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Australian Academy of Science submission on the National Robotics Strategy

The Australian Academy of Science welcomes the opportunity to comment on the Department of Industry, Science and Resources' *National Robotics Strategy: discussion paper*. The Academy makes the following comments:

- The National Robotics Strategy is an opportunity for Australia to proactively steer domestic innovation and create policies that drive national development and growth.
- The increased application and uptake of robotics technology will need to be guided by a public sector (and regulatory settings) adept in interpreting and implementing science advice and responsive to rapidly evolving technologies
- An advanced human workforce is crucial. We must promote and maximise human capital, develop our skills pipeline and foster a collaborative and diverse industry.
- There is a need for Australia to develop priorities in robotics, to target uniquely Australian challenges and to develop niche capabilities in today's hypercompetitive global industry.

Australia's robotics opportunity

A holistic innovation ecosystem for robotics

The National Robotics Strategy presents an opportunity for Australia to proactively guide domestic innovation and establish policies that promote national development and growth. It is crucial to mobilize both industry and academia, fostering collaboration between them. Research in robotics disciplines will serve as the foundation for driving advancements, necessitating significant technical skills and training in the robotics workforce.

Robotics is inherently multidisciplinary, playing a vital role in advancing high-value technology production, materials processing, remote sensing, satellite technologies, renewable energy, and medicine. These advancements heavily rely on interdisciplinary and intersectoral collaboration. Therefore, the Strategy should incorporate sophisticated methodologies to assess the success of collaboration within the sector. This will enable the identification of research and business gaps, as well as the implementation of best practices in robotics research collaboration.

A National Robotics Strategy should provide solutions to Australia's most significant and unique challenges. Robotics is explicitly linked to critical infrastructure sectors, with numerous applications addressing distinct challenges in fields such as humanitarian aid, natural disasters, space industry, and climate change.

Australia has already demonstrated promise in precision agriculture, mining, transportation technologies, and environmental monitoring. By prioritizing robotics in industries of national importance and leveraging existing expertise, these capabilities can be extended and amplified, ultimately supporting decarbonization efforts.

Adapting to new technologies through science advice

Government and regulatory bodies must possess the necessary skills and expertise to effectively interpret and implement scientific advice, while also being responsive to the rapid advancements in technology. Thoughtful investment in robotics will align with the objectives of the National Science and Research Priorities and the National Reconstruction Fund. However, achieving these outcomes necessitates meticulously planned investments and active government involvement, guided by expert advice and responsiveness, to foster Australian innovation.

Scientific capability and human capital

High-quality education in the fundamental sciences forms the bedrock for fostering innovation in robotics.

It is crucial for individuals to develop familiarity with robots and their applications from a young age, while also acquiring fluency in science, engineering, and coding. To sustain a constant supply of skilled graduates, workers, and professionals, Australia must implement a comprehensive strategy that not only attracts but also retains talented individuals, thereby cultivating an advanced problem-solving capability. Central to this effort is the promotion of diversity, inclusion, and intersectionality, ensuring equity for all Australians and fostering environments where our workforce can thrive.

Manufacturing

Australia's economic and industrial resilience relies on its ability to retain the autonomy of its design, production, and manufacturing industries. Global shocks to supply chains, such as those from the pandemic and war in Ukraine, can be mitigated with a sovereign manufacturing capability.

A commitment to promoting local manufacturing will entice globally competitive companies to retain manufacturing in Australia. From a technological point of view, Australia needs to reinvigorate its investment in the following key areas:

(1) mechatronics and electronics
(2) artificial intelligence and machine learning
(3) edge computing
(4) private networks and broadband communications exploiting new frequency bands
(5) autonomy, social acceptance, standards, and legal frameworks.

Australia can facilitate a strong innovation ecosystem for robotics in the Pacific region, promoting collaboration, development and prosperity. This will be instrumental in cementing the nation as a global competitor in robotics and developing a leading manufacturing capability.

Recommended changes to definitions

The Academy makes the following recommendations regarding the definitions used in the Strategy.

1. Robots

Robots of the future will fundamentally rely on communications capability, which should be reflected in the definition. We recommend the following change: *Robots are machines with a degree of autonomy that can move within their physical environment and manipulate objects. Robots have 5 essential characteristics: sensing, communication, movement, energy and intelligence.*

2. Drones

The definition of drones as an ‘uncrewed aircraft system’ is unnecessarily narrow. Other types of unmanned or uncrewed machines, including vehicles, platforms, crafts, aircrafts, ships, and submarines, will all be required in the future. The strategy should offer a broader definition of this type of autonomous platform.

3. Autonomous systems

We recommend including a definition of 'autonomous systems’ for systems, platforms or networks that have elements of robots without the ‘movement’. These systems will be required in the future.

To discuss or clarify any aspect of this submission, please contact Dr Stuart Barrow, Policy and Research Manager, at Stuart.Barrow@science.org.au.