

GREATER WHITSUNDAY DIGITAL ROADMAP

November 2022



GW3D

GREATER WHITSUNDAY ALLIANCE
MACKAY ▶ ISAAC ▶ WHITSUNDAY



Acknowledgement of Country

The Greater Whitsunday Alliance team live and work in Mackay Isaac Whitsunday region and long before these places were known by their colonial names they were actually known as Yuwibara, Koinmerburra Barada Bana, Wiri, Birri, Ngaro, Gia, Juru, Jangga and Birriah respectively. We would like to acknowledge the traditional owners of the Greater Whitsunday region, and their continuing connection to the land, water and community. We pay our respects to Elders past, present and emerging.

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THE NEED FOR A REGIONAL DIGITAL ROADMAP

Continued digitalisation is set to define Australia and the Greater Whitsunday region's prosperity into the next decade and beyond.

Digital technology investment in Australia is expected to increase the nation's gross domestic product by between \$140 billion to \$250 billion,¹ and create demand for an additional 250,000 digital jobs, by 2025.²

Predictive analysis for the Greater Whitsunday region (the region) suggests this will result in approximately 3,000 Information and Communications Technology (ICT) and digital engineering jobs over the next decade.³

The economic and workforce growth expected from digital advancements, is resulting in competition across Australia's regions to lead digital adoption. The benefits of well-planned digital investment strategies – in terms of opportunities for businesses, investments that drive growth and the creation of local prosperity – are all abundantly clear.

Greater Whitsunday Alliance (GW3) has identified digital adoption and skilling as a key regional accelerator that will deliver enhanced employment outcomes, economic prosperity and close the region's digital divide.

Preparing the region for the next phase of digital investment

The region has a powerful economy, built on a long history of supporting traditional industry to evolve and coupled with strong technology adoption and innovation.

A continued focus on digital capability has been identified to ensure the region expands its reputation as an innovation centre, attracts priority growth sectors and creates new and exciting employment opportunities.

A digital future will require a continued focus on foundations like internet and mobile connectivity, speed, reliability and access, whilst also embracing new and emerging technologies including Artificial Intelligence (AI), drones, Internet of Things (IoT) networks, automation, edge computing digital twins and advanced robotics.

All of this can be achieved if technology investment is truly harnessed by businesses, and is supported by a dedicated focus on contemporary digital skilling at differing levels of complexity. It will also require a continued focus on the provision of accelerator support to technology innovators.

This Digital Roadmap provides practical guidance on what is required to support the region's existing and emerging sectors to evolve and embrace technology, ensuring stakeholder buy-in and commitment towards these ambitious goals.

¹Brookings, 2018. *Digital Australia: An economic and trade agenda*. Available at: [Digital Australia: An economic and trade agenda \(brookings.edu\)](#).

²Australian Government, 2021. *Digital Economy Strategy 2030*. Available at: [Digital Economy Strategy \(pmc.gov.au\)](#)

³Greater Whitsunday Alliance., KPMG., Faethm, 2020. *Future Employment Study*. Available at: [Future+Employment+Study+28+Sept+FINAL.pdf \(squarespace.com\)](#)

⁴Greater Whitsunday Alliance, 2021. *Greater Whitsunday Alliance Annual Report*



Greater Whitsunday Alliance (GW3) is driven by a genuine appetite to achieve positive outcomes for the Greater Whitsunday region, and our purpose is to drive economic growth for the region.

To support this vision, GW3 have commissioned the development of a regional Digital Roadmap to support future digital infrastructure needs and to inform strategic program investment decisions that drive growth.⁴

**Greater Whitsunday Alliance
Annual Report 2020-21**



DIGITAL VISION, AMBITIONS AND ROADMAP APPROACH

The Greater Whitsunday Region's Digital Vision

*By 2032, to be
Australia's most
hyperconnected region that
captures sustained global
investment for the benefit
of Greater Whitsunday
communities.*



The Greater Whitsunday Region's Digital Ambitions

01

Increase connectivity, speed and coverage within the region

02

Digitally skill an increased number of the region's professions and community members

03

Support improved and increased digital connection to business premises

04

Digitally enable economic opportunities through the life of the Roadmap

05

Have a regional digital competitive advantage

Roadmap approach for a digital future

Objectives

To ensure the Region is well positioned to achieve the digital vision of being the most connected region in Australia which captures sustained global investment for the benefit of its communities, this Digital Roadmap has three key objectives:

- Align to the Digital Vision and Ambitions established and endorsed by the Regional Digital Connectivity Forum (RCDF);
- Engage a suite of stakeholders from key industries and sectors, to ensure region-wide contribution, collaboration, alignment and buy-in; and
- Extend the recommendations and findings from the work previously undertaken, including the Digital Infrastructure Study and Mobile Database and Ranking Report to deliver an actionable and region-focused Roadmap that clearly articulates and guides the region's next phase of digital investment and activity.

Digital Roadmap Development

This Digital Roadmap has been developed through in-depth desktop research of leading and emerging practice - internationally, nationally and locally, and a highly collaborative approach including one-on-one consultations and workshops in the region across the latter half of 2022.

Consultation engaged a diverse network of stakeholders from various industries, local government areas (LGAs) and businesses with differing levels of digital progress and maturity. This approach acknowledged the region's specific level of 'digital divide' and ensured that areas of low maturity and understanding were identified, and existing pockets of activity and excellence in digital initiatives were harnessed in strategy development.

Workshops were held with relevant stakeholders and explored the digital adoption challenges and opportunities, emerging digital technologies tailored to the sector, and partnership approaches that would be needed to drive improvement. Each workshop provided an overview of the current state and a detailed discussion of proposed future strategies that would deliver the most value.

A sector lens for the Digital Roadmap

The Digital Roadmap's three 'Horizons' recognise that there are both common and specific digital and technology requirements for industry sectors over the coming years.

While all industry sectors will require digital connectivity and underpinning digital infrastructure, they will also require specific technologies and tailored strategies to drive improvement and efficiency in practice.

Horizon I sets out fundamental digital infrastructure and technologies that underpin activity across all industries in the region. Digital access, speed and utility needs to be world-class to ensure the region can attract new investment and support local business growth.

Horizon II covers digital technologies and needs for two key industry sectors and digital skilling. Two key priority industries were identified as a focus for Horizon 2 – agriculture and aquaculture; and mining and Mining Equipment, Technology and Services (METS). Digital skilling is recognised for its importance in harnessing the benefits of technology adoption across the region's workforce.

Horizon III recognises the role that digital will play as the region's emerging sectors continue to evolve and mature. Priority growth sectors include biomanufacturing and aviation and aerospace, and are therefore a focus of this section. Decarbonisation and diversification is also included in recognition of the growing focus from government and industries.



This Digital Roadmap was developed on three inter-related horizons that reflect variability in digital maturity, draw on sector strengths and highlight emerging opportunities.



HORIZON I: Digital Infrastructure and Foundational Technology

Enhancing the region's Digital Foundation

Enhancing **digital infrastructure and connectivity** across the region as a 'foundational technology' that underpins all industry sectors.



HORIZON II: Sector Specific Digital Technology

Accelerating Digital Progress for Priority Industries

Expanding current digital adoption and infrastructure across two key priority industries of focus: (1) **agriculture and aquaculture** and (2) **mining and METS**; and underpinned by a holistic focus on **digital skilling** of the region's workforce.



HORIZON III: Digital Technology for Priority Growth Sectors

Planning for Digital Futures in Emerging Sectors

Exploration of the growth of digital infrastructure and technologies in priority growth sectors of focus: **biomanufacturing, aviation and aerospace** and **decarbonisation and diversification**.



A practical and partnership based approach

This Digital Roadmap is focused on practical strategies to be undertaken whilst recognising that:

- A number of these digital initiatives will take time to realise. This Digital Roadmap reflects differences across industry sectors in how this needs to be realised, and reflects varying levels of digital maturity.
- To achieve these strategies and actions will require a strong partnership approach drawing on GW3's focus on collective impact across the region. Prioritisation of the strategies and programs of work within this Digital Roadmap will be required in order to drive impact and short-term successes that can lead to long-term benefits.
- The digital skilling of the workforce, including the education and training pipeline and pathways, requires significant forward planning before capabilities can be realised.

Keeping pace, evolving maturity

One of the challenges in digital strategy development is in keeping pace with the rapid advancements in technology adoption (particularly over a 10-year time horizon to achieve the region's digital vision). This means the strategies set out in this Digital Roadmap will need to evolve over time in order to reflect future digital advancements and innovations.

A further challenge is accounting for the different levels of maturity and adoption rates which will occur within industry sectors and businesses as they prioritise the technologies in which they invest. Digital adoption, maturity and capability is also grounded across socio-cultural groups so this means a multi-faceted approach that acknowledges differences in change adoption is key to overall progress at a regional level.

Supporting the Roadmap

Existing digital research and reports

- Greater Whitsunday Digital Infrastructure Study
- Mobile Blackspot Database and Ranking Report
- GW3 Future Employment Study
- Greater Whitsunday Future Skills Roadmap
- RDA Regional Development Map (Greater Whitsunday)

Digital partners and collaborators

- Greater Whitsunday Regional Digital Connectivity Forum (RDCF)
- Resources Centre of Excellence (RCOE)
- Greater Whitsunday Biofutures Leaders Group
- Greater Whitsunday Agribusiness Futures Alliance
- Greater Whitsunday AgTech Hub
- Regional Development Australia – Greater Whitsunday
- Mackay Regional Jobs Committee



Horizon I

Digital Infrastructure and Foundational technology

Enhancing the region's Digital Foundations.

Enhancing **digital infrastructure and connectivity** across the region as a 'foundational technology' that underpins all industry sectors.



Horizon II

Sector-Specific Digital Technology

Accelerating Digital Progress for Priority Industries

Expanding current digital adoption and infrastructure in: (1) **agriculture and aquaculture**, 2) **mining and METS** and underpinned by an holistic focus on 3) **Digital Skilling** of the region's workforce.



Horizon III

Digital Technology for Priority Growth Sectors

Planning for Digital Futures in Emerging Sectors

Exploration of the growth of digital infrastructure and technologies in emerging sectors of focus: **biomanufacturing, Aviation and Aerospace** and **Decarbonisation and Diversification**.

By 2030, to be Australia's most hyperconnected region that captures sustained global investment for the benefit of Greater Whitsunday communities.

Digital Ambitions

- 01 Increase telecommunication speed, connectivity and coverage within the region
- 02 Digitally skill an increased number of the region's professions and community members
- 03 Support improved and increased digital connection to business premises
- 04 Digitally enable economic opportunities through the life of the Roadmap
- 05 Have a regional digital competitive advantage



CHALLENGES AND OPPORTUNITIES





The digital divide is a significant issue in modern Australia, particularly with the rapid pace of digitisation brought forward by the COVID-19 pandemic. Digital technology has become an essential requirement for work, study, accessing essential services and connecting with family and friends.

A digitally included country is one where all can participate in the rapidly transforming digital society by having necessary skills, confidence and affordable access to online information and services.⁵

Digital Nation Australia 2021 Report.

Challenges to digital adoption

Over the coming decade, the region needs to address a range of challenges as part of its continued progress in improving local digital adoption and attracting investment. The Digital Roadmap establishes a pathway to address these challenges, in partnership with business, industry and public sector stakeholders. Each of these challenges have been considered in the development of the strategies identified in this Roadmap.

Connectivity across the region



Current limitations in digital infrastructure will need to be addressed to ensure Greater Whitsunday is a region of choice for digital investment and priority growth sectors.

Digital connectivity is a basic requirement for many advanced and sector-specific technologies. The geographical span of the region will mean a multi-faceted approach is needed to uplift connectivity and provide the digital infrastructure needed to support the vision of being Australia's most connected region that captures sustainable global investment for its communities. Delivery of the Digital Roadmap will require a partnership approach from a range of stakeholders for the upgrades to advanced fibre, fixed wireless, satellite services, mobile and IoT networks and other digital infrastructure.

Initial capital outlay



There is often significant investment needed to adopt (or maintain) emerging technologies. Improved articulation of return on investment will encourage businesses to invest in technology.

The region is home to a high proportion of small to medium sized businesses, which traditionally have limited funding available for technological investment. Assisting businesses and entrepreneurs in articulating the return on investment for technologies is critical to their increased adoption. In addition, providing up-to-date and available public and private grant funding information for businesses can provide opportunities to overcome this challenge.

Time to adopt technology



Utilising research and innovation partners can help accelerate technology by strengthening the evidence-base for the use of new technologies.

The traditional demands of running a business, such as operations, human resources, and sales, often mean that small to medium sized businesses have little time to commit to research and development linked to adopting new technologies. Partnering with the education and research sector to strengthen the relevant evidence-base has the potential to reduce the effort required by businesses in the region to research, innovate and adopt emerging technologies.

Access to digital skills



Access to digital skills across all of the region's industries and workforce cohorts will be required as technology adoption increases.

Rapid digitalisation has led to additional skills and competencies being required to prepare the workforce for digital ways of working. The pace of this change will only continue to increase in the future. The region's workforce needs the ability to up-skill and re-skill (particularly those sectors with lower digital maturity) to thrive and build economic and employment opportunity. This will require contemporary approaches to skilling and an understanding of skills gaps to target areas of need and ensure the benefits of new technologies are realised.

The need for tangible experiences with technology



Industries require the need to tangibly experience technologies to see and understand potential benefits and applications, and to build trust.

By its nature, the diversity, breadth, depth and changing nature of available technology means that businesses have differing views about which specific technologies are right for them. Even simply understanding the availability of existing technologies, without considering future advancements, can make determining the best technology difficult. The use of third-party technology forums and local knowledge, paired with technology field day events, can assist in helping local businesses understand and see how technologies will benefit them, and build trust in new technologies.

Technology options that are continually evolving



Technology is constantly evolving, therefore chosen technologies will need to be assessed as fit-for-purpose for longer-term adoption and sustainability.

The technology landscape is rapidly evolving, and while the region is renowned for its innovative approach to the rapid evolution of industries, the challenge is in providing a sustainable environment for digital solutions to be developed and supported over the longer-term. Support may also be needed for small and medium businesses to identify, adopt and maintain technology over the medium and longer term, particularly where capital outlay is high. As technology rapidly evolves in the region, so does the need for cyber security to support change and reduce risks.

Opportunities for the region

The region has a strong reputation for collaboration, innovation and success in digital adoption and technology implementation. Harnessing the various elements of this existing reputation – and working with the region’s businesses – has been key in strategy development to ensure that the region draws on its strengths, partnerships and commitments to create a digital future.

Partnership approaches



Partnership approaches across the public and private sectors, in particular with education providers, will deliver better outcomes and more rapidly boost digital adoption.

There are opportunities to continue the region’s strong focus on radical collaboration and collective impact and partner with relevant entities to support digital adoption and innovation. Partnership opportunities may include: education and research entities to build evidence and focus on what technologies and skills are required; technology start-ups to create innovative and bespoke solutions; local businesses to promote the use of emerging technologies; and federal, state, and local governments in providing grants for technology pilots and research. Each entity will play a critical role in digital adoption and innovation in the region.

Sector-led micro-credentialing



Co-lead and support the development of work and study programs to provide pathways to digital careers.

As digital transformation continues to reshape the working environment, many skilled workers will need to up-skill or re-skill in the use of digital technologies in order to remain competitive. There is an opportunity for the region to increase programs that support sector-led approaches to the digital literacy of employees across the region. The use of micro-credentials and partnerships with the education sector and technology partners are essential.

Accelerators, incubators and centres of excellence



Create, link and support the use of technology accelerators and incubators within the region.

There is an opportunity to support the creation of new sector-specific accelerators and incubators to support innovation within the region and partner with existing centres (such as the Resources Centre of Excellence (RCOE)) to promote digital knowledge sharing and collaboration. Creating a reputation for the region as an innovative digital incubator will help attract further investment, skills and opportunity for a digital future.

Events and promotion



Promote the use of specific technologies by showcasing real-world benefits through field days and promotional material.

Lack of time and technological capability means many local businesses are overwhelmed by the various solutions, platforms and technologies that could benefit their business. There is an opportunity to support the development of digital field days and promotional events to showcase live demonstrations of technology and provide information on potential returns on investment and implementation techniques. Such events can build trust, raise awareness and increase capability of local businesses, as well as provide forums for discussion and dialogue on digital adoption.

Reputation and previous track-record of success



Leverage the region's reputation and energised community to attract further investment opportunity.

The region has had strong success in building partnerships with key entities and attracting investment across a range of pilots and projects. This has been largely due to the willingness and energy of the local community to help build a strong and robust digital ecosystem within the region. There is an opportunity to further leverage the support of the community in identifying innovative approaches to digital adoption and build on an existing strong reputation to attract funding and investment.

Nuanced approaches to digital adoption for each sector



Tailor educational programs and digital adoption approaches to specific industry sectors or cohorts to maximise adoption and reflect local needs.

The region is home to a diverse set of demographic cohorts, industries, sub-sectors and skill sets. Accordingly, targeted approaches – at an industry level – will be required to support specific digital adoption and skills development. In addition, specific cohorts (such as support for Aboriginal and Torres Strait Islander people) will also be considered, to ensure relevance and applicability to the local sector context and community. Lastly, where programs support digital skills and knowledge that is applicable to multiple industries - there is an opportunity for cross-sector sharing of programs and approaches to add value and reduce duplication.



DIGITAL CONTEXT IN THE GREATER WHITSUNDAY REGION





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Digitalisation isn't just about big business. Small businesses have much to gain by investing in digital tools to streamline back-end processes, increasing their online presence and transforming how goods and services are delivered. Highly digitally engaged businesses earn 60 per cent more revenue per employee and grow 28 per cent faster than businesses with poor digital engagement.⁶

Towards 2030: Positioning Australia as a leading digital economy and society.

⁶Department of Foreign Affairs and Trade, 2021. Towards 2030: Positioning Australia as a leading digital economy and society. Available at: [Towards 2030: Positioning Australia as a leading digital economy and society | Australian Government Department of Foreign Affairs and Trade \(dfat.gov.au\)](#)

The Greater Whitsunday Region

The region covers 90,354 square kilometres and is comprised of the Mackay, Isaac and Whitsunday LGAs.⁷ The region is one of the most naturally beautiful and resource rich locations in Australia, contributing more than \$47.7 billion in economic output to the Australian economy.⁸

Mackay	Current State	Population 123,183⁸	Employment 47,975⁸	Gross Regional Product \$9.05 billion⁸
	<p>The Mackay LGA and economy is driven by a number of key industry sectors, such as mining services, education, health, aviation, tourism and agriculture. The region has a strong agriculture history, with extensive sugar farming areas and recognition as one of the most innovative sugar cane and milling areas in Australia. Mackay is a world leader in the METS sector, possessing the largest mining services industrial precinct in the Southern Hemisphere (Paget Industrial Estate), and is currently focused on expanding the service sector hubs of the Bowen and Galilee Basins. Mackay also hosts a number of tourist attractions, such as the Eungella National Park, Finch Hatton Gorge and beaches, and covers some parts of the Great Barrier Reef Marine Park.</p>			



Isaac	Current State	Population 22,426⁸	Employment 21,462⁸	Gross Regional Product \$13.03 billion⁸
	<p>The Isaac LGA and economy is driven largely by the resources and agriculture sectors and is one of Australia’s largest coal and beef producing regions. It includes 26 operating coal mines and four other resource operations. Employment figures are higher than the population in the region due to a large proportion of employees in the resources sector who reside in other locations but who work on a fly-in-fly-out basis. In addition to resources, agriculture is another key sector for the area, with most operations in the area producing livestock, grains, cane and aquaculture.</p>			



Whitsunday	Current State	Population 37,660⁸	Employment 15,805⁸	Gross Regional Product \$2.9 billion⁸
	<p>Tourism, agriculture and mining are the three main industry sectors in the Whitsunday LGA, generating significant Gross Regional Product for the region. Tourism employees comprise the largest share of the Whitsunday labour market and tourism is the second-largest contributor to the Whitsunday economy. Mining is the largest contributor to the Whitsunday region’s economic output. The agriculture sector within Whitsunday is a significant producer of sugar, beef-cattle, horticulture and aquaculture due to its proximity to Bowen and Gumlu, Whitsunday’s Aquaculture Development, and Proserpine sugarcane areas.</p>			



The region's business profile

Small, medium and large businesses within the region

The Australian Bureau of Statistics indicates that, across the Mackay, Isaac and Whitsunday LGAs, there were, as at 30 June 2020:

- 13,337 businesses employing 0-4 employees;
- 1,656 businesses employing 5-19 employees;
- 482 businesses employing 20 or more employees.⁹

This highlights that over 96.9 per cent of businesses in the region are identified as small businesses, employing less than 20 employees.

A key aspect considered in this Digital Roadmap is the approach to supporting small businesses with digital adoption, and addressing the unique challenges they face.

9,892

businesses in
Mackay area⁹

Mackay

1,915 Agriculture and Aquaculture

107 Mining and METS

Mackay LGA businesses as at 30 June 2020.⁹



1,802

businesses in
Isaac area⁹

Isaac

753 Agriculture and Aquaculture

17 Mining and METS

Isaac LGA businesses as at 30 June 2020.⁹



2,674

businesses in
Whitsunday
area⁹

Whitsunday

315 Agriculture and Aquaculture

nine Mining and METS

Whitsunday LGA businesses as at 30 June 2020.⁹



⁷ Greater Whitsunday Alliance, 2021. *Regional Economic Profile*. Available at: [GW3+-+Economic+Profile+2021+\[1184\]+Final+Low+Res+Spreads.pdf \(squarespace.com\)](#)

⁸ REMPLAN, 2020. *Mackay – Isaac – Whitsunday Economy Profile: Employment, Industries*. Available at: [Mackay - Isaac - Whitsunday Economy Profile | Output, Industries | REMPLAN](#)

⁹ Australian Bureau of Statistics, 2020. *region summary: Mackay – Isaac - Whitsunday*. Available at: [Mackay - Isaac - Whitsunday | region summary | Data by region | Australian Bureau of Statistics \(abs.gov.au\)](#)



HORIZON I – Digital Infrastructure and Foundational Technology

Enhancing the region's digital foundation

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As regional communities evolve, so too do the opportunities to improve their quality of life and grow their economies. Shifts in industry make-up and changes to the rate of population growth can necessitate changes in infrastructure requirements.

This can create a need for investment in new or upgrade assets, but can also leave behind stranded assets with surplus capacity.¹⁰

Regional Strength and Infrastructure Gaps Report

¹⁰Infrastructure Australia, 2022. *Regional Strengths and Infrastructure Gaps*. Available at: [5_RSIG_Regional Analysis_QLD.pdf](#) (infrastructureaustralia.gov.au)



Digital infrastructure and foundational technology

The region has set a bold vision and to reach this will require the region to achieve a level of digital connectivity that is on par with, if not better than, other built-up regional centres in Australia.

The foundational digital infrastructure required will need to deliver consistent digital connectivity to all parts of the region.

There are a number of challenges to enhancing the region's digital foundations, including;

- the region's growing population and subsequent demand on digital networks;
- disaster management requirements, in particular the level of network resilience needed and the use of 'more traditional' technologies to address these challenges;
- increased requirement for more collaborative connectivity approaches (relative to larger population centres) to achieve economic scale;
- business awareness of the latest digital connectivity options over a large geographic region; and
- power stability and sustainability within the region and, whilst outside the scope of this review, will be critical to sustaining digital connectivity.

Despite these challenges, significant opportunities exist with initiatives already showcasing the region's ability to partner, secure funding, pilot, and bring communities together to address blackspots and improve connectivity, including the Mackay Pioneer Valley Partnership and the Whitsunday Regional Council IoT network.

Digital in Action

Mackay Pioneer Valley Partnership:

This partnership between QCN Fibre and Mackay Regional Council, with funding support from the Regional Connectivity Program (Commonwealth), will seek to create a new macro mobile site, fixed wireless network and fibre backhaul for the Finch Hatton, Pinnacle, Gargett, Eungella and surrounding areas.¹⁰

Whitsunday Regional Council IoT network:

Whitsunday Regional Council is working with Telstra's integration partner, Nucleus3, to employ a Telstra IoT platform, based on Cumulocity, which provides a single platform to develop and trial various IoT projects. Current use cases for the network within Council-based initiatives are being developed, with the goal of promoting increased business and community use of the enhanced IoT network.¹¹



Australian businesses need access to infrastructure that allows them to thrive in a digital economy. This includes access to reliable, fast and inexpensive telecommunications and mobile networks. Over 70 percent of all businesses have identified mobile internet and access to high speed broadband as either moderately or extremely important for their businesses.¹²

Australian Chamber of Commerce and Industry, Submission to the Digital Economy Strategy Consultation Paper

¹⁰QCN Fibre, 2022. QCN Fibre Improves Solutions for the Mackay region. Available at: QCN Fibre Improves Solutions for the Mackay region - QCNFibre

¹¹Australian Government Regional Telecommunications Review, 2021. Regional Telecommunications Review. Available at: 2021 Regional Telecommunications Review | Australian Government Regional Telecommunications Review (rtirc.gov.au)

¹²Australian Chamber of Commerce and Industry, 2017. The Digital Economy: Opening up the Conversation. Available at: The Digital Economy: Opening up the Conversation (australianchamber.com.au)

Technologies in focus

The digital technologies and key focus areas to be prioritised as part of Horizon I are based on the need to support increased connectivity for businesses and sectors within the region. Each of these technologies is defined in more detail in Appendix A.



Internet Connectivity

Internet connectivity within the region is currently comprised of a patchwork of fibre, fixed wireless and satellite services. These services are expected to continue into the future in order to provide access to a geographically dispersed community.

Fibre: Queensland Rail, Aurizon, AARnet and local government owned fibre optic networks provide internet connectivity largely to the Mackay LGA, supporting high performance communication.

Fixed Wireless: Fixed wireless is utilised within the region to provide high-speed internet to townships, small rural settlements and rural residential areas that lie beyond fixed-line infrastructure.

Satellite Services: NBN Sky Muster and Business NBN Satellite for Virtual ISP, IoT service and bandwidth is available in the region and provides internet to rural communities, including Glenden, Nebo and the Isaac LGA, coastal communities, and the Whitsunday Islands.



Mobile Network

Currently Telstra, Optus and Vodafone networks provide mobile coverage to the region (with **3G** and **limited 4G** services), with upgrade commitments made to support a wider move to **4G** and some **5G** networks over the next three-years. There are a significant number of blackspots, especially in more remote areas of the region. There are key opportunities for infrastructure expansion and shared-infrastructure partnerships to improve connectivity and move to wider adoption of **4G and 5G** networks. Resilience of this network (mobile hardening) was identified as a key opportunity.



IoT Network

IoT provides the opportunity to minimise human effort and create efficiency through devices communicating directly to each other. IoT currently is used in a limited way across the region providing the opportunity to develop use cases and improve understanding of its utility, including understanding of its utility across the LPWAN and LoRaWAN network.



Cybersecurity

Across the world and within Australia, there is an increasing emphasis on cybersecurity. New organisational requirements under the *Security of Critical Infrastructure Act 2018 (Cwth)*, as well as broader industry protection requirements, mean local businesses need to adopt contemporary cybersecurity practices.

Other technologies discussed:



Remote Operating Centres (ROCs)



Data Centres



Public / Private Wi-Fi hotspots



Global Navigation Satellite Systems



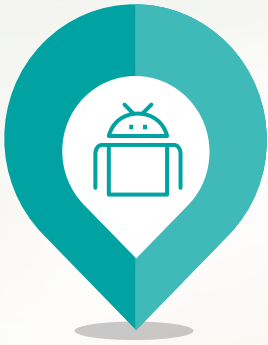
HORIZON I: ENHANCING THE REGION'S DIGITAL FOUNDATION

Strategies and actions

The following strategies will progress the region's foundational digital infrastructure and connectivity and will be progressed by GW3 and partners across industry, government and technology providers.

Strategy	Key Actions
<p>1 Foster strong partnerships with telecommunication providers and commit to proactive planning to deliver digital infrastructure investment the region truly requires.</p> <p><i>Ongoing, updated every 2 years</i></p>	<p>Assess the connectivity landscape, regional partnerships and available funding to assist in proactively preparing business cases for digital infrastructure investment.</p> <p>1.1 Partner with key telecommunications providers to develop a 'connectivity map' collating the region's current connectivity service levels, including known connectivity gaps (i.e., mobile blackspots, low internet speeds) and timing for committed digital infrastructure upgrades.</p> <p>1.2 Based on connectivity gaps and needs, determine the region's desired infrastructure solutions, including network resilience enhancements and preparation of business cases to support development and investment.</p> <p>1.3 Undertake a bi-annual review of the funding context across all levels of government, allowing for the efficient preparation of funding submissions where opportunities arise.</p> <p>1.4 Strengthen relationships between local government as well as telecommunications, industry and technology providers to enhance co-investment or partnership opportunities in delivering digital infrastructure solutions.</p>
<p>2 Enhance businesses' awareness of connectivity options and infrastructure technologies.</p> <p><i>Ongoing</i></p>	<p>Engage with local business networks, technology companies and telecommunications providers to support the delivery of programs that promote connectivity options and emerging technologies, including cybersecurity obligations to businesses in the region.</p> <p>2.1 Encourage telecommunications and technology companies to roll-out programs and training for businesses to better understand their available connectivity and technology options for example, NBN upgrades to fibre to the premise, 5G rollout and local IoT networks.</p>

	Strategy	Key Actions
3	<p>Enhance digital infrastructure planning in local government processes to facilitate 'digital-ready' development.</p> <p><i>Within 2 years</i></p>	<p>Local governments will consider digital infrastructure development requirements as a key part of development approval processes.</p> <p>3.1 Ensure that the region's councils consider the practical planning of tower locations, demands on the existing network and digital requirements for future developments.</p>
4	<p>Encourage greater uptake and utilisation of IoT networks.</p> <p><i>2-5 years</i></p>	<p>Promote IoT network capability in the region through partnership arrangements and exploring use cases.</p> <p>4.1 Encourage and support the promotion of viable and desirable use cases for IoT to expand its use and utility in the region, drawing on the work already being progressed with the local governments and telecommunications providers.</p>
5	<p>Strengthen the region's cybersecurity awareness, capability and response planning.</p> <p><i>Ongoing</i></p>	<p>Work collaboratively with relevant parties to build the region's cybersecurity capability, understanding of obligations to enhance response and resilience.</p> <p>5.1 Collaborate with local governments and relevant state and federal agencies to better understand the region's cybersecurity planning and response and determine any recommendations for improvement.</p>



HORIZON II – Sector-Specific Digital Technology

*Accelerating digital progress for
priority industries*



“

Our region is already home to a diverse and growing list of established and emerging industries that contribute upwards of \$42 billion in economic output to the Australian economy. Supporting this is a suite of natural features that make this region a world-class destination for investment and recreation, and we see GW3's role is to ensure our region's economic potential is maximised both now and into the future through leveraging existing and emerging industries and promoting our natural advantages.¹³

**Greater Whitsunday Alliance
Annual Report 2020-21**

¹³Greater Whitsunday Alliance, 2021. Regional Economic Profile. Available at: [GW3+-+Economic+Profile+2021+\[1184\]+Final+Low+Res+Spreads.pdf \(squarespace.com\)](#)



Digital in Agriculture and Aquaculture

The Agriculture and Aquaculture sector is one of the region's heritage industries and remains a strong economic driver. Agriculture comprises 89 per cent of the region's land use and provides 10 per cent of the State's agricultural production worth \$1.6 billion.¹⁴

Further, the region provides 29 per cent of Australia's sugar cane, is the leading provider of horticultural winter produce and supports a cattle sector worth over \$600 million. It is also home to a burgeoning prawn aquaculture sector, which is the fastest production value growth industry in Queensland. In 2021 it represented almost 40 per cent of Queensland's aquaculture production value, making the region the biggest regional area for aquaculture production value in Queensland.¹⁵

Digital infrastructure and technology adoption in Australia's agriculture and aquaculture sector has been flagged as critical to our economy and Australia's future food security, and is predicted to increase the gross value of production by \$20.3 billion across Australia.¹⁶

When compared on a global scale, other countries, such as the United States, are investing significantly more in AgTech advancements.¹⁷ For the region's agriculture sector to maintain its competitive edge, it must increase digital adoption and harness the advantages of technology in improving precision, efficiency and productivity in its operations.

Several challenges to digital adoption exist, including:

- sourcing initial capital funding for (often small) businesses;
- a need for improved understanding of the benefits and return on investment;
- the level of trust in the advice of technology providers; and
- the creation of incubation support for AgTech innovators.

Limited digital skills and understanding were also identified as key barriers that can result in challenges in maintaining technologies and in harnessing the full benefits of emerging technologies.

Whilst challenges exist, the region also has demonstrated strengths in harnessing AgTech, providing partnership approaches that acknowledge the importance of digital technologies through the MIW Agribusiness Future Alliance and Mackay Sugar Co-operative.

Digital in Action

MIW Agribusiness Futures Alliance

The MIW Agribusiness Futures Alliance has sought to develop capacity and capability to solve common issues in the adoption of technology.¹⁷

To date, the Alliance has helped secure funding for an Agriculture and Aquaculture Tech Skills Hub in the Whitsunday area, upgrade the Biocommodities Plant in Mackay, commissioned a Supply Chain Baseline Study and sought to establish a Greater Whitsunday AgTech Hub.¹⁸

Mackay Sugar Co-operative

In 2005, Mackay Sugar introduced GPS tracking to harvesting groups across approximately 11 per cent of cane farms in the region.¹⁹ This GPS technology tracks and converts harvester locations to visualise harvester tracks and harvest area. This data is utilised to calculate areas with supply input data to estimate the total harvest yield and can calculate daily loading requirements, creating leading efficiency in operations.²⁰



Agriculture is key to driving the economic growth and success of our region, which is why it's so important to provide support to the industry... Being actively involved in a conversation like AgTech can open up great opportunities for our region and the future of our workforce.²¹

Professor Pierre Viljoen

**Assoc Vice-President and Chair,
Automation and Future Work Skills,
CQUniversity**

Technologies in focus

The technologies explored during the Digital Roadmap development across the agriculture and aquaculture sectors were based on a combination of emerging digital technologies in use within the region, and those emerging in Australia and globally. Each of these technologies is defined in more detail in Appendix A.



Agriculture, Forestry and Fishing



Output
\$1.5639 billion²¹



Employment
4,762 (5.5%)²¹

Sector-specific Emerging Technologies:

- | | | |
|--|----------------------------------|--------------------|
| 1. Automation and robotics | 4. Water management technologies | 6. ROCs |
| 2. AI and data platforms | 5. Farm management technologies | 7. Sensors and IoT |
| 3. Global navigation satellite systems | | 8. Biosecurity |



¹⁴ Greater Whitsunday Alliance, (n.d). *Agriculture and Aquaculture*. Available at: [Agriculture and Aquaculture — Greater Whitsunday Alliance](#)

¹⁵ Queensland Government *State Development Infrastructure, Local Government and Planning, 2022. Greater Whitsunday region*. Available at: [Greater Whitsunday region | State Development, Infrastructure, Local Government and Planning](#)

¹⁶ Australian Government Department of Agriculture, Water and the Environment, 2021. *Delivering Ag2030*. Available at: [Delivering Ag2030 May 2021 \(agriculture.gov.au\)](#)

¹⁷ United States Studies Centre, 2018. *Australian AgTech: Opportunities and Challenges as seen from a US Venture Capital Perspective*. Available at: [Australian AgTech: Opportunities and challenges as seen from a US venture capital perspective — United States Studies Centre \(ussc.edu.au\)](#)

¹⁸ Greater Whitsunday Alliance, 2021. *MIW Agribusiness Futures Alliance*. Available at: [GW3-Roundtable-presentation.pdf \(smartransformation.com.au\)](#)

¹⁹ Mackay Sugar Co-operative Association Ltd, 2014. *Sugar GPS Coordination Applications and Future Directions*. Available at: [Sugar-GPS-Coordination-Applications-and-Future-Directions.pdf \(actfa.net\)](#)

²⁰ Regional Development Australia Greater Whitsundays, 2021. *The Future of Farming is Here*. Available at: [The future of farming is here — RDA Greater Whitsundays \(rdagw.org.au\)](#)

²¹ Greater Whitsunday Alliance, 2021. *Regional Economic Profile*. Available at: [GW3++-Economic+Profile+2021+\[1184\]+Final+Low+Res+Spreads.pdf \(squarespace.com\)](#)



Strategies and actions

GW3 and key regional stakeholders commit to progressing the following strategies to support improved digital adoption, innovation and advancement for the agriculture and aquaculture sector. Digital Skilling initiatives are outlined under the Digital Skilling strategies later in this Digital Roadmap.

	Strategy	Key Actions
1	<p>Utilise research and scientific evidence to accelerate the region's adoption of digital technologies and AgTech.</p> <p><i>Ongoing</i></p>	<p>Work with research and industry partners to grow the research and evidence-base to address barriers to adoption for key agriculture and aquaculture technologies.</p> <p>1.1 Identify research priorities, undertake research activities in partnership with leaders and universities (such as CQUniversity, CSIRO and Sugar Research Australia) and distribute research findings to support and amplify the sector's adoption of existing and emerging digital technologies (i.e., sensors, IoT, robotics, digital twins and AI).</p> <p>1.2 Respond to an industry need to identify AgTech solutions to help address biosecurity challenges in the region (such as blockchain, IoT and sensors) to collect and report on relevant data and information. This needs to be undertaken in partnership with Commonwealth and State biosecurity priorities.</p>
2	<p>Encourage greater awareness of, and connection to, AgTech digital innovators and adopters within the region.</p> <p><i>Within 2 years</i></p>	<p>Facilitate greater events and networking activities to promote the region's AgTech digital innovators and connect to opportunities to accelerate the sector's digital adoption.</p> <p>2.1 Facilitate and encourage promotional activity through groups like "Regional AgTech Activators Network" (e.g. face-to-face demonstrations, field days and shed meetings) for emerging AgTech, to increase understanding and encourage new opportunities to accelerate adoption of technology. Link to existing events or programs (such as the AgTech Summit) where possible and promote hosting in the region.</p>
3	<p>Investigate expanding a shared IoT network and data centre to enhance the sector's use of data, accelerate productivity and enhance resilience.</p> <p><i>Within 3 years</i></p>	<p>Work with industry to investigate and understand the needs and business case for expanding digital infrastructure to better deliver sector-specific technology solutions (i.e., IoT network and data centres).</p> <p>3.1 Collaboratively develop the business case for an expanded and enhanced digital infrastructure network to better support the sector's whole-of-region data collection and reporting, identify Biomanufacturing opportunities and assist in collecting productivity and viability information when securing finance.</p>





HORIZON II: EXPANDING DIGITAL PROGRESS FOR PRIORITY INDUSTRIES MINING AND METS

Digital in Mining and METS

The mining and METS sector has long been a cornerstone of the region's economy and currently provides 46.3 per cent of the region's economic output, worth \$19.4 billion. The region spans a large area of the Bowen Basin, which is particularly resource rich and home to a large number of coal and mineral mines, such as the Isaac Plains Coal Mine and the Black Ridge Mine.²²

To retain its current competitive advantage, the region needs to ensure that its mining and METS sector continues to evolve to respond to rapid technological advancements and shifting geopolitical landscape.

As a result of a rapidly changing global environment and expectations, a number of mining and METS sector-specific emerging technologies have been identified as key to progressing digital adoption and infrastructure. This includes autonomous operations, vehicles and drilling, artificial intelligence, machine learning and data platforms, geospatial data and 3D mapping, cybersecurity, sensors and IoT, blockchain, task assistive technology and ROCs.

The last five-years have seen strengthened maturity in the advancement of digital adoption across the mining sector within the region. Capital outlay is typically less of an inhibitor within the mining industry; however, there is a need to bring businesses operating in the METS sector, technology organisations and entrepreneurs together to showcase innovations that can be adopted and drive further improvements.

While the region competes with other mining locations across Australia for digital investment and priority, the region is able to evidence existing strengths, such as the RCOE and Digital Innovation Skills Hive.

Digital in Action

Resources Centre of Excellence

The RCOE provides world-class facilities for resource development, including an underground mine simulated training and testing facility. Its success in building strong partnerships between industry, governments, education providers, researchers and the community has led to two further expansions planned for the RCOE over the next three-years, including an expansion of the Mackay facility and a new site servicing the Isaac LGA in Moranbah.²³

Digital Innovation Skills Hive

CQUniversity and the BHP Mitsubishi Alliance (BMA) have launched a Digital Innovation Skills Hive in Mackay that showcases and promotes initiatives that support the collective efforts of industry organisations and education providers. Together with the RCOE, it supports the mining and METS sectors by providing a space for collaboration to occur within the region.²⁴



Innovation, people and skills combined with technological advances will deliver a more globally competitive minerals sector. Quality and responsive education, training and workforce development are a crucial mechanism to ensure a supply of skilled workers enter and remain in the industry.²⁵

**Minerals Council of Australia,
Media Release 2020**

Technologies in focus

The digital technologies explored for the Digital Roadmap across the mining and METS sector were based on a combination of emerging digital technologies in use within the region, and those emerging in Australia and globally. Each of these technologies is defined in more detail in Appendix A.



Mining and METS



Output
\$20.391
billion²⁶



Employment
16,591
(19.5%)²⁶

Sector-specific Emerging Technologies:

1. Autonomous operations, vehicles and drilling
2. Geospatial data and 3D mapping
3. Sensors and IoT
4. AI, machine learning and data platforms
5. Cybersecurity
6. Blockchain
7. Task assistive technology
8. ROCs



²² GW3 and KPMG, 2000. *Future Employment Blueprint*. Available at: *Future Employment Blueprint — Greater Whitsunday Alliance*

²³ Resources Centre of Excellence, 2022. *About Resources Centres of Excellence*. Available at: *About RCOE | Mining Equipment, Technology and Services — Resources Centre of Excellence*

²⁴ CQUniversity Australia, 2022. *Digital innovation skills hive launches in Mackay*. Available at: *Digital Innovation Skills Hive launches in Mackay – CQUniversity*

²⁵ Minerals Council of Australia, 2020. *Media Release 'New jobs, more skills and more productive mines through innovation'*. Available at: *New jobs, more skills and more productive mines through innovation | Minerals Council of Australia*

²⁶ Greater Whitsunday Alliance, 2021. *Regional Economic Profile*. Available at: *GW3+-+Economic+Profile+2021+[1184]+Final+Low+Res+Spreads.pdf (squarespace.com)*



**HORIZON II: EXPANDING DIGITAL PROGRESS FOR PRIORITY INDUSTRIES
MINING AND METS**

Strategies and actions

GW3 and key regional stakeholders commit to progressing the following strategies to support improved digital adoption, innovation and advancement for the mining and METS sector. Digital Skilling initiatives and cybersecurity initiatives are outlined under the Digital Skilling strategies later in this Digital Roadmap.

	Strategy	Key Actions
1	<p>Utilise research to identify new digital opportunities and accelerate emerging technology adoption in the region’s mining and METS sector.</p> <p><i>Ongoing</i></p>	<p>Enhance partnerships between industry and universities to grow the research and evidence-base on the benefits and barriers to adoption of existing and emerging mining and METS technologies, with focus toward related commodity opportunities (i.e., critical minerals).</p> <p>1.1 Identify research priorities, undertake research activities in partnership with leaders and universities and distribute research findings to support and amplify the sector’s adoption of existing and emerging digital technologies (i.e., blockchain, edge computing, AI and robotics).</p>
2	<p>Encourage greater awareness of, and connection to, mining and METS digital innovators and adopters within the region.</p> <p><i>Within 2 years</i></p>	<p>Facilitate greater events and networking activities to promote the region’s digital innovators and connect to opportunities to accelerate the sector’s digital adoption.</p> <p>2.1 Facilitate promotional activity that expands on existing events and networking (such as Advanced Manufacturing Week, the RCOE and the Digital Innovations Skills Hive), to enhance awareness of the region’s mining and METS digital innovators, latest research and encourage new opportunities to accelerate adoption. Where possible, link to State and Commonwealth sponsored events or programs and promote hosting of events in the region.</p>





Digital Skilling

The digitalisation of industries over time has led to Australia's workplaces fast becoming reliant on technology. Few industries remain where there is no dependency on some element of digital skilling, and organisations operating across the region are – like others globally – facing the task of continuously up-skilling and re-skilling the workforce to participate in an expanding digital world.

In line with contemporary workforce changes impacting industries globally, the region will see a number of roles augmented by digital transformation and increased demand for specialised ICT professionals over the next 10-years. It is therefore critical that the region sets plans and strategies in place to identify key skilling gaps and makes the most of potential opportunities across the identified cohorts.

These include:

- foundational digital skilling;
- advanced digital skilling;
- specialised ICT professionals; and
- digital skilling for Aboriginal and Torres Strait Islander peoples.

Stakeholders across the region acknowledge that progress is being made in foundational digital skilling. However, there are still challenges in identifying relevant and specific digital skilling gaps within the region, limited targeted and relevant training programs at more advanced levels, and limitations with cohort sizes and therefore sustainability of education programs.

While challenges exist, the region has the opportunity to leverage the current national focus on digital skills, build relationships with other regions to support sustainable programs, and partner with technology companies, industry and the education sector to advance targeted, micro-credentialing programs. Additionally, the region is able to draw on its existing examples of good practise, such as the Queensland Future Skills Partnership and Agriculture and Aquaculture Tech Skills Hub.

Digital in Action

Queensland Future Skills Partnership

Partnering with BMA, TAFE Queensland and CQUniversity, Advance Queensland is implementing the Queensland Future Skills Partnership Pilot Program. The program is focused on fast-tracking digital development and delivering automated technology pathways, skillsets and qualifications to Queensland. The implementation is especially focused in regional locations, and is targeted at the resource sector, with 12 accredited skillsets designed specifically for the METS sector and micro-credentials offered around other digital areas.²⁷

Agriculture and Aquaculture Tech Skills Hub

The Federal Government, Queensland Government, CQUniversity and TAFE Queensland have partnered to deliver a \$1.5m multi-commodity training package for Agriculture and Aquaculture digital and technology skills enhancement. This provides the opportunity to fast-track career pathways and skilling solutions for the Agriculture and Aquaculture workforce, preparing the region to meet current and future digital workforce demand.²⁸



These [digital] jobs are critical to Australia's future. They are among the fastest-growing, highest-paid, safest, and most flexible jobs in the nation. Because of their importance to the Australian economy, they are critical to almost every industry.²⁹

Patrick Kidd
CEO, Digital Skills Organisation

Digital Skilling Cohorts

Digital skilling of the region's workforce will require a nuanced understanding of different capabilities required to drive meaningful change that are matched with sector needs. To align with sector needs and expected employment opportunity, the strategies around digital skilling have been grouped into four key cohorts.



Foundational Digital Skilling

Foundational Digital Skilling refers to the digital literacy required across the region's workforce of greater than 85,000 people, in order to adopt current, new and emerging technologies and effectively utilise digital infrastructure. While skilling requirements will change over time as the workforce and technologies evolve, it currently includes areas such as: security and privacy; reliable and accurate electronic recordkeeping; and safety in the utilisation of digital technologies. In the near future, requirements are expected to include: understanding interoperability and of technology systems; data analysis and understanding of how technologies can be harnessed to drive improved business decisions.



Advanced Digital Skilling

Advanced digital skilling refers to the capabilities of a more specific workforce which requires targeted digital skills, but who are not ICT professionals. This may include those who are digital champions in the workplace, require digital skills to fulfil their role (e.g. working to lead digital systems or projects) or who need both professional and technology skillsets to deliver tailored and fit-for-purpose systems, applications or innovations. Digital skills may include: designing requirements for new systems; the early adopter or digital advocate; utilising digital systems or tools to achieve sector-specific outcomes; and providing solutions to complex problems involving digital tools, systems and learning environments.



Specialised ICT Professional

The Specialised ICT Professional cohort refers to strategies to grow and develop workforces that need to keep pace with new and emerging ICT roles. Analysis within the region identified that the digital occupations in demand over the next decade will include (but are not limited to): data engineers; data scientists; software developers; cybersecurity analysts; IT governance specialists, AI research scientists, software quality assurance engineers and testers.³⁰



Aboriginal and Torres Strait Islander Digital Skilling

Aboriginal and Torres Strait Islander digital skilling refers to targeted digital skilling for First Nations peoples within the region. This includes both the uplift of foundational digital literacy, as well as the specific support of Aboriginal and Torres Strait Islander people to transition into advanced specialised ICT professions and emerging technology roles as digital transformation continues to shape the working landscape.

²⁷ Advance Queensland, 2022. Queensland Future Skills partnership. Available at: Queensland Future Skills Partnership | Advance Queensland | Queensland Government

²⁸ CQUniversity Australia, 2022. Future skills to extend to agriculture and aquaculture. Available at: Future skills to extend to agriculture and aquaculture - CQUniversity

²⁹ Digital Skills Organisation, 2022. Australia needs 1.2 million Tech workers by 2030. Is it possible?. Digitally Upskilling Australia Available at: Australia needs 1.2 million Tech workers by 2030. Is it possible? (digitalskillsorg.com.au)

³⁰ Greater Whitsunday Alliance and KPMG, 2020. Future Employment Study. Available at: <https://www.greaterwhitsundayalliance.com.au/new-blog/future-employment-blueprint-kghk>.



HORIZON II: EXPANDING DIGITAL PROGRESS FOR PRIORITY INDUSTRIES
DIGITAL SKILLING

Strategies and actions

GW3 and key regional stakeholders commit to progressing the following digital skilling strategies to promote digital workforce and skilling development across the region’s foundational, advanced, specialised (ICT), and Aboriginal and Torres Strait Islander cohorts.

Strategy	Key Actions
<p>1 Identify, quantify and prioritise the digital skilling needs within the region for the greatest impact on employment and economic prosperity.</p> <p><i>Ongoing</i></p>	<p>Partner with sector leaders and established networks to define the digital skills gap and identify sector and cohort based digital skilling priorities every two-years to drive digital change.</p> <p>1.1 Identify and publish the overall demand, available training, and gaps across each digital skilling cohort with sector leaders and established networks to determine digital skilling priorities. This will link to priorities outlined in the Future Employment Study and Future Skills Roadmap for the region.</p>
<p>2 Strengthen local digital skilling programs through international collaboration.</p> <p><i>2-5 years</i></p>	<p>Explore a possible relationship with a global “sister city” to share ideas on skills adoption and to progress the region in line with world standards.</p> <p>2.1 Develop an engagement plan that identifies international regions or cities that have leading practice in digital skilling. Outline what insights can be offered and reciprocated within a “sister city” or “digital twin” relationship.</p> <p>2.2 Develop lines of communication to begin initial discussions on potential partnerships, knowledge sharing and networking opportunities with their universities, regional leaders and innovative program leaders.</p>
<p>Foundational Digital Skilling</p>	
<p>3 Identify and partner with local players interested in growing and developing digital skills within the region.</p> <p><i>Ongoing</i></p>	<p>Partner with industry, technology companies and the education sector to reshape local education and training qualifications to support job readiness for the region’s digital roles.</p> <p>3.1 Partner with the education sector and micro-credentialing providers to tailor local curricula to include subjects, content and training designed to equip students to perform digital roles.</p>

Strategy	Key Actions
Advanced Digital Skilling	
<p>4 Develop programs that support the digital upskilling of the current workforce ‘on-the-job’.</p> <p><i>Within 3 years</i></p>	<p>Develop industry specific micro-credentials that assist in advancing digital skilling of the workforce.</p> <p>4.1 Promote local employers to engage study programs available in the region to upskill employees whilst they work.</p> <p>4.2 Work with the training providers to expand program reach and cohort size by promoting study, both within and out-of-region, to ensure commercial viability and sustainability of developed programs.</p>
Specialist ICT Digital Skilling	
<p>5 Build capacity and capability in the ICT professional workforce within the region.</p> <p><i>Ongoing</i></p>	<p>Partner with the Queensland Government and local businesses to promote incentives for specialised ICT professions to work within and contribute to the region.</p> <p>5.1 In collaboration with local partners, develop an incentive plan to attract digital workers to the region. This may be in the form of a ‘Future Growth Services Precinct’ (identified in the Greater Whitsunday Workforce Development Playbook) that highlights the region’s employment opportunities in digital occupations.</p> <p>5.2 Partner with local businesses to encourage digital professionals who are living in region, but working remotely in an out-of-region role, to consider working directly for local businesses’.</p>
<p>6 Ensure that skills and capability transfer is passed on to maintain and develop the region’s specialised ICT workforce.</p> <p><i>Within 5 years</i></p>	<p>Ensure technology companies and other service providers who provide ICT services, train the region’s workforce for in-demand digital skills to reduce dependence on out-of-region contractors.</p> <p>6.1 Explore potential partnerships with technology businesses or other service providers to design a hybrid offering for digital consulting and upskilling to provide for regional businesses.</p> <p>6.2 Trial the hybrid offering on a small subset of regional businesses and create case studies to promote the benefits to other businesses.</p> <p>6.3 Partner with the Queensland Government and businesses to introduce contractual obligations in government and sector contracts where out-of-region ICT staff are encouraged to upskill and train local workforce while employed by businesses in the region.</p>



Strategy

Key Actions

Aboriginal and Torres Strait Islander Digital Skilling

7

Develop a tailored Aboriginal and Torres Strait Islander digital skilling, career pathways and mentoring program that builds and identifies future ICT career pathways.

2-5 years

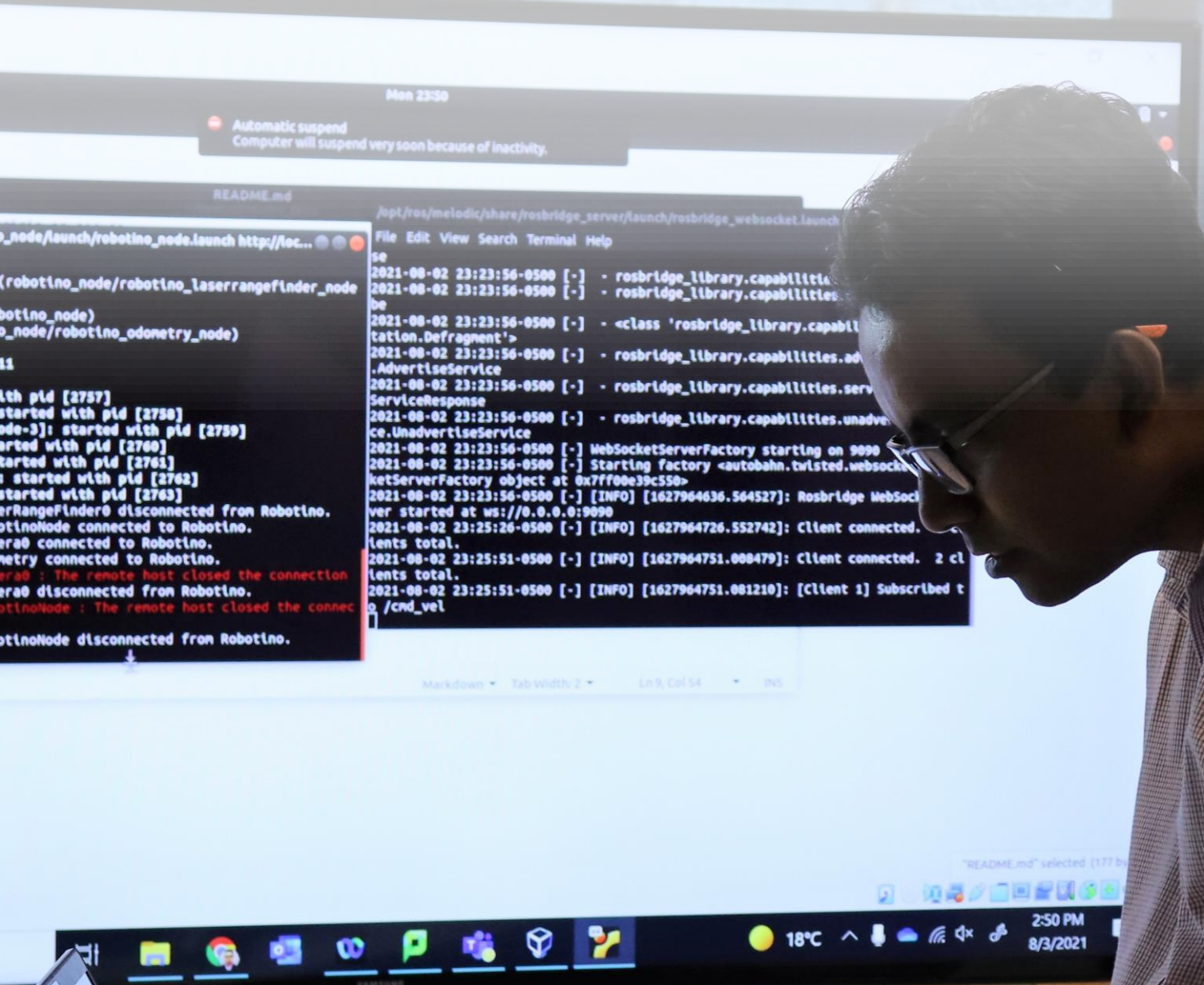
Explore partnerships with industry, existing digital training, coaching, mentoring and education providers to develop skilling programs catered to Aboriginal and Torres Strait Islander peoples and support ongoing development of skills, employment opportunities and early entry pathways.

7.1 Explore opportunities with organisations experienced in targeted training of Aboriginal and Torres Strait Islander cohorts to learn key insights in the development of cohort-specific training and explore partnerships to expand this to a region-based initiative.

7.2 Leverage and promote existing Aboriginal and Torres Strait Islander mentoring and coaching organisations (such as Australian Indigenous Mentoring Experience) to establish an ICT mentoring network within the region for young First Nations people interested in the technology sector.

7.3 Establish networks and partnerships with the education sector and not-for-profits (such as 'Indigital' or 'Deadly Digital Communities') to develop programs aimed at educating Aboriginal and Torres Strait Islander youth on ICT career pathways. Where possible connect with Commonwealth and State initiatives and organisations to drive sustainable change.

7.4 Partner with a local high school to pilot the program and collect insights on benefits to ensure it is a place based solution.



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HORIZON III – Digital Technology for Priority Growth Sectors

*Planning for digital futures in
emerging sectors*





Digital Technology for Priority Growth Sectors

Horizon III recognises that the region's priority growth sectors will be strategically prioritised as being key to its success over the next decade. These priority growth sectors will bring a new scale of technology to the region that has not been seen before, and will provide opportunities to leverage the region's existing resources and capabilities to service these new technologies. Planning for digital technology and infrastructure that support priority growth sectors will be key to attracting international and national organisations to the region.

Falling within the region's broader decarbonisation and diversification focus, biomanufacturing is a sector that is predicted to experience significant growth within the region. Global biomanufacturing services are projected to reach US\$57 billion by 2028,³¹ and therefore there is significant opportunity for biomanufacturing businesses to establish themselves in the region and capitalise on the region's access to biomass, human talent and supporting infrastructure. This can be further harnessed due to regional infrastructure including a bioethanol production facility and biocommodities pilot plant, as well as demonstrated world leading collaboration.

Critical investment from both the *Queensland Biofutures 10-year Roadmap and Action Plan*, which aims to develop a \$1 billion sustainable Biofutures sector, as well as the \$1 billion *Critical Technology Fund (National Reconstruction Fund)*,³² will assist in ensuring the significant digital uplift of biomanufacturing technology. Further, the region has established the Biofutures Leaders Group and is pursuing commercial opportunities in biomanufacturing, especially connected with precision fermentation of sugarcane.

The rise in global expectations to lower carbon emissions provides a significant opportunity for the region. Unique differentiators, such as large amounts of sunlight, space and low population density, means that the region is well-positioned to mitigate risks and capture opportunities presented by environmental and social challenges driven by decarbonisation and diversification today and into the future.

However, investment in digital infrastructure (such as Renewable Energies and digital twins) and digitalisation of machinery and technologies, combined with ongoing engagement with investors and stakeholders, is key to ensure economic prosperity for the region. There is also significant opportunity to drive circular economy and supply chain initiatives that reduce waste emissions, particularly from resource intensive industry sectors.

The growing aviation and aerospace sector also provides economic growth opportunities for the region. The region's desirable location and renowned technical capability is already attracting significant investment from aviation and aerospace organisations. Favourable conditions, such as location, low population density (minimising risk) and significant existing infrastructure, mean that the sector continues to develop a strong economic presence in the region, one that must be supported by digital infrastructure and technologies, including IoT, sensors and control towers.

Examples where emerging technologies are already being progressed in the region include Gilmour Space Technologies, who have unveiled a new 3D printed liquid oxygen kerosene engine that is capable of powering the third stage of its Eris rocket to orbit. There is also opportunity for the region to ensure that digital skilling efforts are aligned to growth industries such as aviation and aerospace, including training infrastructure.



The world is changing rapidly and the traditional industries that have supported us and been the backbone of our state are strong but our economy is transitioning... We need to be committed to meeting the challenges of the future head-on and drive innovation to secure our future.³³

**The Honourable Anastacia Palaszczuk
MP, Premier of QLD, Minister for Trade**

Technologies in focus

The digital technologies explored across Horizon III were based on a combination of emerging digital technologies in use within the region, and those emerging in Australia and globally. Each of these technologies is defined in more detail in Appendix A.



Biomanufacturing



By 2035, an industrial biotechnology and bioproducts sector could contribute **\$1.8 billion** to the Queensland economy.³⁴

Sector-specific Emerging Technologies:

1. AI/machine learning accelerators
2. Synthetic biology systems
3. Continuous flow chemical synthesis systems
4. IoT sensors
5. Blockchain



Decarbonisation and Diversification

The Queensland Government is proactively looking at strengthening ESG across the State, recognising Queensland's exposure to carbon intensive industries balanced with opportunities to build on Queensland's natural advantages.³⁵

Sector-specific Emerging Technologies:

1. Drones
2. Digital twins
3. Blockchain
4. Renewable energy
5. Data analytics, reporting and ethics
6. Security and privacy
7. Robotics
8. Critical minerals extraction and processing Systems



Aviation and Aerospace



Queensland's aerospace sector's economic contribution is forecast to grow by **\$53 million+** each year through 2025-26.³⁶

Sector-specific Emerging Technologies:

1. AI
2. IoT and sensors
3. Sustainable aviation fuel
4. 3D printed rocket engines
5. Augmented and virtual reality
6. Simulation technologies

³¹ Greater Whitsunday Alliance, (n.d). Biofutures. Available at: Workforces of the Future — Greater Whitsunday Alliance

³² Department of Industry, Science and Resource, 2022. National Reconstruction Fund: diversifying and transforming Australia's industry and economy. Available at: National Reconstruction Fund: diversifying and transforming Australia's industry and economy | Department of Industry, Science and Resources

³³ QLD Department of State Development, 2016. Queensland Biofutures: 10 year roadmap and action plan. Available at: biofutures-10yr-roadmap-actionplan.pdf (statedevelopment.qld.gov.au)

³⁴ Queensland Government, 2016. Queensland Biofutures 10-year Roadmap and Action Plan. Available at: biofutures-10yr-roadmap-actionplan.pdf (statedevelopment.qld.gov.au)

³⁵ Queensland Government, 2021. Queensland Sustainability Report 2021. Available at: Queensland-Sustainability-Report-November-2021-1.pdf (treasury.qld.gov.au)

³⁶ Queensland Government, 2022. Queensland Aerospace: 10-year Roadmap and Action Plan. Available at: QUEENSLAND AEROSPACE 10-Year Roadmap and Action Plan (statedevelopment.qld.gov.au)



HORIZON III: PLANNING FOR DIGITAL FUTURES IN PRIORITY GROWTH SECTORS - BIOMANUFACTURING, AVIATION/AEROSPACE, DECARBONISATION

Strategies and actions

GW3 along with key regional stakeholders commits to progressing the following strategies which are aimed at improving digital technologies for the aviation and aerospace, biomanufacturing and broader decarbonisation and diversification priority sectors.

Strategy		Key Actions
1	<p>Include digital infrastructure and emerging technologies in planning for priority growth sectors.</p> <p><i>Within 5 years</i></p>	<p>Collaborate with industry leaders and stakeholders to ensure infrastructure and service development planning for emerging industries includes digital infrastructure and technology considerations.</p> <p>1.1 Support sector leaders to work alongside industry innovators and hubs (e.g. The RCOE and Greater Whitsunday Biofutures Leaders Group) to identify and utilise emerging digital advancements and programs of work that can be piloted and expanded within the region.</p>
2	<p>Identify funding and grant opportunities that strengthen digital acceleration and pilots for priority growth sectors.</p> <p><i>Ongoing</i></p>	<p>Explore grant and innovation funding support for digital technologies in emerging sectors, in partnership with technology accelerators, research bodies and universities.</p> <p>2.1 Partner with industry and networks to prioritise digital programs of work that will enhance these priority growth sectors through existing committees in the region (e.g. Greater Whitsunday Biofutures Leaders Group and the RCOE Innovator in Residence Program).</p>
3	<p>Promote the region’s digital successes in priority growth sectors to attract further opportunity and investment.</p> <p><i>Within 3 years</i></p>	<p>Utilise the existing digital innovations and precincts in the region’s emerging sectors to further attract, promote and market opportunity and investment.</p> <p>3.1 Work with local industry leaders to attract and showcase and promote digital innovations to State and Commonwealth Government leaders, entrepreneurs, and global and Australian business leaders to expand and enhance the region’s digital reputation, innovation and economic growth.</p>

Strategy**Key Actions****Decarbonisation and Diversification**

- 4 Expand on existing digital initiatives and partnerships to promote decarbonisation and diversification opportunities in the region.**

Within 3 years

Establish local networks, identify industry innovators, promote funding opportunities and drive digital adoption across all industry sectors to strengthen the digital focus on decarbonisation and diversification.

- 4.1 Collaborate with industry innovators to expand on existing digital initiatives (including those supported by the Queensland University of Technology Mackay Renewable Biocommodities Pilot Plant and RCOE expansions) through increasing investor and stakeholder knowledge of facilities, and supporting pilot programs and new initiatives.
- 4.2 Promote digital infrastructure and technologies needed to improve decarbonisation and diversification data reporting and outcomes for all industry sectors, and seek grant funding partnerships to accelerate digital adoption.

Evaluation and continuous improvement

To ensure the region drives outcomes from this Digital Roadmap and continues to strengthen its digital reputation, it is important to consider and implement evaluation and continuous improvement measures.

A culture of continuous evaluation across digital strategies and programs of work will assist in meeting the region's digital vision and ambitions.

Robust and systematic evaluation is essential to identify and share what works, what does not work and why, and to improve the uptake and success of the digital strategies outlined in this document.

Adopting a consistent approach to evaluation supports the development of an evidence-base that can be used to inform and optimise future investment.

To underpin the success of the strategies, it is recommended that an evaluation framework is developed that:

- Identifies new and emerging digital challenges and risks that need to be addressed;
- Clearly sets out the interrelation and alignment between digital initiatives in terms of target audience, content and reach;
- Establishes key performance indicators for each initiative; and
- Supports the regular monitoring and review of the strategies.

Key enablers for success

Leadership and governance: Strong leadership and governance is vital in driving the cultural change needed to support evaluation and monitoring.

Planning and co-design: Initiatives should be developed collaboratively with key stakeholders and government agencies to harness synergy. A key element of this is clear accountability.

Data and evidence: The collection and analysis of qualitative and quantitative data is crucial to form the evidence-base on which future decisions are made.

Communication and engagement: As a lead economic development agency in the region, GW3 will help to build the case for adoption of the digital strategies and secure buy-in from key stakeholders.

A principles-based approach to program evaluation

There is no one size fits all approach to the evaluation of digital technology strategies and actions. Rather than a prescriptive approach to evaluation, it is recommended that GW3 adopt contemporary, best-practice principles to guide the development of an evaluation culture for Digital Roadmap strategy adoption.

Principles may include that all initiatives are:

- Evidence-based;
- Measurable;
- Outcomes focused;
- Co-designed;
- Collaborative;
- Cost-effective;
- Targeted; and
- Contemporary





APPENDICES



Appendix A: Glossary of Technologies



Horizon I – Technologies

Term	Definition
Fibre optic	Fibre optic is an internet connection delivered via fibre optic cable, which uses pulses of light along thin strands. This type of connection is superior in terms of reliability and speed over other connection types. It is used for long-distance and high performance communication. It can support more information than copper wire with higher bandwidth and faster speeds with less maintenance required than other connection types, however it is more expensive than copper.
Fixed wireless and Satellite	Fixed wireless technology uses a terrestrial, point-to-point microwave or radio link to transmit data over radio signals to connect premises (houses or buildings) to existing cable, fibre (e.g. NBN) networks. Fixed wireless relies on small stations to transfer this data at high-speeds, and extend current fixed-line service footprints in a cost-effective and reliable approach. As such, it is generally used in rural and remote areas that lie beyond fixed-line infrastructure to provide high-speed internet or broadband access. Regional and remote areas also have satellite connection as an option, which is internet via a roof satellite and modem.
Mobile network	A mobile phone network is defined as a communication network where the last link to and from end nodes is wireless, enabled by a network of base stations. It is composed of a large number of cells which overlap to form a geographically large coverage area, allowing users to move between cells without losing connection. Each cell is powered by a base station which receives transmissions from mobile devices, connecting to the closest or least congested base station, facilitating the digital exchange of data between devices.
Remote Operating Centres (ROCs)	ROCs harness technology to ensure safe, reliable operations from a centralised location. They have become common practice in high-risk industries, such as petroleum, defence and aerospace industries. Benefits for utilising ROCs include the ability to optimise operations by maximising the effectiveness of scarce expertise within industries, by allowing remote operations to occur across (often) difficult to reach sites and/or multiple sites simultaneously.
Global Navigation Satellite System (GNSS)	GNSS, when using GPS, has current accuracy of 5-10 metres, which is expected to be reduced to 10 centimetres in areas with connectivity over the next three-years through the Australian Satellite-Based Augmentation System (SBAS). SBAS fixes errors by connecting to data streams from fixed reference stations which will enable 10 centimetre accuracy without the need of additional private base stations.



Horizon I – Technologies

Term	Definition
Internet of Things (IoT) Low-Power Wide Area Network	<p>IoT is a broad term that refers to the connection of all types of devices to the internet and to each other. Connection types include Mobile network – 3G, 4G, 5G; Satellite; Traditional networks - Bluetooth, Wi-Fi; and Low Power Wide Area Networking.</p> <p>Low Power Wide Area Networking (LPWAN) describes a variety of wireless technologies used to connect low-bandwidth, battery-powered devices with low bit rates over long ranges. LPWAN networks are typically used for low data rate transfers, making them applicable to many regional use cases where only small packets of data need to be sent.</p>
LoRa frequency and LoRaWAN protocol on LPWAN	<p>The LoRaWAN protocol is a LPWAN communication protocol. The LoRaWAN specification is typically open so anyone can set up and operate a LoRa network. LoRa is a wireless audio frequency technology that operates in a license-free radio frequency spectrum. LoRa is a physical layer protocol that uses spread spectrum modulation and supports long-range communication.</p>
Public and private Wi-Fi hotspots	<p>A public Wi-Fi hotspot is an area where access to the internet is provided through wireless technology by a public provider. These networks are often free and unsecured and may be at increased risks to personal information and safety. Businesses may offer Wi-Fi hotspots free for customers, and some may require a password and perhaps acceptance of terms of use. Some hotspots charge a fee for access.</p>
Cyber security	<p>Cyber security is a collective term for the people, processes and technologies that protect digital assets from those who should not be accessing them. Cyber security can be broken down into several disciplines, such as: user education; information security; and infrastructure security – all of which help an organisation protect its digital assets from malicious acts. Malicious acts can take a number of different forms, including ransomware, internal breaches, and phishing, and continue to evolve over time. As the region becomes more connected, it is important that the right practices are put in place to protect organisations' sensitive data.</p>



Digital – Technologies across all industry sectors

Term	Definition
Automation and robotics	Automation and Robotics refer to the process of equipping or implementing technologies to complete repetitive and manual tasks and activities automatically that result in process efficiencies.
Predictive analytics	Predictive Analytics technologies are tools that use algorithmic-based process and prediction software to evaluate data inputs, extracting relevant information and solving specific queries.
Artificial intelligence (AI)	AI refers to the simulation of human intelligence in machines and systems that are programmed to think, learn, and problem-solve like humans and mimic their actions.
Edge computing	Edge Computing is the practice of capturing, storing, processing and analysing data at its point of capture and origin, instead of in a centralised data-processing warehouse.
Sensors and Internet of Things (IoT)	IoT is a broad term that refers to the connection of all types of devices to the internet and to each other. Sensors utilise inputs from the physical environment and internal programming to perform predefined functions upon the detection of specific inputs.
Data platforms	A Data Platform refers to software designed to ingest, process, analyse, structure and visualise data in order to detect or present trends and assist in organisational decision-making.
Digital twin	A digital twin is a real-time digital simulation of a real-world physical system, process, or asset that serves as a direct copy for practical purposes. Digital twins are typically used to conduct simulations, integration, testing, monitoring, or maintenance.
Data centres and micro data centres	A Data Centre is a centralised facility of networked computers and storage systems that stores, processes, and distributes an organisation's data and / or system applications. A micro Data Centre meets the same definition but utilises smaller or containerised (modular) architecture that is designed for storage and processing that does not require traditionally sized facilities.
Blockchain	Blockchain is a shared, immutable ledger that facilitates the process of recording transactions (called blocks) and tracking assets within a network of machines.

Agriculture and Aquaculture – Technologies in practice



Term	Application in practice
Automation and robotics	These technologies have been used for a number of complex tasks, including: autosteer seeding or planting, harvesting and post-harvesting technologies, and are expected to increase productivity and reduce labour costs.
Water management technologies	Water management technologies include automated water management systems and sensing equipment that improve decision-making and irrigation efficiency. It can be applied to monitor external weather factors and reduce workforce requirements.
Farm management technologies	Farm management technologies refers to any technologies which replace repetitive, labour-intensive farm management tasks, and provide other benefits, including reducing the labour force requirements and costs. It can be used for providing metrics for livestock management and reducing methane emissions from livestock and waste.
Sensors and Internet of Things (IoT)	Sensors and IoT is being applied to monitors and wearable devices to improve operational productivity and efficiency. It is also able to bridge the harvest yield supply and demand gap and process data to pass on to other applications to support decision-making and enable IoT.
AI and data platforms	AI is being used in supply chain technologies to increase consumer confidence and offer farmers and consumers transparency, accountability and traceability. It is also able to be applied to meet regulation and premium export requirements.



Mining and METS – Technologies in practice

Term	Application in practice
Automation operations vehicles and drilling	Autonomous vehicles are vehicles that can navigate autonomously in unstructured environments with specific functions. Autonomous Drilling: Autonomous drills are able to collect real-time data and, using advanced analytics, provide information to operators that enable tailored adjustment of drill patterns to suit the mineral characteristics.
Autonomous rail	Trains are the most common form of long distance haulage in the mining sector, and are used to move materials between mine sites and ports. Autonomous trains are also able to use advanced analytics and autonomous decision-making to enhance both safety and efficiency.
Geo-spatial data and 3D mapping technology	Geo-spatial data and 3D mapping technology provide the ability to view, compare and evaluate data to build a greater understanding of what is beneath the Earth's surface. When used for mineral exploration, the use of these technologies can increase geological and metallurgical prediction, providing the organisation with an increased probability in recovery of mineral deposits.
Sensors and Internet of Things (IoT)	Sensors are being installed to collect data and determine mine equipment problems before the point of failure, thereby reducing down time and costs.
Data platforms	Data platforms are being applied to monitor, manage and reduce mining's footprint and can lead to greater cross-industry collaboration on environmental issues within the industry.
Augmented reality	Augmented Reality provides interactive experiences between the real, physical and a computer-generated simulated reality. It incorporates real-world elements with computer-generated environments.
Chemical analysis and photon assay	Chemical Analysis and Photo Assay is the process of analysing a substance to determine its composition or quality. It minimises waste and can be used to detect and calculate metal grade.
Data and analytics	Data and Analytics are being used to help mine planners and managers to monitor, collect and analyse information from pieces of mining equipment.
Predictive analytics	Predictive Analytics technologies are tools that use algorithmic-based process and prediction software to evaluate narrow data inputs, extracting relevant information and solving specific queries.
Artificial Intelligence (AI)	AI can be used to enhance the predictability of mine sites and analyse large volumes of complex structured and unstructured data.
Edge computing	Edge Computing is the practice of capturing, storing, processing and analysing data at its point of capture and origin, instead of in a centralised data-processing warehouse. It is being applied to improve the speed of transferring data, allowing for faster decision-making. In addition, it allows for better security for sensitive data in the mines and decentralised data-processing.



Bio manufacturing – Technologies in practice

Term	Application in practice
Biomanufacturing	Biomanufacturing is a type of manufacturing that uses biological systems (living cells) to produce important biological products and materials, such as antibodies and enzymes for environmental remediation and recycling plastics.
Artificial intelligence / machine learning accelerators	AI is being utilised in the production, testing and analysis of cells with the ability to produce images, results and map outputs and inputs. This testing provides fast in-process testing to ensure manufacturing remains efficient and accurate, with little destruction to the cells. Further automation is utilised in competitive areas where labour market costs constrain production (e.g. automated harvesting of biomass and automated manufacturing for repetitive manual tasks, etc.), helping to increase profitability for businesses.
Continuous flow	Continuous flow produces finished bioproducts using a continuously-flowing (uninterrupted) process, with integrated sequences of unit production (rather than batches). This improves the speed and efficiency of processes for biomanufacturing products.
Synthetic biology systems	Synthetic biology systems are used for the design and creation of new biological systems, devices and parts not found in nature, or for the replication of existing systems found in nature. Synthetic biology systems are therefore a sub-type of biomanufacturing, examples of application include redesign of existing genes and cells, creating microorganism's that clean environment pollutants, precision fermentations of proteins and the manufacture of nature identical staple food items such as egg-whites, milk and fats.
Sensors and the Internet of Things (IoT)	Sensors and IoT are being utilised to collect essential information and data to the cloud for analysis, which can be utilised to increase productivity and reduce expenses and inefficiencies. Further, it is being applied in biomanufacturing to communicate and automate decisions between machinery to improve processes, increasing efficiency and decreasing labour costs.
Blockchain	Blockchain is a system that records the transaction of assets in a consensual database, shared across multiple sites, places or people at the same time. This offers enhanced customer relationship and supply chain management, demonstrating the provenance of bioproducts sold.



Decarbonisation and Diversification – Technologies in practice

Term	Application in practice
Decarbonisation	Decarbonisation is a process aimed at reducing the overall amount of greenhouse gas (GHG) emissions that accumulate in Earth's atmosphere. Achieving this is a twofold process that involves both the reduction of GHG emissions produced by society's activities, and the removal of carbon dioxide emissions already accumulated in the atmosphere. Reducing societal emissions is achieved through the use of zero- or low-emission energy sources and improving energy efficiency, for example. Removing carbon dioxide is achieved by various forms of carbon sequestration.
Drones	Drones can be used to help sow seeds, fertilise fields more precisely and protect insects. When combined with blockchain technology, drones are able to create transparency for consumers to assist in putting an end to the unchecked increase in resource consumption. Drones can also assist with aerial mapping of forestry for conservation purposes and are able to be deployed to collect data, such as weather and soil moisture, enabling more effective land management.
Digital twins	Digital twins can reduce environmental impacts by improving operational efficiencies and prospectively identifying and removing errors to optimise performance. The technology behind digital twins also offers an unprecedented acceleration in innovation that helps make food production more productive, resilient and sustainable.
Blockchain	Blockchain enabled reporting tools allow companies to collect verifiable data and generate trustworthy reports that demonstrate their Decarbonisation credentials. The transparency that blockchain provides can be crucial in tracking the materials and goods from source to end-use, resulting in the development of reliable data on responsible and ethical sourcing.
Data analytics, reporting and ethics	There is potential for new regulations that require businesses to report on their Decarbonisation efforts. Technology such as cloud transformation can be used to create effective Decarbonisation reporting strategies, helping to capture actuarial and finance data, analyse the data and produce pre-and post-consolidated reporting at the actual levels. Underpinning technology advancements in Decarbonisation data analytics is the notion of ethical reporting, which focuses on aligning business ethics with operational and strategic Decarbonisation objectives.



Term	Application in practice
Security and privacy	<p>Data privacy strategies include incorporating intelligence and automation into operations. The same intelligence and automation tactics can also help organisations "go green", as computing also has a considerable carbon footprint. By taking steps to centralise technology in the cloud to cut down on vulnerable, emissions-producing physical server rooms and computer centres, organisations can simultaneously promote data minimisation and reduce the carbon footprint of data and computing operations.</p>
Robotics	<p>Robotics are being applied across multiple initiatives aimed at reducing carbon emissions through increased food production systems. These include, increasing nitrogen efficiency, reduced food waste, delivering regenerative agriculture and electrifying robotic vehicles. Robotics will also become increasingly relevant in supporting the extraction of resources from waste to recirculate in circular economy models.</p>
Renewable energy	<p>Queensland is looking to transition from 20 per cent to 50 per cent renewable energy by investing \$40 million for energy network upgrades in the northern Queensland region, creating the opportunity to make energy systems that ensure that cleaner, more affordable energy can be delivered to all Queenslanders. The region sits in a renewable energy zone, an area with high-quality renewable resources such as strong wind and solar, that is a renewable powerhouse for the State.</p>
Critical minerals extraction and processing systems	<p>Critical minerals extraction and processing systems allow for the safe, efficient and sustainable extraction and process of the wide range critical minerals found within Australia. This is aimed at ensuring a more sustainable supply of critical minerals, including deducing carbon emissions.</p>



Aviation and Aerospace – Technologies in practice

Term	Application in practice
Artificial intelligence (AI)	AI can be used by airports to make better sense of complex data to create and manage improved aircraft boarding processes by helping to implement just-in-time, queue-less experiences. The technology can also be used to make airport travel safer by identifying potential threats in baggage service as well as critical points within security lines.
Internet of Things (IoT) and sensors	IoT and Sensors enable the collection and analysis of vast amounts of operational data from critical aviation components. This data can then be leveraged to track and predict the maintenance needs of critical assets and prevent unscheduled maintenance stoppages. IoT technology can assist in identifying the most efficient routes for aircraft, optimising fuel consumption and reducing costs.
Sustainable aviation fuel	Sustainable Aviation Fuel is a biofuel used to power aircraft that has similar properties to conventional jet fuel but with a smaller carbon footprint. It can lead to increased aircraft performance and improvements to the environment.
3D printed rocket engines	3D printed rocket engines involve creating products for rocket engines using 3D printing technology. This technology allows for a revolutionised, trial-and-error rocket development, with parts that would have previously required hundreds of distinct components now being able to be printed in a matter of days. 3D printing also helps to reduce the weight of a rocket, as fewer parts are required to produce an engine.
Augmented and virtual reality	Virtual Reality (VR) is being explored as a new way to train pilots, by embedding portions of the virtual world onto a pilot’s visor using VR technology. Augmented reality is also emerging as a training tool in the field of maintenance repair and operations for an aircraft.
Simulated technologies (including digital twin)	Simulation technologies involve the imitation of an operation of a real-world process or system over time. They can be applied to aerospace engineering design by simulating engine designs alongside turbulence models and scalable combustion. This process involves using the collection and analysis of data from existing tests to build models so engineers are not required to rely on physical tests.

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