

JOB TRANSFORMATION, SKILLS AND EDUCATION FOR I4.0 AND BEYOND

University or Indusversity

Industry 4.0¹ brings new technology, innovative everyday practices, and a dramatic repositioning of the global workforce⁽¹⁾. Automation and digitisation are transforming workplaces and traditional job roles and dramatically reshaping the demand for certain skills.

JOB TRANSFORMATION

In 2020, The World Economic Forum predicted *“work to be divided equally among humans and machines by 2025, with machines carrying much of the heavy lifting with respect to data processing, administrative tasks and routine manual jobs”*⁽²⁾.

This public fear of automation-related displacement enforces the need to upskill and reskill for new jobs. Statistics⁽²⁻⁴⁾ have shown the potential impact of I4.0 on jobs globally and in Australia (see Figure 1).

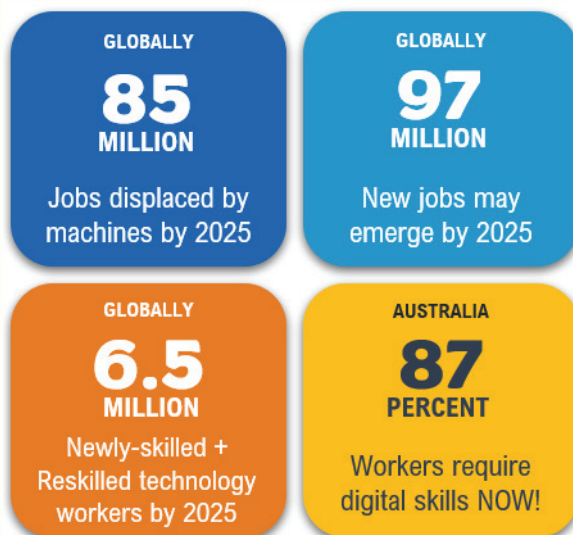


Figure 1. The impact of automation on jobs⁽²⁻⁴⁾.

“The impact of emerging technologies on the workforce will occur in two key ways: automation, where technology will replace the need for some tasks to be done by humans, will occur at the same time as augmentation, where technology will work alongside humans to support traditional roles.”

—KPMG, Future Employment Study 2020⁽¹³⁾.

Key findings across each of the four industry sectors in the Mackay-Isaac-Whitsunday Region shows the impact that automation is expected to have in terms of Full-Time Equivalent (FTE) staff.

It also shows the demand for new Information and Communications Technology (ICT) related roles to support the adoption, implementation, and maintenance of these technologies (see Figure 2).

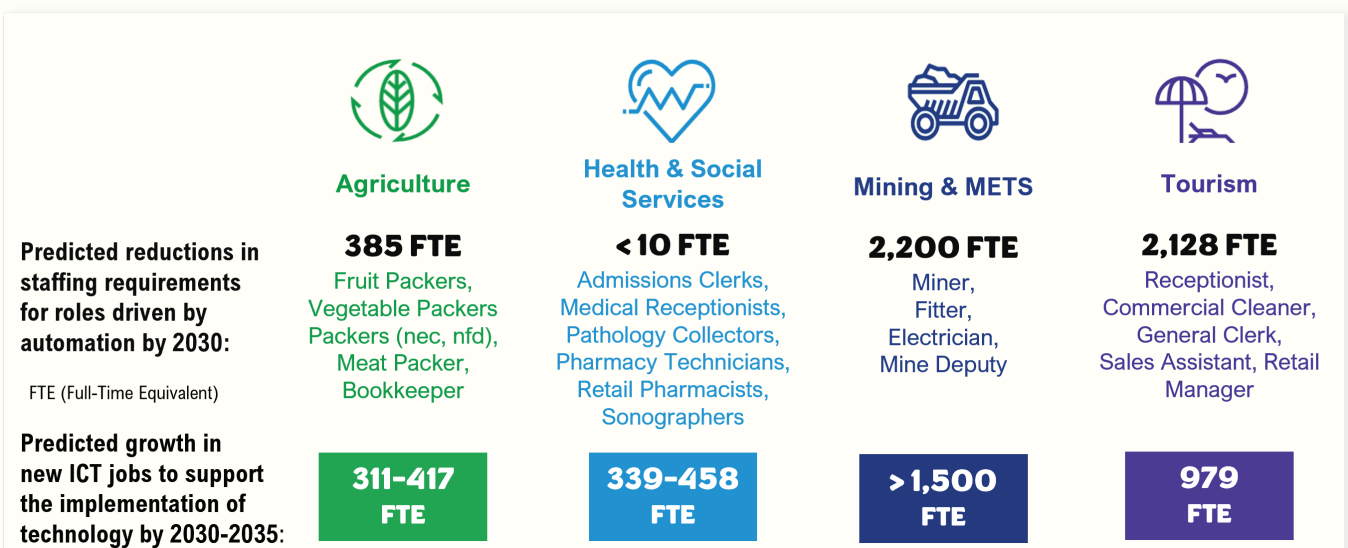


Figure 2. Predicted reductions and growth in the future workforce of the Mackay-Isaac-Whitsunday Region⁽⁵⁾.

Given the anticipated increase in the range of knowledge and skills with which workers would need to be equipped to adapt to remain relevant, productive and employable, education and training solutions should allow for the expanded scope of tasks in existing jobs.

SKILLS

Research and industry consultation suggests that besides developing technical skills and knowledge relevant to technological advancements, like artificial intelligence, virtual reality and cloud computing, it is equally important to enhance the development of soft skills.

These skills are essential for workers to fulfill their human potential in a machine-augmented future, to be flexible and to cope with the rapid changes in the workplace as a result of disruptive technologies^(6,7).

Core skills, as identified by the Mackay Regional Jobs Committee in the Greater Whitsunday Roadmap⁽⁸⁾, are the skills that will be required across broad-reaching workforces and essentially need to form the foundation of education and training programs for both new entrants and transitional workforces.



Figure 3. Core skills for an Industry 4.0 workforce⁹.

EDUCATION

During the 20th century, learners in formal education were treated as large amorphous segments, whereas we now need education and training that is more personalised and give people access to the right education and training to suit their individual needs and context⁽¹⁰⁾ (see Figure 4).

New accessible teaching methods and learning assistance systems form part of the education and training solutions. It calls for the development of standards for the recognition of non-formal and informal education to ensure that individuals' training potential is recognised as well as the development of digital learning techniques and the use of digital media and innovative educational technologies relevant to knowledge transfer and skills acquisition⁽¹³⁾.

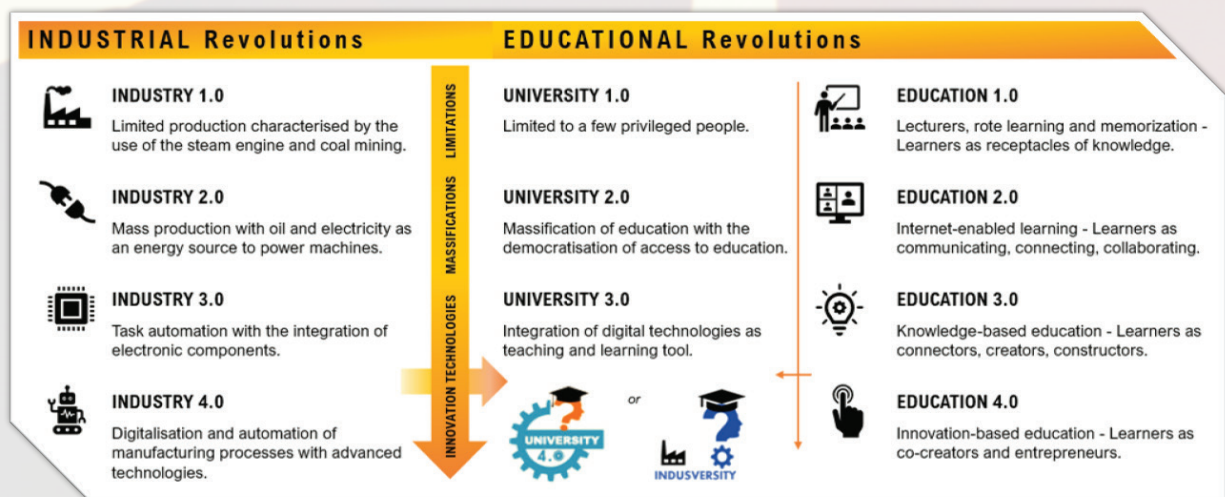


Figure 4. The revolution of education and universities through the industrial revolutions^(11,12).

The core skills include those identified as technical and digital skills, while the methodological and social skills, identified as enterprise and soft skills, support long-term job success (see Figure 3).

A 2021 study mapping education and training available for regional communities have shown that the core skills are being offered, but are scattered throughout qualifications with not sufficient focus on building the skills in demand and with no clearly established pathways towards skilling and upskilling for an Industry 4.0 workforce⁽⁹⁾.

With the rapid pace of technological changes and the potential impact on jobs, graduates may complete their formal education with skills that are no longer relevant to employers.

Considering factors such as the duration to complete qualifications, prerequisites, entry-requirements, funding of programs, training and development of accredited trainers, and the multi-year national consultation process to accredit any changes to educational programs^(6,9), it is an obvious challenge for education providers and regulators to address.

Given those at the highest risk of displacement are working adults, including women and underserved minorities, who balance caregiving, paying their bills and minding their personal and mental health^(14,15), a traditional higher education degree may not be an appropriate vehicle to accomplish career progression and professional goals.

Quality, non-degree credential programmes can overcome the hurdles mentioned above and play an important role in supporting workers' transitioning into the new fields of work by allowing people of all ages to access a curriculum that would prepare them for the jobs of tomorrow.

These programmes should simultaneously foster curiosity and creativity that will inspire workers to remain engaged in lifelong learning, and the interpersonal and global citizenship skills to be ready for a world of collaboration and connection^(16,17).

Jyotishi⁽¹⁷⁾ recommended five criteria for identifying quality non-degree programs.

This includes the development of programs that (1) leads directly to an in-demand, high-quality job that provides at least the local living wage; (2) leads to life-long learning by providing the students with credit that can count towards a future advanced credential or degree; (3) is affordable, resulting in a reasonable average student debt load and accompanied with financial aid eligibility; (4) has a respectable completion and pass rate for licensure or certification exams where applicable; and (5) attracts students that demographically resemble or include more underrepresented groups compared to the region's population.

Education is at the center of the skills supply. Yet, too often, Higher Education providers are reluctant to accept that now is the time to embrace innovation and craft a digital solution that will change the face of education. Universities can thrive in this new industrial landscape, but only if they have the vision to reimagine their approach to digital.

Although there is no question about the extent, urgency and universal nature of the future skills challenge, it also offers an opportunity to establish long-term, sustainable, equitable and inclusive growth for the education sector as well as the global workforce⁽¹⁰⁾.

With the type of skills required by organisations changing, it profoundly impacts an individual's career path. It requires the need for individuals to develop processes of learning new skills (reskilling) to enable them to do a different job or train people to do a job differently^(10,13,16,19). It further requires individual workforce transitioning plans *"which identify the existing skills gaps against the career goal and the cross-industry skilling and development pathways to address these gaps"*⁽⁸⁾.

Through engaging in dialogue with industries, education providers can ensure that the requirements of the digital economy are reflected in training provisions. There should be improved mobility and pathways between vocational and higher education and between the different training and continuous professional development programmes and systems. There should be recognition of skills that are still relevant in the workplace despite not being connected to an employee's specialist area^(6,16,17).

“Higher education plays a vital role in this new landscape, tasked with preparing the next generation to enter the industrial world. But how should universities fulfill the needs of students and employers when change is the new norm?” ⁽¹⁾

OPINION

The technology-driven labour market change, accelerated by the COVID-19 pandemic, not only created disruption but also created new opportunities for online learning, redeployment and reemployment^(10,16,19).

Existing and future workforces need to align their professional and career pathways to a future where the world of work will increasingly be shaped by digitalisation, automation and artificial intelligence.

It necessitates a new mindset of continual development and lifelong learning to reskill the current workforce.

It requires closer integration, collaboration and training partnerships between organisations and education and training providers, supported by the government and society, to equip people to meet the employment challenges of the Industry 4.0 and beyond.

With this in mind

- Have we (really) thought about the implications for education and skills provisioning in the face of the unfolding Industry 4.0?
- What changes should education institutions make to address the education and skills required to support industry's adoption and implementation of new technology?
- How can education be transformed to be more responsive and flexible in addressing constantly changing current- and future workforce requirements?

“Moving from University to Indusversity will require deep and pervasive engagement and collaboration and a willingness to evolve.”

— Chair in Automation and Future Work Skills, CQUniversity.

REFERENCES

- 1 Johnson P, Crowther S. 2020. Education 4.0 White Paper. The Impact of the 4th Industrial Revolution on Higher Education's Role in Society. <https://www.ctidigital.com/events/education-4-whitepaper>.
- 2 World Economic Forum. 2020. The Future of Jobs Report 2020. <https://www.weforum.org/reports/the-future-of-jobs-report-2020#report-nav>.
- 3 Deloitte Access Economics. 2021. ACS Australia's Digital Pulse. Future directions for Australia's Technology workforce. <https://www2.deloitte.com/au/en/pages/economics/articles/australias-digital-pulse.html>.
- 4 AlphaBeta. 2021. Unlocking APAC's Digital Potential: Changing Digital Skill Needs and Policy Approaches. <https://access.awscloud.com/i/1354318-awsps-apac-digital-skills-research-report-en-mar-2021/0?>
- 5 KPMG. 2020. Future Employment Study. 2020. <https://static1.squarespace.com/static/5e4ce5c91e5a64752b65c169/t/5f72e20a6c7b762662a5b6fe/1601364627102/Future+Employment+Study+-28+Sept+FINAL.pdf>.
- 6 Seet P, Jones J, Spoehr J, Hordacre A. 2018. The fourth industrial revolution: the implications of technological disruption for Australian VET. <https://ro.ecu.edu.au/ecuworkspost2013/4821>.
- 7 Thurston M, Hayes L. 2021. Will the 5th Industrial Revolution be the next Renaissance? <https://www.aurecongroup.com/blog/posts/5th-industrial-revolution-next-renaissance>.
- 8 GWA. 2021. Greater Whitsunday Future Skills Roadmap. https://static1.squarespace.com/static/5e4ce5c91e5a64752b65c169/t/6011f81d0f7b8726d5b05e69/1611790399867/GW3_Future+Skills+Roadmap+Publication+%5BFinal%5D.pdf.
- 9 Viljoen JP, Viljoen R. 2021. Industry 4.0 Education Framework and Training Offerings Matrix for the Greater Whitsundays Region. https://www.cqu.edu.au/_data/assets/pdf_file/0017/251135/viljoen-iiindustry-4.0-skills-and-education-framework-october-2021.pdf.
- 10 Mehra A, Mann G, Green S. 2021. Reskilling the workforce, one person at a lifetime. <https://www.weforum.org/agenda/2021/06/reskilling-the-workforce-lifelong-learning/>.
- 11 Makrides GA. 2019. The Evolution of Education from Education 1.0 to Education 4.0: Is it an evolution or a revolution? https://www.l-cloud.eu/wp-content/uploads/2019/03/Evolution_of_Education.pdf.
- 12 Gueye M, Expósito E. 2020. University 4.0: The Industry 4.0 paradigm applied to Education. <https://hal-univ-pau.archives-ouvertes.fr/hal-02957371>.
- 13 Ivaldi S, Scaratti G, Fregnan E. 2021. Dwelling within the fourth industrial revolution: organizational learning for new competences, processes and work cultures. <https://doi.org/10.1108/JWL-07-2020-0127>.
- 14 Alexander TL, Vesselina R, Saadia Z. 2016. The future of jobs: employment, skills, and workforce strategies for the Fourth Industrial Revolution. <https://apo.org.au/node/246006>.
- 15 Davis N. 2016. What is the fourth industrial revolution? <https://www.weforum.org/agenda/2016/01/what-is-the-fourth-industrial-revolution/>.
- 16 Zahidi S, ed. 2021. Building back broader: 6 steps to a global jobs recovery plan. <https://www.weforum.org/agenda/2021/06/building-back-broader-6-steps-to-a-global-jobs-recovery-plan/>.
- 17 Jyotishi S. 2020. How teaching 'future resilient' skills can help workers adapt to automation. <https://www.weforum.org/agenda/2020/12/automation-work-non-degree-credentials>.
- 18 Haenisch S, ed. 2021. Four lessons in workforce skilling and lifelong learning. <https://www.weforum.org/agenda/2021/05/back-to-school-4-lessons-in-workforce-skilling>.
- 19 World Economic Forum. 2020. The Reskilling Revolution: Better Skills, Better Jobs, Better Education for a Billion People by 2030. <https://www.weforum.org/press/2020/01/the-reskilling-revolution-better-skills-better-jobs-better-education-for-a-billion-people-by-2030/>.



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The Chair in Automation and Future Work Skills role was established to focus on the impact of automation on regional cities and communities.

The role is funded by CQUniversity and BHP Mitsubishi Alliance (BMA) to coordinate research, outreach and engagement with relevant industries across Queensland, and to drive the development of new innovative training qualifications and courses in automation and new workplace skills beyond the mining sector, including in METS, Agriculture, SMEs and Construction.

The purpose of the partnership is to bring people and resources together to unlock and accelerate skills, training and educational outcomes for the future in their communities.

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