

Manufacturing Industry Reference Committees

The Australian Industry and Skills Committee (AISC) commissioned the [Future Skills and Training Resource](#) to provide a summary of data on current and future Australian and international megatrends and support Industry Reference Committees (IRCs) develop their Industry Skills Forecasts and Proposed Schedules of Work.

Future Skills Workshop Outcomes

The following trends and considerations are based on workshop discussions held with each of the following Manufacturing IRCs over the past year: Aerospace; Manufacturing and Engineering, Furnishing; Process Manufacturing, Recreational Vehicle and Laboratory; Sustainability; and Textiles, Clothing and Footwear.

The Future Skills and Training Resource gathered and analysed data on Australian and international skills trends to build an understanding of the potential impacts on Australia's workforce in the future, with particular emphasis on the implications for the Vocational Education and Training (VET) sector. These have been grouped under the following five categories: Business and Economics, Political and Institutional, Resources and Environment, Society and Culture, and Technology.

This document provides an overview of the trends currently impacting the Manufacturing industry as well as the ranking of key generic skills identified by the Manufacturing IRCs.

Business and Economics

The key trends are:

Empowered Customers

Consumer expectations have changed as society becomes more self-aware and customers become more informed and empowered.

Manufacturing businesses respond to many changes that are based on behavioural economics and psychology. As the Sustainability IRC commented, consumer demands and improved economic outcomes have now overtaken regulation as the key drivers of change in sustainable practices, along with a trend towards expenditure in ethical investments.

Customers are also showing less brand loyalty as they are now driven by high speed competition, which is evident in the Aerospace industry, where airlines feel constant pressure from consumers demanding lower airfares. Customer behaviour also drives the entire Furnishing supply chain as consumers gain more detailed product knowledge, and hence, are more discerning with their spending.

Consumers seeking serviceability are demanding a more hands-on approach with regard to designing their clothes and accessing end-to-end ability to repair and alter. There are also signs of a shift in consumer behaviour from owning to renting outfits in the Textiles industry.

Skills Mismatch

The impact of skills mismatch is greater in the broader Australian manufacturing sector than it is globally. However, as noted by the IRCs, the impact varies from industry to industry within the sector.

In the Aerospace industry, there is a mismatch between expectations of new workforce entrants, the maintenance of ageing aircraft and the use of old tooling and traditional hand skills, and work practices. The Furnishing industry has also been greatly affected as automation takes over process work. At the same time, this change has resulted in an increase in the higher-level trade skills required to operate more sophisticated equipment, like computer numerical control, maintain equipment and undertake diagnostics, fault finding and problem solving.

In all industries, IRCs agreed that skills mismatch and workforce vulnerability are also impacted by economic cycles. Boom periods see a focus on output, which often result in a narrowing of workforce skills. In contrast, bust periods require a more productive workforce with a broader range of skills, but this comes with a lack of opportunities to undertake training.

Changing Workplace Dynamics

IRCs discussed an emerging trend in Process Manufacturing with teams becoming increasingly fluid in terms of sizes, interactions and tasks. The relational aspect of working together will matter more than its technical aspects. In the manufacturing environment, a tension exists between the drive toward innovation and the need for standardisation. IRCs anticipate that 'structured flexibility' will become prevalent in the industry.

The Aerospace IRC commented that it has seen some sectors of the industry and employers taking less responsibility in ensuring career pathways exist for industry entrants, with their focus being on 'just in time' training for key skills that meet compliance requirements.

The changing workplace dynamics is expected to impact the Textiles, Clothing and Footwear industry over the next ten years. The IRC discussed the need for workers to start up their own business due to limited opportunities to work elsewhere. But these businesses also face other challenges, such as difficulty in securing capital as corporate investors are risk-averse about financing new, niche markets or trialling different production models.

Other Trends

IRCs also considered that access to high speed internet is an important requirement for every business, particularly as workforces are increasingly spread across different geographical locations.

Emerging markets were a focus of the Aerospace IRC, who discussed how forecasted growth of the aviation industry in South East Asia is expected to impact the Australian industry as the demand for skilled workers in the region outstrips training capacity.

While Australian manufacturers have a 'can do' attitude and are innovators, which often requires 'outside the box' solutions, this is not always supported by current systems. Hyper-competition is driving faster product development and business cycles, yet innovation is sometimes hampered by bureaucracy as well as management within organisations. Employees need to be provided with conscious opportunities to innovate, generate ideas and test designs in supportive environments.

Political and Institutional

The key trends are:

Innovation Ahead of Regulation

IRCs commented that policy sometimes hampers innovation as it is often slow to respond to changing business and industry needs. Innovation is important for industry and organisational sustainability and needs to be taught, particularly where it relates to improving a business and making it sustainable.

Innovative and creative entrants to any industry need start up thinking, as online technologies offer new entrants unprecedented opportunities to reach markets and supply chains. In regard to both manufacturing and sales, regulation is not keeping up with new design standards to address ageing and changing consumer needs.

In other industries, licensing requirements drive the skills needs and training for the industry. In Aerospace, Australian regulation and licensing requirements need to be harmonised to International Standards to enable the sector to capitalise on growth opportunities in South East Asia and to enhance global mobility of the skilled workforce. The Textiles industry also needs to strengthen self-regulation and promotion of good practice in some areas and sectors with inconsistent licensing requirements, for example, the installation of textile structures which include sails or shades.

Political Appetite for Reform

The changing nature of the manufacturing industry from large conglomerates to niche providers means that the industry needs government support and stability. The breadth of government policies and the volume of policy changes lead to uncertainty, and frequent changes in governments impact the implementation of reform agendas that are important for industry sustainability.

Governments also need to ensure funding for training is funnelled into the right skill areas for workers to access, particularly to meet regulatory requirements. Small-medium sized enterprises (SMEs) across the sector are an example of a group which would benefit, from targeted funding arrangements as SME engagement with workforce development and training remains a challenge due to market pressures.

Other Trends

The lack of agility of the VET system also has an impact on industry. IRCs noted that the delays for RTOs to get updated qualifications on scope is affecting industry's ability to innovate. This has led to an increasing amount of non-accredited training being delivered to meet employers' needs for 'just in time training', which may result in less portability of skills. With society and industry focussing more on industry value chains and lifecycles, and alignment of training with new/expanding industries, there is greater demand for Skill Sets.

Resources and Environment

Many industries are reliant on their access to resources to maintain their economic growth. The key trends are:

International Sustainability Action

The IRCs recognised that international regulations are emerging as a key driver of change with Australia looking to harmonise to international standards, such as those around emission targets. Sustainability standards and legislation changes occurring in the EU will increasingly impact upon Australian businesses contributing to global supply chains, such as those in the Textiles and Furnishing industries. An increased focus on sustainability is driving innovation in product design and development, as well as being a focus on continuous improvement of processes and practices to improve efficiency and productivity.

Matters relating to sustainability have a significant impact across the industry and operational environment. The Aerospace IRC noted that one industry consideration is the disposal of airline componentry like carbon fibre casings, which can have negative environmental impacts if not discarded correctly. Industry is looking at ethical supply chains and responding to modern slavery practices ahead of anticipated international legislative frameworks. More generally, resources are more widely understood and accepted as finite, and challenges faced by industry are related to disposal of process waste, cost of energy use and access to ICT-related infrastructure. Younger generations are more concerned about environmental issues, which has led business and society to give more value to sustainability. Changes in sustainable practice, however, are more likely to be adopted when evidence of financial viability is provided.

Access to Quality Internet

IRCs have noted that the need to access high speed, reliable internet is essential for many industries, for the purposes of online collaboration, real time ordering and online tracking of orders through the supply chain, especially as more customer service and training is delivered online. There is also an expectation that data relating to sustainability targets is made available in real time for reporting, and this relies on country-wide high-speed, quality internet access.

Financial Viability

IRCs discussed how all industries are sensitive to rising operational costs. While impacted by access to resources and their cost, the key challenge for businesses in the industry sectors is to remain financially viable to stay competitive and continue to employ and train people. Rising operational costs affect the ability for SMEs (which dominate some industry sectors) to innovate and adopt new practices and technologies.

There is a trend of funding only full qualifications, which is a barrier to industry as some workers may only require upskilling in key areas. With the rising cost of delivery and thin markets, there have been increased opportunities to use simulation for training delivery, however it requires a costly initial investment by Registered Training Organisations (RTOs).

Other Trends

As ethical sourcing of new materials and legislative requirements slowly takes hold, there is an increased requirement for 'Chain of Custody' documentation. Some industry sectors perceive the required changes in business processes in order to meet ethical sourcing requirements as a potential challenge. Other companies are implementing 'Cradle to Cradle' principles when designing new products, and it is anticipated that this will become more prevalent in Australian-based businesses with the example set by international markets. European manufacturers, for example, are required to demonstrate how they meet this principle before products can be taken to market.

Government, industry and employers often underestimate the impact of changes in weather patterns on jobs. Climatic weather shifts provide opportunities for the Textiles industry as textiles are often used in response to adverse events, such as cleaning up oil spills, creating new materials which will not be damaged in weather events, as well as for emergency housing or tents.

Society and Culture

The key trends are:

Changing Work and Career Values

IRCs highlighted that new entrants to the Manufacturing industry often have varying career expectations with respect to long term tenure, and they no longer expect to see out their career with a single organisation. New entrants, particularly from other industries, can also bring a different range of practical knowledge with them.

Changing attitudes mean workers have the flexibility to undertake roles which interest them. Employers can also benefit from the broader perspectives gained from employees' experience in other areas. However, if workplace changes are imposed on workers, the benefits for individuals are not always positive.

In some sectors, younger industry entrants have different work expectations and seek different learning approaches, including the use of mobile technology as a learning tool. The uptake of new skills is related to a person's willingness to undertake training and where they see the benefits for their careers at a particular point in time. Some employers are becoming less willing to invest in training as they believe their employees will not remain long enough to get a return on investment. Many new industry entrants are self-taught and undertake sporadic skills development through accessing bites of training as needed via online or short courses (both accredited and unaccredited).

IRCs agreed that careers advice on different sectors within the Manufacturing industry needs to be improved as some advisors perceive it as a 'declining' industry with limited future work opportunities, although at the same time, younger, tech-savvy generations continue to want to design, make, buy, use and sell manufactured products.

Ageing Population

The Manufacturing industry's current workforce is ageing, and this has an urgent and critical impact on training investment as well as attracting new, younger entrants into the industry.

Many industries' skills and knowledge are embedded in workers now in their 60s and 70s, and their expertise and specific technical skill sets and knowledge may disappear. Some ageing business owners may be constrained as they do not have successors and will ultimately need to close their businesses. In some sectors, people are leaving earlier due to the physical demands, creating a gap in the workforce as their extensive skills and knowledge leaves with them.

In some sectors, people are remaining in the workforce longer and need to be able to adapt to increasing use of new technologies in the workplace. For example, aspects of the Aerospace industry's multigenerational workforce also pose challenges to ways of working, communication and learning within the industry.

From a public perspective, the ageing population has an impact on business, economic and design considerations with the need to ensure products cater to the growing market of older consumers.

Global Mobility

Social mobility, fuelled by social media, is having a significant impact on the industry, particularly on how people learn, and on their career and work choices.

IRCs are seeing many industries affected by higher level skills and industry knowledge leaving Australia to follow industry jobs moving offshore; the Aerospace IRC has noted that its industry has been particularly affected by this trend. Australian expertise is highly sought after, which results in experienced aircraft maintenance engineers leaving for lucrative overseas roles that offer higher remuneration and lifestyle benefits. Lower level, technical skills are required and increasingly filled by migrants, which poses language, literacy and numeracy challenges to workplaces.

Mobility obstacles are also present within Australia. Across the Manufacturing sectors, facilities are also primarily located in urban centres, meaning regional workers find it difficult to secure work without relocating.

IRCs reported that many organisations look to employ workers on short term visas as an avenue to attract new entrants. This will be further compounded by recent changes to 457 visa arrangements, which no longer assist employers seeking experienced overseas workers to fill labour gaps in Australia.

Other Trends

Equal gender representation is another trend that IRCs discussed, and discovered that although women are not well represented in the majority of sectors of the industry (as evidenced by low participation rates as apprentices), the design and sales sectors of the industry do have a high proportion of women.

IRCs also noted that more of the younger generations are working for themselves. However, this can in turn lead to workforce vulnerability, leaving fewer opportunities for workers to become skilled.

Technology

Technology has become a major factor and necessary skill across the Manufacturing industry. The key trends are:

Artificial Intelligence, Augmented/Virtual Reality, Machine Learning

IRCs have noted that global trends around automation, robotics, sensors, data analytics, advanced materials, additive manufacturing and augmented and virtual reality are impacting on the ways in which work is conducted, as well as providing new business opportunities and increased efficiency and productivity for businesses.

The Textiles and Furnishing industries are embracing new technologies with virtual stores and showrooms. Some local designers are using holograms to showcase their design on international catwalks, and the introduction of 3D printing reduces the need for labour in some instances. In both industries, smaller operators often find it cost-prohibitive to automate and digitise, and so, they are unable to keep up with larger businesses. The industry could see onshoring of some production as labour inputs are reduced in favour of robots. The impact of increasing levels of automation and digitisation is also likely to further drive the demand for up-skilling and re-skilling, as well as for new skills that enable people to work effectively alongside machines.

In Process Manufacturing, AI technologies are an established trend and have been implemented across the sectors in various ways. However, there is a significant challenge for policy and regulation to keep up with the pace of change and implementation. IRCs noted the industry also needs to become better at promoting the employment and skilling opportunities of technology adoption, such as in the Aerospace industry, where the Defence sector has already implemented augmentation and virtual reality qualifications which are aligned to Certificate IV level.

Cross Disciplinary Science

IRCs have noticed an emerging trend that requires people and teams to have a functional knowledge across a number of disciplines. In Textiles, workers now need to understand mathematics, provenance, quality management, due diligence, fabric type, and customer fit to participate in the industry. The increased adoption of new technologies is also driving a need for new combinations of skills, such as the combination of mechanical and electronic skills, particularly in the areas of maintenance and diagnostics, as well as in the field of mechatronics, such as in Engineering and Aerospace. In the Furnishing industry, increasing digitisation has resulted in a focus on digital literacy, as well as generic skills such as critical thinking, research and problem solving as there is a need for a workforce that is aware of what technology exists and has a preparedness to recognise any equipment issues that arise.

IRCs have noticed that industry and sectoral boundaries are becoming blurred. An example is 'where does farming end and manufacturing begin?' Science and economic skills are increasingly needing to be combined, and the bespoke approach to producing goods and services is also becoming repeatable with material and technological advances.

Other Trends

Mobile connectivity and the increased use of cloud-based services is largely determined by customers' access to high speed data networks, which is impacted by distance and distribution. Some uncertainty exists about data security and general privacy, as IRCs reported that the industry is seeing an increased use of Unmanned Aerial Vehicles, as well as integrated systems. They have also noted that digitisation and big data are providing the basis for improved monitoring and reporting (increasingly in real time), which in turn, is driving improvements in sustainable practices. There is also an increased use of tablets and devices to complete work such as scheduling, reporting, diagnosis and sign-off on maintenance.

Manufacturing Key Generic Skills

In developing their Industry Skills Forecasts and Proposed Schedules of Work Manufacturing IRC members ranked the importance of key generic workforce skills as indicated in the table below.

Manufacturing IRCs Key Generic Skills

- 1 Design mindset/Thinking critically/Systems thinking/Solving problems skills
- 2 Technology use and application skills
- 3 Learning agility/Information literacy/Intellectual autonomy and self-management skills
- 4 Communication/Collaboration including virtual collaboration/Social intelligence skills
- 5 Science, Technology, Engineering and Mathematics (STEM) skills
- 6 Language, Literacy and Numeracy (LLN) skills
- 7 Data analysis skills
- 8 Managerial/Leadership skills
- 9 Customer service/Marketing skills
- 10 Environmental and Sustainability skills
- 11 Entrepreneurial skills
- 12 Financial skills

Reflecting on the impact of technological change across the sector, manufacturing IRCs prioritised the need for design thinking, creativity, systems thinking, problem solving and skills related to maximising the use of new technology.

Underpinning skills to adapt to a changing industry, work environment and practices such as communication, collaboration social intelligence and STEM were highlighted as important. IRC members noted that higher-level communication skills were needed to adapt to the increasing use of automation and robotics.

IRC members also observed that although there was an expectation that learners already possess the necessary LLN and STEM skills when enrolling in qualifications, this is often not the case. Industry consultations also indicated that a greater focus is needed on the development of underpinning generic skills amongst learners in the manufacturing industry.

Changing business models are also impacting the skills needed by organisations to lead and manage change. Many IRC members acknowledged the importance of Environmental and Sustainability skills but felt that due to the prevalence of SMEs in the sector the core skills to run, promote and meet customer needs ranked more highly.

The Future Skills and Training Resource presents key skills trends grouped under five categories: Business and Economics, Political and Institutional, Resources and Environment, Society and Culture, and Technology. The value of discussing these key trends in a structured way enabled the Manufacturing IRCs to consider the skilling implications for their particular sectors and for Australia's workforce.

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