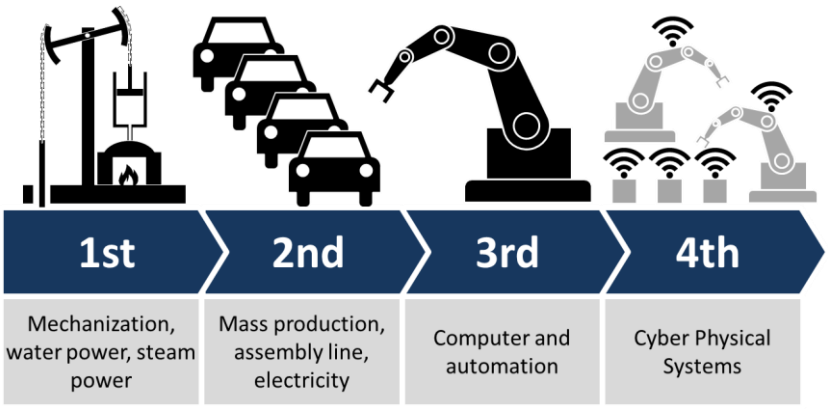
2.1 Emergence of the importance of Industry 4.0

The term Industry 4.0 originates from Germany, when a project to digitalise manufacturing was launched under the name 'Industrie 4.0' at the Hannover trade fair in 2011. The term derives from the assertion that it represents the fourth industrial revolution, coming after the mechanisation made possible by steam power; the mass production made possible by electrification; and the development of automated production that followed the rise of computers and electronics.



The world of the fourth industrial revolution includes automation, machine learning and networked cognition where technologies link the physical, digital and biological spheres.[1] The term Industry 4.0 encompasses the digitalisation of production processes based on devices autonomously communicating with each other along a value chain.

Automation, sensors, cloud computing, the internet of things, big data analytics and machine-to-machine communications are the tools of Industry 4.0, driving new business opportunities through integration with a global supply chain. Industry 4.0 technologies make it possible to gather and analyse data across machines enabling faster, more flexible, and more efficient processes to produce higher quality goods at reduced costs.

In effect, Industry 4.0 is the bringing together of all of these technologies. "Industry 4.0 is a state in which manufacturing systems and the objects they create are not simply connected, drawing physical information into the digital realm, but also communicate, analyse, and use that information to drive further intelligent action back in the physical world to execute a physical-to-digital-to-physical transition."[2]

[1] In the fourth industrial revolution we need an education overhaul, The Australian, March 14, 2018.
[2] Deloitte Consulting LLP, 2016, Industry 4.0 and manufacturing ecosystems

A reflection of the importance of this area is the creation of the Prime Minister's Industry 4.0 Taskforce in November 2015 following the release of the report of the Australia-Germany Advisory Group. Mr Jeff Connolly, CEO of Siemens Australia and New Zealand, was appointed the first chair of this group. In April 2017 the Taskforce signed a cooperation agreement with *Plattform Industrie 4.0* to share information between the two countries. This involves working across five work streams including reference architectures, standards and norms; research and innovation; security of networked systems; work, education and training; and test laboratories.[3]

Left to right: Patricia White, Engineers Australia, Henning Banthien, Plattform Industrie 4.0 Secretary General; Brigitte Zypries; HE, Lynette Wood, Australian Ambassador to Germany; Jeff Connolly, Chair of the Prime Minister's Industry 4.0 Taskforce; Gavin Smith, President of Robert Bosch (Australia) Pty. Ltd

In Germany, there are three Industry 4.0 initiatives all working to complement one another.

- **Plattform Industrie 4.0** is a German strategic initiative, defining the cyberphysical systems that will revolutionise manufacturing industries.
- **Labs Network Industrie 4.0** supports German industry in testing the practical use of Industry 4.0, described as a "one-stop shop for the coordination of different Industry 4.0 approaches".
- The **Standardization Council Industrie 4.0** provides access for companies to standardisation bodies on Industry 4.0.[4]

Recent research has indicated that Australian executives conceptually understand the changes that Industry 4.0 will cause but they are less certain about how to act to derive benefit from these changes. Executives understand they need to invest in technology but they have a hard time making the business case to fully address Industry 4.0 opportunities, because of a lack of internal strategic alignment and short-term focus.[5]

Industry 4.0 requires a level of digital skills from all participants. All workers will need to acquire generic digital skills to be able to use technologies in their daily work (e.g. access information online

[3] https://industry.gov.au/industry/Industry-4-0/Pages/PMs-Industry-4-0-taskforce.aspx
[4] Swinburne University of Technology, 2017, Industry 4.0 Testlabs in Australia: Preparing for the Future
[5] https://which-50.com/australian-execs-unprepared-industry-4-0-changes/

or use software). At another level, many workers will need specialist skills to program, develop applications and manage networks. Many workers will also need complementary skills, including the capability to process complex information, communicate with co-workers and clients, solve problems, plan in advance and adjust quickly. Significantly higher demands are placed on all members of the workforce in terms of managing complexity and higher levels of abstraction and problem solving .[6]

Given that the skills gap tends to be larger for people in low-skill occupations than for those in middle- and high-skill occupations, it is especially important to ensure that adults with weak literacy, numeracy and digital skills can easily take up opportunities to improve their skills so that they too can participate fully in society and share in the benefits that ICTs and other technologies can bring to all of society.[7]

[6] OECD, 2017, Key Issues for Digital Transformation in the G20, G20 German Presidency/ OECD, <https://www.oecd.org/g20/key-issues-for-digital-transformation-in-the-g20.pdf

[7] ibid