

The Australian Manufacturing Industry

Economics References Committee Inquiry

SUBMISSION - SEPTEMBER 2021



Overview

The Australian Manufacturing Industry

The Australian Industry Group (Ai Group) welcomes the opportunity to make a submission regarding the Australian manufacturing industry.

Ai Group is a peak national employer organisation representing traditional, innovative and emerging industry sectors. We have been acting on behalf of businesses across Australia for nearly 150 years. Together with partner organisations we represent the interests of more than 60,000 businesses employing more than 1 million staff. Our members are small and large businesses in sectors including manufacturing, construction, engineering, transport & logistics, labour hire, mining services, the defence industry, civil airlines and ICT.

Below is a summary of key themes and recommendations as they relate to the terms of reference, followed by more detailed responses at the base of the submission.

State of Play and Opportunities

The Australian manufacturing industry has experienced some important rebalancing in terms of its sectors, products, technologies, and supply chains in response to long-term and global structural shifts over the last 20 years or more. Rapidly advancing technologies are now producing waves of wider innovation across the economy as businesses and individuals build new social practices and business models upon them.

Current areas of strength in the Australian manufacturing landscape are food and beverages (& tobacco), machinery & equipment, metal products and chemicals. Australia enjoys several areas of comparative advantage, such as our 'clean green' image and trustworthy regulatory settings, which are leveraged by many successful manufacturers. However, manufacturers continue to struggle with the waste crisis, delivery delays and rising costs, including for various metals, raw material, and imported components. Rising freight costs are also a reoccurring theme which negatively impact importers and exporters.

We recommend:

- Australia should focus on its strengths and take a pragmatic approach to those areas of manufacturing in which it cannot compete with international peers.

- Australia is demonstrating strength in the manufacturing of food and beverage (& tobacco), machinery/equipment, metal products and chemicals. These areas therefore represent an obvious opportunity to invest in and expand further.
- Government could support manufacturers to leverage areas of comparative advantage further, such as our clean, green, and highly regulated image. Similarly, Australia has outstanding research capability, providing scope for growth in high-value knowledge intensive industries, like medical products and devices.
- Australia should consider connected targets and goals when making decisions about the direction of investment in manufacturing. For example, Australia's ambitious waste reduction and recycling targets, circular economy vision, as well as climate commitments and impacts.
- Australian manufacturers should be supported to become more globally competitive by taking fuller advantage of Industry 4.0 and digitalisation.

Research and Development (R&D)

Australia is recognised globally for its high-quality research and despite only having 0.3% of the world's population, we've contributed to over 4% of world research publications¹. However, Ai Group have heard that R&D is too costly and there is not enough support for local participation, with the current R&D tax incentive failing to encourage more research commitment. Similarly, businesses have indicated there are challenges to collaborating with universities given cultural differences. These differences include overvalue of IP by universities and the difference in pace between a faster moving private sector and a traditionally slower moving research process.

We recommend:

- Government schemes and tax arrangements could better incentivise or support improved manufacturing industry-university collaboration through a focus on mutual benefit between businesses and universities.
- R&D funding should recognise the external benefits that can flow from business R&D through contribution to knowledge that can be used by others. Public backing for business R&D activity to stimulate innovation that factors in flow on community benefit would be valuable.
- Additional Government support for R&D, beyond the R&D TI, should align with selected areas of national priority (such as the Modern Manufacturing Strategy and resilient supply chains).
- Australia should consider its research and industry strengths and invest in them, while de-prioritising areas that are likely to be more successful offshore.
- Government should invest in uplifting the capability of the accounting industry in providing guidance to SMEs in utilising R&D support schemes.

¹ ['Partnering with Australia on Innovation, Science and Research,'](#) Department of Industry, Science, Energy and Resources (2020) p.9

Attracting Investment

Australia's current foreign investment regime has been successful, demonstrating relative transparency, predictability, and fairness in addressing ownership and sovereignty issues that are concerns in every country but rarely so well handled. As such, we have been the world's tenth biggest destination for foreign direct investment in recent years.

Private sector investment in manufacturing is fundamental to its future growth, to improvements in productivity, and therefore also to the incomes of its employees, the returns of business owners and the international competitiveness of the sector. This investment requires access to capital, profitable investment opportunities, and business owners and managers willing and able to take a risk, to deploy capital by combining it with their workforce and supply chains, and to deliver outcomes in a competitive environment.

We recommend:

- Government policy has a role to play in helping businesses to access capital. This could include promoting success stories that highlight and celebrate manufacturing achievement and the role of finance providers in that success, as well as the design of policy measures that leverage private sector capital, without crowding it out.
- Government should recognise the importance of our regulatory and tax regimes for securing a strong share of global investment approvals. Governments at all levels should deliver continuous improvements in these areas and seek to reduce company tax rates where possible.
- Government policy should seek to lift the ambitions and capabilities of Australian manufacturers, particularly smaller and medium-sized businesses. This could be through expansion of programs such as the Entrepreneurs Program, tailoring policy to extend the capabilities of manufacturers that have exhibited strong signs of success and promoting case study materials that show the paths to success taken by other manufacturers.

Supply Chain Support

The COVID-19 pandemic has exposed weaknesses in the operations of global and domestic supply chains, including the extended interruption of global supply, the weakness of relying on human-centric systems to deliver on time, and the need to ensure suppliers of essential products and components remain active and engaged in difficult times, and are not lost entirely to new markets. A robust domestic manufacturing sector Australia requires supply chain infrastructure that enables and facilitates Australian businesses to overcome logistics issues, move from human to digital systems and provide integrated systems that are efficient and robust in changing environments.

Australia is a long way from overseas supplier markets. To strengthen the resilience of manufacturing supply chains and to reduce Cost of Goods Sold (COGS), the industry should seek supplies from local sources, specifically by utilising and employing circular economy principles.

We recommend:

- Government support to shore up our industrial supply chains and their ability to service Australia. The Government must consider how it encourages the development of supply chain skills and investment into supply chain technology and operations.

- The creation of a regulatory regime that maintains our high product and service standards while reducing compliance costs for businesses.
- Drive the adoption of an end-to-end integrated supply chain management system that provides industry-wide and business-level efficiencies. This might include Blockchain, integrated ERP, and a standardised global Supply Chain Management platform that engages with similar systems overseas.
- Adopt a harmonised approach that encourages efficient nation-wide freight movement and supplier engagement to address known freight inefficiencies in Australia.
- While many issues associated with shipping are global and undoubtedly outside of Australia's control, Government should remain ambitious when it comes to resolving local issues that are within our control.
- Invest in world class supply chain skills through the creation of a national qualification for Supply Chain Management (SCM), focusing on data, analytics, and integrated end to end supply chain management.
- Support the move from linear to circular supply chains through assisting business to invest in better product stewardship practices and unlock the potential of waste as a resource.

Government Procurement

Governments have significant market power and could better manage the opportunities and challenges associated with such a role. Governments can create positive market impacts in line with broader goals such as stimulation of domestic manufacturing capability, creation of good quality employment opportunities, management of the waste crisis, circular economy transition, and environmental sustainability more broadly. Barriers to access such as specifications and complexity, emphasis on upfront costs and a lack of harmonisation need to be addressed, to better support domestic manufacturers to participate, grow and gain access to more local and global opportunities.

We recommend:

- Procurement processes across Australia should be aligned to the greatest extent possible, transparent, and subject to ongoing improvement to reduce the costs of tendering and access for domestic suppliers, particularly SMEs.
- Government should consider exploring a 'principles-based' approach to some elements of procurement to better facilitate innovation and manage competing interests (local content, recycled content etc.).
- Procurement projects should be designed to enable businesses to leverage the relationships they build, or the products/processes they develop, to find more opportunities in local and global supply chains.
- Governments should be flexible on the definition of local content, and 'local' should apply to Australia broadly, not single states.

Trade Policy

Global Value Chains (GVCs) are at the heart of modern trade, with 75% of trade consisting of intermediate goods and services. As a significant exporter of mineral products, Australia's role in GVCs can look high, however the GVC export participation rate among Australian manufacturers is among the lowest in the OECD. What is missing in the Australian trade narrative is the important role that imports and outbound investment can have on improving competitiveness and gaining control of GVCs. While successive Government policies have reduced Australia's tariffs, improving access to the Australian market for imports, we do very little to support Australian companies who wish to invest offshore to take ownership of their supply chains. Time and distance are contributing factors to GVC participation that do not work in Australia's favour and Australian companies must expand their footprint closer to their customers and suppliers. Support for companies setting up offshore manufacturing or distribution facilities is limited as most trade services are focused on transactional exports.

Of the 56,772 Australian businesses directly exporting goods from their Australian base in 2018-19, 50% had fewer than 3 export transactions, 40% had between 3 and 50 export transactions and only 10% had more than 50 export transactions in the year². This illustrates the concentrated nature of Australia's goods exports activity and the challenges faced by Australian manufacturers.

We recommend:

- Government should support international competitiveness. This support should go beyond a narrow view on export opportunities to creating a domestic and global environment that supports business.
- Prioritise multilateral Free Trade Agreements that have modern rules of origin that support GVCs and proactively advocate for global digital trade rules that position Australian companies to be globally competitive.
- Provide more support to companies who undertake international expansion, including advice on local regulations, introductions to local officials and political risk insights.
- Build the capabilities of Australian businesses and exporters to adjust to post-pandemic exporting.
- Implement a development agenda that improves the governance and administration capabilities of economies in our region, which in turn improves the security of our region.

Skills and Training

Australia's skills landscape is facing much change and in need of urgent attention. Skills underpin all work and manufacturers need the right skills for recovery now, and to fuel innovation and increased capacity into the future. With skills depreciating faster than in the past and new technologies generating gaps in workers' skills, the Government, along with organisations and education and training systems, need to adapt to the rapid and continual technological development to remain fit for purpose. Without continued change in the skills landscape our manufacturing sector will be hampered in both its strength and growth.

² ABS, Characteristics of Exporters, 2018-19

We recommend:

- The Government should take more intensified action, building on progress already made in reform areas and take a leadership role in establishing, or increasing, action in the following areas:
 1. New templates for partnerships across the skills eco-system
 2. Broad digital skills development integrating human capabilities
 3. A re-imagined apprenticeship system
 4. Work-based learning as a core principle in qualifications and
 5. Flexible qualifications allowing short-form training with skill-needs focussed training incentives

The opportunity for reliable, cheap, renewable energy to keep Australia's manufactured exports competitive in a carbon-constrained global economy and the role that our manufacturing industry can play in delivering the reliable, cheap, renewable energy that is needed.

Australian industry had for many years an advantage in access to low-priced coal and gas and cheap electricity, largely generated by burning inexpensive coal. However, it was not universally beneficial or unproblematic. Low energy prices for some manufacturers were partially the result of cross-subsidies: preferential prices or dedicated infrastructure paid for disproportionately by other users or taxpayers. Low energy prices were also partially the result of shifting the unrecognised costs of greenhouse gas emissions onto future generations. Additionally, while energy costs are life-or-death for some manufacturers, most are not energy-intensive; the cost and productivity of labour and other inputs are much more important to their competitiveness, though reliable energy supply is essential for business continuity.

Ai Group is confident that a new Australian energy advantage can be constructed, with opportunities in producing clean energy; supplying materials and equipment to the global clean energy sector; making clean energy-intensive products; and construction and infrastructure to support it all. The falling costs of renewable energy technologies, driven by dramatically increasing rollout worldwide, have made them the cheapest source of new electricity supply in most places and Australia is a promising place to develop renewable energy. However, there are challenges, the most obvious being that while renewable electricity is a cheap source of bulk electricity, it is also variable. We must also remember that our advantages are not unique and other economies have strong clean energy potential too. In short, a world increasingly pursuing net zero emissions will not necessarily hand energy advantage to Australia on a plate. We will need to work for it.

We recommend:

- Australia should adopt a clear national vision of net zero emissions by 2050 and organise energy policy around the pursuit of long-term competitive advantage in a net zero emissions world.
- We should take steps to reduce natural gas demand and only facilitate new gas supply options that make long-term sense and can be developed with community safety and consent.

- On electricity, we should continue to develop and implement significant reforms to demand side participation, generation and transmission coordination, and resource adequacy.
- Australia should enhance its power networks, accelerate the development of new infrastructure, and reduce the risks to energy users.
- Australia should manage its coal closures effectively, with adequate notice, alternative investment and fair treatment of affected workers, communities, and supply chains.
- We should aim for globally competitive costs for energy infrastructure delivery. Australia's success in reducing finance costs, delivering timely and stable regulatory decisions, and increasing construction sector productivity will play a significant role in determining our energy competitiveness.
- The Low Emissions Technology Statement process should continue to be iterated and coupled with clearer guidance from an overarching Long Term Strategy on climate change.
- Ai Group made range of recommendations on Carbon Border Adjustment Mechanisms (CBAMs) in our recent report, *Swings and Roundabouts*, including the negotiation of an Australia-EU agreement to recognise data from Australia's National Greenhouse and Energy Reporting System for EU CBAM compliance purposes to avoid to disadvantageous default emissions intensity assumptions.

Detailed Response

Manufacturing in Australia – State of Play, Opportunities

Over the past 20 years and more, manufacturing has experienced some important rebalancing in terms of its sectors, products, technologies, and supply chains in response to long-term and global structural shifts, most recently, the COVID-19 pandemic.

Outside of, and well before the COVID-19 pandemic, Australian manufacturing was evolving into more advanced modes, requiring very different mindsets, business models, skills and capabilities. These innovative approaches built on digital technologies are often referred to as Industry 4.0 or Smart Manufacturing.

Rapidly advancing technologies are producing waves of wider innovation across the economy as businesses and individuals build new social practices and business models upon them. Manufacturers are grappling with these changes in different ways and with different levels of readiness and capability.

COVID-19 has highlighted how interconnected many businesses are, and digital technology has served as an enabler for many businesses to remain open and sustainable. Though challenging, this unstable environment presents an opportunity for industry to emerge more globally competitive by taking fuller advantage of Industry 4.0 and digitalisation and promoting a technology led recovery to the COVID-19 pandemic.

Recovery from the current COVID-19 crisis is critically important for Australia. Widespread lockdowns in 2020 created additional strain for the country, in addition to the existing impacts of the bushfire crisis and extended, severe drought. The effects on manufacturing have been somewhat mixed, though we have enjoyed a boost in production for household and medical necessities (soap, hand sanitiser, masks, ventilators, food and beverage, groceries, toiletries etc.) which even saw some re-shoring of manufacturing activity. However, in 2021 many manufacturers are still struggling with lengthy lockdowns, restrictions and supply chain difficulties associated with global and domestic conditions related to the management of the pandemic. This is before monetising the health impacts in staff and the wider community, which represents a less visible and more personal cost.

In July 2021, the [Australian Industry Group Australian Performance of Manufacturing Index](#) (Australian PMI®) stayed in strong expansionary territory at 60.8 points in July but eased by 2.4 points from the record high in June (seasonally adjusted). This indicated strong (but decelerating) growth for manufacturing activity in June, despite widespread lockdowns. This was the tenth consecutive month of recovery for the Australian PMI® following the severe disruptions of COVID-19 in 2020. Results above 50 points indicate expansion, with higher results indicating a faster rate of expansion.

The food and beverages (& tobacco) sector produced \$27.4bn in real value-added output in the year to Q1 2021 (25% of manufacturing real value-added output). It employed 235,000 people in May 2021 (27% of manufacturing employment, ABS data) and remains Australia's largest manufacturing sector. Though supermarket sales were up due to lockdowns across different parts of the country, lockdowns hurt food and beverage manufacturers selling to other retailers such as the restaurant industry and into overseas markets.

Meanwhile, the machinery & equipment, metal products and chemicals manufacturing sectors all reached record highs in July 2021 (trend). A new high was also recorded for the input price index in July. Respondents attributed surging activity and prices to strong demand for manufactured products that supply the construction, mining, agricultural and transport sectors. However high prices for various metals, raw materials and imported components continue to create difficulties for many manufacturers. While some respondents reported higher demand for Australian made products due to the difficulty in sourcing materials from overseas, some reported they had shifted production back to their overseas facilities due to inability to source suitable skilled labour and/or inputs in Australia.

The situation declined in August 2021, with the Australian PMI® dropping by 9.2 points to 51.6 points, indicating extremely weak expansion across manufacturing and effectively pausing a solid period of recovery throughout 2021 (seasonally adjusted). Although remaining very mildly positive, this was the weakest monthly result for the Australian PMI® since September 2020. Results above 50 points indicate expansion, with higher results indicating a faster rate of expansion.

Indexes for most manufacturing sectors fell sharply in August, with machinery and equipment stalling and metal products and building products both falling into contraction. The very large food and beverage sector continued to report expansion in August, as did the related chemicals sector (which includes cleaning and sanitation products). These weak results are attributable to the disruptions caused by widespread lockdowns.

In July and August 2021 supply chain disruptions were widespread for manufacturers, with respondents reporting delivery delays and price rises for various metals, raw material and imported components. Rising freight costs are also a reoccurring theme which negatively impact importers and exporters.

Opportunities

While all support for the manufacturing industry should be considered on the merits of the sector or projects concerned, it is clear Australia is demonstrating strength in the manufacturing of food and beverage (& tobacco), machinery/equipment, metal products and chemicals. These areas may therefore represent an obvious opportunity to invest in and expand further.

Australia does enjoy areas of comparative advantage, such as our clean, green, and highly regulated image that helps to increase the attractiveness of our locally produced food, beverages, and skincare items. These advantages could be leveraged further.

Beyond areas of current strength, it would also be prudent for government to consider wider targets and goals when making decisions about the direction of investment in manufacturing. For example, Australia has ambitious waste reduction and recycling targets, which would be supported by further development of manufacturing capability to support the circular economy. Australia also has climate impacts to consider, such as commitments to emissions reduction and a need to avoid projects unsuited to our environment where possible, for example, those that would require high water use in dry areas.

As discussed in more detail below, Australia is recognised globally for high quality research, and therefore a focus on knowledge intensive industries would be broadly useful.

Research and Development (R&D)

Australia is recognised globally for its high-quality research and despite only having 0.3% of the world's population, we've contributed to over 4% of world research publications³.

In terms of supporting Australian research and development as it relates to local manufacturing, using funding and other incentives to align better align research to selected areas of national priority (such as the Modern Manufacturing Strategy and resilient supply chains) would be valuable. Funding for research and development activity should consider factors such as comparative advantage, commercialisation opportunity and business need, while taking a pragmatic approach to areas of research and technology that Australia can't compete in. Simply, we should consider our strengths and invest in them, while de-prioritising areas that are likely to be more successful offshore.

Incentives to Invest in R&D

Although it is only one element of innovation, Ai Group is a strong supporter of business R&D activity as a key driver of improvements in productivity and, through that, of higher incomes and commensurate benefits across the broader community.

We also recognise the external benefits that can flow from business R&D by its contribution to knowledge that can be used by others without payment. These "positive externalities" or "spill overs" are benefits to others and are not captured by the individual business undertaking the R&D. Because of this, an individual business left to its own devices would finance less R&D than is socially optimal because it does not get rewarded for the full benefits flowing from the R&D activity. Accordingly, Ai Group supports public backing for business R&D activity as a means of lifting the total amount of business R&D to more closely approximate its optimum level.

Feedback from industry indicates that SMEs in particular are reticent to invest or participate in research and development activity without clear demand signals from customers. As such, supply side programs are probably not going to be as effective as actually creating demand signals for business. These signals can come from the market itself, or from the government highlighting clear manufacturing priorities with long term funding opportunities associated.

One incentive for participation could be a tiered system for the R&D Tax Incentive (R&D TI). Ai Group are aware of businesses who are engaging in R&D, but report that current tax arrangements are not the driver of this activity, and do not encourage more research commitment. Other members have reported that it is simply too costly and there is not enough support to participate in R&D locally, which represents a missed opportunity. Adding to this costliness is the worrying perception that applying for the R&D TI is a risky process and requires substantial investment in third party accountants to manage. This puts businesses, particularly SMEs, at risk of being taken advantage of, or dissuaded from applying.

Government schemes could better incentivise or support improved manufacturing industry-university collaboration through a focus on mutual benefit between businesses and universities. However, any such scheme would also need to consider cultural issues, such as overvalue of IP

³ 'Partnering with Australia on Innovation, Science and Research,' Department of Industry, Science, Energy and Resources (2020) p.9

by universities and the difference in pace between a faster moving private sector and a traditionally slower moving research process.

Manufacturing Business-Research Collaboration

Lifting the frequency and quality of collaborative innovation between Australian businesses and researchers is essential to improve competitiveness and open new commercial opportunities. To build on recent progress in this area, several steps could be taken:

- Continue and expand the Innovation Connections element of the Entrepreneurs' Programme;
- Consider wider access beyond the Entrepreneurs' Programme to incentives for employment of recent STEM graduates in innovation roles;
- Promote case studies and best practices for collaboration to both business and researchers, including the benefits of cross-organisational teams and deeper 'stage zero' collaboration that starts from joint problem analysis rather than contracting out solution delivery; and
- Assess the success of recent efforts to link public sector research funding to industry collaboration and real-world impact and refine the formulae and metrics if warranted in consultation with industry and the research community.

Industry-Researcher Engagement

Innovation can be distinguished from business or organisational improvement in general by the greater novelty of changes and the greater likelihood that they extend the frontiers of efficiency and economic activity rather than move organisations towards existing frontiers.

Whether or not innovation involves the introduction of wholly novel changes to business models, processes, products, services or distribution, it inevitably builds on and extends existing practice and is most likely to be generated by new or established innovation-ready organisations and entrepreneurs with a keen awareness of leading practice.

Centres of Excellence and Industry Networks

Organisations and networks that keep abreast of leading business practices, technologies and other developments in relevant fields can play central roles in improving innovation readiness and lifting awareness of new opportunities for Australian businesses. Critically, they can help keep stock of existing domestic capabilities and gaps in those capabilities and would assist in developing strategies to build resilience and preparedness to address disruptions like those highlighted during the early months of the COVID-19 pandemic.

The Growth Centres, various CRCs, Centres of Excellence, some specialist industry associations and research organisations such as CSIRO already perform these roles to different degrees. Greater focus on opening, extending and linking existing networks would disperse benefits more broadly with commensurate improvements in economy-wide payoffs. Current coverage is far from exhaustive and there are strong opportunities to create new networks and Centres of Excellence. Gains from these initiatives can be extended if their successes are celebrated and publicised. More extensive use of accessible case study material has the potential to lift awareness of specific opportunities. More generally, they can promote interest in collaborative approaches to innovation and help break down the cultural and information barriers to greater business-research collaboration.

There is scope also to build the capabilities of Centres of Excellence and their associated networks by ongoing critical examination and dissemination of leading practices, successes and failures.

Finally, we note that there is significant opportunity for Australian research and development in the defence area, however work will need to be done on matters such as security clearances and ensuring that those taking part in projects are not being groomed by foreign governments to unlock this potential.

Attracting Investment

Australia's current foreign investment regime has been successful, demonstrating relative transparency, predictability, and fairness in addressing ownership and sovereignty issues that are concerns in every country but rarely so well handled. Australia has been the world's tenth biggest destination for foreign direct investment in recent years.

Access to foreign capital and expertise is of great value in expanding the quantity and quality of infrastructure, goods and services that Australians can enjoy. Trade liberalization has made a significant contribution to the strength of the Australian economy and contributed to our attractiveness as an investment destination. The commitment to remaining an open economy and advocate for globalisation has meant that Australia's GDP is 8.1% higher and real exports 34% higher than they would have been if we had remained a closed economy with barriers to imports, investment and migration. According to DFAT, one in five Australian jobs are trade-related, and according to the Foreign Investment Review Board, foreign direct investment supports one in ten jobs and 40% of exports.

Private sector investment in manufacturing is fundamental to its future growth, to improvements in productivity, and therefore also to the incomes of its employees, the returns of business owners and the international competitiveness of the sector. This investment requires access to capital, profitable investment opportunities, and business owners and managers willing and able to take a risk, to deploy capital by combining it with their workforce and supply chains, and to deliver outcomes in a competitive environment.

Access to capital

Australia is awash with financial capital. Our major banks are profitable and well capitalised; we have within our borders a disproportionate share of the world's best pension funds; our stock markets are receptive to small businesses; and we have made some progress in developing the eco-systems around early-stage investment.

There are nevertheless reports of difficulties for smaller business in accessing funds beyond what can be secured by physical assets and there are also reports of banks attaching relatively high risk ratings when assessing loans to manufacturers.

To some extent these barriers are a chicken and egg problem with success in obtaining a loan reliant on the investment that requires a loan. On the positive side, the more success in manufacturing can be demonstrated, the more readily these barriers will come down.

Government policy has a role to play in addressing these barriers:

- Promoting success stories that highlight and celebrate manufacturing achievement and the role of finance providers would seem a no-brainer (although one that can be readily undermined if used for political gain).

- There are also measures that can assist more directly in the availability of capital. It is critical that policy measures are designed to leverage private sector capital and do not crowd it out. A key vulnerability in this regard is the risk of stifling rather than stimulating the further development of the early-stage capital eco-systems.

Incentives to invest

Whether they are locally owned or foreign owned, the range of investment opportunities available to many manufacturers extends well beyond Australia's borders.

The chief policy areas relevant to securing for Australia a strong share of global investment approvals are the efficiency of our regulatory regimes and our tax systems:

- Australia's local, state, and federal governments should deliver results in the continuous improvement of regulatory regimes and regulator practice.
- While all taxes are relevant in international comparisons, Australia's relatively high recourse to income taxation and taxes on profits stands out as the key tax policy priority (we are among the very highest in the OECD in terms of income and profits to GDP). The design of Australia's company tax system (dividend imputation) means that the main way to impact favourably on both local and foreign owned companies is by lowering the company tax rate. This was a key recommendation of the Henry Tax Review.

Delivering Outcomes

Capital and opportunity are necessary but not sufficient for successful investment. Successful delivery is also critical. There are key roles for policy in this and these have been mentioned elsewhere.

There is a still underdeveloped role for policy in lifting the ambitions and capabilities of Australian manufacturers, particularly smaller and medium-sized businesses:

- The Entrepreneurs Program and its predecessors provide countless examples of a successful and adaptive policy measure that has materially improved the management of the businesses that have benefited from its services. There is considerable scope for expansion and rejuvenation of this, and similar programs.
- A complementary emphasis on advisory policies tailored to extend the capabilities of manufacturers that have exhibited strong signs of success is one that Australia should explore. In New Zealand, for example, businesses that can demonstrate success in exporting can be eligible for government supported business mentoring and advice services aimed at accelerating them on their growth path.
- Another area for policy relevant to this area is through the promotion case study material that drills down into paths to success taken by other manufacturers.

Supply Chain Support

The COVID-19 pandemic has exposed weaknesses in the operations of global and domestic supply chains, including the extended interruption of global supply, the weaknesses associated with relying on human-centric systems to deliver on time, and the need to ensure suppliers of essential products and components remain engaged and active in difficult times, and are not forced to move out of markets entirely to survive.

To build a robust domestic manufacturing sector Australia will need to build supply chain infrastructure that enables and facilitates Australian businesses to overcome logistics issues,

move from human to digital systems and provide integrated systems that are efficient and robust in changing environments. There are opportunities to shift from slow and complex manual management of supply chains to a more agile approach and improve whole of supply chain transparency to identify weak links and gaps through increased monitoring of global suppliers.⁴ Government should drive the adoption of an end-to-end integrated supply chain management system that provides industry-wide and business-level efficiencies. This might include Blockchain, integrated ERP, and a standardised global Supply Chain Management platform that engages with similar systems overseas.

As supply chains become more complex and integrated, Australia will need to consider its skill capabilities. Government may consider supporting the creation of a national qualification of Supply Chain Management (SCM), focusing on data, analytics, and integrated end to end supply chain management. World class skills in this area would help Australia compete in increasingly competitive global markets.

Australia is a long way from overseas supplier markets. To strengthen the resilience of manufacturing supply chains and to reduce Cost of Goods Sold (COGS), we should aim to seek supplies from local sources, specifically by utilising and employing circular economy principles (including wider use of waste as a resource). This focus on local sources, however, should be complimented by a global outlook that embraces international standards and best practice, an important success factor in enabling a shift to a more agile system. Technology is pivotal in this shift.

Although many of our strong regulatory settings are a competitive advantage for Australia (strict environmental, safety and production standards creating a clean green image on which to market our products), it can still create unnecessary burdens and barriers to entry or participation for some manufacturers. To support these businesses, we should create a regulatory environment that maintains our high standards, while reducing the cost of compliance to businesses. A compliance platform using machine learning and digitalisation to reduce cost and improve compliance performance would assist in this.

Ports and Shipping Issues

Australia has significant issues associated with port operations and shipping, which could undermine the resilience and competitiveness of our supply chains going forward, should we fail to address them.

As an island nation, 98% of Australia's goods trade goes through our ports and most Australian jobs rely on ports in some way through import/export trade⁵. In 2012, Shipping Australia reported that Australia was 'losing ground' in terms of productivity and competitiveness in almost all areas of shipping⁶. They argued that key pinch points included sea/land interface (connections to/from ports, lack of harmonisation between states and territories, planning and space issues), lack of skilled labour and increasing port costs exacerbated by inadequate infrastructure⁷. Eight years on, similar concerns are still being raised and the issues appear exacerbated by instances of

⁴ "Coronavirus and the antifragile supply chain" (March 2020), Link: <https://www.supplychaindigital.com/supply-chain/coronavirus-and-antifragile-supply-chain>.

⁵ Value of Ports, Ports Australia

⁶ Shipping Australia's view on increasing productivity/competitiveness of the Australian maritime industry, Ken Fitzpatrick Chairman (August 2012)

⁷ Ibid

industrial action, like the acute pain felt in Sydney through 2020. Similarly, the COVID-19 pandemic has created even more chaos, demonstrating a need to plan for disasters or unexpected global disruptions in all areas of the economy, including in our ports.

As nearly all our goods trade is through ports, these issues need close government attention and action where appropriate, to ensure Australia, and our supply chains, are competitive, productive and resilient into the future.

While many issues associated with shipping are global and undoubtedly outside of Australia's control, Government should remain ambitious when it comes to resolving local issues within our control to help to ease some of the pain felt by Australian businesses. Steps could include:

- Adopting a harmonised approach that encourages nation-wide freight movement and supplier engagement, unlocks blockages to freight movements (including off the ports) through local government and across state borders and addresses the fundamental freight inefficiencies evident in Australia.
- Ensure that workplace laws and associated arrangements facilitate the achievement and preservation of flexible, efficient and productive workplace practices.
- Review of competition issues, including those raised by the ACCC⁸, to ensure that regulatory regimes are effective in constraining the exercise of market power particularly in the case of "natural monopolies" such as ports.

Government Procurement

Governments have significant market power, and their procurement practices have the ability to shape markets for the better. Therefore, it is crucial governments acknowledge this power and use it to create positive market impacts in line with broader goals such as stimulation of domestic manufacturing capability, creation of good quality employment opportunities, management of the waste crisis, circular economy transition, and environmental sustainability more broadly.

Common Concerns with Government Procurement Processes

- **Transparency:** businesses report tendering information can be hard to access at times, and tenders are often announced suddenly, with little information provided to those who intend to bid. Although industry appreciate that some flexibilities are required and at times, time sensitive projects are unavoidable, the lack of information and short deadlines can create barriers to local manufacturers winning work.
- **Specifications and Complexity:** businesses report tender specifications can be difficult to understand, which may be more of a barrier to SMEs who are generally less resourced to navigate these complexities. Additionally, some specifications are unreasonable. For example, certain kinds of insurance may be excessive, financially strenuous, and take longer to negotiate than the tender deadlines offered. Requirements around environmental management and Industrial Relations can also create confusion. Many SMEs could do with further support from government to better navigate these complexities.

⁸ 'Port privatisation forces price inflation on Australian importers and exports,' Australian Financial Review (June 2017)

- Emphasis on upfront costs: public sector procurement processes often place undue influence on up-front costs rather than whole of life costs. This emphasis results in the purchase of lower quality goods and services, neglecting maintenance and through-life support costs, which are key advantages local suppliers can offer. Additionally, it is not in line with our broader circular economy goals.
- Local producers are required to manufacture to stringent Australian and International standards, with non-conformity or false claims of conformity much more rigorously enforced than is the case with many imported alternatives. This represents a fairness issue that should be considered.

Harmonisation

Over time there have been attempts to improve procurement practices made by numerous governments with various industries, and although incremental improvements have been made, harmonised reform has not been achieved across the country. Lack of harmonisation creates barriers to economies of scale and generates complexities that can act as a barrier to participation for some businesses.

Government should make a concerted effort to better align procurement practices to policy values and encourage harmonisation across the country. While this reform would need broad consultation, collaboration, and big picture thinking, it would be worthwhile.

There are threats and weaknesses to many of Australia's supply chains, which have been laid bare during the COVID-19 pandemic. Acting as an isolated island nation, fragmented again by lack of harmonisation between states and territories, represents a significant constraint to our growth, domestically and in terms of our international competitiveness.

These issues should not be viewed as separate to procurement, given strong domestic conditions that promote growth and strength at home contribute to the kind of stable environment in which businesses can innovate and grow beyond the constraints of our shoreline. To that end, procurement projects should be designed so as to enable businesses to leverage the relationships they build, or the products/processes they develop, to find more opportunities in global supply chains. This creates valuable opportunities for manufacturers (especially SMEs).

Local Content

Governments should be flexible on the definition of local content. For example, local content could be the local assembly of inputs made overseas when that is the most sensible option that delivers value for money for the government. Local should also refer to businesses operating in Australia broadly, not limited to a single state. Furthermore, there should be flexibility to account for competing policy values connected to the procurement process. For example, where local content requirements limit options to meet requirements for 'clean' content or recycled inputs, or requirements for 'clean' or recycled content leads to having to import recycled inputs from overseas due to domestic shortages.

Procurement Skills

Procurement is complicated, and governments must take responsibility for raising the core skills and competences of public sector personnel responsible for it. Improvements in the skills of public procurers accompanied by more time and resources directed at the outset of a project on factors such as the desired functional and performance outcomes and/or specific technical specifications can play a key role in reducing infrastructure costs, while creating opportunities for manufacturers/suppliers. Experienced public sector procurement personnel are also valuable

when considering possible conflicts between principles, for example, where a desire for local content may limit options for 'clean' content or recycled inputs, and this tension must be managed by an expert with sufficient skill to manage the conflict in the broad public interest, while applying fiscal discipline and unlocking the best value for the taxpayer.

Innovation

Government should consider exploring a 'principles-based' approach to some elements of procurement to better facilitate innovation and the pace at which technology moves by creating a set of principles for procurement that specify intended outcomes, rather than prescriptive rules that may date quickly.

Government opportunities that have significant flexibility and are not too specific in their requirements have the potential to provide businesses of all sizes with the opportunity to offer innovative products or processes. This opens the door to new, innovative or R&D opportunities to develop new products for government customers through local R&D collaborations.

That said, Ai Group acknowledge that some elements of procurement will always require a strong set of rules, particularly where there are significant community safety considerations in play. Where specifications or standards are required, a preference for Australian standards or agreed international standards if available would be preferable as a uniform approach.

Trade Policy

Australia has a rich tradition of innovation in manufacturing, often characterised by a special ability to identify a problem and the desire to deliver an effective solution. Proving our innovative, manufacturing aptitude on the international stage started early, even before Andrew Brown McKenzie was granted the first Australian patent for the Westinghouse Air Brake for trains in 1904.

Over the past two decades, export earnings from labour intensive and low-skill exports have been relatively flat (see trade figure 1). This likely reflects intense global competition for these types of products and the progressive relocation of production to emerging and developing economies with lower labour costs. High labour costs in Australia result in a comparative disadvantage in producing these types of homogenous, labour-intensive goods. Medium-skill and technology-intensive exports rose from 1998 to 2008 but have fallen since 2008. The sharp decline in early 2009 reflects declining exports of passenger cars, which are included by UNCTAD in this category.

In contrast, export earnings from high-skill and technology-intensive manufactured goods have more than doubled over the past two decades.

Between 2008 and 2015 high-skill and technology-intensive export earnings were relatively flat, probably reflecting the high Australian dollar during the mining investment boom. Since 2015 however, exports earnings from these goods have risen sharply, increasing by 7.3% in 2018 alone. Australia's high-skill and technology-intensive exports in 2018 included medicaments, medicinal & pharmaceutical products, aircraft parts and aircraft equipment.

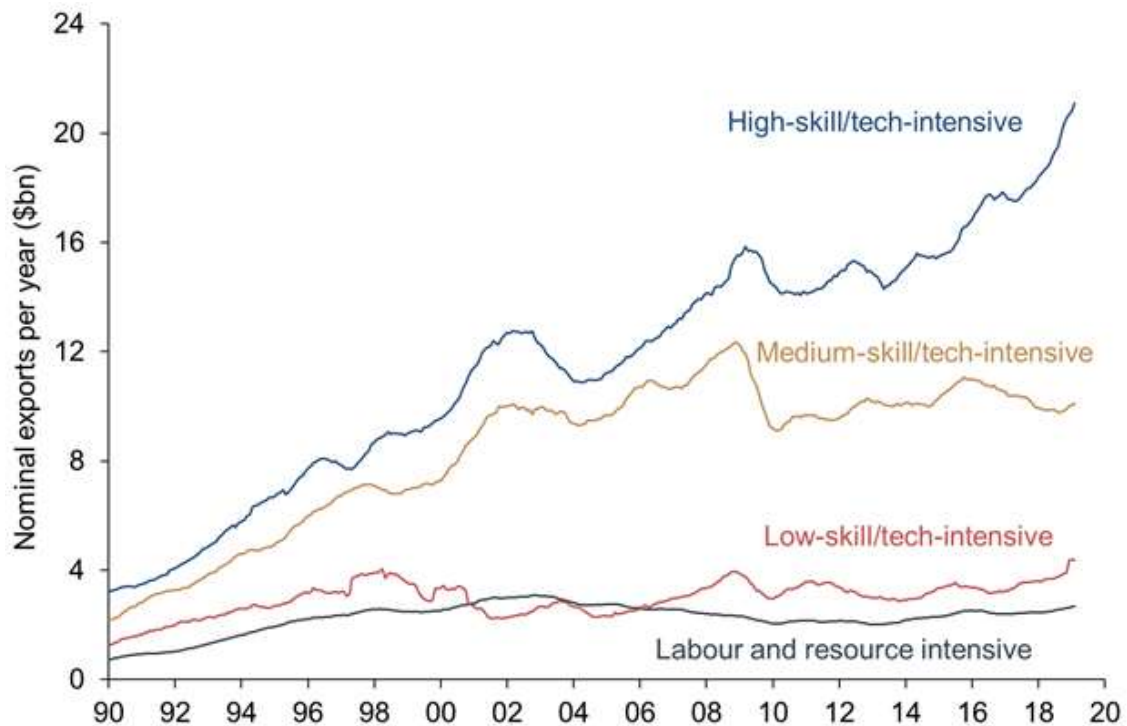


Figure 1 – Manufacturing Exports by Skill Level and Technology Intensity

Source: ABS, *International Trade in Goods and Services*, Feb 2019; UNCTAD Product Classification, *Manufactured goods by degree of manufacturing groups (SITC Rev. 3)*.

Global Value Chains (GVCs) are at the heart of modern trade, with 75% of trade consisting of intermediate goods and services. As a significant exporter of mineral products, Australia’s role in GVCs can look high, however the GVC export participation rate among Australian manufacturers is among the lowest in the OECD. What is missing in the Australian trade narrative is the important role that imports, and outbound investment can have on improving competitiveness and gaining control of GVCs. While successive Government policies have reduced Australia’s tariffs, improving access to the Australian market for imports, we do very little to support Australian companies who wish to invest offshore to take ownership of their supply chains. Time and distance are contributing factors to GVC participation that do not work in Australia’s favour and Australian companies must expand their footprint closer to their customers and suppliers. Support for companies setting up offshore manufacturing or distribution facilities is limited as most trade services are focused on transactional exports.

Multilateral Free Trade Agreements that have modern and comprehensive rules of origin and cumulation rules provide the architecture that supports GVCs. More effort should be spent on explaining the benefits of these agreements to exporters and outbound investors as well as defending their interests if members are not compliant with the terms of the FTA.

Global trade is no longer characterised by the import/export from one country to another of raw materials and finished manufactured products, but rather vast webs of trade in intermediate products, across different sectors, and often involving numerous countries, business trips and data exchanges. Recent estimates show that 60% of global commerce involves intermediate products, and 30% of the total is conducted between affiliates of the same multinational

corporation⁹. This raises the importance of trade transaction costs including burdensome border administration which increase the costs of trade, particularly where products must travel through numerous countries before the final good can be sold. Broadly defined, trade facilitation is any measure that contributes to lowering trade transaction costs and creating standard efficiencies. There are numerous costs to inaction on trade facilitation including the:

- direct and administrative costs to traders;
- direct administrative cost to governments;
- time lost, which results in higher working capital needs; and
- uncertainty.

Among the many ways to enable trade, reforming border administration requires relatively little money and can be done quickly. Unlike tariffs, which do provide revenue for governments, all the resources spent on overcoming administrative barriers are lost. According to Zaki's (2014) estimates halving trade facilitation costs could deliver nearly ten times the benefit of halving tariffs.

Of the 56,772 Australian businesses directly exporting goods from their Australian base in 2018-19, 50% had fewer than 3 export transactions, 40% had between 3 and 50 export transactions and only 10% had more than 50 export transactions in the year¹⁰. This illustrates the concentrated nature of Australia's goods exports activity and the challenges faced by Australian manufacturers. Reducing the cost of export is essential if we are to increase the number of export transactions.

Government initiatives such as Single Window and The Australian Trusted Trader Scheme are welcome programs that will ensure that Australian exporters and importers who already comply with the rules can focus their attention on building their businesses rather than being caught in a web of red tape. With our major trading partners already employing such schemes, Australian companies can now realise the productivity gains across their supply chain that their competitors already enjoy. The Program that has been deployed is a good example of government working with industry to design a regime that is both business friendly and meets government compliance requirements. Priority should now be given to negotiating Mutual Recognition Arrangements with our key GVC trading partners such as China, Japan, and the US.

Maintaining Foreign Aid

Foreign Aid is an important function of Australia's soft power and ability to productively engage with our neighbours and efforts to ensure security in the region. There may be a temptation to reduce our Aid program as we address budget shortfalls, however as a member of the G20, we have a responsibility to share our wealth and expertise with less developed countries in our region.

While other countries take a transactional view to Foreign Aid; building infrastructure that requires the purchase of materials and expertise from the donor country, Australia focuses on capacity building that will make a material difference to transforming the recipient's economy. Ai Group understands and supports this view; however we ask that priority be given to supporting the agencies that regulate the industries that are in Australia's economic interest. This will assist in removing the behind the border barriers that limit the success of Australian exporters and

⁹ Gary Hufbauer, Martin Vieiro, John Wilson, "Trade facilitation matters!", VOX CEPR's Policy Portal, available at: <https://voxeu.org/article/trade-facilitation-matters>

¹⁰ ABS, Characteristics of Exporters, 2018-19

investors and local companies, which in turn prevent developing economies from reaching their potential.

Priority areas for training and capacity building:

- Minerals extraction governance and regulation
- Industrial and food standards development and administration
- Customs and Border control administration
- Health Administration
- Water and environment regulation and administration
- Financial Services governance.
- Digital Economy governance and regulation

Improving Exporter Capability

The most problematic issue for Australian businesses wanting to export is lack of expertise in identifying overseas markets and customers. Despite the advances in electronic communication and availability of market information, understanding how to find customers is still a significant barrier for many companies, but particularly SMEs, even if they are current exporters.

An important element in the success of converting opportunities from free trade agreements into commercial outcomes is the role of Austrade as well as State trade mission agency staff operating in market and advising companies in Australia. Such commitments are expensive and resource-intensive, but the significant investment by the Government has made in negotiating these agreements – \$350 million according to the Productivity Commission Report into Bilateral and Regional Trade Agreements – warrants a significant investment post implementation to ensure that Australian companies benefit from the gains secured by DFAT.

As a consequence of successive years of efficiency targets, the frontline presence of business capacity building agencies such as Austrade have diminished to unacceptable levels. Companies need trusted advisors to bridge skill gaps, assist with advice on local market conditions and regulations and introduction to reputable business partners.

Skills and Training

Without continued change in the skills landscape our manufacturing sector will be hampered in both its strength and growth. Skills underpin all work and manufacturers need the right skills for recovery now, and to fuel innovation and increased capacity into the future. With skills depreciating faster than in the past and new technologies generating gaps in workers' skills, the Government, along with organisations and education and training systems, need to adapt to the rapid and continual technological development in order to remain fit for purpose.¹¹

In 2021 Ai Group members have reported strains caused by re-emerging skill gaps and shortages. The manufacturing industry had lived with skill shortages for a few years before the pandemic, most acutely for trades workers and technicians. After a short hiatus last year, skill shortages have quickly reappeared as one of the main concerns for our members. Firms are increasingly struggling to attract applicants and are having difficulty finding candidates with the desired skills and experience. This has been exacerbated by international border closures

¹¹ Working Paper, Asian Development Bank, 2020.

that have prevented skilled migrants from entering Australia, thereby alleviating some of these shortages.

Ai Group believes Australia's skills landscape is facing much change and in need of urgent attention. A number of factors are converging to create an urgency to skills formation and development. We are at a juncture where the pace of change is colliding with the development of skills. New technologies are reshaping existing industries and creating new ones. Advanced, clean, new and future manufacturing will increasingly include hybrid occupations that are mixes of current professions and trades. Workplace cultures are shifting. Higher productivity is being achieved through remote-work arrangements and multiple, rapid meetings.¹² Data science and interpretation are becoming larger parts of many roles. Circular and sustainable planning and processes loop in new capability needs. Corporate social responsibility endeavours are colliding with skills as companies consider diverse cohorts disadvantaged through COVID-19 when re-building capabilities.

COVID-19 has led to a forced and more rapid switch to digitisation for many. Global McKinsey data¹³ show that in a matter of months many companies accelerated the digitisation of their customer and supply chain interactions and internal operations by three to four years. While many companies did pivot, Ai Group is seeing signs that the switch to digitisation has not always been as deep as it needs to be and that some companies are still requiring basic digital skills before they move to more sophisticated technologies.¹⁴

Late in 2020 we undertook a survey that focussed specifically on the skill needs and workforce development plans of businesses as they ramped up their activity. Ai Group surveyed CEOs nationally receiving 115 responses from companies employing a total of 39,447 people. Responses came from a mix of industry sectors: Manufacturing (58 per cent), Construction (9 per cent), Services (13 per cent), Mining (3.5 per cent) and other sectors (16 per cent). Respondents represented all company sizes: 31 per cent small-sized, 45 per cent medium-sized, and 24 per cent large-sized businesses.¹⁵

Findings from the survey show technicians and trades workers re-emerging as the most difficult roles to fill, followed by managers, professionals and sales workers. The digital skills employers most need to increase are basic digital skills, cyber security and data analytics. Fewer said they required cloud computing, AI, augmented or virtual reality or blockchain. This suggests many are yet to reach the stage of harnessing technologies together in an integrated and digitalised approach that captures wide-ranging digitalised capability needs: production technologies; 'design to operate' process flows; sourcing and procurement; asset management; finance; HR and payroll. Increasingly this will become an issue as the forced switch to digital operations will require deeper digital strategies and the capacity to adopt, and have employees engage with, more advanced technologies.

Other findings from Ai Group's 2020 survey include:

- an increased demand for soft skills across all occupational categories
- an increased commitment to taking on apprentices

¹² Speed and resilience: five priorities for the next five months, McKinsey, March 2021.

¹³ How COVID-19 has pushed companies over the technology tipping point, October, 2020.

¹⁴ Skills Urgency: Transforming Australia's Workplaces, Australian Industry Group, April, 2021.

¹⁵ *ibid*

- the most important entry level recruiting factors are a positive attitude and soft skills
- wage subsidies allow many employers to take on displaced workers and young people
- employers would take on more university or TAFE students as higher apprentices, cadets or interns to increase their skill levels as their business needs change.

In July 2021 Ai Group held a member forum¹⁶ on skill shortages. Members with rigid shortages reported:

- experienced trades (welders, boilermakers, mechanics, process workers) are in short supply and experienced, skilled migrants are unavailable
- some apprentices are being poached by firms towards the end of their apprenticeships through offers of higher salaries and defined career pathways. This is increasing the perceived risk of taking on apprentices
- states are targeting different skill levels and occupations for permanent residency, making relocation to those states attractive and leaving gaps in other states
- it is challenging to find the right mix of skilled and experienced workers.

Those with flexible shortages reported:

- unskilled labour (i.e. entry level process work) is in short supply and hard to find
- the job market is tightening which is forcing some members to reconsider their recruitment requirements (levels of experience, credentials etc.)
- previously there has been an abundance of choice, which led firms to ratchet up their requirements for roles. This is now being rolled back in order to fill positions with the smaller pool of skill and experience sets available
- skill shortages previously experienced in rural communities are now moving into cities as general labour shortages.

While broader than manufacturing, the National Skills Commission’s release in 2020 of the 25 emerging occupations in Australia reflected global digital transformation with emerging areas focussed on digital technologies dominating.¹⁷ Ai Group has developed a list of the skills it sees as vital to the future workforce capability of Australia’s manufacturing sector. Our skills list is gleaned from discussions with members and has consistency with a range of reports that examine the manufacturing sector’s future skill needs. These skills form the basis for transforming manufacturers to high-value advanced manufacturing operators geared for future digitalised scenarios.

<p>Leadership skills</p> <p>Knowing how to move to, thrive and innovate in new digital environments</p>	<ul style="list-style-type: none"> • Developing digital-at-the-core vision, strategy and risk • Mapping technology architectures for manufacturing • Decision-making using real-time data • Aligning a rapidly up-skilled workforce with strategy • Building intelligent, adaptive and agile operations • Collaborating to create new value • Moving to sustainable, circular business models
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¹⁶ 45 Ai Group member companies participated

¹⁷ 25 Emerging occupations, National Skill Commission, 2020.

<p>Technical skills</p> <p>From advanced digital technology specialisations through to widespread basic digital skills</p>	<ul style="list-style-type: none"> • Advanced skills for specific manufacturing sectors that equip a range of specialist engineers, technicians and trades workers • Complex data engineering, architecture, and analytics • AI/machine learning/mobile machinery • Blockchain technology • Cloud computing • Cyber security • Augmented Reality/Virtual Reality • Sophisticated logistics/supply chain management; sourcing and procurement; asset management • Advanced sustainability: environmental monitoring; energy management, use and procurement • Advanced maintenance and diagnostics • Remote operations • Marketing and customer experience analysis • Basic digital literacy (whole workforce)
<p>Human skills</p> <p>Knowing how to work with other humans and machines in digital environments</p>	<ul style="list-style-type: none"> • Cross-functional teaming • Creativity • Analytical thinking • Complex problem solving • Adaptability • Active learning • Resilience

Major disruption in industry and manufacturing through digitalisation should be seen as a natural trigger for major disruption in education and training. Under current education and training models, development is often not quick enough to recalibrate the skills required for entry level employees. Companies are struggling to find timely, relevant short programs to re-skill existing workers at pace. Learning models are under pressure. Educators are exploring how to prioritise and integrate the human-centred skills increasingly flagged as dominant skills for the future. Skilled migration has plummeted creating opportunities to improve the system during the pause in student arrivals.¹⁸

Adding to the major disruption in the skills landscape, research on the changing workplace is showing there is an evolution to the nature of work.¹⁹ It speculates that the way people work is changing in an unprecedented way, suggesting skill development needs a different approach moving forward: where learning is not separate from doing; where we immerse learning in work environments.

Skills urgency is pointing to the need for new responses, new support and upscaled collaborations across Australia’s broad skill ecosystem. Ai Group believes the Government, engaging other stakeholders, must explore new ways of building skills and capabilities for manufacturing companies and individuals to ensure Australia’s skill development outcomes are in line with current and emerging economic needs. Future-focused education and training must

¹⁸ A good match: optimising Australia’s permanent skilled migration, Committee for Economic Development of Australia, March 2021.

¹⁹ Frank, K. and Frenette, M., Are new technologies changing the nature of work? The evidence so far, Institute for Research on Public Policy, Canada, January 2021.

be delivered with and in industry. It must not only positively impact our large and leading manufacturing companies and providers, some of whom have arranged innovative and sophisticated partnerships, it must assist SMEs and the supply chain companies that need to be part of this in order to build our sovereign capability.

The Government must take more intensified action, building on progress already made in reform areas. Ai Group has noted the Government's recent progress to further VET reform. It promises to address a number of the system-wide issues identified in major reviews commissioned over the past few years. The National Skills Commission has been a crucial new component of the revised architecture for VET, with its functions including advice on workforce skill needs, the state of labour markets and the performance of the VET system, amongst others.

The Government must be a leader in establishing, or increasing, action in the following areas:

1. new templates for partnerships across the skill eco-system
2. broad digital skills development integrating human capabilities
3. a re-imagined apprenticeship system
4. work-based learning as a core principle in qualifications and
5. flexible qualifications allowing short-form training with skill-needs focussed training incentives.

1. Partnerships: establish new templates

Embedding collaborative cultures for skills development will assist Australia's future success. BAE Systems Australia has recently circulated a Request for Information to other companies to collaborate on innovative education and training initiatives to nurture talent for their industry. The company is similarly working with universities and TAFEs to achieve these ends. Such collaborative activity now needs to be widespread, and supported by Government, in particular to encourage involvement by smaller-sized companies.

Organically designed, co-located industry-training 'hubs', physical or virtual should exist across the business landscape. Industry training hubs are best if they are multi-partner – large and small companies, universities, TAFEs, schools, government - involving any or all of training, placements, projects, competitions, research/incubation and co-location. These collaborative industry-education sector metropolitan and regional hubs, like Centres of Vocational Excellence in Europe, develop strategies to meet local skill needs and assist large and small companies to create innovative solutions. The hubs would develop partnerships between industry-student-provider engagement models that foster and increase relationships, and result in industry-tuned workforce entrants. They could involve workforce boards to support creative challenges and organise rapid reskilling in specific locations and industries. Next generation tech sector partnerships, work-based learning networks and/or pipeline partnerships could operate according to need.²⁰ The Government's Local Jobs program is encouraging some of this activity.

The idea of such hubs feeds into a broader re-thinking of the traditional education and training campus concept. The pandemic has precipitated education and training provider rationalisations in terms of space and the level of attraction to campuses, according to one

²⁰ Advancing innovation in work and learning, Strada Education Network newsletter, March 2021

report that focuses on the university sector.²¹ Digital learning environments and online experiences have the potential to encourage connection, active participation and critical thinking; social media can emphasise discussion, openness and independent thought.²²

Industry actors, CISCO and Optus, recognise that virtual learning platforms will contribute to increased accessibility, efficiency, and scale of in-demand skills training. They have recently established the National Industry Innovation Network to create a new model for collaborative research with universities in which they see new technologies driving remote collaboration in real-time virtual labs. This initiative provides a critical opportunity to leverage cutting edge innovations in automation, machine learning, and education in support of short-term, rapid-cycle skills training.

The future campus will embody fewer people; be more automated and efficient; be more experiential and alive; have more porous boundaries to industry; promote health and well being; and will provide access to specialist equipment such as labs. 'As microcosms of cities, there is an exploration within universities of treating physical campuses as 'living labs'. They will need to be more closely connected through incubators, commercial spaces, government agencies and student job ready industry connections.'²³

Intensified change should include the exploration of innovative tertiary education institutes that mix vocational and higher education where such combinations are needed. An example of this, the newly announced NSW Institute of Applied Technology, promises to fully integrate VET and higher education in a cohesive tertiary curriculum, providing students with access to industry representatives, and employers invited to deliver their own proprietary training.

The two sectors would better service the economy if a number of enduring sectoral issues were addressed. Tertiary education in Australia is characterised by a highly unbalanced binary model. While recognising the distinctive features of higher education and VET there is a need for a more coherent and connected tertiary education policy and equitable funding framework to be established. Until the two are regarded as two parts of an effective whole, the opportunity to capably equip learners for Australia's economy will not reach its potential.

New partnerships should be built across the tertiary education system. Ai Group has argued for a more coherent tertiary education system in Australia²⁴ which drives a more effective overall policy direction and governance of the system.

2. Digital skills: broad development, integrated with human capabilities

As stated above, Ai Group's research late in 2020 found the digital skills that manufacturers and other employers most needed to increase were basic digital skills, cyber security and data analytics. This is notwithstanding the great need for higher level, specialist technical skills needed for advanced manufacturing.

There has been a growing range of state and federal government initiatives around digital skills. Australia will benefit from a coordinated map that identifies the whole range of entry level and

²¹ The Tipping Point for Digitisation of Education Campuses, VECTOR Consulting, November 2020

²² Payne, A. L., Swinburne University of Technology, A lot of us can relate to struggling to keep on top of everything: this is what mature-age students need from online higher education, The Conversation, March 2021

²³ The Tipping Point for Digitisation of Education Campuses, op. cit

²⁴ Realising Potential: solving Australia's tertiary education challenge, The Australian Industry Group, 2019

existing skill needs, qualification/course availability and gaps. However Ai Group emphasises incorporating human capabilities.²⁵ Employers demonstrated a growing need for human capabilities in the survey, most greatly for managers and professionals. In manufacturing alone there is evidence of increased demand for interpersonal skills in job ads over the last five years.²⁶

There is still a need to support the training of existing workers in companies to transition into roles impacted by rapid adoption of new technology and practices. The training should span basic digital skills, cyber security and data analytics, as well as adaptability, creativity and problem-solving skills to function in changing work environments.

3. Renew the apprenticeship system: central to skills development in manufacturing

The apprenticeship system needs to be seen as a central component in Australian manufacturing's future growth. It is an effective vehicle for young people to enter or re-join the labour market, and is more critical in an environment of limited skilled migration. The Australian Government has provided solid support for the apprenticeship pipeline during the pandemic through its *Boosting Apprenticeship Commencements* subsidy. Moving forward the apprenticeship system will better serve the economy if it continues to be well-supported, broadened and available at higher levels.

The system must be supported to attract and retain more diverse cohorts including more female and indigenous young people. Renewed incentive rates should be applied to reflect the rising costs to employers of supervising and training apprentices. Other supports that could be introduced would focus on apprentice supervisor mentoring and workshops and targeted funding for Group Training Organisations to assist SMEs and disadvantaged groups to participate in the system.

Driven by the need for apprentice numbers to increase, the Australian Productivity Commission²⁷, along with some state governments, has recommended that governments encourage non-apprenticeship pathways for trade skills to enable students to continue training and build skills for occupations with skills shortages. Ai Group believes the development of such pathways will require careful consideration to ensure good outcomes for employers and for those who choose these pathways. For example new trade qualifications will need to be designed for people without employment and relevant industrial awards may require rates for those with qualifications but no relevant work experience.

Apprenticeships primarily exist at a Certificate III level, however the digital economy increasingly needs higher level skills incorporated into training for workers in these roles. Ai Group undertook a pilot focused on high-level technical skills in engineering and digital technology, in partnership with Siemens and Swinburne University. This program trained higher apprentices in a Diploma and Associate Degree in Digital Technologies and the model is now being rolled out across Australia. At the same time PwC has been involved with pilots of higher level apprenticeships across a range of professional services industries.

²⁵ Transferable capabilities of adaptability, creativity, problem-solving, communication and initiative must be well incorporated with technical skills

²⁶ CSIRO Data61/Adzuna Australian Skills Dashboard

²⁷ National Agreement for Skills and Workforce Development Review, Productivity Commission Study Report, December 2020

A broader range of new priority occupations should be identified for higher skill programs in order to increase participation. STEM skills and transferable skills can be developed through Diploma-level traineeships in technical occupations and management skills developed through Diplomas for para-professional occupations. One example is Ai Group's Victorian Government-funded Digital ICT Apprenticeships project which is securing trainees for employment in companies as they undertake Certificates IV or Diplomas in ICT.

Different higher apprenticeship approaches have been implemented in the UK, France and the US. These approaches have the twin benefit of increasing the level of qualification awarded for apprenticeships as well as extending the scope to non-trade and more para-professional occupations. In the UK the higher apprenticeship framework covers qualifications in a wide range of occupations not usually associated with apprenticeships such as: accounting; advertising and marketing communications; banking; care leadership and management; construction management; facilities management; information security; legal services; life sciences; power engineering; and supply chain management.⁵

There are challenges in making higher apprenticeships more broadly available. State Training Authorities currently recognise only VET-level qualifications as apprenticeships or traineeships and industrial awards generally do not make provision for them. This underscores the importance of national tertiary policy and funding coordination across the jurisdictions in overcoming challenges to roll out higher apprenticeships.

Within the higher education sector, Ai Group is hopeful that one of the briefs of the National Priorities and Industry Linkage Fund, to develop new higher education advanced apprenticeships, will assist the needs of industry.

4. Work based learning: make it a core principle in qualifications

Work-based learning should now be a consideration beyond apprenticeships and across more qualifications. If not purely employment-based, then the learning should include forms of work integrated learning (WIL). Work environments are now best served by learning that is connected to and closely reflects workplace skill needs. There is broad industry acknowledgement that exposure to authentic work environments is highly effective at increasing students' work readiness. The greatest barriers to engaging employers in the activities are a lack of time, limited resources and the capacity to supervise students.

Through its members, Ai Group sees many quality and innovative pockets of work-based learning and WIL both in higher education and VET where formal education and training is augmented in the workplace, over time, by other skilled workers. A few examples include Ai Group's involvement with a Defence SA program which is matching student interns with companies in the Defence supply chain; and Ai Group members TEi, a Townsville SME manufacturer taking on higher apprentices in applied technologies; Agilent with its enduring IT scholarship program for students in order to nurture new talent; and BAE establishing its own Degree Apprenticeships in Australia.

Eighty per cent of respondents to Ai Group's 2020 skills survey reported they would take on higher apprentices, cadets or interns in order to increase their employees' skill levels. Half of these employers said they could do it only with government support. Tangible action here would

be the take up by the Government of proposals such as the national cadetship proposal for VET and university students proposed by the Mitchell Institute. The proposal suggests apprenticeship-style subsidies for employers to take on students at scale using existing system infrastructure.

The National Priorities and Industry Linkage Fund (NPILF) promises to focus WIL activity. However without industry incentives, currently included only as a range of options in the Appendix of the NPILF Final Report, increased uptake by employers will be more limited. Employers' increased engagement also needs to be supported by access to innovative WIL models that expose students to contemporary practices. Innovative WIL models enable different levels of capacity to engage and encourage expanded activity from a range of businesses, particularly small to medium enterprises.

Support for up-scaled WIL connections between employers and research graduates is also needed to assist with research and development collaboration. Ai Group cites one successful program as an example of coordinated industry-university engagement. As a Program Steering Committee member of the Australian Postgraduate Research Intern program (APR.Intern), we are aware of the successful outcomes for companies involved with this program. It connects PhD students with industry through short-term internships across all sectors, disciplines and universities. It links businesses with fresh ideas to innovate and provides pathways for universities to expand research collaborations. Initially funded by the Australian Government's Department of Education and Training, and now continuing to be run by the Australian Mathematical Sciences Institute (AMSI), the national expansion of such programs should be explored.

5. Develop the shorter form training needed by companies and offer skill-needs focussed training incentives

The manufacturing industry needs flexibility and speed from the education and training sector as it races to reskill and upskill. And it needs skill needs-focussed training incentives to assist manufacturers in taking up the shorter form training it needs.

As industry has moved through the COVID-19 environment, focussed training programs that were aligned with specific work opportunities have been crucial. The demand from industry for readily available, short form training reflects various re-skilling and up-skilling needs primarily arising as a result of increasing digital transformation. The crisis identified the need for short courses at a number of different AQF levels; it has highlighted the need for access to information on offerings for the public; for coherence in offerings; and for information on where credentials sit/how they stack in relation to specific qualifications.

Government, through the public education and training sector, should be cognisant of an increasing number of initiatives by large companies that by-pass the formal system and implement company specific competency frameworks and digital learning development systems. Companies are embedding social platforms so that training is social and community led. This allows them to meet their specific organisational needs and offer their own training for existing workers and new entrants. They are using micro-credentials, digital badges, e-portfolios and open-source learning platforms. Ai Group's 2020 survey found that companies were mainly interested in offering short courses over the next 12 months and a greater percentage intended

to use private or in-house providers rather than TAFEs or universities (unless investing in formal qualifications in which case a much greater use of TAFEs and private RTOs was intended). Qualifications need to be designed differently, combined differently and be accessible across contexts in many more varied and timely ways. This questions funding models, the role of institutions and the relationship between learning and credentialing. Moving into the future Australia needs a coherent framework of micro and macro credentials, adaptable by industry and individuals, underpinned by a modern qualifications framework, and which better connects the tertiary education sectors.

It is essential that the government-accepted recommendations of the Australian Qualifications Framework Review are progressed quickly to bed down the re-imagining of qualifications. They need to be able to support and build upon dynamic and fluid combinations of skills and knowledge. Qualifications should also not necessarily be assembled hierarchically, as individuals will access qualifications and skill sets over their working life to meet the demands for critical reskilling and upskilling.

Ideally qualifications for the manufacturing sector under the new framework will have a purposeful balance between technical and generic skills, and knowledge, all of which could be developed through an engaging applied learning pedagogy. They could be completed in entirety or accessed via meaningful groupings or skill sets allowing for shorter forms of training/micro-credentials to be brought together in a qualification linked to an occupation or a career.

The opportunity for reliable, cheap, renewable energy to keep Australia’s manufactured exports competitive in a carbon-constrained global economy and the role that our manufacturing industry can play in delivering the reliable, cheap, renewable energy that is needed.

The Advantage We Had

Australian industry had for many years an advantage in access to low-priced coal and gas and cheap electricity, largely generated by burning inexpensive coal. The basis of the genuine element of advantage was that Australia had energy resources that were largely isolated from global markets, large relative to local demand, and relatively cheap and easy to produce. This advantage was genuinely important to many businesses and workers. However it was not universally beneficial or unproblematic:

- Low energy prices for some manufacturers were partially the result of cross-subsidies: preferential prices or dedicated infrastructure paid for disproportionately by other users or taxpayers.
- Low energy prices were partially the result of shifting the unrecognised costs of greenhouse gas emissions onto future generations.
- Low energy prices did not necessarily translate into proportionately low energy costs. Relatively low prices made it rational to invest less in the efficient use of energy than in economies with higher prices.
- Most manufacturers are not energy-intensive; the cost and productivity of labour and other inputs are much more important to their competitiveness, though reliable energy supply is essential for business continuity.

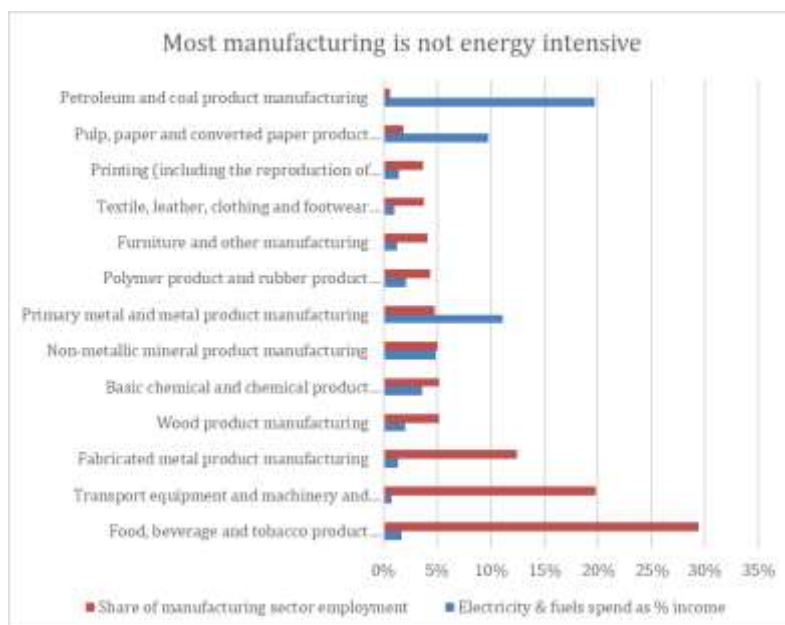


Figure 1 - manufacturing employment and energy spend, 2017-18²⁸

²⁸ Derived from ABS Australian Industry 2017-18; ABS Energy Use and Electricity Generation, Australia 2017-18. Energy spend includes electricity, gas, diesel, LPG, petrol and ‘other fuels’. ‘Other fuels’ is 41% of the total spend but ABS do not

The genuine and problematic elements of the old advantage have now largely evaporated, and it appears variously impossible or undesirable to reconstruct them.

- The establishment and expansion of large export channels for coal and gas has linked local fuel prices to those in export markets, reducing the local price advantage to the avoided short-run costs of exporting fuels.
 - This appears irrevocable - the channels exist and there is no political consensus for effective de-linking measures.
- The expansion of production, largely for export, has depleted the cheapest resources and driven development of new resources with higher production and/or transport costs.
 - The countervailing forces of innovation and resource depletion will shape future production costs, but geology and geography make a return to past costs for coal and gas very unlikely (and irrelevant unless Australian resources become isolated from global markets).
- Cross-subsidies have been largely wound back with the introduction of cost-reflective pricing; the expiration of legacy contracts negotiated with State entities and their replacement with market contracts; and new regulatory processes for the approval and cost allocation of infrastructure.
 - There would be many objections to the return of cross-subsidies, particularly in the absence of a compelling case for broader long term benefit such as deep decarbonisation.
- The costs of greenhouse gas emissions are increasingly recognised and may be reflected in domestic policies such as the Safeguard Mechanism; overseas policies such as carbon border adjustment mechanisms; and the strategies of the growing cohort of businesses with climate commitments of their own.
 - The importance of a successful global transition to net zero emissions is clear.
- Existing thermal electricity generation capacity is ageing and new thermal generation capacity appears very expensive due to a combination of high fuel cost, high capital cost, the substantial cost premium of carbon capture and storage (CCS), and the impact of the high emissions intensity of non-CCS generation on expected future operations and hence the finance risk premium.
 - Thermal generation technologies are mature and innovation and experience can reduce but not eliminate the CCS cost premium.

This is a bleak outlook for those manufacturing businesses built around Australia's old energy advantage, though as noted the fate of most manufacturers does not hinge on energy costs.

The Advantage We May Build

Ai Group is confident that a new Australian energy advantage can be constructed. The falling costs of renewable energy technologies, driven by dramatically increasing rollout worldwide,

publish much of the spending by major subsectors. Ai Group has attributed this as follows: 45% to petroleum and coal product manufacturing (coal and oil); 45% to primary metal and metal product manufacturing (coal); and 10% to pulp, paper and converted paper products (wood and biomass).

have made them the cheapest source of new electricity supply in most places. Australia is a promising place to develop renewable energy for several reasons:

- We have very high quality renewable resources, enabling higher average output from generators;
- We have very large renewable resources, much of it on land with a low market value, enabling very large absolute output if there is sufficient demand;
- We are a stable, predictable and investment-friendly jurisdiction, with lower risks enabling lower finance costs and more potential capital allocation; and
- The cost of renewable energy is largely in construction and finance, with very low operating costs. Managing the cost of capital and increasing construction sector productivity can potentially offset our relatively high labour costs.

However, there are also significant challenges.

The most obvious is that while renewable electricity is a cheap source of bulk electricity, it is also variable. There are many flexible resources that can complement renewables and ensure overall demand is met - recalling that continuity of supply is important to all businesses, while the importance of price varies. These include interregional transmission and resource diversity; various forms of short- and long-term storage; demand-side flexibility; and dispatchable generation such as gas- or hydrogen-fuelled peakers. These flexibility options come at a cost, and it is not yet clear which mix of them will be best as the renewable share of electricity continues to increase. Plausible scenarios for long-term delivered prices to energy users range from globally competitive to globally mediocre. We should reach for the former, but we can't yet assume success.

We also need to remember that Australia's advantages are not unique and other economies have strong clean energy potential too. China has strong resources and a desire for energy security. Middle Eastern economies are highly motivated to seek post-oil opportunities. Offshore wind remains more expensive than onshore wind and solar, but its falling cost and increasing performance may significantly expand the energy options available to economies like Japan. In short, a world increasingly pursuing net zero emissions will not necessarily hand energy advantage to Australia on a plate. We will need to work for it.

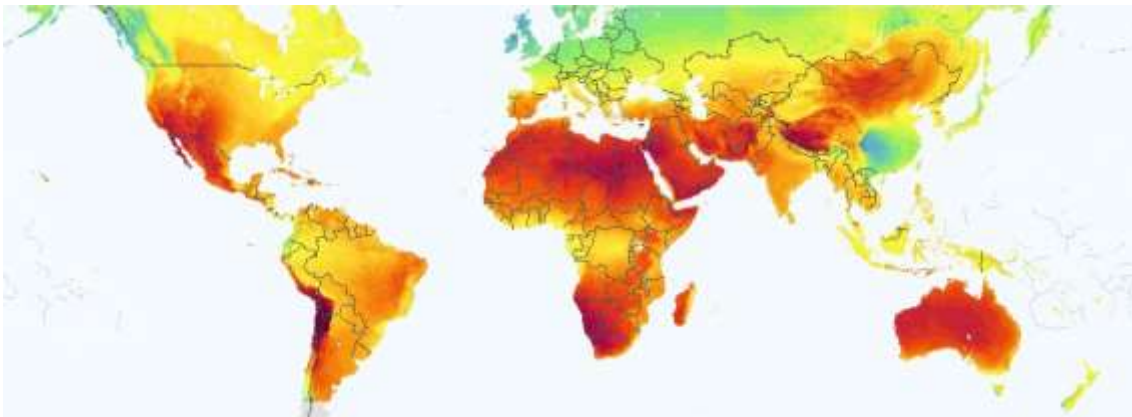


Figure 1 - global solar resources²⁹

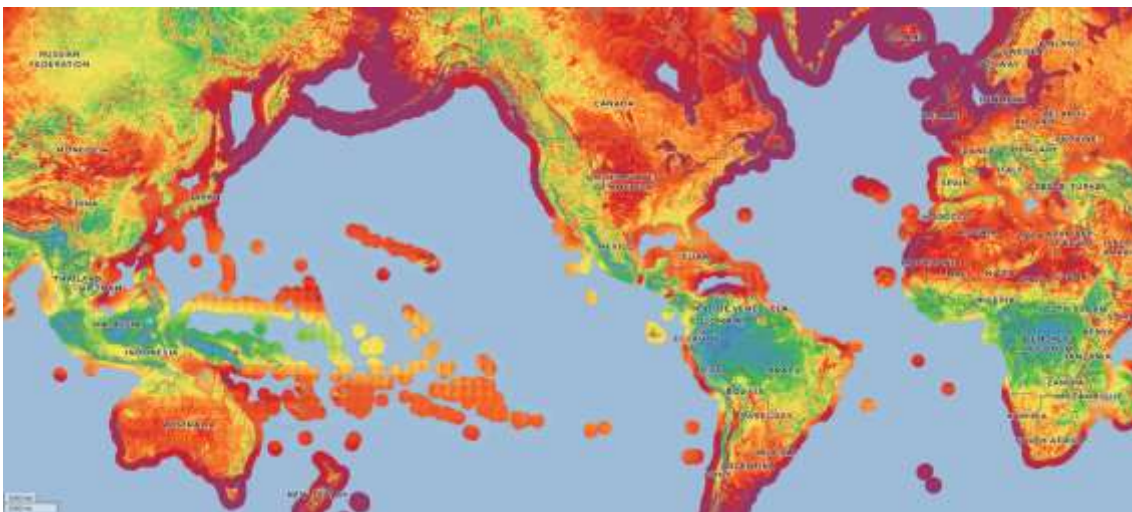


Figure 2 - global wind resources³⁰

A third category of challenge relates to the difference between electricity and energy. Renewables are a cheap way of generating electricity, but electricity is only around a third of the manufacturing sector's total energy spend. The remainder is a mix of fuels for transportation, heat and feedstock. Renewable substitutes for these fuels are possible, but their relative cost, maturity and availability vary. They are not yet as obvious a source of potential advantage for Australian manufacturing as renewable-intensive electricity may be for current electricity-intensive activities.

²⁹ World Bank Group Global Solar Atlas

³⁰ World Bank Group Global Wind Atlas

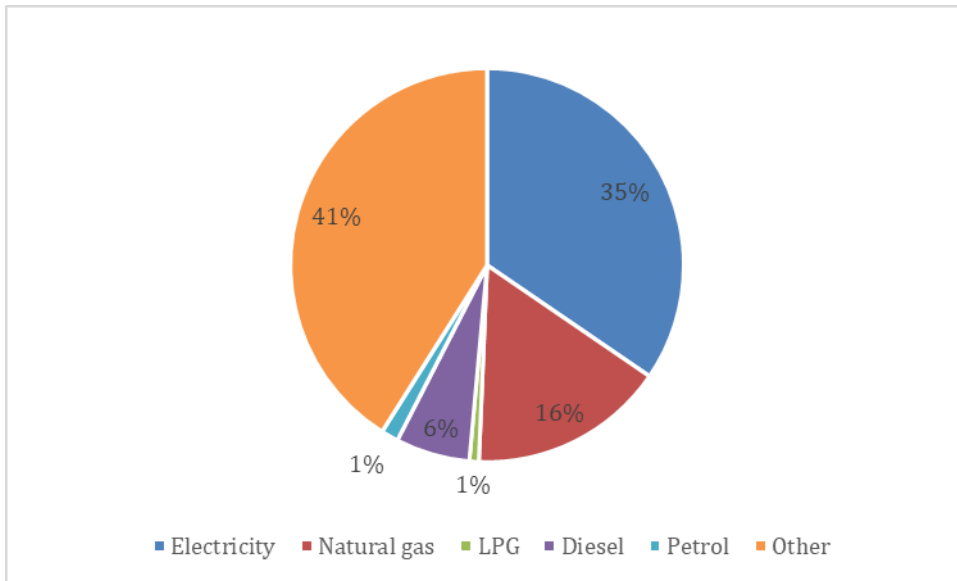


Figure 3 - manufacturing energy spend 2017-18³¹

Renewable substitutes for manufacturing fuel use, and their status, include:

Substitution opportunity	Status
<i>Electrification</i> of process heat with various technologies including high temperature heat pumps;	Opportunities vary widely. Partial electrification appears cost-viable in many manufacturing contexts, but full substitution often has cost or performance challenges.
<i>Electrification</i> of transport with battery-electric or hydrogen-electric vehicles;	Increasingly attractive for light vehicles, but heavier vehicle economics and model availability are further behind.
<i>Biofuels</i> , biogas and biomass for various feedstock, heat and transport needs, assuming sustainable production of biomass;	Easily available, inexpensive and clearly sustainable feedstock is very limited. Expanding feedstock is possible at a cost and with care, but potential feedstock will not be able to satisfy all potential demand.
<i>Hydrogen</i> and derivatives like ammonia as a fuel for heat and transport, a substitute for gas in chemistry and a substitute for coking coal in steelmaking.	Hydrogen is very expensive compared to coal and gas but more competitive in transport. Reducing hydrogen production costs relies on extensive global deployment, which appears to be getting underway. Blending small shares of hydrogen is relatively easy, but high substitution requires extensive upgrades or entirely new facilities and processes.

³¹ Derived from ABS Energy Use and Electricity Generation, Australia 2017-18

These challenges are more complex and fragmented than the more straightforward task of minimising the cost of a heavily renewable electricity system. Considerable industry and policy attention is warranted to overcoming them.

Focusses for Advantage in a Global Clean Energy Economy

It is worth distinguishing the possible benefits that Australian policy makers may seek from a clean energy advantage. The opportunities may be relevant to construction, manufacturing, mining and other sectors, and are probably better considered in an integrated way rather than one sector at a time.

Inputs to clean energy: Batteries, electric vehicles, solar farms, wind farms and other elements of a clean energy economy require many inputs, including minerals like copper, iron ore and lithium; materials like aluminium, cement and steel; and components and equipment like photovoltaic cells, towers and transformers. Australia is clearly a strong contender in some of these categories, with large low cost supplies or globally competitive producers. In others we may never catch up.

Clear thinking is needed. Many economies aspired to build solar cell manufacturing strength in the past decade, perhaps with the theory that in gold rushes it was often the provisioners and not the prospectors who prospered. But most production wound up in China and most solar cell manufacturers, even in China, found it a nightmarishly competitive sector where fortunes are easily lost. In the solar gold rush so far it is the prospectors and end customers - solar developers and energy users - who have benefitted more than the provisioners. The potential value of Australia providing a greater share of any given clean energy input needs to be examined, not assumed.

Another lesson from other episodes of industry policy is also relevant here: strategies centred around export promotion, while hardly guaranteed to succeed, are more likely to deliver value than those focussed on import substitution. The pursuit of international customers with many choices requires discipline from industry and policy makers. An inward focus may not, especially if there is a temptation to constrain the choices of local buyers. And even a large and successful Australian clean energy production sector will be just a fraction of the addressable world market for mineral and product inputs.

Building Clean Energy

Construction of the infrastructure for a clean energy economy involves enormous potential activity, particularly if Australia proves competitive as an exporter of clean energy or clean energy intensive products. The construction phase of individual projects will be relatively brief and employment needs in operation will be much lower, risking boom-bust dynamics - especially at the regional scale.

However, with a steadier national transition the pipeline of projects could sustain high overall demand for construction services and material inputs while allowing regions more opportunity to adjust to shifts in the focus of demand. Even if some key components are likely to be imported, such as electrolysers, the range of componentry involved in the balance of systems can be wide and contain many opportunities.

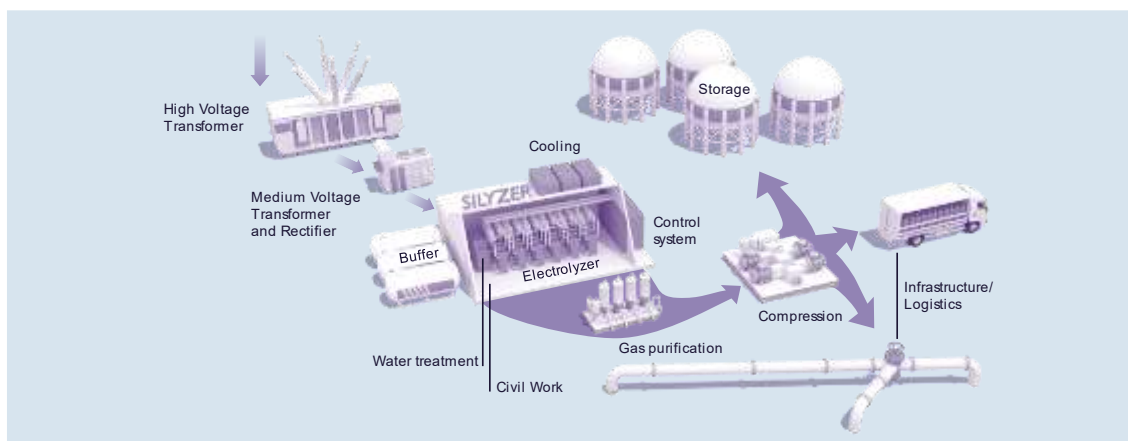


Figure 4 - components of a hydrogen electrolysis project³²

Making Clean Energy

The production of various forms of clean energy is likely to be a very large industry in value terms, though many parts of the sector will have low labour intensity in operation. Much of this activity will resemble the existing electricity sector, albeit with new assets in new locations and on a larger scale. However the production of clean molecules (whether hydrogen, biofuels or otherwise) for domestic and export use will be more analogous in operations, skill set and supply chain to activities like aluminium smelting, liquefied natural gas production or petroleum refining.

Electrification with clean energy is the most obvious pathway to decarbonise many activities. One of the other key pathways for end uses is hydrogen, which is most likely to be made at a scale and cleanliness relevant to global decarbonisation through electrolysis. Thus decarbonisation entails a very large increase in the global electricity sector, and even moreso in energy exporters.

What is not clear is the extent to which Australia will be an energy exporter in a net zero emissions world, and the most promising form of any energy exports. As noted already there will be competing exporters and energy importers may have more options than in the past. Exporting electricity via cable is possible and there are live proposals along these lines, though there are geographic limits to the addressable market (and potentially constraints at the intersection of energy security and international security). Exporting hydrogen or derivatives like ammonia is also possible and could in principle provide a larger market.

However the actual size of the clean hydrogen export market will depend on a complex interplay between the rate of global decarbonisation; trends in the significant costs of transport and/or conversion of hydrogen; the performance of other decarbonised energy options; and the competitiveness in each economy of imported hydrogen (with low production costs and high transport costs) versus domestic hydrogen (with high production costs and low transport costs).

³² Siemens Energy

The combination of potential and uncertainty around hydrogen production and export is a significant barrier to investment at a scale consistent with decarbonisation goals. Firming up sources of hydrogen demand is a major challenge for all advanced economies, including Australia.

Making Clean Energy Intensive Products

Australia could be a very attractive place to make energy intensive products, including aluminium, chemicals, steel and other materials, if we can achieve a new energy advantage. Our potential success in many other manufacturing sectors, such as food processing or machinery and equipment, will depend much more on our performance in the other areas of policy addressed in this submission.

In some cases the advantage may be larger and more consequential than the old fossil-intensive advantage. The most obvious possibility is in steel. While Australia has sustained locally important steel production, the bulk of our iron ore and coking coal production are exported. The cost of shipping is not high enough for avoided transport costs to outweigh disadvantages to making more steel in Australia rather than China, Japan or Korea. However the transport costs of hydrogen are significantly higher than for coking coal, and as a consequence the economics of steelmaking could look quite different - if hydrogen-based direct reduced iron becomes a major steelmaking technology. Closeness to market and economic sovereignty concerns might prevent the full value chain relocating, but Australia might be a more attractive place to perform the most energy intensive steps, including production of pure iron. Australia might substantially expand our share of the world market. Considerable uncertainties remain, however, not least over which low- and zero-emissions steelmaking technologies will prove viable in the long term.

Building the requisite energy advantage will be very demanding. It requires much more than coasting on our strong natural endowment:

- an efficient construction sector that can scale up to develop many projects nationwide at globally competitive costs without generating excessive cost inflation;
- Sustained low costs of capital, in part through stable market and policy designs that moderate investor risk; and
- Energy market design, planning, policy and regulation that achieve an efficient development path and sustain efficient operation.

The second and third requirements can easily be in tension. The delivered cost of capital-intensive energy projects can be greatly reduced by limiting financial risk, such as through foundation contracts to buy the output at a set price. But the resulting energy system, while composed of cheap individual projects, can be very expensive unless the right mix of projects is selected and efficiently coordinated. This is a weighty task, whether it is delivered by market forces, planners or (as is typical) a mixture.

Pathways to Advantage

Ai Group laid out several recommendations for building a new energy advantage in our [August 2020 paper](#) *Post Pandemic Policy: Climate and Energy*. In brief, and updated for recent developments, these include:

An overall recommendation to adopt a clear national vision of net zero emissions by 2050, and organising energy policy around the pursuit of long term competitive advantage in a net zero emissions world.

Our recommendations on gas were:

Demand

Take steps to reduce natural gas demand in households, industry and the power sector through efficiency, electrification and fuel switching to biogas, hydrogen and any other emerging clean options. This will help with immediate energy user pressures from high export-driven gas prices, and with the longer term transition to net zero. Growing supply and demand for alternative fuels in tandem will be essential for success and underlying cost reduction.

Supply

Facilitate only those new gas supply options that make long-term sense considering their underlying cost to supply, the amount of capital at risk, and the associated production and consumption emissions; and where they can be developed with community safety and consent. Avoidance of acute supply shortages is important even as demand falls over the long term.

Reform

Carry on with gas market reform processes now underway is important to sustain competitive pressure and transparency, though current proposals are unlikely to alter fundamentals.

Our recommendations on electricity included:

Post 2025 market design

Complete the renovation of electricity markets now underway. Significant reforms to demand side participation, generation and transmission coordination, and resource adequacy require further development work. It will be especially important to detail the proposed capacity market mechanism further, with the close participation of energy users and other stakeholders, before it can be properly assessed.

Networks

Enhance power networks, including by building on the Integrated System Plan process and using public finance and funding to both accelerate the development of new infrastructure and reduce the risks to energy users.

Decoupling from gas prices

Reduce the influence of gas prices on wholesale electricity prices by easing the integration of alternative sources of flexibility, including energy storage and demand response.

Coal closures

Manage coal closures effectively. Closures are accelerating given age, market dynamics, public policies and the emissions imperative. With adequate notice, alternative investment and fair

treatment of affected workers, communities and supply chains these closures can be managed. Rushed or poorly planned closures risk a repeat of the tight market and high prices that followed the closure of Hazelwood with five months' notice in 2016-17.

Productivity

Improve energy productivity and management through capital investment supports of different sorts in all sectors, very much including industry.

Emissions Policy

Close the emissions policy gap. The lack of clear energy policies or market design elements incorporating emissions objectives (rather than imperfect proxies like renewables deployment) is a serious barrier to investment, efficient operation of the electricity system and confidence about the rate of retirement of older generators. The vacuum also makes it harder to reach agreement on other energy reforms, since the emissions impact of these is imaginably large and certainly unaddressed.

Infrastructure costs

Aim for globally competitive costs for energy infrastructure delivery. Since most of the cost of clean energy is in capital expenditure not operating costs, Australia's success in reducing finance costs, delivering timely and stable regulatory decisions and increasing construction sector productivity will play a huge role in determining our energy competitiveness.

Our recommendations for clean economy included:

Pathways

The Low Emissions Technology Statement process is useful and should continue to be iterated, but requires clearer guidance from an overarching Long Term Strategy on climate change that targets net zero emissions by 2050.

Platforms

The commitment of significant new funds to the Australian Renewable Energy Agency, and recommitment to the continuation of the Clean Energy Finance Corporation, are both positive. Further expansion of ARENA's funds is appropriate, as is the expansion of both organisations' scope to more economic sectors and all relevant technologies for delivering net zero emissions by 2050.

Policies

Innovation grants can get demonstration projects going while clean technologies are expensive, and concessional finance can ease their normalisation when they are cheaper. In between those stages there is a role for policies that drive deep cost reductions, and ultimately broad emissions reductions, through mass deployment. One of the most obvious cleantech deployment opportunities is to build on the Safeguard Mechanism through a combination of below-baseline crediting, steady reductions in baselines, and measures to ensure the competitiveness of trade exposed industries is maintained.

Managing export risks

There is a perceived risk to Australian competitiveness from the introduction of Carbon Border Adjustment Mechanisms in the European Union and potentially other major economies. The other steps recommended here to put Australian industry and energy on a path to net zero emissions will also put us in a position to gain competitiveness from CBAMs rather than lose it.

Ai Group has a range of further recommendations on CBAMs in our recent report *Swings and Roundabouts*, including the negotiation of an Australia-EU agreement to recognise data from Australia's National Greenhouse and Energy Reporting System for EU CBAM compliance purposes. This will greatly improve the position of Australian exporters to the EU, who otherwise may be subject to disadvantageous default emissions intensity assumptions.

There is a much bigger risk to current Australian exports from the energy transitions taking place in our major markets for coal and gas. These are out of our control, but look likely to greatly reduce demand for our fossil exports over time. For instance, Japan's updated Basic Energy Plan targets a halving of the use of LNG in the power sector by 2030. Diversifying Australia's economy would be a sensible hedge. The various opportunities for clean energy inputs, production and use considered in this submission are the inverse of the risks to our coal and gas exports.

Industry 4.0, digitalisation (and cyber security) in Manufacturing

Well before COVID-19, Australian manufacturing was evolving into more advanced modes, requiring very different mindsets, business models, skills and capabilities. These innovative approaches built on digital technologies are often referred to as Industry 4.0 or Smart Manufacturing.

Associated with this, rapidly advancing technologies are producing waves of wider innovation across the economy as businesses and individuals build new social practices and business models upon them. Ai Group's members are grappling with these changes in different ways and with different levels of readiness and capability. The collective impact of these changes is part of the Fourth Industrial Revolution.

Now, amidst a pandemic-driven recession, businesses are facing challenges greater than any in living memory. The pandemic has also highlighted broader economic vulnerabilities, raising questions about the scope of our domestic capabilities including in manufacturing and resilience of global supply chains.

COVID-19 has also highlighted how interconnected many businesses are and digital technologies has been an enabler for many businesses to remain open and sustainable. This unstable environment presents an opportunity for industry to emerge more globally competitive by taking fuller advantage of Industry 4.0 and digitalisation, where these can play critical parts of Australia's technology led recovery to the COVID-19 pandemic.

Striking the right balance between local production capability and reliance on global markets does not mean insulating Australia from international engagement and competition. One of the major intrinsic benefits of advanced manufacturing is the increased capacity to export to global markets and integrate with global value and supply chains. In this area, Industry 4.0 technologies and digitalisation can also play a role in building resilience in our global network.

For example, there are opportunities to shift from slow and complex manual management of supply chains to a more agile approach, and improve whole of supply chain transparency to identify weak links and gaps through increased monitoring of global suppliers.³³ Embracing

³³ "Coronavirus and the antifragile supply chain" (March 2020), Link: <https://www.supplychaindigital.com/supply-chain/coronavirus-and-antifragile-supply-chain>.

global standards will be an important success factor in enabling this shift.³⁴ Technologies have the potential to help address these issues.³⁵

While just-in-time manufacturing has helped increase efficiencies and reduce supply chain costs for manufacturers (especially in high tech industries) in recent decades, COVID-19 has highlighted its vulnerability to sudden shocks and supply shortages. Greater use of Industry 4.0 technologies such as AI could help decision makers to identify and predict supply and demand patterns.³⁶

Increased attention to local manufacturing and immediate concerns with human social distancing may also spark a renewed conversation about leveraging deeper into technologies to boost our manufacturing capability and resilience.³⁷

There are many other relevant technologies and applications with new business use cases continually evolving. These innovations are an important piece for solving the larger puzzle of growing Australia's competitiveness.

But investment in technologies only form part of the paradigm. In the policy context, other areas for action require building a policy environment that incentivises investment in innovation and R&D; lowering regulatory barriers for companies to compete globally; reforming workplace relations to increase flexibility and productivity; and developing the appropriate skills and talent to help businesses innovate and compete.

General comment on cyber security

While in many ways diverse, businesses including in manufacturing have a common and collective interest to be cyber secure. Strong cyber secure and resilient businesses are central to customer trust. This includes protecting data privacy, competitiveness, the strength of our economy and the reliability of our infrastructure.

Ai Group has been supportive of the Government's release of its revised 2020 Cyber Security Strategy last year, reinforced in the 2020-21 Federal Budget with a \$1.7 billion commitment over ten years to invest in strengthening Australia's security through initiatives designed to improve cyber security.

In our 2019 submission to Home Affairs' 2020 Cyber Security Strategy Discussion Paper, we noted that cyber security threats continue to grow and evolve as a risk management issue for many organisations and their boardrooms, with news about data breaches and cyber security attacks becoming more mainstream.³⁸ If left unchecked, these can diminish corporate trust and reputation, business and consumer confidence, as well as disrupting business operations and

³⁴ "Coronavirus is proving we need more resilient supply chains" (March 2020), Link: <https://hbr.org/2020/03/coronavirus-is-proving-that-we-need-more-resilient-supply-chains>.

³⁵ "How IoT, AI and blockchain can transform supply chains in 3 steps" (May 2020), Link: <https://www.forbes.com/sites/hodfleishman/2020/05/28/how-iot-ai-and-blockchain-can-trasform-supply-chains-in-3-steps/>.

³⁶ "Coronavirus: How AI, 3D printing and blockchain can help overcome supply problems in a crisis" (March 2020), Link: <https://theconversation.com/coronavirus-how-ai-3d-printing-and-blockchain-can-help-overcome-supply-problems-in-a-crisis-133826>.

³⁷ "The coronavirus has thrust human limitations into the spotlight. Will it mark the rise of automation?" (May 2020), Link: <https://theconversation.com/the-coronavirus-has-thrust-human-limitations-into-the-spotlight-will-it-mark-the-rise-of-automation-139198>.

³⁸ Ai Group submission to Home Affairs (November 2019), https://cdn.aigroup.com.au/Submissions/Technology/2020_Aust_Govt_Cyber_Security_Strategy_Discussion_Paper_1N_ov_2019.pdf.

provision of services. And in light of growing public awareness and scrutiny about data privacy and rights, it is important organisations ensure they are adequately meeting public expectations and level of trust. These threats are further compounded as organisations become more digitalised and connected through the internet.

These are certainly ongoing concerns for many. With more people working from home in light of the COVID-19 pandemic, there are new risks. The Government's announcement in June last year about malicious cyber activity against Australian organisations was a timely reminder that businesses and the community need to be vigilant during this time, and that cyber security is a shared responsibility.

This is especially the case when businesses also become victims. The Government has stated that cyber security incidents cost Australian businesses up to \$29 billion each year, with almost one in three Australian adults impacted by cybercrime. Recent reports released by the ACSC and ACCC highlight the impact of cyber security incidents. According to the ACCC, Australians lost over \$850 million to scams in 2020.³⁹ The ACSC indicates that it received almost 60,000 reports a year, or one report every 10 minutes – and bearing in mind those are only reported incidents, noting that cybercrime within Australia is underreported.⁴⁰ These various reports also highlight the importance of proper coordination between various government agencies to assist businesses and individuals that are victims of cyber security related incidents.

It is also essential that any reforms that may arise including those currently under consultation by Government do not result in excessive or overlapping regulation and that any additional obligations placed upon business recognise the importance of ensuring industry is not excessively burdened as the economy seeks to lift itself from the damaging impacts of the pandemic. It would also be a perverse outcome if reforms are proposed that do not address the underlying problem and root cause that could lead to unintended consequences.

Given the rapidly evolving state of cyber threats and attacks, it is essential that our nation is sufficiently resourced and supported through industry and government collaboration to ensure national security, and to protect businesses and the community against global cyber crime and related threats. Indeed, Ai Group works closely with Government and its agencies on improving Australia's cyber security.

Ai Group has made an extensive submission with recommendations to the Department of Home Affairs in its recent consultation about strengthening cyber security incentives and regulations in August 2021, which we can make available on request.

Government's role in Industry 4.0 and digitalisation in manufacturing

Generally, Government's role should be to set a vision for the nation, and ensure that public policy is conducive to digital investment and competition that benefits industry and the community in the long term. Government also has a leadership role to allay business and individuals' fears of "Digital Darwinism" including Industry 4.0, by preparing the community to prosper in an increasingly technology-driven era.

However, we have observed a continuing and growing trend of multiple concurrent activities by different Government agencies, which appear to be addressing similar or overlapping issues, albeit with different objectives. While we appreciate diversity of perspectives, we are concerned about the potential for fragmented and conflicting regulation or legislation that could arise in absence of proper coordination between these multiple bodies. We therefore support a need for

³⁹ ACCC, "Targeting scams: Report of the ACCC on scams activity 2020" (June 2021).

⁴⁰ ACSC, "Annual Cyber Treat Report, July 2019 to June 2020" (September 2020).

improved coordination between the various agencies around policy issues including those that are arising from new and emerging technologies such as in Industry 4.0. This will help to ensure that government's potential role in promoting Industry 4.0 investment and uptake is not stifled by other government activities that may inhibit it. This valuable coordinating role would also ensure consistent policy, efficient use of research/industry resources, and helping to connect industry capability.

For example, there are potentially positive activities that have arisen from the revised 2021 Digital Economy Strategy, revised 2020 Cyber Security Strategy, complementary Federal Budget announcements, and other various industry initiatives such as the I4AMF.

In terms of process, we recommend that better coordination should be undertaken between relevant Government agencies to enable for proper consultation and integration.

Regulatory barriers to Industry 4.0 investment and competitiveness

Regulation is an important area that could make or break the growth of an industry at its early stages of development. The extent to which industry is regulated associated with new and emerging technologies can act as an investment barrier and diminish our attractiveness relative to other jurisdictions. There should be careful consideration of any new forms of regulation against global best practice approaches and the extent of industry support overseas.

As suggested above, there are various initiatives that promote and provide incentives to adopt and invest in technologies, while there are other proposed regulatory reforms that have the potential to stifle investment.

For instance, there are positive initiatives such as those arising recently from the Federal Budget including the \$1.3b Modern Manufacturing Initiative, \$107.2m Supply Chain Resilience Initiative, \$52.8m Manufacturing Modernisation Fund round two, \$800m JobMaker Digital Business Plan, \$1.7b cyber security investment, and many others. There are existing initiatives that are working effectively e.g. Industry Growth Centres, Cooperative Research Centres such as the Innovative Manufacturing Cooperative Research Centre (IMCRC), and the Entrepreneurs' Programme.

But as highlighted above, there are various regulatory initiatives underway that have their own specific mandate that may inadvertently stifle innovation and investment in productivity enhancing initiatives. It is therefore important to reiterate the need for better government coordination between those activities. For instance, when agencies undertake RIS assessments, do they consider as part of their regulatory process other government initiatives aimed to promote investment such as Industry 4.0 and whether their proposal might inhibit that activity? Incorporating considerations such as these within regulatory thinking might help to implement a more balanced and productivity-considered approach towards regulation.

A possible step to address such barriers could be to assess key regulatory challenges to the uptake of Industry 4.0. This could lead to the identification of cross-cutting gaps and themes, alignment with industry use cases, and use this to assist in prioritising, coordinating and integrating Government funded research, for example, to address them (and also reducing duplicative research activity). This also leads to a wider conversation about innovation policy and providing opportunities for exploring Industry 4.0 in a safe and collaborative environment.

Other barriers to Industry 4.0 investment and competitiveness

Beyond regulation and connecting and integrating various initiatives, it is also important to appreciate other barriers that could contribute to stifling Industry 4.0 investment in Australia.

In Ai Group's 2019 Fourth Industrial Revolution Report, we highlighted the journey of some businesses, especially manufacturers, transitioning to and within Industry 4.0 (or the Fourth Industrial Revolution).⁴¹

Indeed, many SMEs are progressing Industry 4.0 strategies without using this label. Instead, their primary objectives are to implement new approaches to enable them to manage their operations, become more energy efficient, improve productivity, lower costs or meet new demands from customers. On the other hand, others are not yet adopting Industry 4.0 building blocks under any label.

As expected, such steps are often neither perfect nor easy and present successes along with their own practical challenges. The following were some anecdotal feedback that we have come across with respect to Industry 4.0:

- Changing organisational mindsets: getting the organisation to appreciate the impact of digitalisation; and overcoming fear of failure.
- Leadership: technology helps leaders focus on leading yet also highlights where they do not; need for people managers and critical thinkers, not traditional process leaders; and capability required in change management.
- Justifying expenditure: Some businesses with digitalisation strategies had difficulties justifying expenditure on particular Industry 4.0 initiatives.
- Incremental success: Some businesses started small – rather than changing everything at once – to demonstrate success and sought approval afterwards.
- Trusting and adapting to technology: getting traditional workers to trust data more than their experience and intuition; getting people used to AI and chatbots; need for a technology adaptive culture; and a dilemma for some companies is whether it is easier to hire a new generation of workers with new skills or retrain a senior workforce that may be resistant to change.
- Perceptions: no matter how much businesses were doing and how big they were, they all thought they were beginners on Industry 4.0; and for some manufacturers, difficulty in attracting people to work in manufacturing was more of a challenge than skill shortages – while concepts like gamification might make jobs more interesting, many factory processes were still largely predigital and the work itself not as easily attractive.
- Data use: lots of data were being collected already but some businesses were not sure what to do with it all; finding the right people to turn the collected data into insights; people have technical ability but not the mindset to maximise the use of data; and uncertainty as to who controls or owns the data.
- Interoperability issues: system integration was a challenge; and middleware was used to overcome different standards and proprietary systems.
- Supplier capability: a major constraint was matching suppliers with the capability required by the company; and if digitalisation enables companies to increase just-in-time production, especially globally, a model will be required for addressing delays in physical delivery.
- Digital innovation: one company wrote its own software because it saw it as a business opportunity; and another company used digital collaboration along its supply chain to allow for global problem solving and live design.

⁴¹ Ai Group, "The Fourth Industrial Revolution: Australian businesses in transition" (August 2019), Link: https://cdn.aigroup.com.au/Reports/2019/AiGroup_Fourth_Industrial_Revolution_Report.pdf.

And more generally with respect to digital technologies, anecdotal feedback from businesses (particularly SMEs) over the last several years have offered reasons for barriers to digital technology uptake, including:

- Not knowing where to start
- The speed of change makes it hard to keep up and adapt, even for innovative companies
- Wanting to understand what others are doing to determine the industry benchmark
- Not having the time to assess digital technologies to know what is relevant to them and what the benefits may be
- While there may be interest from businesses in digital technologies, development and implementation of a business case is the real challenge. (This may also be partly due to the lack of skills, knowledge or capability within the organisation).

And now anecdotal reports suggest that businesses who already have digital transformation projects underway have reprioritised and accelerated their projects to respond to the immediate impact of COVID-19, driven by social distancing and quarantine safety measures. But the gap between Industry 4.0 leaders and other businesses could be substantial – and this current pandemic has the potential to swing that pendulum either way.

There are potentially various ways that this can be addressed. We have suggested better integration and connectedness between government initiatives that promote Industry 4.0 investment. There are also other additional ways which we discuss throughout this submission.

About Australian Industry Group

The Australian Industry Group (Ai Group®) is a peak employer organisation representing traditional, innovative and emerging industry sectors. We are a truly national organisation which has been supporting businesses across Australia for more than 140 years.

Ai Group is genuinely representative of Australian industry. Together with partner organisations we represent the interests of more than 60,000 businesses employing more than 1 million staff. Our members are small and large businesses in sectors including manufacturing, construction, engineering, transport & logistics, labour hire, mining services, the defence industry, civil airlines and ICT.

Our vision is for a thriving industry and a prosperous community. We offer our membership strong advocacy and an effective voice at all levels of government underpinned by our respected position of policy leadership and political non-partisanship.

With more than 250 staff and networks of relationships that extend beyond borders (domestic and international) we have the resources and the expertise to meet the changing needs of our membership. We provide the practical information, advice and assistance you need to run your business. Our deep experience of industrial relations and workplace law positions Ai Group as Australia's leading industrial advocate.

We listen and we support our members in facing their challenges by remaining at the cutting edge of policy debate and legislative change. We provide solution-driven advice to address business opportunities and risks.

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