effectiveness measures are defined in the problem-space.
Thematic Analysis	Thematic analysis is a qualitative research strategy for identifying, analysing, and reporting identifiable patterns or themes within data ² . It is usually applied to a set of texts, such as an interview or transcripts. The researcher closely examines the data to identify common themes – topics, ideas and patterns of meaning that come up repeatedly.
Technical Performance Measure	Technical Performance Measures (TPM) measure attributes of a system element to determine how well a system or system element is satisfying or expected to satisfy a technical requirement ³ .

² [APA Dictionary of Psychology](#)

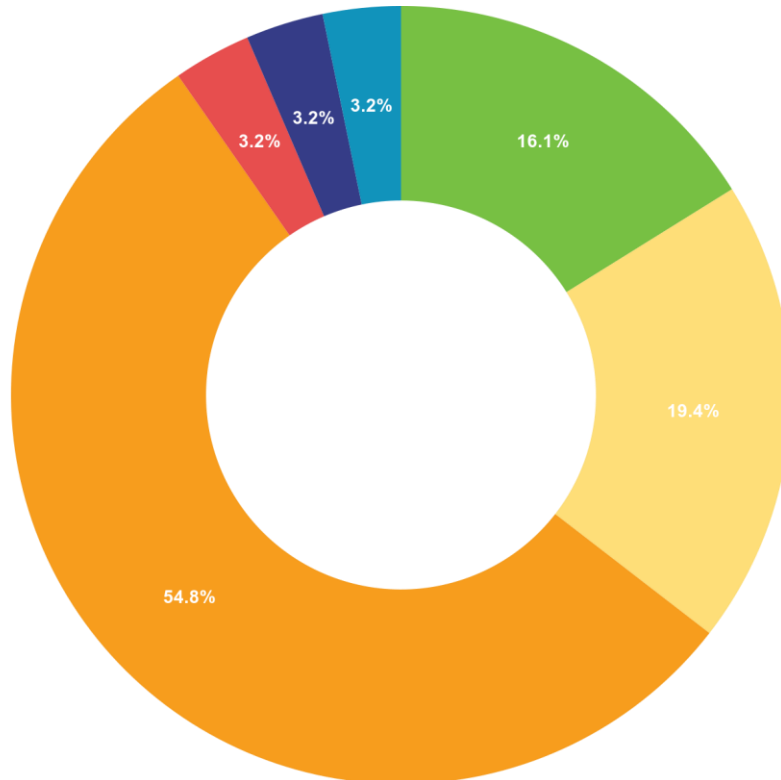
³ <https://www.incose.org/>









Appendix A: Data Collection

A.1 Survey Data

Q1 What industry to you work in?

Multiple Choice

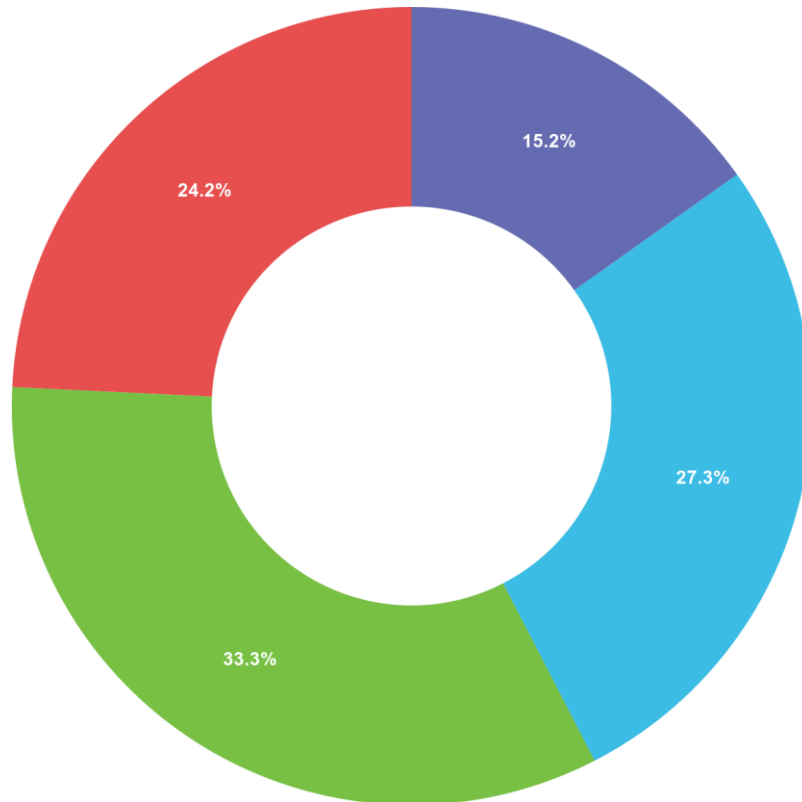








	Choice	Totals
	State/Federal Government	0
	Australian Defence Force	0
	Department of Defence	5
	Defence Prime (e.g. BAE/Raytheon/Boeing)	6
	Defence-Related SME/Supplier	17
	Research Organisation (Government Owned)	1
	Research Organisation (Privately Owned)	1
	Other	1

Responses 31, Answered 31, Unanswered 0,

Q2 What is your job classification?

Multiple Choice

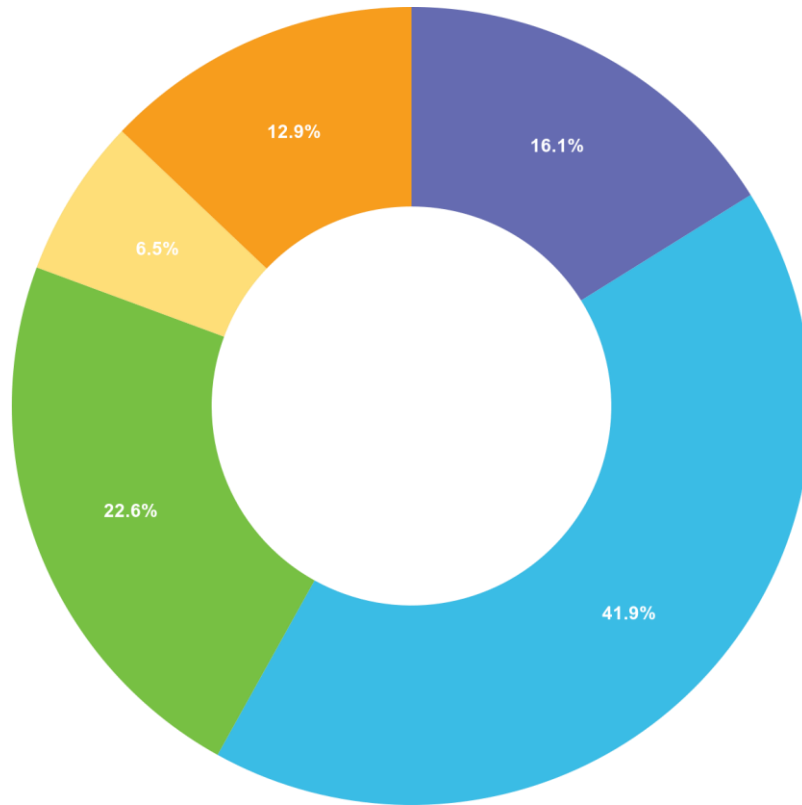








	Choice	Totals
	Engineering	5
	Project/Program Management	9
	Senior Leadership	11
	Research/Development	0
	Australian Defence Force (ADF) Member	0
	Other	8

Responses 31, Answered 31, Unanswered 0

Q3 What type of entity is your organisation?

Multiple Choice

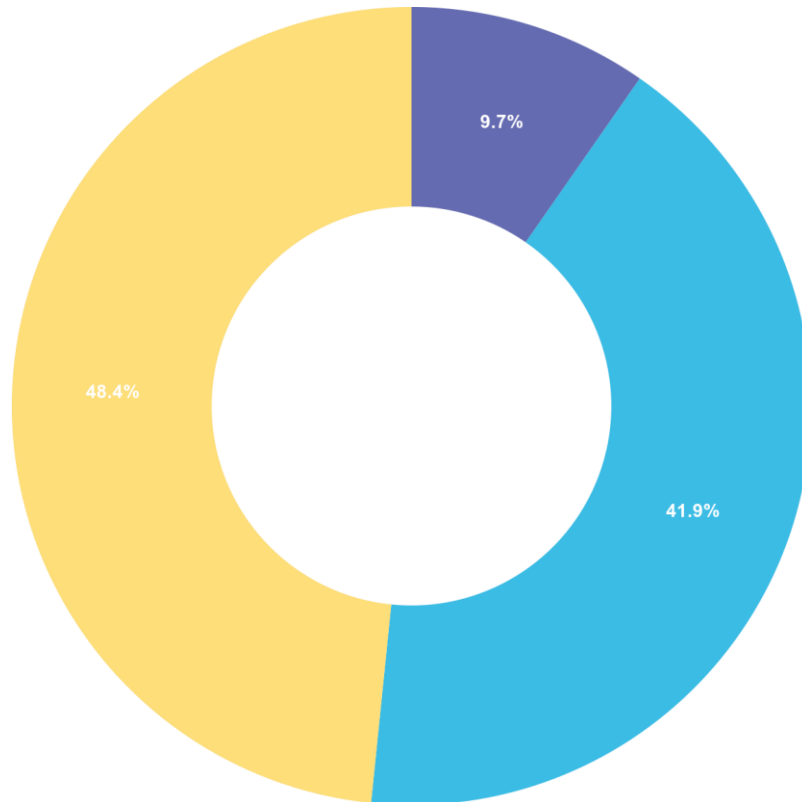






	Choice	Totals
	Government Organisation	5
	Privately Owned Organisation (Australian)	13
	Privately Owned Organisation (Foreign)	7
	Publicly Owned Organisation (Australian)	2
	Publicly Owned Organisation (Foreign)	4
	Other	0

Responses 31, Answered 31, Unanswered 0

Q4 What size business/organisation do you work for?

Multiple Choice

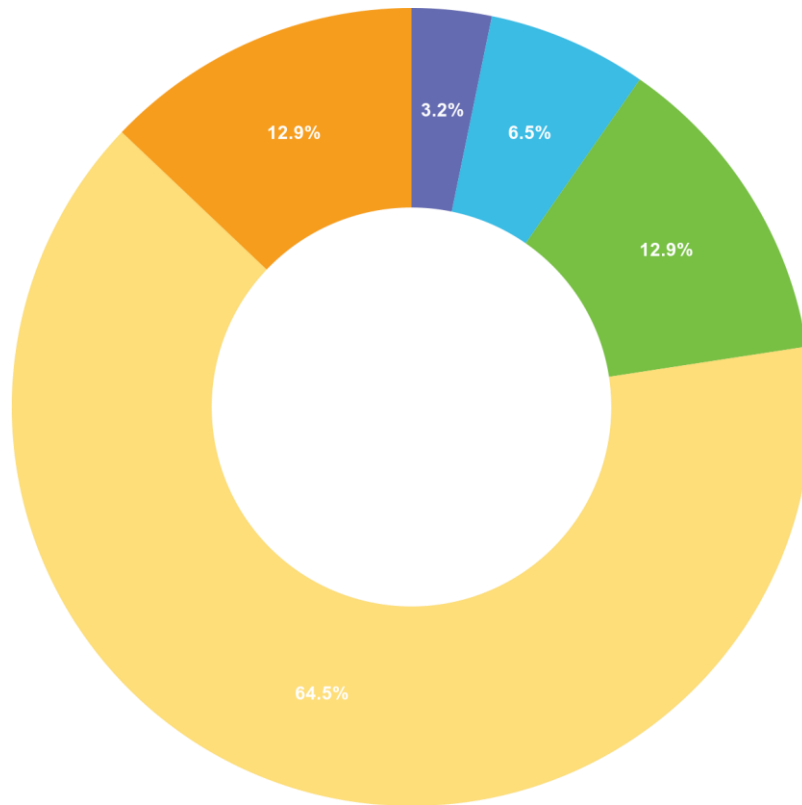







	Choice	Totals
	Small Enterprise/Start-Up (1-20 employees)	3
	Medium Enterprise (21-199 employees)	13
	Large Enterprise (200-499 employees)	0
	Very large Enterprise (500+ employees)	15

Responses 31, Answered 31, Unanswered 0

Q5 What Technology Readiness Level(s) (TRL) does your company engage with on Acquisition Projects?

Multiple Choice

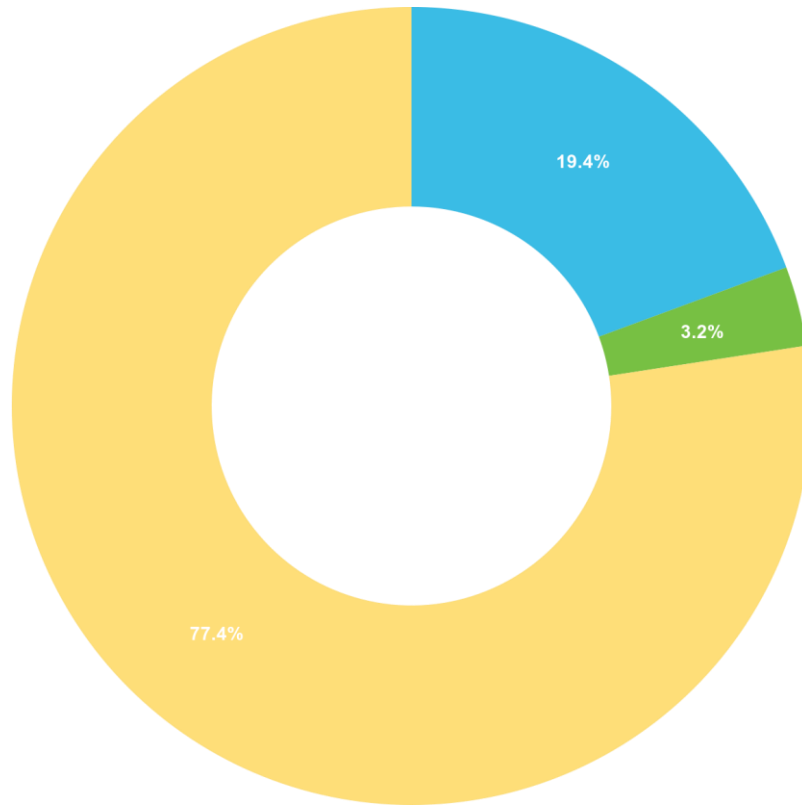






	Choice	Totals
	TRL 1-3 (Research)	1
	TRL 4-6 (Development)	2
	TRL 7-9 (Deployment)	4
	All of the Above	20
	Not Applicable/Do Not Engage	4

Responses 31, Answered 31, Unanswered 0

Q6 How long have you worked in the defence industry?

Multiple Choice

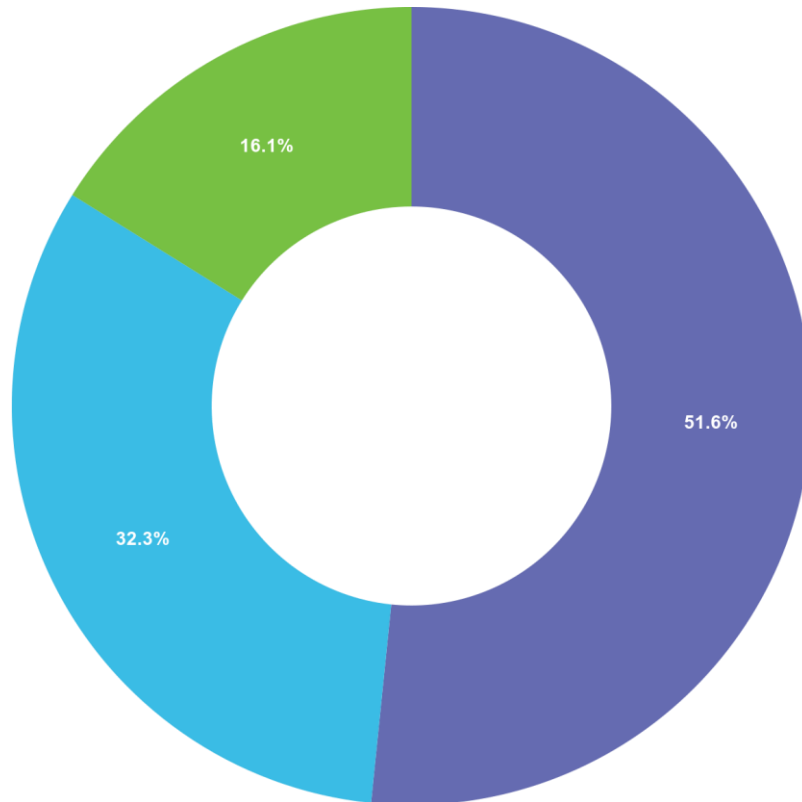






	Choice	Totals
	<1 year	0
	2-5 years	6
	5-7 years	1
	7+ years	24

Responses 31, Answered 31, Unanswered 0

Q7 Does your organisation access or use existing State/Federal/Commonwealth research funding?

Multiple Choice

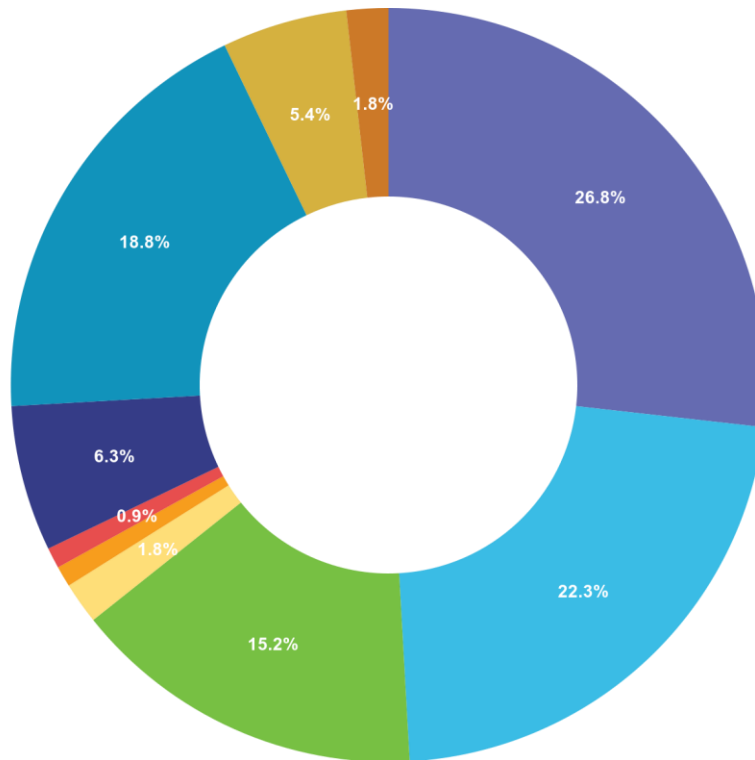













	Choice	Totals
	Yes	16
	No	10
	Unsure	5
	Other	0

Responses 31, Answered 31, Unanswered 0

Q8 Please indicate which government research organisations, institutes, and programs you are currently aware of.

Multiple Choice

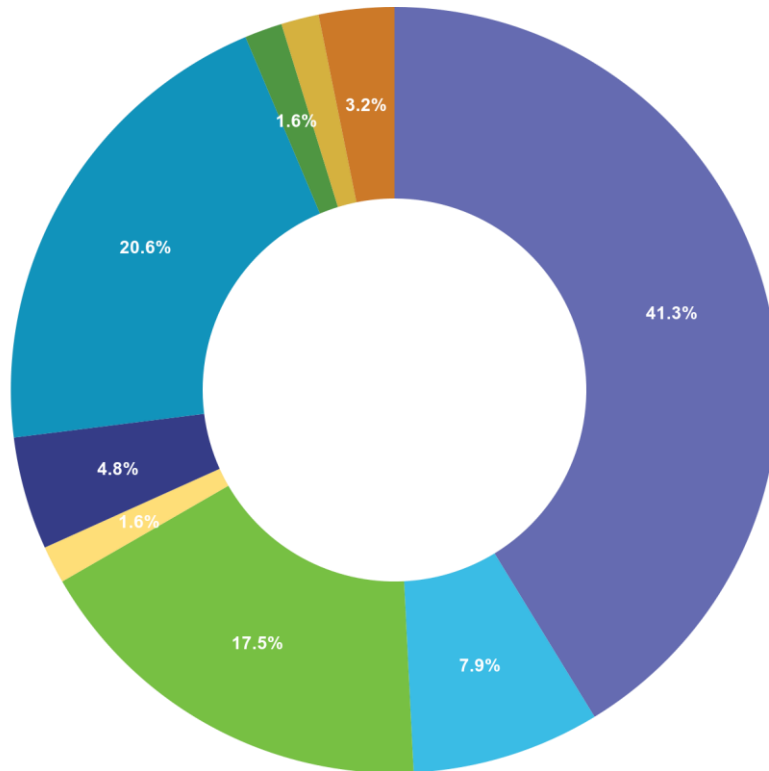













	Choice	Totals
	DSTG	30
	CSIRO	25
	Trailblazer	17
	Line Zero	2
	QDISA	1
	Common Mission	1
	Defence Science Institute	7
	ASCA	21
	None of the above	0
	Other	6
	__archived__	2

Responses 31, Answered 31, Unanswered 0

Q9 Please identify which organisations/institutes your organisation currently engages with?

Multiple Choice

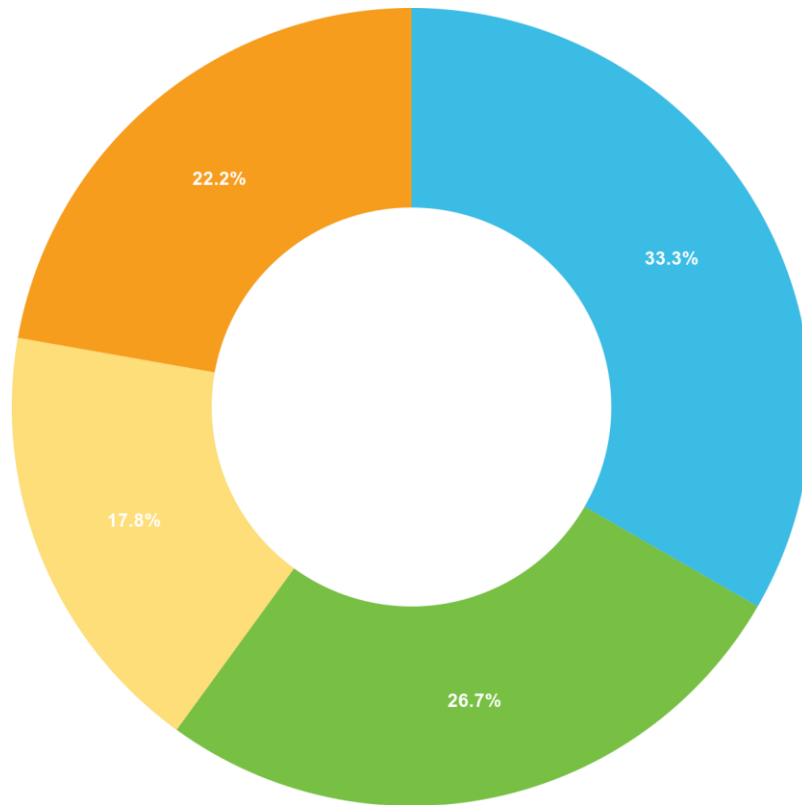


	Choice	Totals
	DSTG	26
	CSIRO	5
	Trailblazer	11
	Line Zero	1
	QDISA	0
	Common Mission	0
	Defence Science Institute	3
	ASCA	13
	Do not collaborate	1
	Other	1
	__archived__	2

Responses 31, Answered 31, Unanswered 0

Q10 To what extent do you believe the Federal Australian Government focuses/invests in innovation within the Australian Department of Defence?

Rating

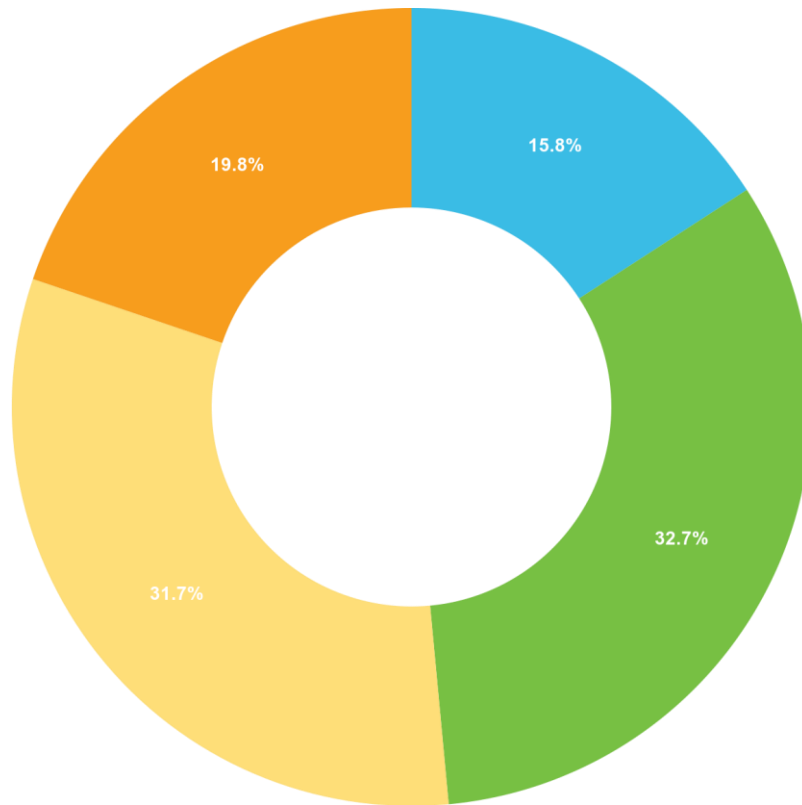







	Value	Label	Rating	Total
	1	Not at all	0	0
	2	Vague Focus/Investment Area	30	15
	3	Long Term Focus/Investment Area	24	8
	4	Top Three Focus/Investment Areas	16	4
	5	Primary Focus/Investment Area	20	4

Responses 31, Answered 31, Unanswered 0, Rating Average 3 — Long Term Focus/Investment Area

Q11 To what extent do you believe the Australian Defence Industry (e.g. Primes) focus/invest in innovation?

Rating

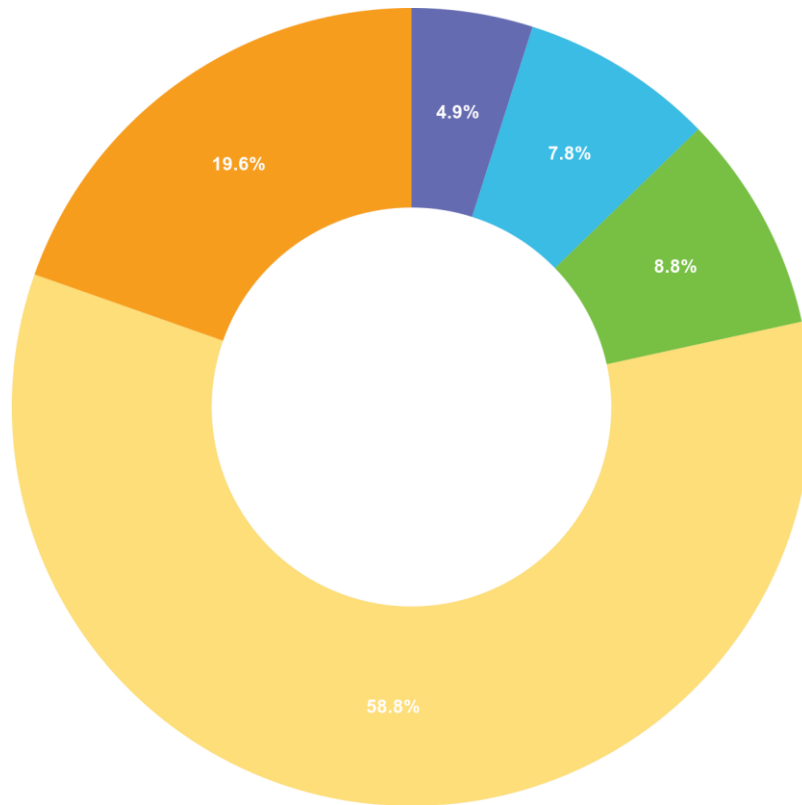







	Value	Label	Rating	Total
	1	Not at all	0	0
	2	Vague Focus/Investment Area	16	8
	3	Long Term Focus/Investment Areas	33	11
	4	Top Three Focus/Investment Area	32	8
	5	Primary Focus/Investment Area	20	4

Responses 31, Answered 31, Unanswered 0, Rating Average 3 — Long Term Focus/Investment Areas

Q12 To what extent do you agree with the following statement: “Australian Defence is ultimately an integration, assembly, and sustainment provider”.

Rating

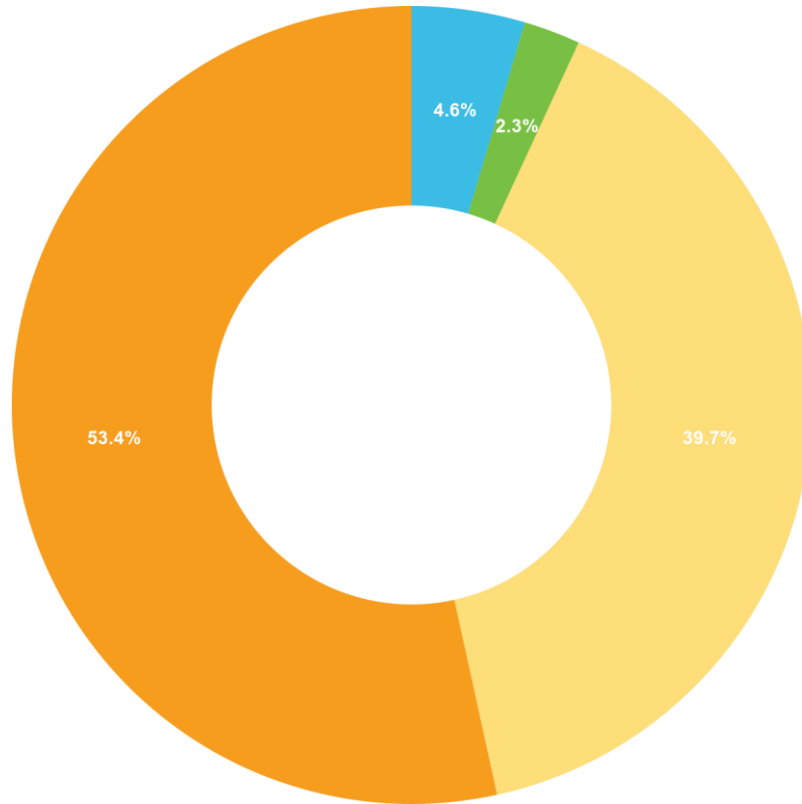







	Value	Label	Rating	Total
	1	Strongly Disagree	5	5
	2	Partially Disagree	8	4
	3	Unsure/Divided	9	3
	4	Partially Agree	60	15
	5	Strongly Agree	20	4

Responses 31, Answered 31, Unanswered 0, Rating Average 3 — Unsure/Divided

Q13 To what extent do you agree with the following statement: “Australian Defence must focus on Australian-led innovation”.

Rating

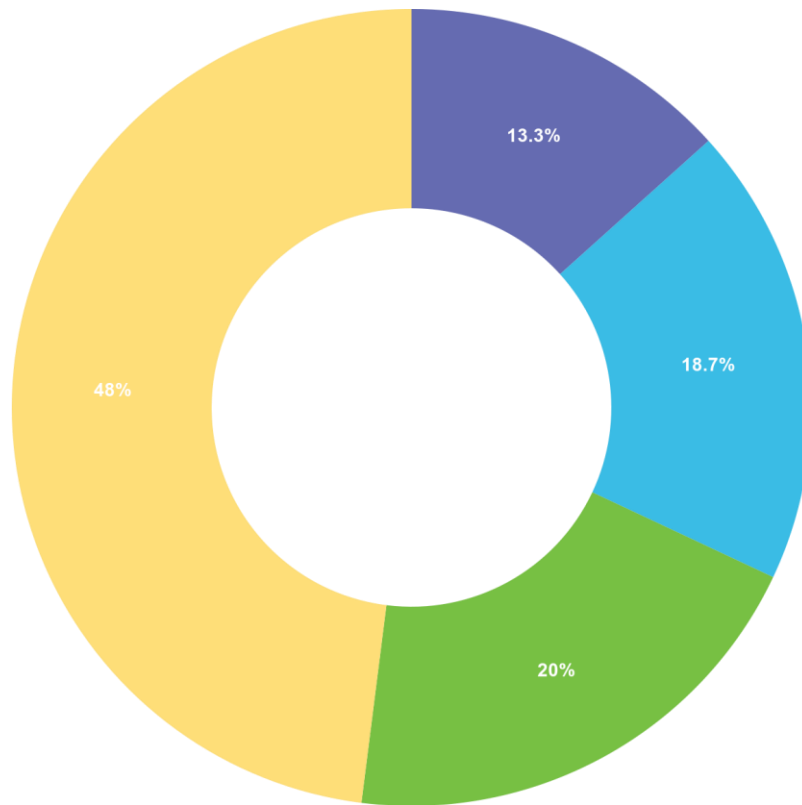







	Value	Label	Rating	Total
	1	Strongly Disagree	0	0
	2	Partially Disagree	6	3
	3	Unsure/Divided	3	1
	4	Partially Agree	52	13
	5	Strongly Agree	70	14

Responses 31, Answered 31, Unanswered 0, Rating Average 4 — Partially Agree

Q14 To what extent do you agree with the following statement: “Australian Defence invests adequate funding into ensuring sovereignty in its products/services”.

Rating

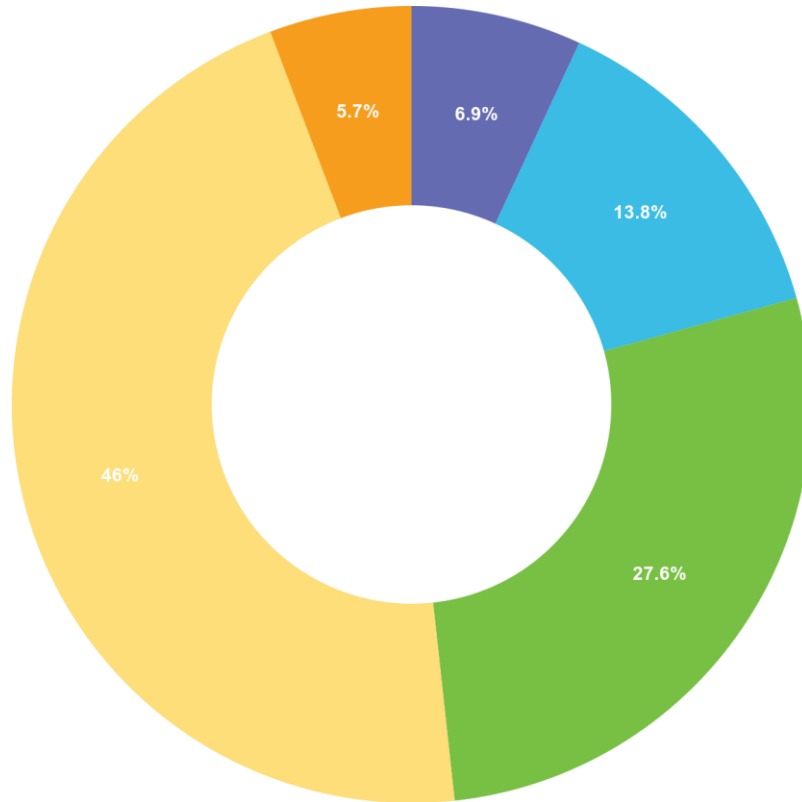







	Value	Label	Rating	Total
	1	Strongly Disagree	10	10
	2	Partially Disagree	14	7
	3	Unsure/Divided	15	5
	4	Partially Agree	36	9
	5	Strongly Agree	0	0

Responses 31, Answered 31, Unanswered 0, Rating Average 2 — Partially Disagree

Q15 To what extent do you agree with the following statement: “Australian Defence invests adequate funding into Australian Industry Capability”.

Rating

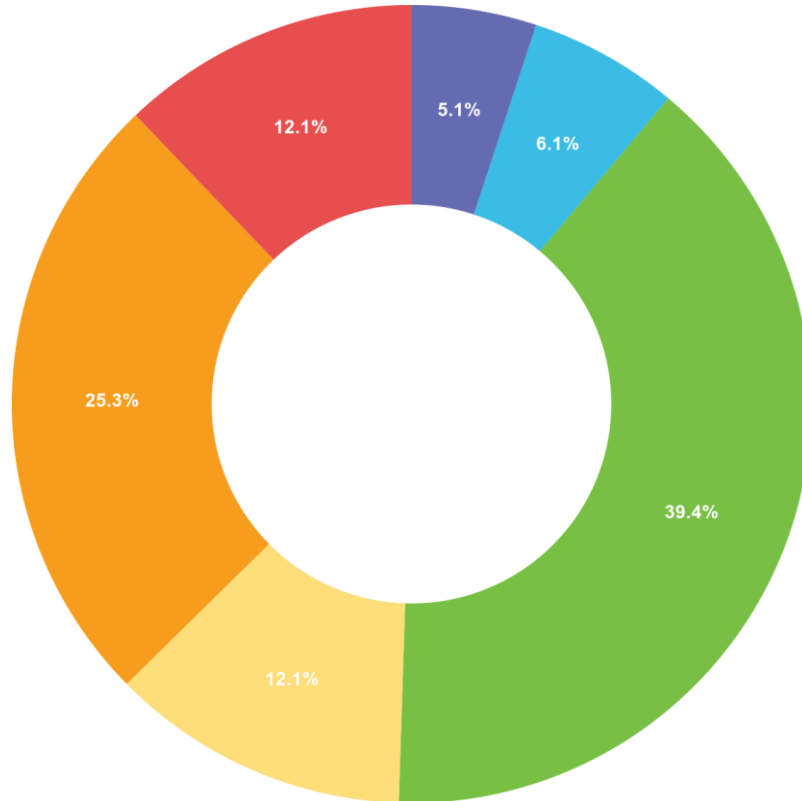








	Value	Label	Rating	Total
	1	Strongly Disagree	6	6
	2	Partially Disagree	12	6
	3	Unsure/Divided	24	8
	4	Partially Agree	40	10
	5	Strongly Agree	5	1

Responses 31, Answered 31, Unanswered 0, Rating Average 3 — Unsure/Divided

Q16 To what extent does your organisation invest in Defence-related research (Australian only)?

Rating

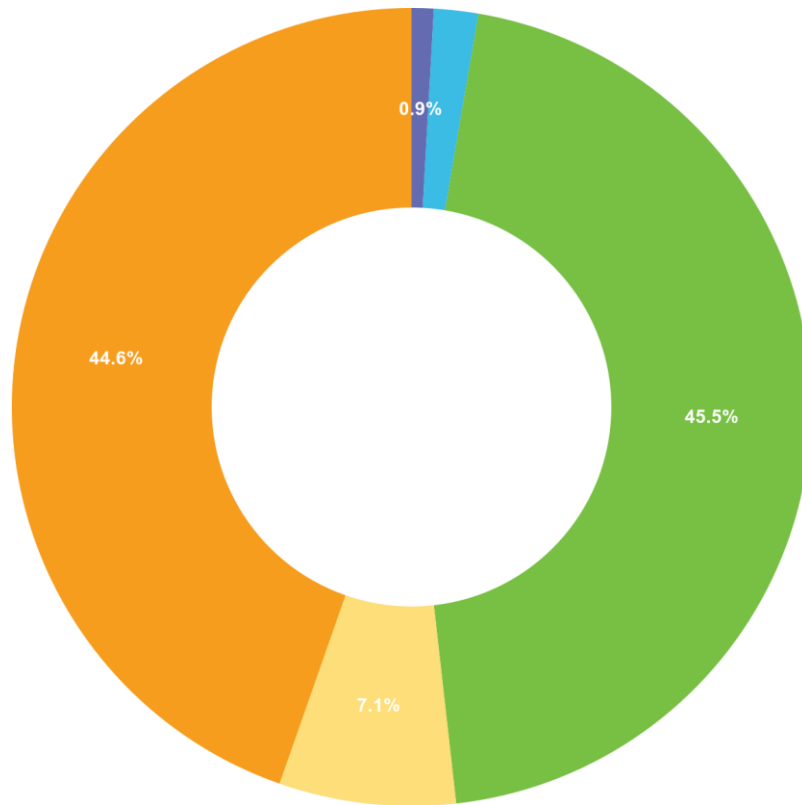








	Value	Label	Rating	Total
	1	No investment at all	5	5
	2	Previously invested in research (not currently investing)	6	3
	3	Some levels of investment	39	13
	4	Future plans for investment	12	3
	5	High levels of published investment	25	5
	6	NA	12	2

Responses 31, Answered 31, Unanswered 0, Rating Average 3 — Some levels of investment

Q17 To what extent does your organisation collaborate on innovative products/services with other Defence organisations?

Rating

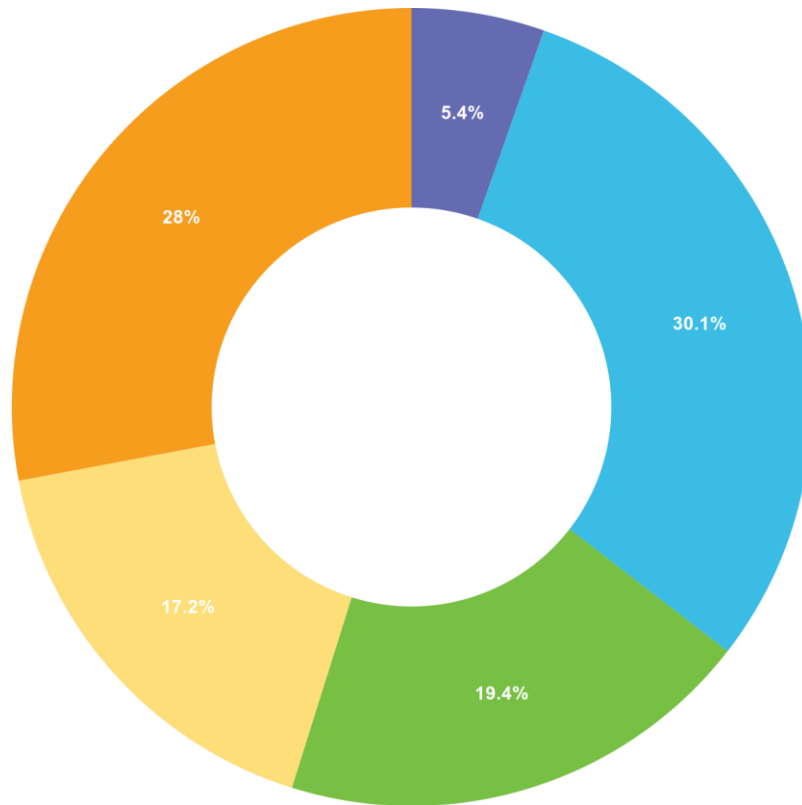







	Value	Label	Rating	Total
	1	No collaboration at all	1	1
	2	Previously collaborated (no current activities)	2	1
	3	Some levels of collaboration	51	17
	4	Future plans for collaboration	8	2
	5	High levels of documented investment/collaboration	50	10
	6	NA	0	0

Responses 31, Answered 31, Unanswered 0, Rating Average 4 — Future plans for collaboration

Q18 Please identify the three primary factors that you believe the Australian Department of Defence utilizes to select product/service acquisitions.

Multiple Choice

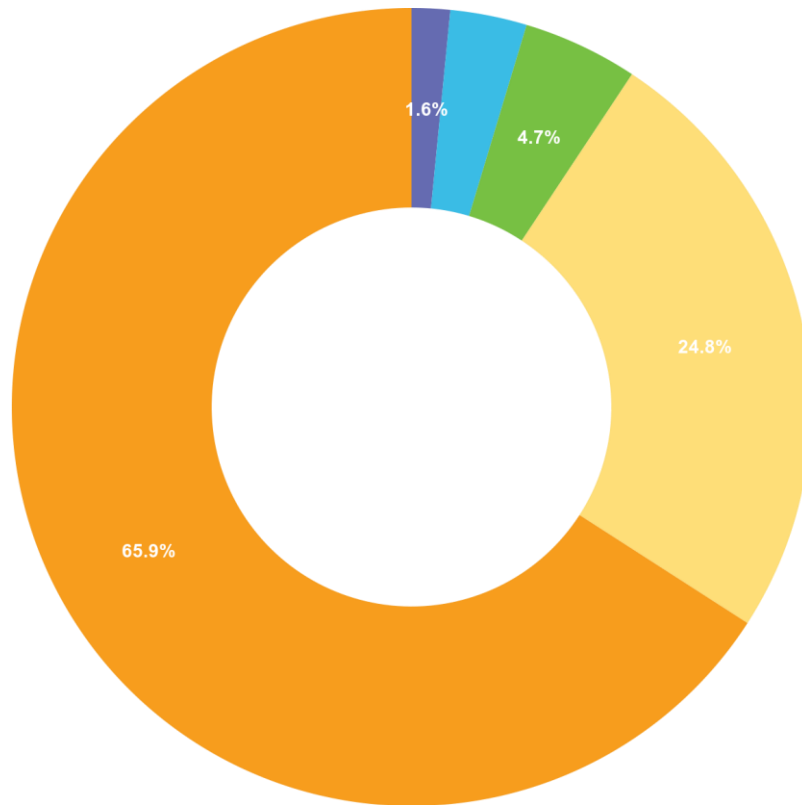







	Choice	Totals
	Innovation	5
	Cost	28
	Time into Service	18
	Australian Industry Capability/Sovereignty	16
	Capability for the Warfighter/End-User	26

Responses 31, Answered 31, Unanswered 0

Q19 To what extent do you agree with the following statement: “CSIRO/DSTG should have increased collaboration with defence industry”.

Rating

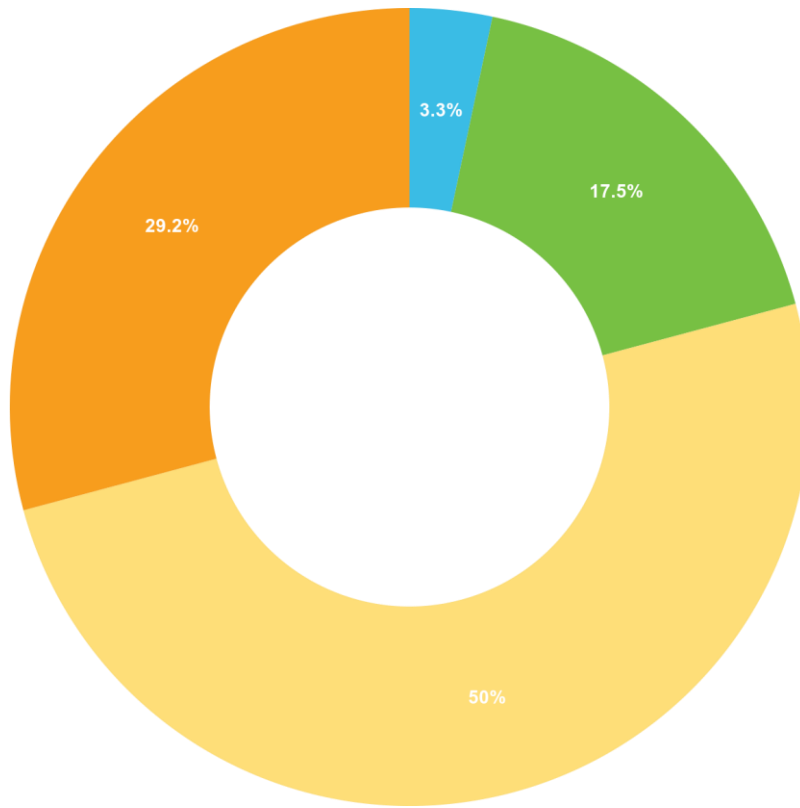







	Value	Label	Rating	Total
	1	Strongly Disagree	2	2
	2	Partially Disagree	4	2
	3	Unsure/Divided	6	2
	4	Partially Agree	32	8
	5	Strongly Agree	85	17

Responses 31, Answered 31, Unanswered 0, Rating Average 4 — Partially Agree

Q20 To what extent do you agree with the following statement: “the Australian Defence acquisition strategy is focused primarily on cost effectiveness/value for money”.

Rating

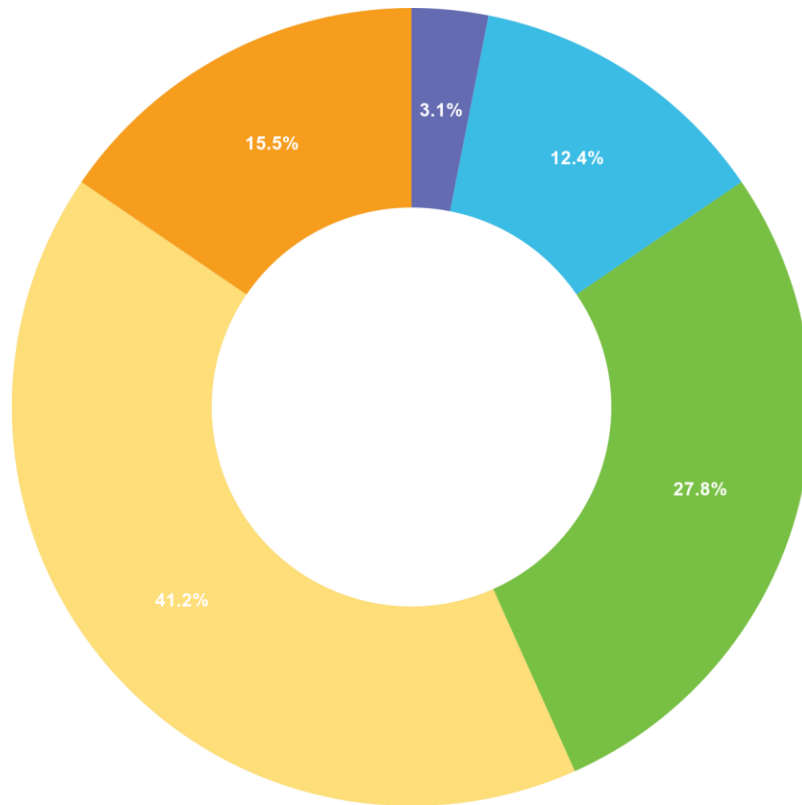







	Value	Label	Rating	Total
	1	Strongly Disagree	0	0
	2	Partially Disagree	4	2
	3	Neither Agree/Disagree	21	7
	4	Partially Agree	60	15
	5	Strongly Agree	35	7

Responses 31, Answered 31, Unanswered 0, Rating Average 4 — Partially Agree

Q21 To what extent do you agree with the following statement: “the Australian Defence acquisition strategy is adequately focused on speed to capability”.

Rating

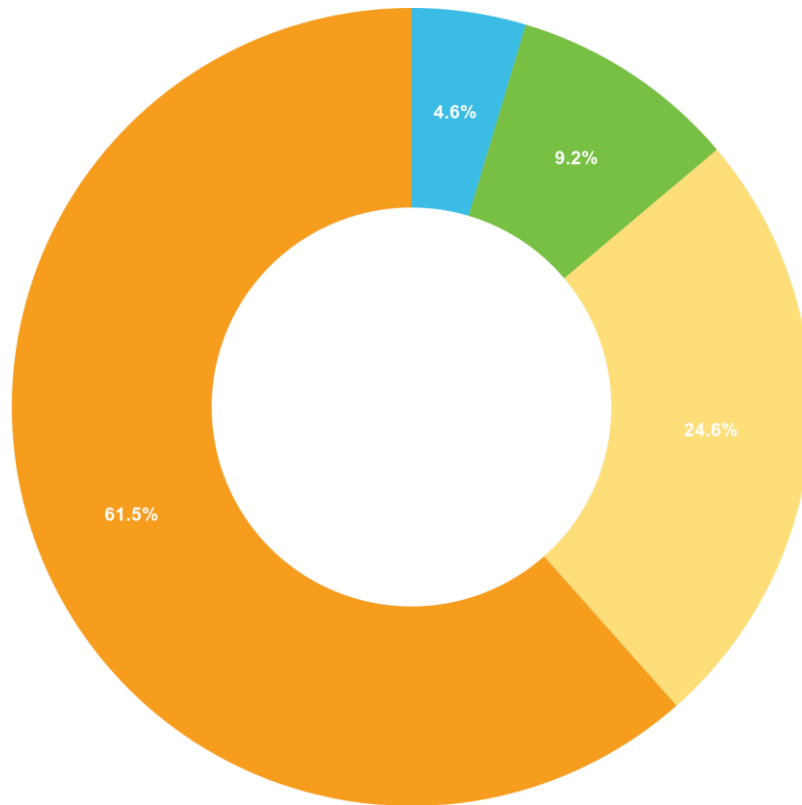







	Value	Label	Rating	Total
	1	Strongly Disagree	3	3
	2	Partially Disagree	12	6
	3	Neither Agree/Disagree	27	9
	4	Partially Agree	40	10
	5	Strongly Agree	15	3

Responses 31, Answered 31, Unanswered 0, Rating Average 3 — Neither Agree/Disagree

Q22 To what extent do you agree with the following statement: “the Australian Defence force should leverage Australian research organisations more in support of product/service innovation”.

Rating

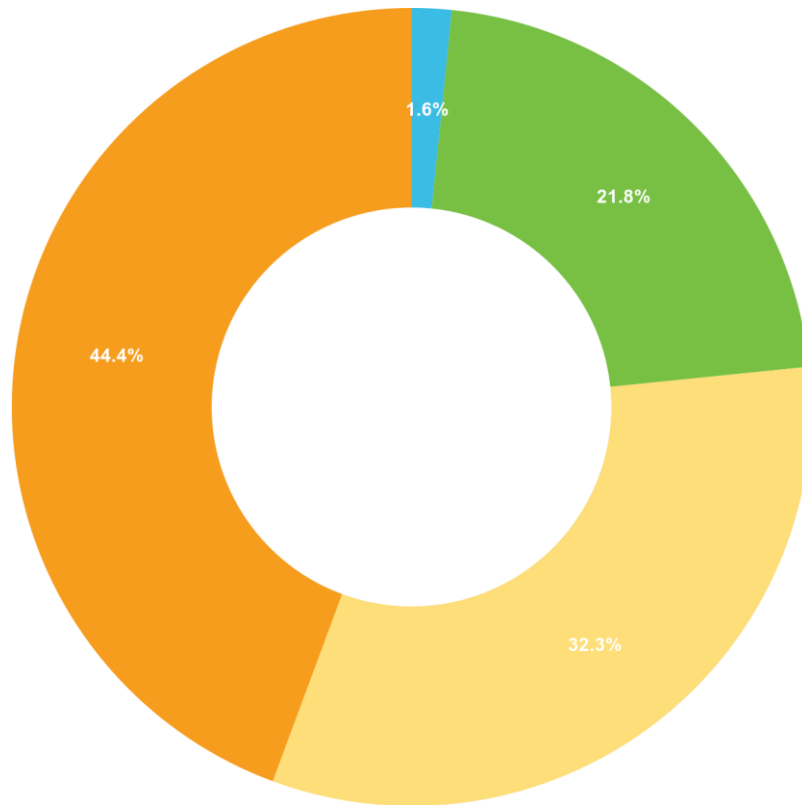







	Value	Label	Rating	Total
	1	Strongly Disagree	0	0
	2	Partially Disagree	6	3
	3	Neither Agree/Disagree	12	4
	4	Partially Agree	32	8
	5	Strongly Agree	80	16

Responses 31, Answered 31, Unanswered 0, Rating Average 4 — Partially Agree

Q23 To what extent do you agree with the following statement: “there is benefit to increasing CSIRO’s involvement with Defence industry innovation to support applications in parallel industries”.

Rating

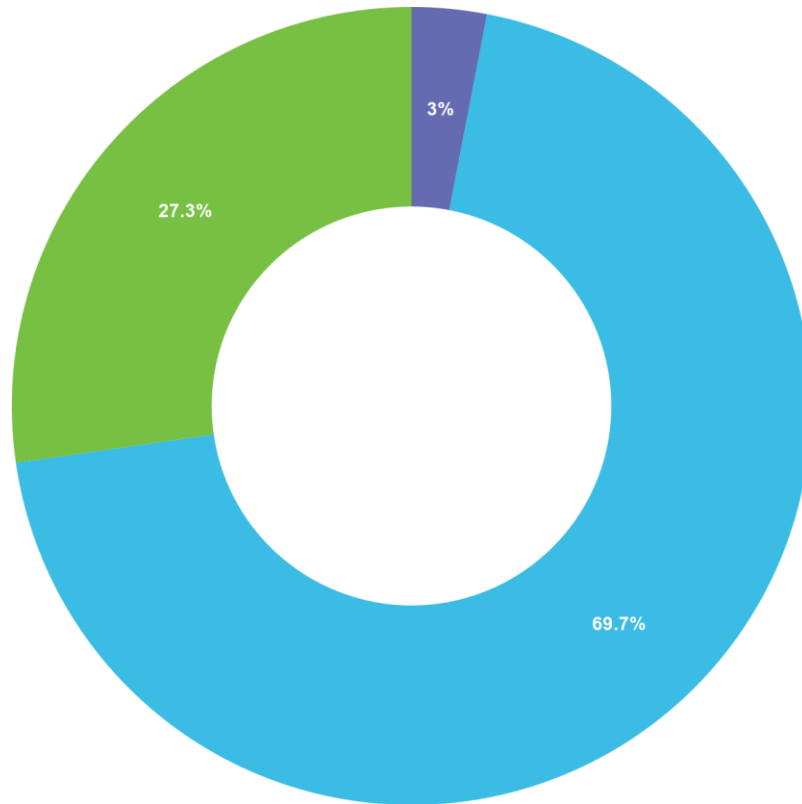





	Value	Label	Rating	Total
	1	Strongly Disagree	0	0
	2	Partially Disagree	2	1
	3	Neither Agree/Disagree	27	9
	4	Partially Agree	40	10
	5	Strongly Agree	55	11

Responses 31, Answered 31, Unanswered 0, Rating Average 4 — Partially Agree

Q24 To what extent do you believe government research organisations/programs have contributed to new innovative technologies, which have transitioned into service to benefit the warfighter (high technology readiness level) ?

Rating

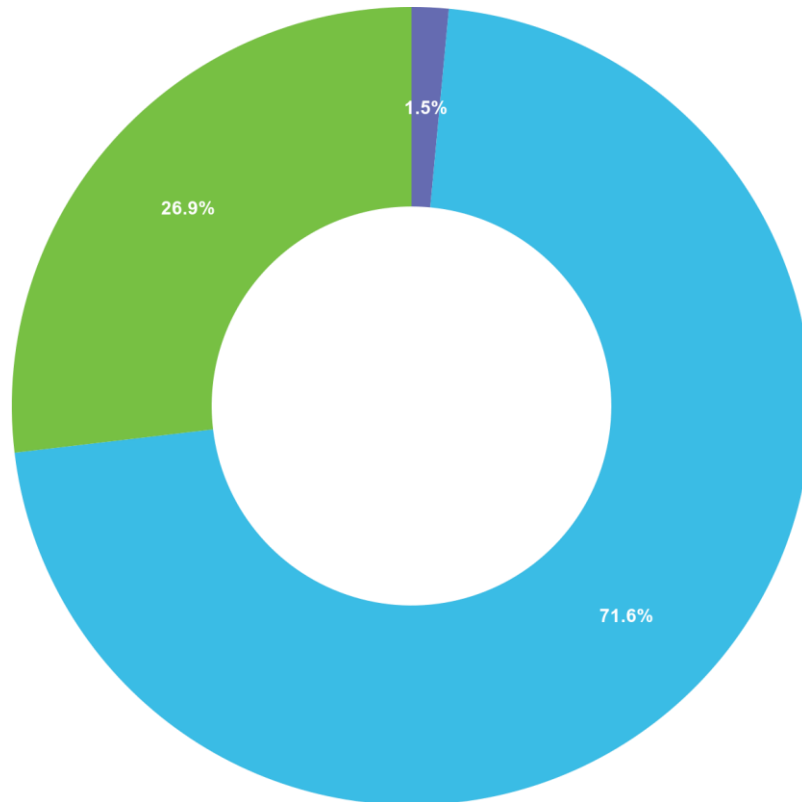





	Value	Label	Rating	Total
	1	No contribution at all	2	2
	2	Marginal contribution to some technologies	46	23
	3	Greatly contributed to numerous technologies	18	6

Responses 31, Answered 31, Unanswered 0, Rating Average 2 — Marginal contribution to some technologies

Q25 To what extent do you believe government research organisations/programs have contributed to new innovation insights and knowledge for the wider R&D Defence community (low -medium technology readiness level)?

Rating



	Value	Label	Rating	Total
	1	No contribution at all	1	1
	2	Marginal contribution to some technologies	48	24
	3	Greatly contributed to numerous innovative technologies	18	6

Responses 31, Answered 31, Unanswered 0, Rating Average 2 — Marginal contribution to some technologies

Q26 Is there anything further you wish to comment on regarding Research and Development within Australian Defence?

Response
More Money Please :)
R&D within Australia is a mixed bag, some incredible wins; but Australian Defence attitude is buy from overseas which is confusing. R&D is a very useful instrument in Diplomatic negotiations. Seems to be underutilised and valued - yet historically fundamental to winning wars.
I would like to see closer alignment between warfighter needs, R&D institutions, Australian Defence Industry and CASG to increase delivery speed of new and innovative capabilities. It is moving in the right direction but not fast enough to address the needs in the current geopolitical arena we live in. ASCA for example, has significant funding now and, from my perspective, could be moving much faster to pour that into innovative solutions. Recent pitch day was a start but these should be rolling on a monthly cycle with contracts awarded to many in parallel. Create innovation hubs where Defence operators, Research institutions and Defence industry work at pace against current and immediately emerging problems. The rhetoric is good, the supporting pace and funding does not match it.
The scale of innovation investment (across the board) is not competitive with global trends and is further harmed by disjointed acquisition process and absence of an Australian Defence prime that prioritises national interest (i.e. Commonwealth of Australia (CoA) co-ownership like other developed nations).
if there is perceived political stability and large strategy for people to work to, there will be greater confidence that R&D can become a profitable venture. it's currently too risky for companies to invest in large-scale R&D as even a successful technology may not be acquired locally, and international markets are challenging to navigate. If the stability is there, the market will naturally look to fill voids and fix problems with innovative solutions, knowing they can then profit from this. We could take a capitalist and market-based approach to solving the problem.
One thing to remember is that government research organisations are often gatekeepers of innovation and on occasion can prove to be hurdles to privately led R&D as opposed to enablers. DSTG, as trusted adviser to the CoA, are essential in the technical role they play in R&D activities, however this can have a downside as they sometimes demonstrate institutionalised thinking and a lack of open-mindedness to new and progressive technologies in which they lack expertise. DSTG especially lack formal engineering expertise, and this makes the hurdle to migrate new capability to late TRL stages even higher. Instead of drawing down more on government research organisations, consideration should be given to enable private industry to have more influence and flexibility in securing R&D funding without interference in the engineering process from scientific-based organisations.
I don't believe the Australian Government are serious about building sovereign defence capability or developing sovereign R&D capability. Australia has invested billions into foreign supplied capabilities, and Australian defence industry is left with the crumbs.
Nil
IP, International Traffic in Arms Regulations (ITAR), Poor integration between various agencies coupled with a lack of strategic focus due to short-term contracting it is the greatest impact to innovation in Australia. There are plenty of smart people on both sides hampered by poor process.

Responses 31, Answered 9, Unanswered 22

A.2 Survey Questions

The following table details each of the questions used for the survey and their alignment to each of the MOEs.

Table 1 Survey Questions

#	Questions	MOE
1	What industry do you work in?	General Metrics
2	What is your job classification?	General Metrics
3	What type of entity is your organisation?	General Metrics
4	What size business/organisation do you work for?	General Metrics
5	What Technology Readiness Level(s) (TRL) does your company engage with on Acquisition Projects?	General Metrics
6	How long have you worked in the defence industry?	General Metrics
7	Does your organisation access or use existing State/Federal/Commonwealth research funding?	Economical, Effectiveness
8	Please indicate which government research organisations, institutes, and programs you are currently aware of.	General Metrics
9	Please identify which organisations/institutes your organisation currently engages with?	General Metrics
10	To what extent do you believe the Federal Australian Government focuses/invests in innovation within the Australian Department of Defence?	Effectiveness
11	To what extent do you believe the Australian Defence Industry (e.g. Primes) focus/invest in innovation?	Economical, Efficiency
12	To what extent do you agree with the following statement: "Australian Defence is ultimately an integration, assembly, and sustainment provider".	Economical,
13	To what extent do you agree with the following statement: "Australian Defence must focus on Australian-led innovation".	Effectiveness
14	To what extent do you agree with the following statement: "Australian Defence invests adequate funding into ensuring sovereignty in its products/services".	Effectiveness, Economical
15	To what extent do you agree with the following statement: "Australian Defence invests adequate funding into Australian Industry Capability".	Effectiveness, Economical
16	To what extent does your organisation invest in Defence-related research (Australian only)?	Economical
17	To what extent does your organisation collaborate on innovative products/services with other Defence organisations?	Effectiveness, Economical
18	Please identify the three primary factors that you believe the Australian Department of Defence utilises to select product/service acquisitions.	General Metrics

#	Questions	MOE
19	To what extent do you agree with the following statement: “CSIRO/DSTG should have increased collaboration with defence industry”.	General Metrics
20	To what extent do you agree with the following statement: “the Australian Defence acquisition strategy is focused primarily on cost effectiveness/value for money”.	Economical
21	To what extent do you agree with the following statement: “the Australian Defence acquisition strategy is adequately focused on speed to capability”.	Efficiency
22	To what extent do you agree with the following statement: “the Australian Defence force should leverage Australian research organisations more in support of product/service innovation”.	Effectiveness, Economical
23	To what extent do you agree with the following statement: “there is benefit to increasing CSIRO’s involvement with Defence industry innovation to support applications in parallel industries”.	Effectiveness
24	To what extent do you believe government research organisations/programs have contributed to new innovative technologies, which have transitioned into service to benefit the warfighter (<i>high technology readiness level</i>)?	Efficiency
25	To what extent do you believe government research organisations/programs have contributed to new innovation insights and knowledge for the wider R&D Defence community (<i>low -medium technology readiness level</i>)?	Efficiency
26	Is there anything further you wish to comment on regarding Research and Development within Australian Defence?	Economical, Effectiveness, Efficiency

A.3 Interview Questions

The following table details each of the questions used during each of the interviews, including their alignment to each of the MOEs.

Table 2 Interview Questions

#	Questions	MOE
1	Do you believe the Australian Government is providing enough/too much funding for innovative research with possible defence applications? Why/why not?	Economical, Effectiveness, Efficiency
2	To what extent do you and your organisation understand how the Government R&D structure operate? (yes/no)	Effectiveness, Efficiency
3	Statement: “Australian defence industry must invest in R&D to avoid becoming an integration, assembly and sustainment provider”. Do you agree with this statement? Why/why not? How do you see your organisation in relation to this question?	Economical, Efficiency
4	How effective do you feel the collaboration is between existing R&D programs / grants and organisations?	Effectiveness, Efficiency

#	Questions	MOE
	Has your organisation ever engaged with, shared data or collaborated with other R&D institutes (DSTG/CSIRO)?	
5	Do you believe the commercialisation of Intellectual Property (IP) within private companies impacts research collaboration? Why/why not? Please provide examples. is IP managed effectively within the R&D environment? National vs international benefits	Economical, Effectiveness, Efficiency
6	Do you believe the warfighter has seen the impacts of Australian innovation in the Defence market? Please provide examples Where do you believe these innovations (technologies/products) have primarily come from? (R&D Defence Industry Grants, Universities, Defence Primes)	Economical, Effectiveness, Efficiency
7	As per the above the questions, what are your thoughts in terms of what can be done better? (if you can fix one thing, what would it be?)	Economical, Effectiveness, Efficiency
8	Can you please provide any further points of contact or papers/studies/examples that would further benefit our research?	N/A
9	Feedback: How could we improve this interview process?	N/A
10	If we had any clarifying questions after this interview, would you be ok for us to reach back out?	N/A

A.4 Thematic Analysis

Table 3 Thematic Analysis and Themes

Source	Code	Category
Interview	Enduring investment in focused research	Funding
Interview	Lack of funding for research continuation	
Interview	Small/Partial funding support not beneficial	
Academic Research - Integrated Investment Program 2024 article	Government is investing additional \$5.7 billion for next 4 years and \$50.3 billion over next decade to 2034.	
Interview	Fragmented funding is not helpful	
Interview	Scalable funding will be beneficial	
Integrated Investment Program 2024 article	proportional investment by capability priority	
Interview	Focused strategic research	Innovation
Interview	Skilled resources	
Interview	Best Academic institutions working on research programs	

Source	Code	Category
Interview	Innovation as competitive advantage	
Interview	dual-use edge will support increased research	
Interview	Innovation boosting employee retention	
Interview	Recognition of positive contributions	Culture
https://www.industry.gov.au/sites/default/files/May%202018/document/extra/australia-2030-prosperity-through-innovation-summary.pdf	Enhance the national culture of innovation by launching ambitious National Missions	
Interview	Embrace Risk	
Academic Research - Publication: Australia-2030-prosperity through innovation	Innovation investment can be strengthened by fostering greater diversity	
Interview	Risk averse	
Academic Research - Publication: Australia-2030-prosperity through innovation	Collaboration among Australian governments will support innovation through flexible regulatory environment	
Academic Research - Publication: Australia-2030-prosperity through innovation	Encourage social innovation investment across Australia	
Interview	Fostering culture of collaboration over competition	
Interview	Interesting work	
Interview	Intellectual property commercialisation	Commercialisation
Australia-2030-prosperity	Innovation enriches our lives	
Interview	Increase commercialisation capability in research organisations	
https://www.education.gov.au/newsroom/articles/new-trailblazer-gamechanger-defence-industry	The Defence Trailblazer project worth \$240 million, is a collaborative initiative creating innovative solutions to bolster Australia's national security, new employment opportunities and growing the economy.	
Academic Research - Publication: Australia-2030-prosperity through innovation	Expanding and making better use of trade agreements	
Interview	Innovative mindset	
Interview	Partnering opportunity	Collaboration
Interview	Engage with each other	

Source	Code	Category
Interview	Enhance collaboration with trusted partners across industry, universities, research organisations via networking group/channels like ADSTAR; space conferences etc	
Interview	Common space for likeminded/similar organisation	
https://www.industry.gov.au/sites/default/files/May%202018/document/extra/australia-2030-prosperity-through-innovation-summary.pdf	Introduce collaboration premium on tax offset to incentivise collaboration	
Interview	Data sharing within organisations	
Interview	Secure long-term funding for national priority research infrastructure	Strategy
Interview	Identify minimal viable capability instead of gold-plated solution	
Interview	develop a more effective framework to evaluate the performance of Australia's innovation programs	
Interview	Develop methodology and metrics to link innovation to economic, social and environmental benefits	
https://www.education.gov.au/newsroom/articles/new-trailblazer-gamechanger-defence-industry	The Defence trail blazer program led by the UoA in partnership with University of New South Wales (UNSW), CSIRO and over 30 industry partners, will create approx. 100 new products, 1000 new jobs and another 1400 additional jobs across the wider defence industry.	
https://www.minister.defence.gov.au/media-releases/2024-02-29/landmark-strategy-maximise-support-defence-industry	The Sovereign Defence Industrial Priorities (SDIPs) provide detail, certainty and timelines that Australian industry needs to invest	