Gold Coast Industry 4.0 Business and Investment Project

October 2020

industry4.0.rdagoldcoast.org.au

BETTER CITIES GROUP
DESIGN · ECONOMICS · ACTIVATION

Giles Consulting
INTERNATIONAL
Business and Economics

Document Structure

Gilmore Space Technologies

Project Partners

- Regional Development Australia Gold Coast
- Queensland Government
- City of Gold Coast
- Gold Coast Health and Knowledge Precinct

Project Objectives

- To review the Gold Coast's current Industry 4.0 capability
- To identify Industry 4.0 enablers
- To identify potential Industry 4.0 clusters
- To identify current and emerging industry supply chain connections
- To review current and future skilled workforce requirements to support businesses to implement Industry 4.0.

Executive Summary

- Industry 4.0 describes the ongoing automation and digitisation of supply chains with reduced need for human intervention
- The Gold Coast has Industry 4.0 capability and sector leading organisations
- COVID-19 has fast tracked technology adoption, hybrid sector partnership and a push for a “sovereign” supply chain
- The conventional supply chain has been joined by the “digital” supply chain which presents further opportunities
- The City has a strong digital city platform
- Skills and workforce for Industry 4.0 are a constraint and presents opportunities

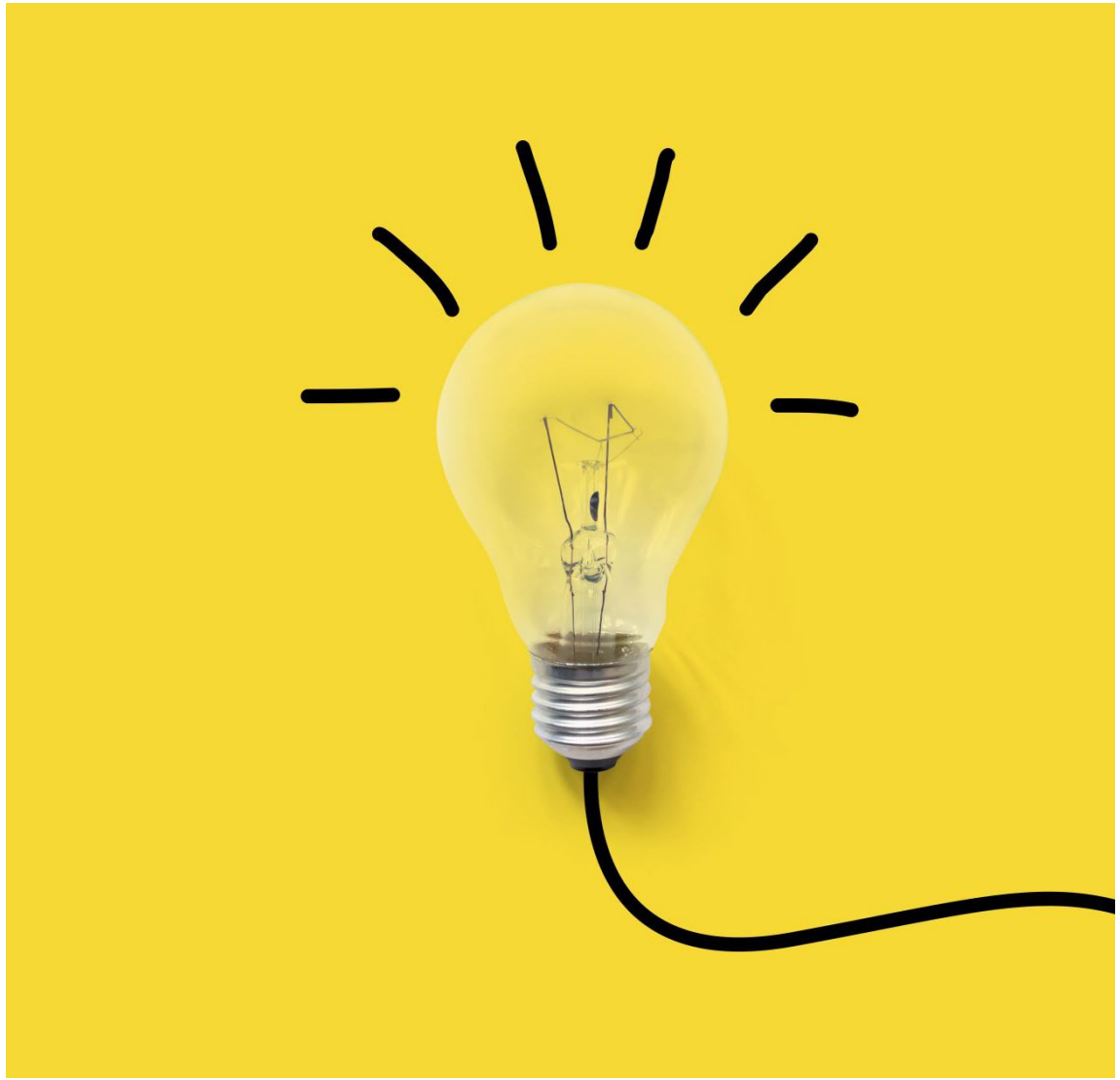
Gold Coast Industry 4.0 Market Analysis

Gold Coast Industry 4.0 Market Analysis Structure

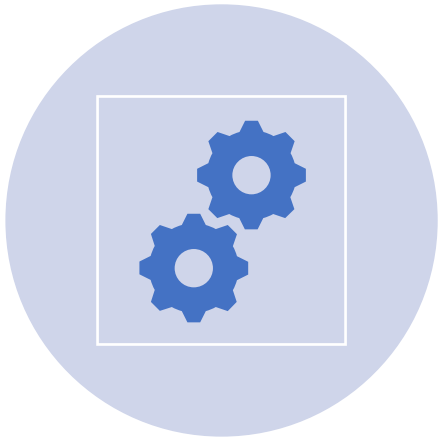
- Industry 4.0
- Trends
- Gold Coast Context & Economy
- COVID-19
- Stakeholder Engagement – Methodology and Outcomes
- Gold Coast Industry 4.0 Businesses
- Gold Coast Industry 4.0 Enablers
- Gold Coast Industry 4.0 Clusters
- Current & Emerging Strengths

Gold Coast Industry 4.0 Business and Investment Project

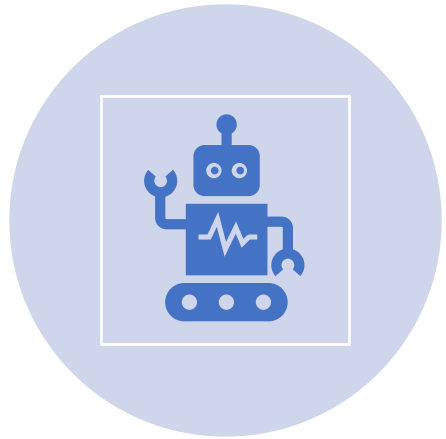
- Objective to have Gold Coast businesses more:
  - competitive
  - productive
  - efficient
- Resulting in higher investment and employment
- Adoption of Industry 4.0 technologies to achieve these objectives



Application of Industry 4.0 technologies



The concept of Industry 4.0 has traditionally applied to manufacturing



Other sectors are using advanced technologies to improve their processes

(digitising or automating to improve supply chain)

International trends

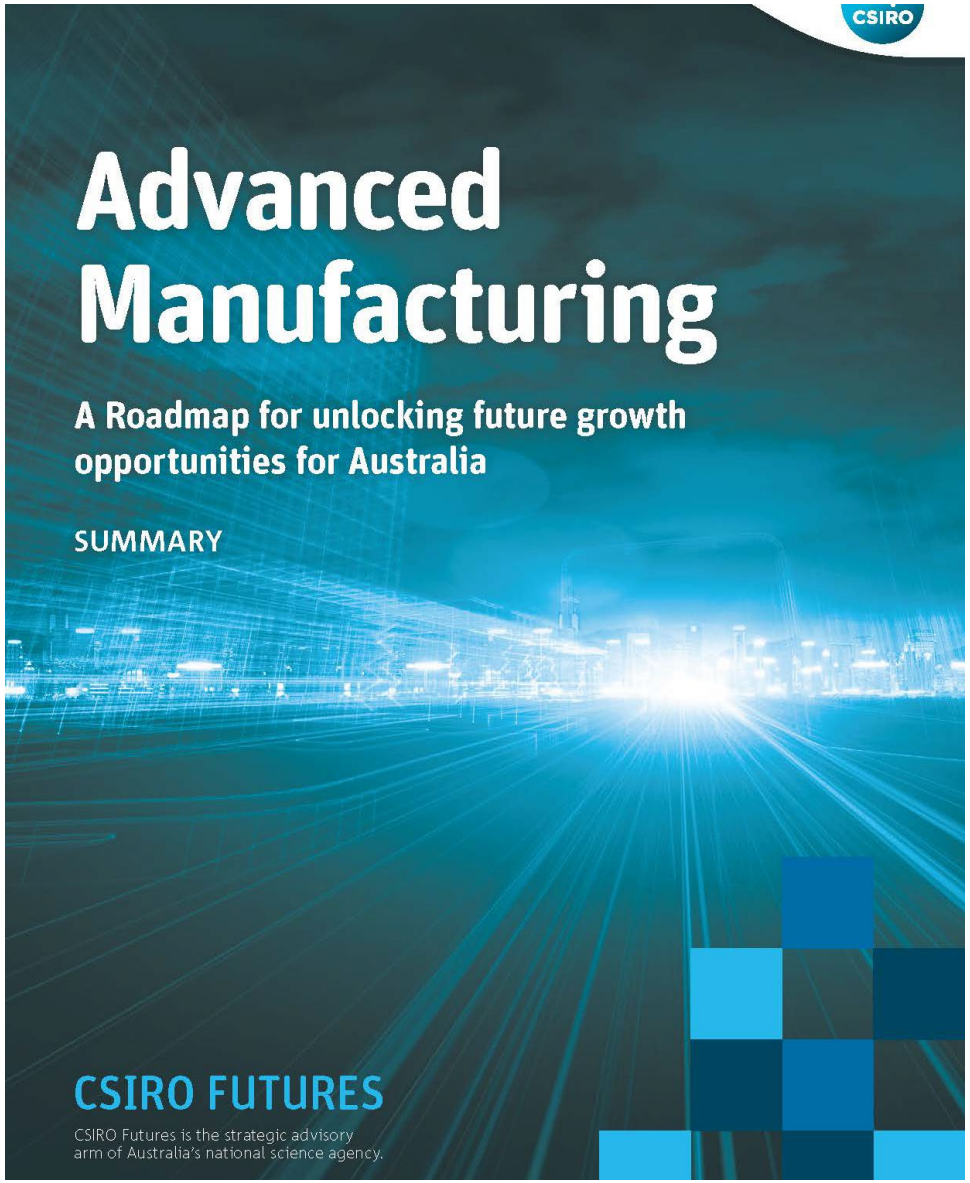
- The Fourth Industrial Revolution (Industry 4.0) is a concept developed to encompass the automation and integration of business and manufacturing processes.
- The first major nationwide application was the advanced manufacturing strategy developed by the German Government in 2013.
- Initially applied to the manufacturing sector, the core technologies have application in many other sectors of the economy.

National trends

In recognition of the rapid rate of technological change and the competitive imperative, the Commonwealth and Queensland Governments have promoted Industry 4.0 initiatives.

Examples include:

- Austrade is supporting advanced manufacturing across multiple sectors
- CSIRO has developed an Advanced Manufacturing Roadmap
- The Commonwealth Department of Industry, Science, Energy and Resources has a number of programs to fund Industry 4.0 developments
- The Queensland Government is sponsoring critically important initiatives concerning the future of manufacturing and industry

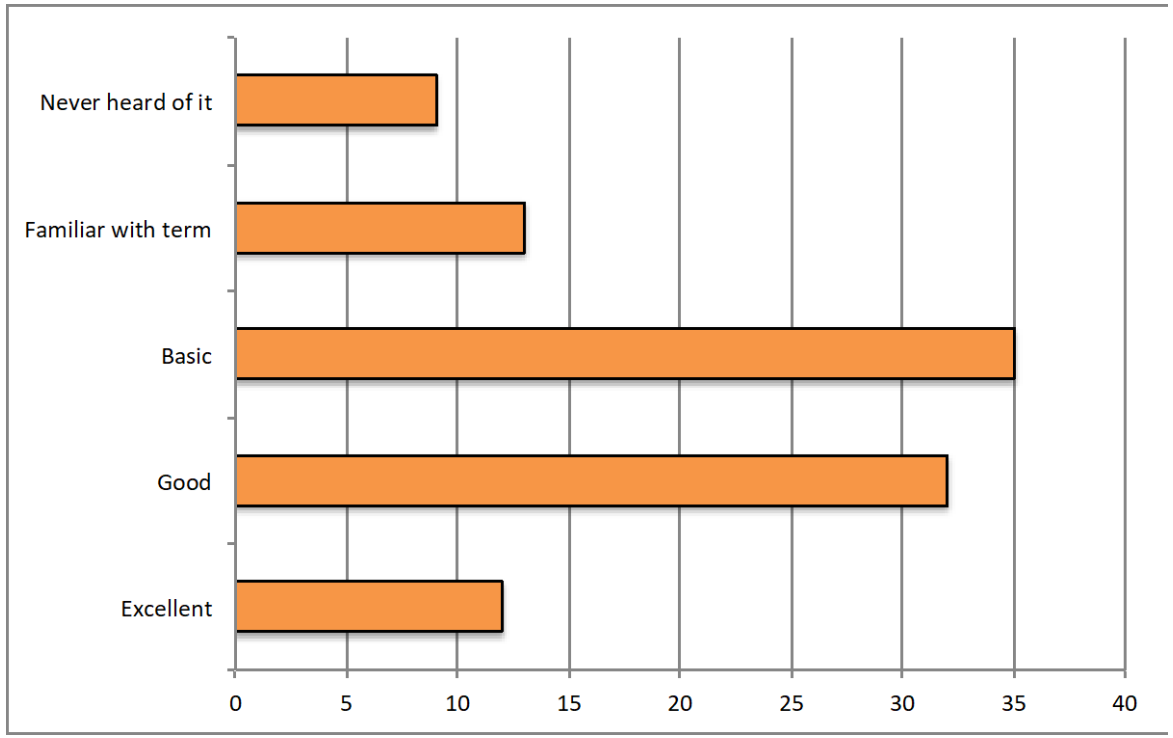


Understanding of ‘Industry 4.0’

While the concept is known to most businesses, many lack a deep understanding of Industry 4.0

Familiarity with the term “Fourth Industrial Revolution” (%)

Survey of 195 Australian Business Leaders



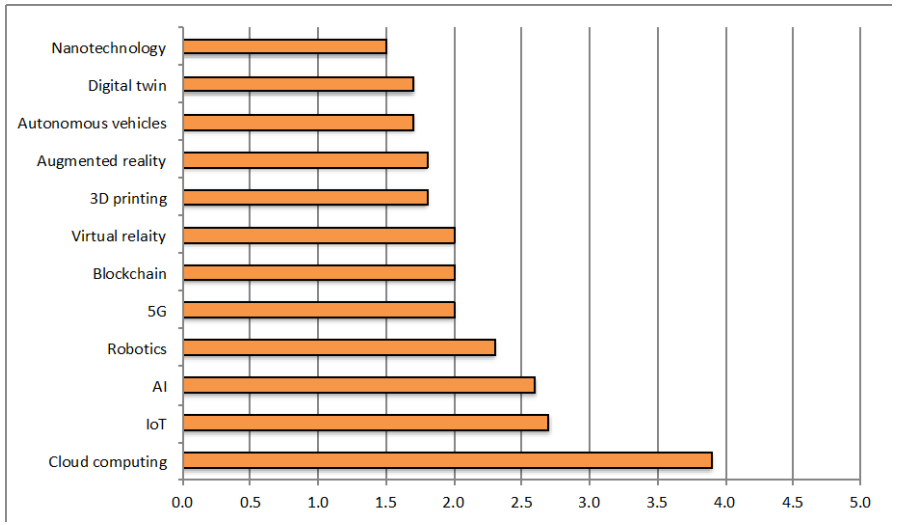
Reference: 2020 Fourth Industrial Revolution Benchmark, KPMG 2020

National uptake of Industry 4.0 technologies

- Cloud computing is the most established and used Industry 4.0 technology
- The Internet of Things (IoT) and Artificial Intelligence (AI) also have relatively high uptake

Adoption of advanced technologies

Survey of 195 Australian Business Leaders



Scale of maturity of adoption

0 = not at all and no vision to adopt

5 = cutting edge use and clear vision

Reference: 2020 Fourth Industrial Revolution Benchmark, KPMG 2020

Gold Coast context

- The Commonwealth Government Intergenerational Reports identified the 3Ps as the key drivers of economic growth:
  - population
  - participation (employment)
  - Productivity

- Gold Coast has relied on strong population growth

- COVID-19 places key components (+70%) of population growth at risk:
  - International migration
  - Interstate migration
  - Intrastate migration
- Need to rely much more on productivity
- Industry 4.0 type initiatives provide key pathway to productivity growth, exports, competitiveness

Reference: Commonwealth Government Intergenerational Report, 2015

ABS Data

COVID-19 shock

- Disruptions in global supplies of essential goods have increased expectations for Australia to retain the capacity to domestically produce manufactured products that may be crucial to national security and well-being.

- National post COVID-19 strategies
  - Reshoring
  - Gas-energy
  - Manufacturing modernisation fund
  - Medical supplies
  - Supply chain resilience

- State post COVID-19 strategies
  - Queensland’s Economic Recovery Plan

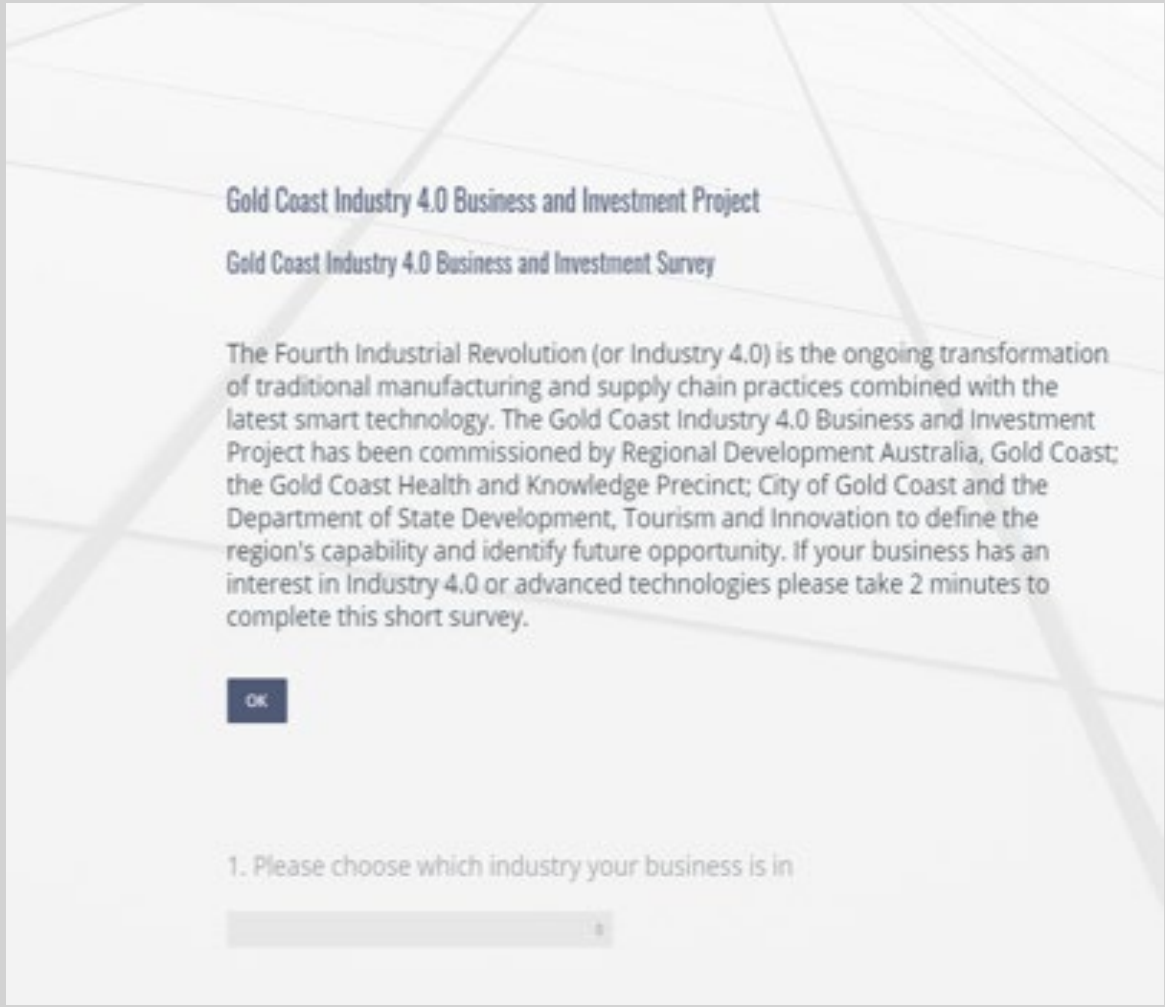
Stakeholder Engagement / Methodology

Structured Interviews

- Peak Bodies /
- Government representatives
- Teaching Institutions
- Technology Leaders
- Highlighted Gold Coast Businesses

Online Survey

- Gold Coast Businesses

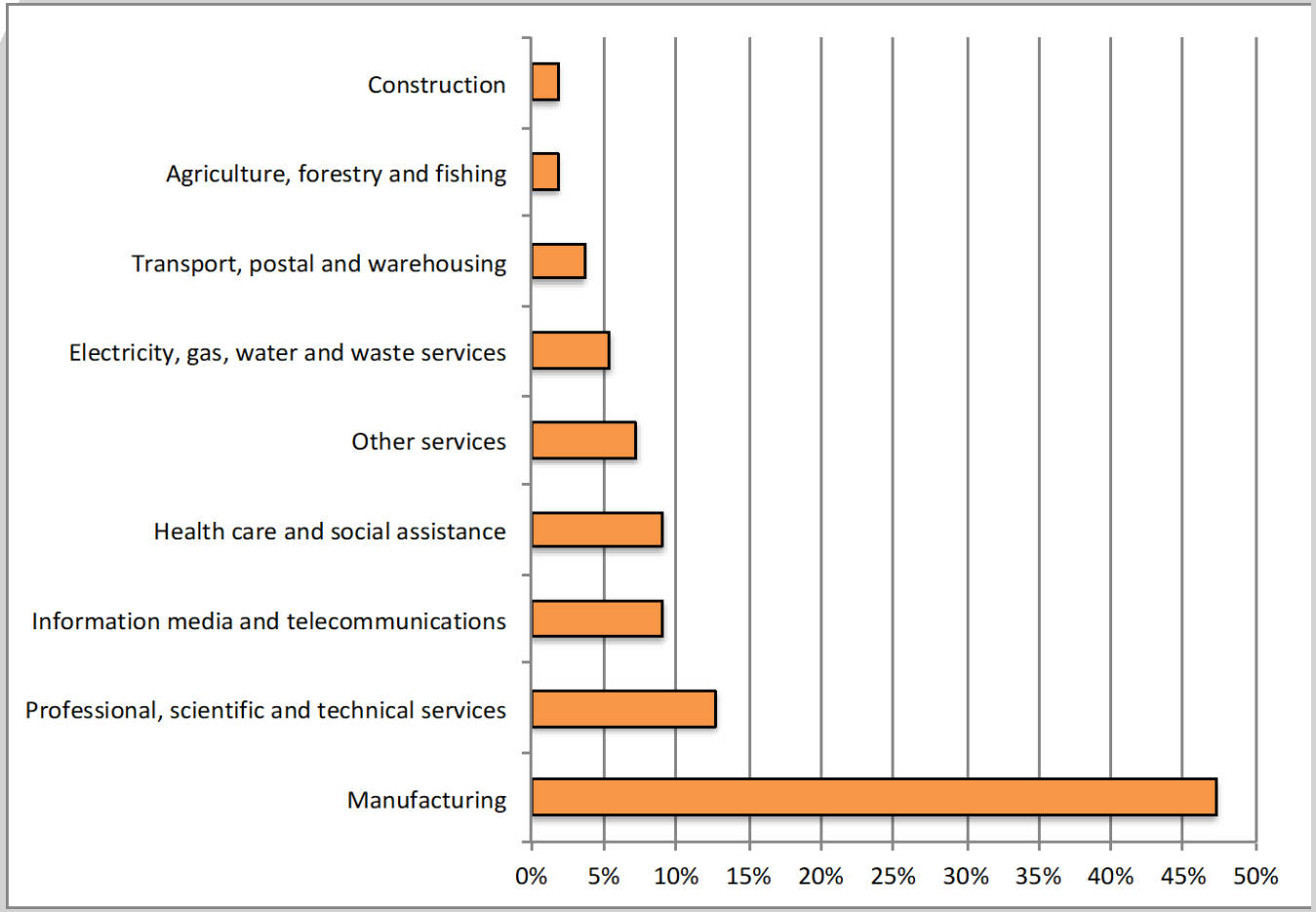


Leaders Engaged - Peak Bodies / Government representatives / Teaching Institutions / Technology

- Advanced Manufacturing Growth Centre
- Destination Gold Coast
- Australian Beverages
- Queensland Robotics
- Life Sciences Queensland
- Queensland Government
- Regional Development Australia Gold Coast
- TAFE Gold Coast
- Bionics Queensland
- COHORT
- Bond University
- Griffith University
- Advance Queensland

Online Survey – Industry of business (%)

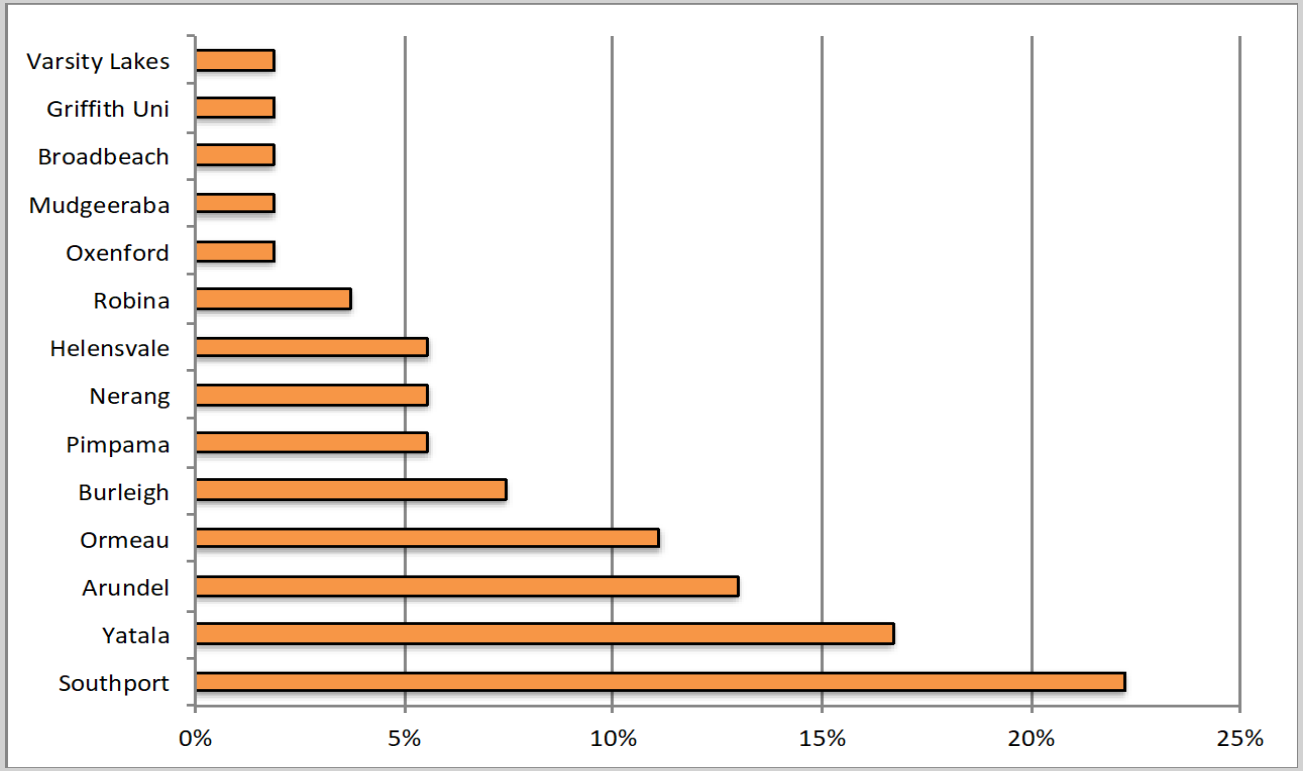
- Most respondents were in manufacturing
- Other respondent industries included:
  - Information media
  - Professional and scientific
  - Electricity gas and water
  - Health care



Online Survey - Location of business (%)

Key geographic clusters included:

- Northern around Yatala and Alberton
- Central around Southport and Molendinar
- Central south around Burleigh and Broadbeach
- Nerang
- Robina and Varsity Lakes
- Oxenford



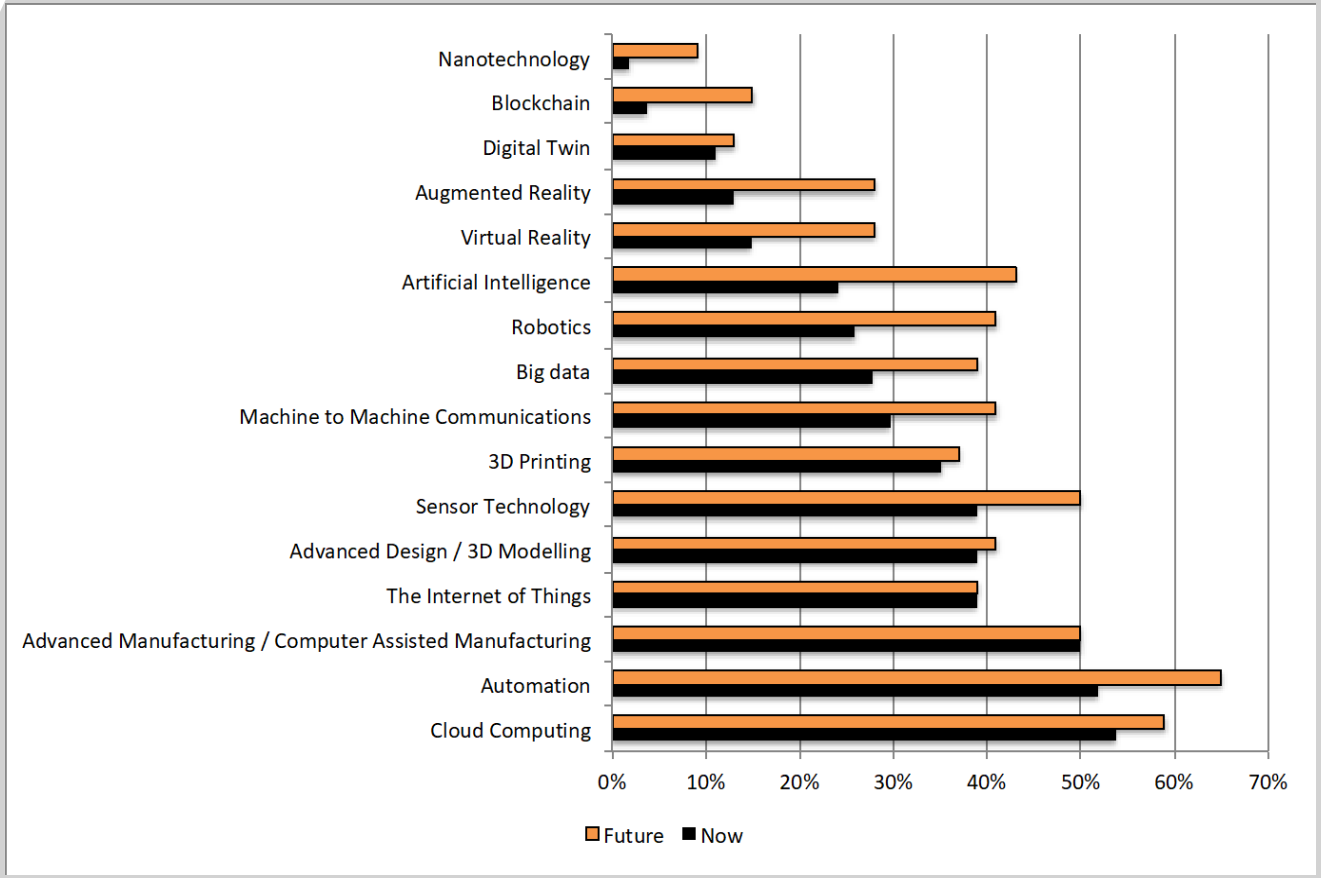
Online Survey - Technology now and future (%)

Industry defined high use of technologies such as cloud computing, automation and advanced manufacturing

The areas of most rapid expected technology uptake include:

- Sensor technology
- Artificial intelligence
- Machine to machine communications
- Robotics
- Big data, augmented and virtual reality

Note: Multiple answers mean totals add to more than 100%



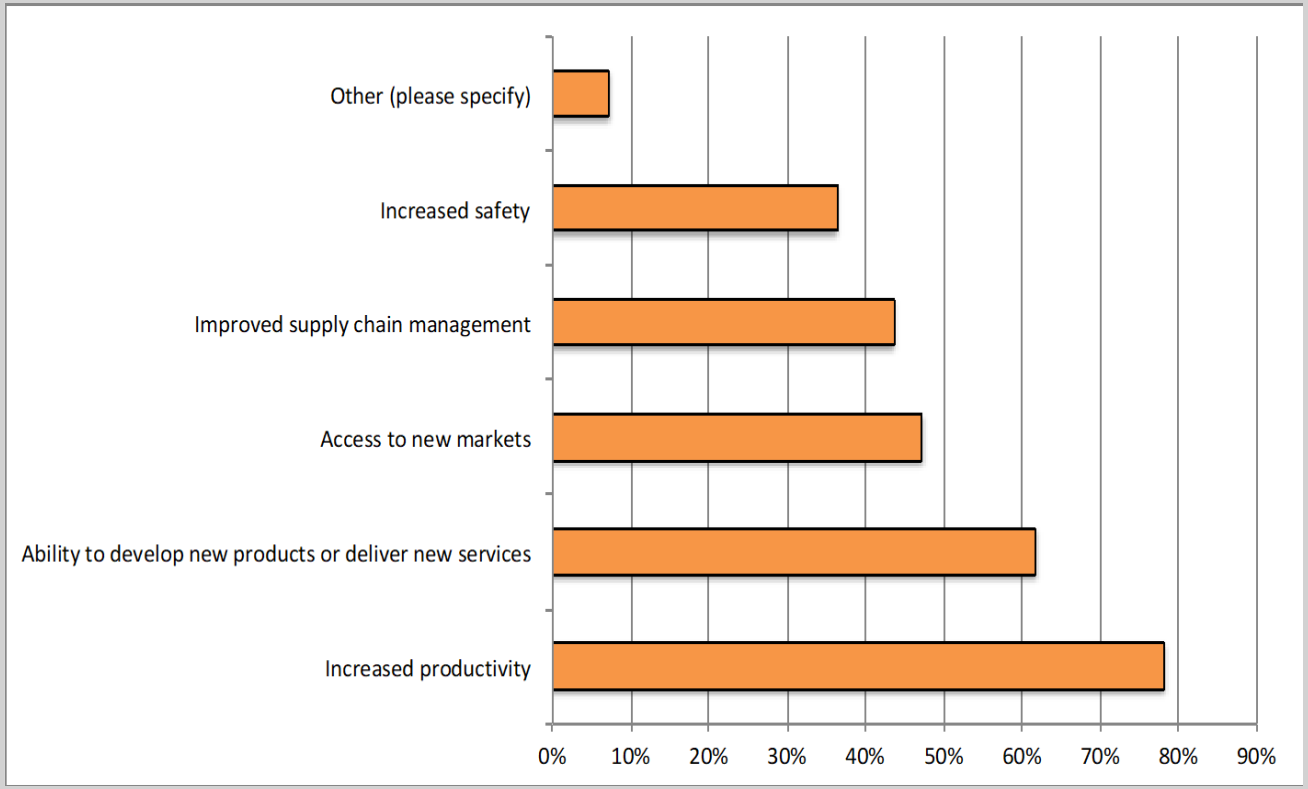
Online Survey - Main growth opportunities of technology use (%)

There is a clear focus of business to invest in new technology to:

- Increase productivity
- Develop new products
- Improve supply chain management
- Access new markets

This focus is vital if the Gold Coast is to rely on productivity improvements to sustain future economic growth

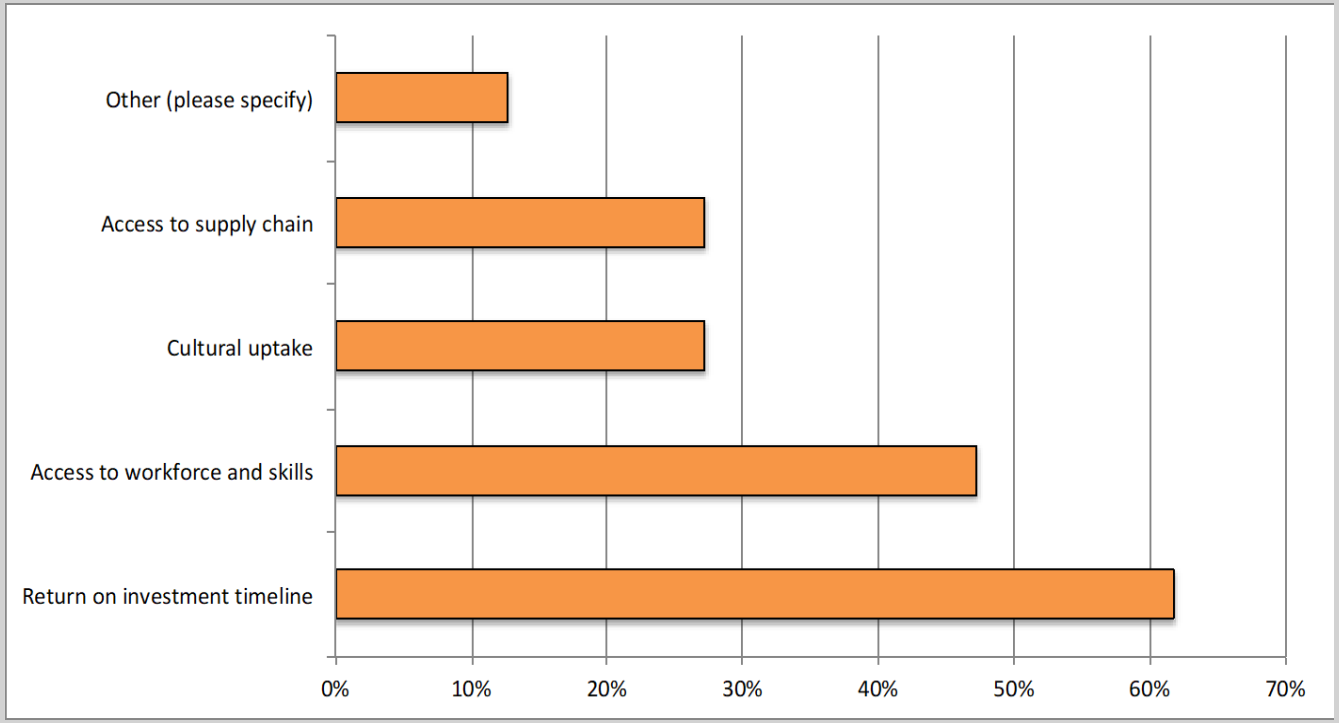
Note: Multiple answers mean totals add to more than 100%



Online Survey - Main barriers to Industry 4.0 adoption (%)

- New technology is often expensive so there is a focus on the need to make financially prudent investments
- The skills issue was very important to respondents and reinforced in stakeholder engagement
- Having the right business strategy, culture and business systems are vital in creating the right environment for Industry 4.0 to be successfully and productively introduced

Note: Multiple answers mean totals add to more than 100%

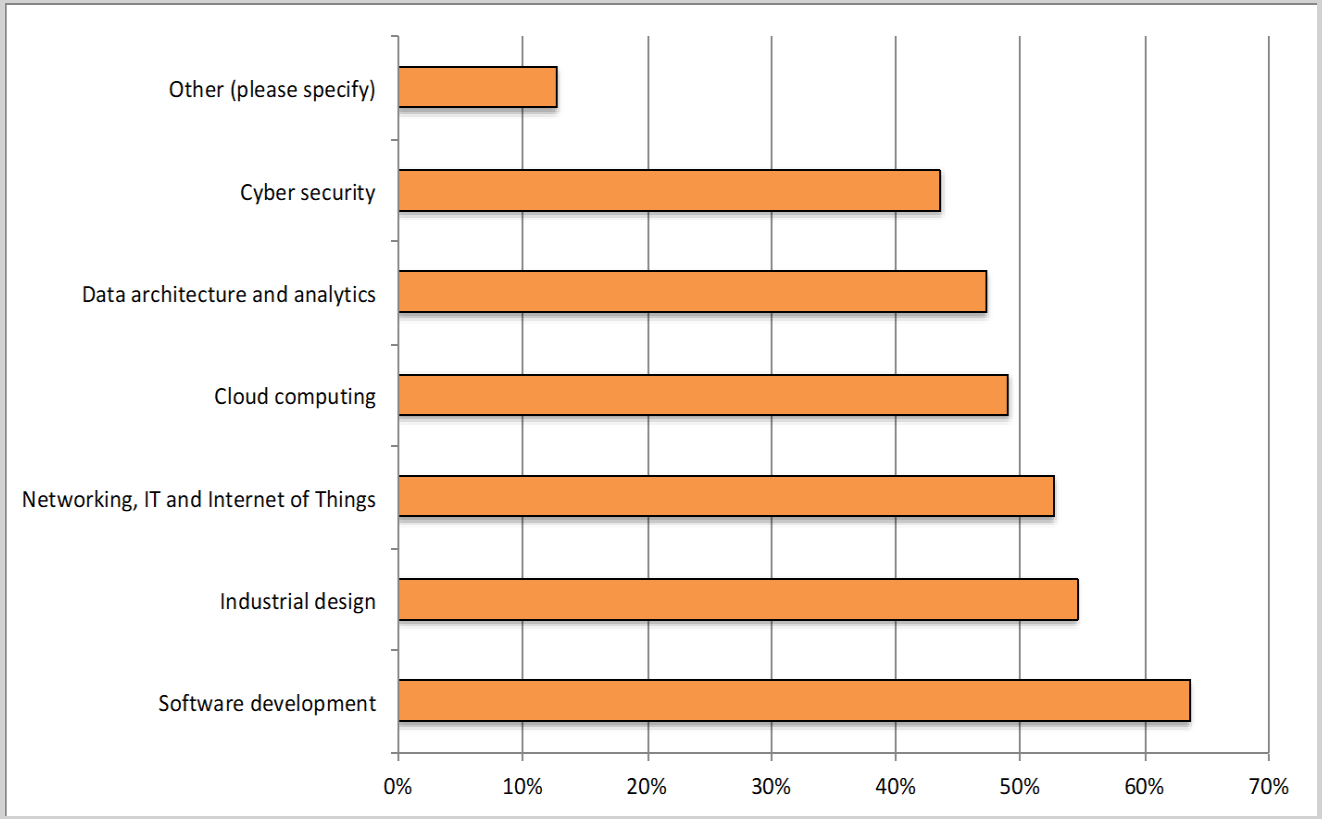


Online Survey - Most important skills (%)

Availability of specialist skills is seen as one of the key issues

Key skills required:

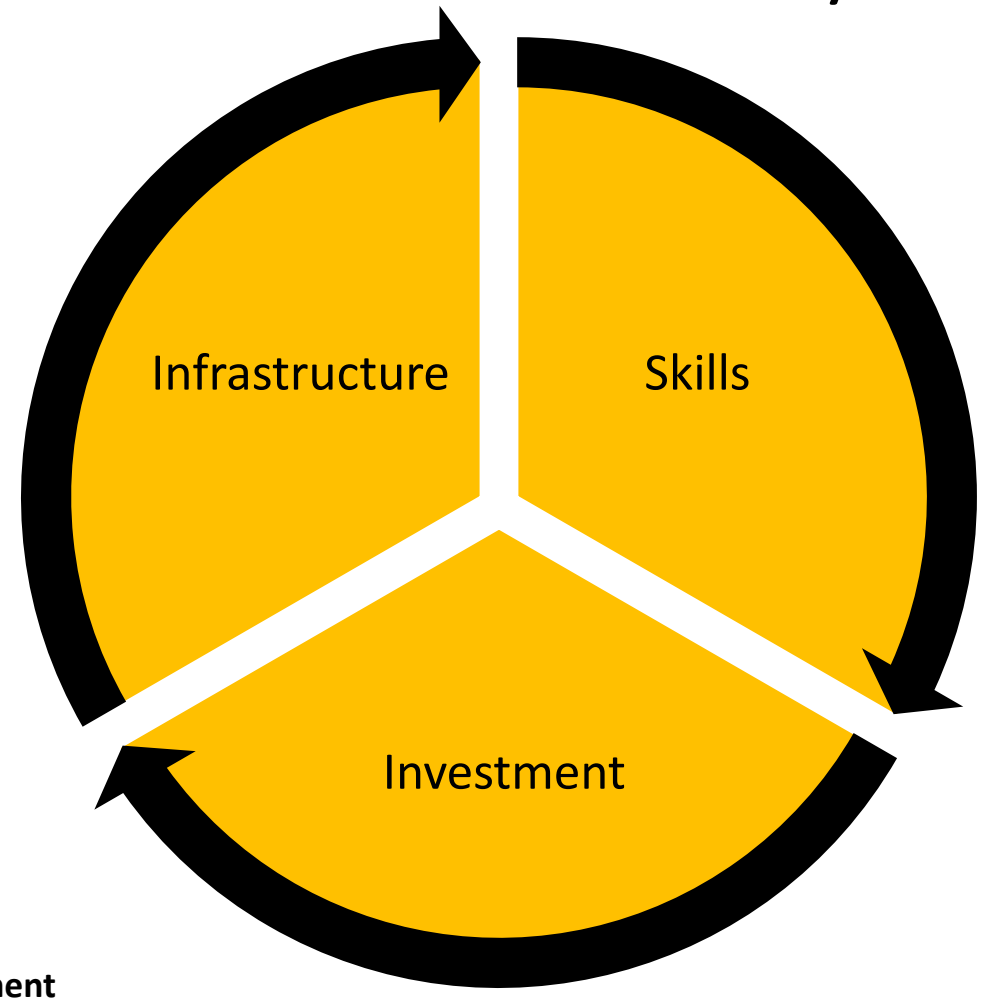
- Software development
- Networking
- IoT
- Cyber security
- Cloud applications
- A wide range of industrial design skills are also virtual



Best Practice Enablers of Industry 4.0

Infrastructure

- *IoT systems and platforms* – Devices and machines connected and communicating.
- *Network capability and capacity* – the volume of IoT systems and devices will drive the need for greater capacity, reliability and lower latency of networks.
- *Data storage and processing capability* – Large volumes of data is required to be stored and processed for it be effective and usable in short life cycles. This will drive the need for storage and processing and fast application at point of capture (i.e. within business).



Skills

- Use and understanding of type and application of emerging technologies (i.e. sensor technology, utilisation of big data, use of statistics and 'general IT knowledge').
- Tertiary qualifications/micro credentials
- Fit-for-purpose skills and competencies within organisations.
- Knowledge sharing and transfer – clusters, sectoral networks, business associations/partnerships and industry development initiatives.

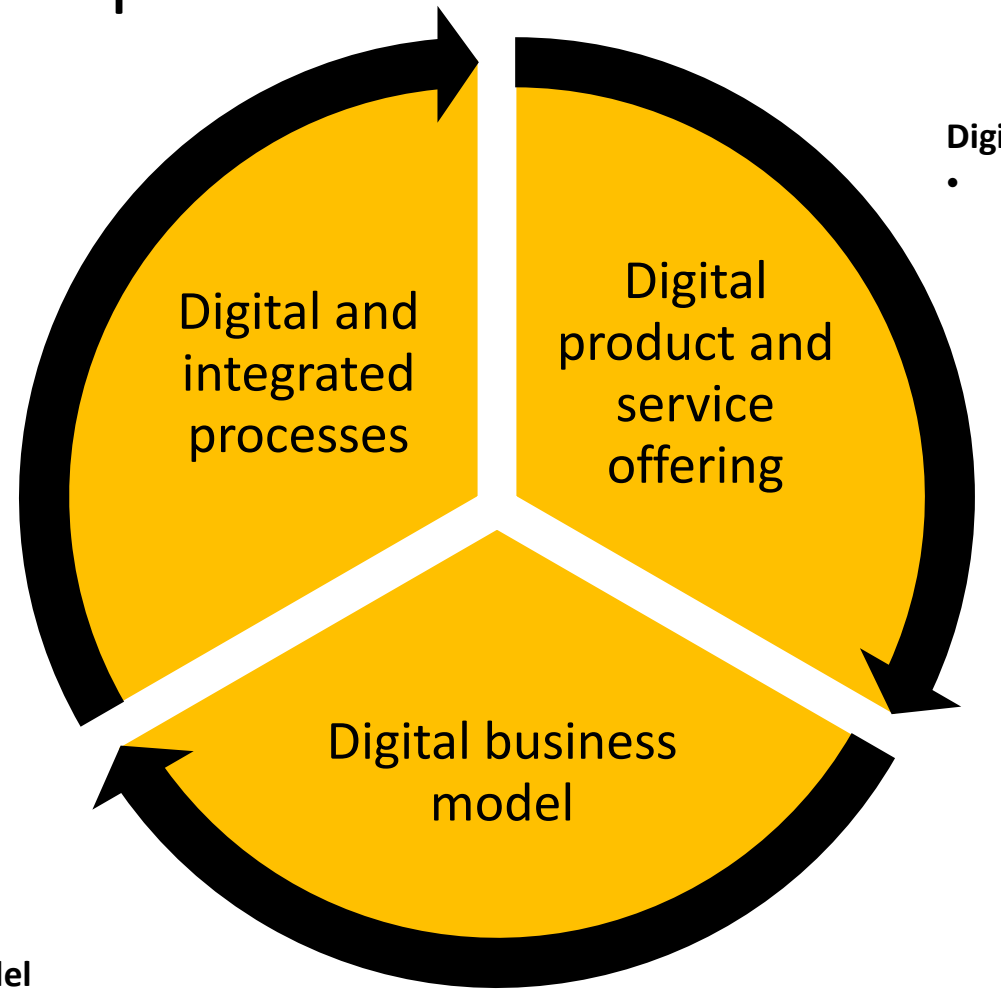
Investment

- Continual business investment in technologies, storage and processing capabilities
- Education and skills investment for application of technologies in business practice
- Investment in network capability and capacity

Best Practice Implementation

Digital and integrated processes

- Full integration of business operations and process (i.e. product development, production, logistics, operations). Requires a holistic perspective and integration to deliver benefits to customers and business performance.



Digital product and service offering

- Selling the eco-system of the business, rather than a specific product or service. Companies are able to deliver and leverage this value for the benefit of customers, while maximising business return on investment.

Digital business model

- Optimisation of interaction within the business. This includes customers, suppliers, internal operations and inputs. Complete end to end solution as opposed to departmental focus or ‘silo approach’ within the business.
- Worker centric. Need to view workers as central to full integration of business operations and processes. Workers are just as critical in this process as customers and suppliers.

Drivers of Industry 4.0

- Maintain competitiveness in a global marketplace
- Improve business productivity
- Access to new markets (domestic and international)
- New product and service development and delivery
- Improving business communication channels (face to face and virtual)
- Access to and developing supply chain capability (business operations, logistical partnerships, research and development partnerships)

Gold Coast Smart City Enablers

Australian Government

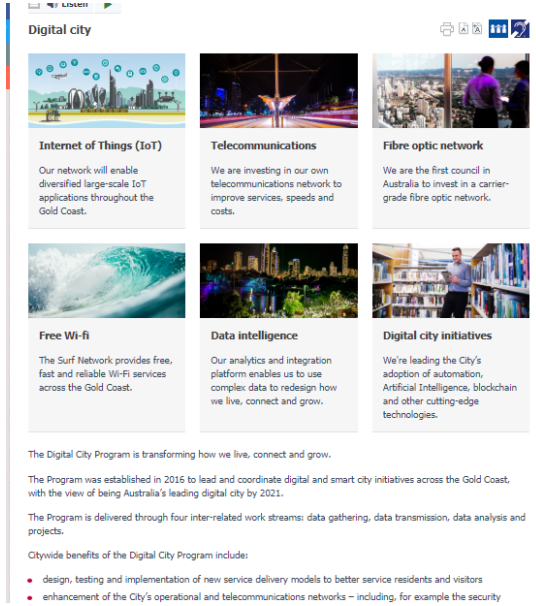
- **NBN.** The National Broadband Newtork (NBN) is Australia's open-access data network. NBN is the wholesale provider, with access to retail service providers who sell access to the network to end users (I.e. business and residential access). The network comprises a range of connection technologies such as copper, fibre optic, hybrid fibre coaxial and satellite and fixed wireless. In September 2020, the Federal Government announced a $4.5 billion upgrade to the NBN, focused on increase to internet speeds.

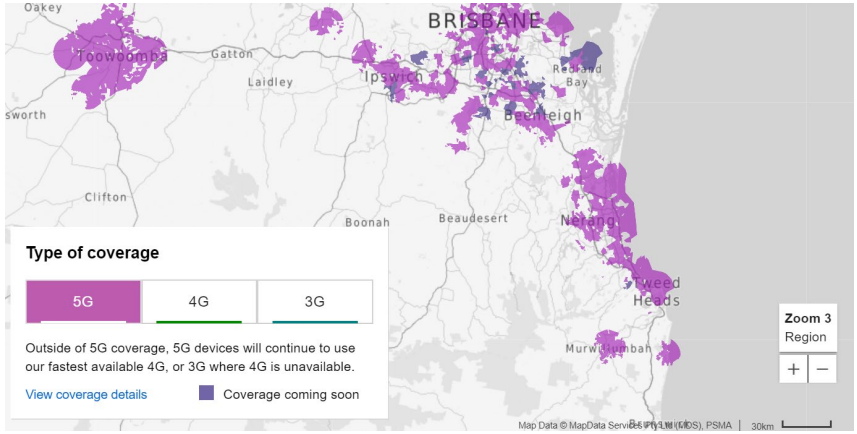
City of Gold Coast

- **LoRaWAN.** CoGC have installed a commercial-grade Low Power Wide Area Network (LPWAN) using the globally-adopted open standard LoRaWAN technology. The network enables a diversified large-scale Internet of Things (IoT) applications throughout the Gold Coast. An example of a City-led IoT application is the installation of smart water meters.
- **Fibre Optic Network.** An 864-core carrier-grade fibre optic network. The network extends along the 21km light rail corridor from Helensvale to Broadbeach. A leased fibre connection continues the route for a further 32kms to Coolangatta. A second loop runs for 37km from Broadbeach to Burleigh Heads and Robina, then through Nerang to Parkwood and connects to the Gold Coast Health and Knowledge Precinct. This network is expected to accelerate wide-spread installation of 5G, which is an infrastructure requirement to support Industry 4.0 business applications.

Private sector

- **5G Network**. 5G is the next generation of mobile networks. The figure above shows the coverage of 5G on the Gold Coast. Coverage is currently concentrated along the coastal corridor and up into the northern Gold Coast. This coverage differs to 4G which has saturation across the Gold Coast.





Gold Coast: Smart City Initiatives

City of Gold Coast

- **Free Public Wi-Fi.** The Surf Network is a free public Wi-Fi network and is powered by the fibre optic network. It is available across Southport (Broadwater Parklands), Surfers Paradise, Chevron Island, Broadbeach, Miami and Coolangatta.
- **Data Intelligence.** A platform has been developed to enable Council to use complex data and real-time information to redesign the way services are delivered to the community. The purpose is to reduce cost and administration required for delivering services such as management of car parking services. This initiative is also being applied to the tourism sector by monitoring the performance in terms of visitation, expenditure and behaviours.

Queensland Government

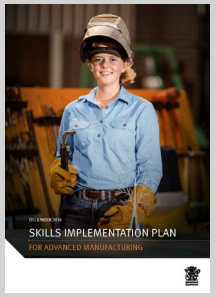
- Policy settings regarding space, advanced manufacturing, skills, robotics, biomedical, Mining equipment, technology and services (METS), defence, beef processing, craft brewing etc
- Business engagement, industry development, workforce development and supply chain development

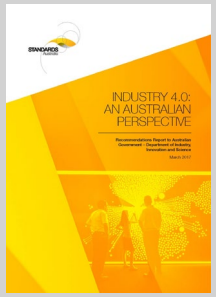
Federal Government

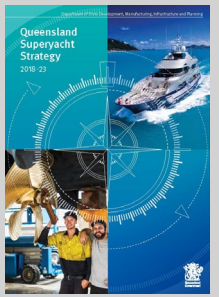
- Smart Cities Plan
- Smart Cities and Suburbs Program
- Industry 4.0 Testlabs Program

Policy Context

There is a strong policy context at all levels of government supporting the delivery of Industry 4.0.







Gold Coast Industry 4.0 Clusters

HEALTH AI CLUSTER – SOUTHPORT

AEROSPACE CLUSTER – NORTHERN GOLD COAST

TEXTILES CLUSTER - YATALA

BREWING CLUSTER – BURLEIGH

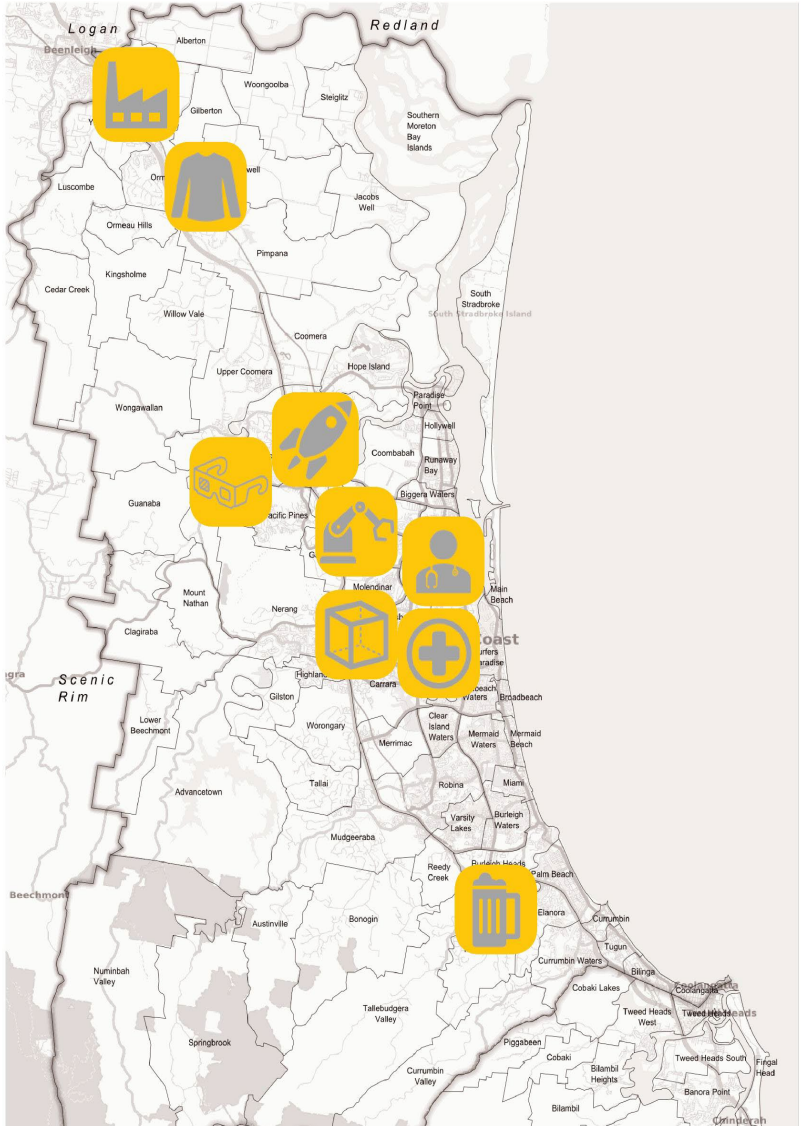
MED TECH (DIGITAL TWIN) – SOUTHPORT

MANUFACTURING CLUSTER – YATALA

ADVANCED MANUFACTURING – ARUNDEL

FILM VISUAL EFFECTS – OXENFORD

ADDITIVE MANUFACTURING - SOUTHPORT



AI Health Cluster – Southport

Aerospace Cluster – Northern Gold Coast

Textiles Cluster - Stapylton

Brewing Cluster – Burleigh

Med Tech Cluster (Digital Twin) – Southport

Manufacturing Cluster – Yatala

Advanced Manufacturing Cluster - Arundel

Film Visual Effects Cluster – Oxenford

Additive Manufacturing Cluster - Southport

Industry 4.0 cluster locations

Current and Emerging Strengths

AEROSPACE / SPACE

MEDTECH (DIGITAL TWIN / BIONICS)

HEALTH AI

FILM VISUAL EFFECTS

ADVANCED MANUFACTURING

ADDITIVE MANUFACTURING

FOOD TECH

Image: Bottle Packaging and Palletising System Developed by Gold Coast Company MEXX Engineering

Gold Coast Industry 4.0 Supply Chain Analysis

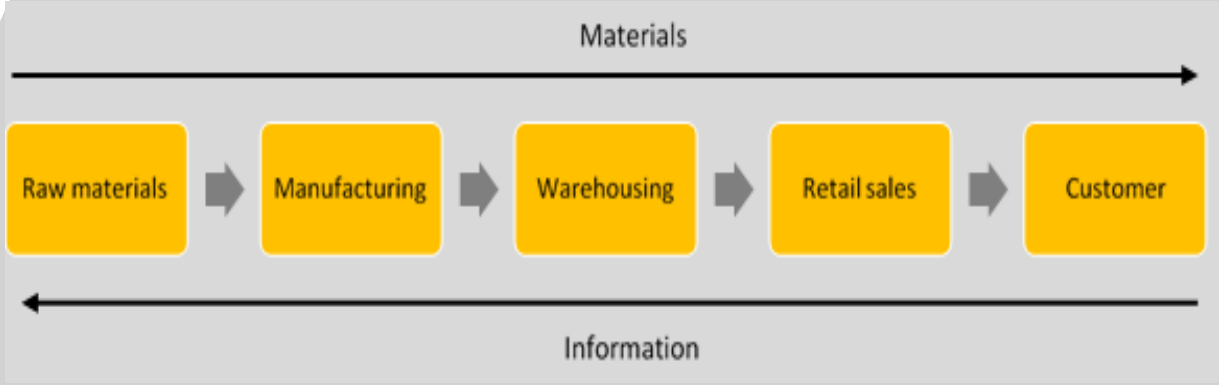
Supply Chain Data Sources

The Gold Coast Industry 4.0 Supply Chain Analysis used the following as data sources:

- One-on-one interviews and online surveys undertaken with:
  - —Industry associations/peak bodies
  - —Technology experts
  - —Leading Industry 4.0 practitioners
  - —Gold Coast Industry 4.0 businesses
  - —Education and Training providers
- Analysis of Gold Coast economic structure based on ABS and Economy.id
- Other reports, studies from KPMG, Deloitte, PwC, Australian Computer Society, CSIRO and others

Conventional Supply Chains

Traditional Supply Chain



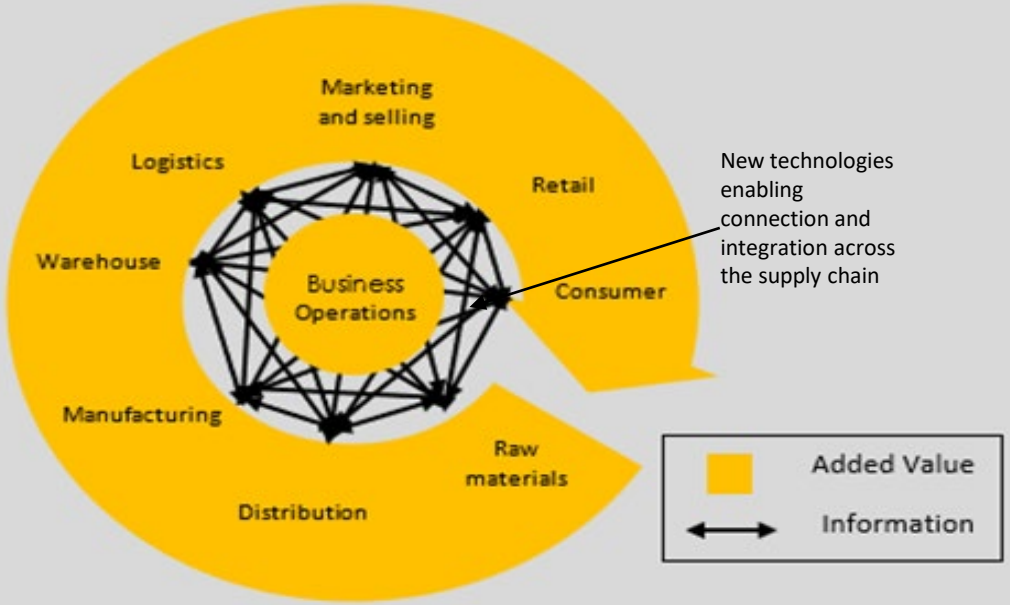
Key characteristics of conventional supply chains

- Physical
- Cost driven
- Locational clusters based on distance and access
- Set of policy responses

- Traditionally supply chains have centred on the interaction of people, activities and resources with the objective to move a product and/or service to an end user or customer. In its basic form it relates to the transformation of raw materials, through distribution and logistics channels, to manufacturing and/or processing plant for development into a finished product. At the core of traditional supply chains are the transactions and interaction between materials, information, capital, labour and time, which as a result creates some form of unit of value. This process has generally been characterised as linear and is depicted at left.

The linear nature of the supply chain has also meant it is quite structured and compartmentalised. This is evident in each step along the chain being dependent upon the preceding one before it. The drawback of the traditional supply chain has been that inefficiencies in one chain can cascade to subsequent stages of the supply chain, replicating similar inefficiencies along the process. Through this traditional supply chain, human interaction in the process is generally limited to a step (or process) and this means human interactions along the chain are not aware or visible to the inefficient processes and/or activities at other stages. Under these circumstances, this limits the ability to respond or change activities to improve efficiencies, and as such the replicated inefficiencies through the chain can result in fluctuations in production, impact time and distribution reliability, subsequently impacting costs of production. Eventually these impacts need to be redeemed by the business, which ultimately impact the customer.

Digital Supply Chains



Key characteristics of digital supply chains

- Mix of physical and virtual
- For virtual
  - —new ways of linking physical and digital or virtual assets
  - —enabled by new technologies
  - — new levels of performance, improving operational efficiencies and effectiveness
  - —new revenue streams

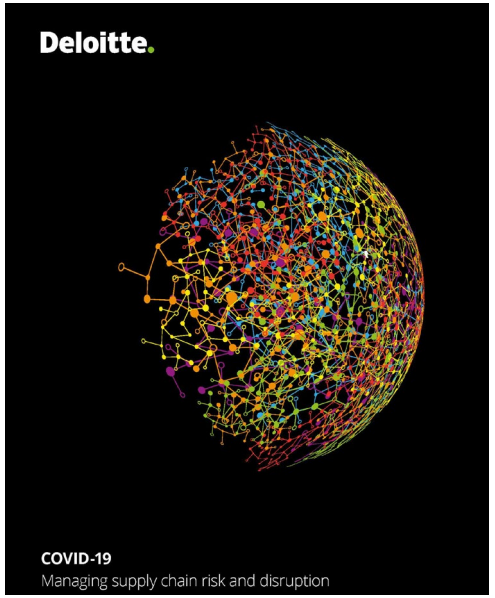
- The emergence of new technologies and digitisation have impacted business operations and the traditional supply chains. This has included reduction in transaction costs, reduced latency of information feedback, and enabled innovation to the production process itself. The shift from linear supply chains requires organisations to adopt new ways of linking physical and digital or virtual assets. Virtual assets can come in the form of Intellectual Property and knowledge and it is this form of value for businesses that can be traded or input to the supply chain across virtual channels.

- The digital supply chain (See above) is being enabled by new technologies and investment in infrastructure and skills. Through connection and integration across different elements of the supply chain, this is enabling new levels of performance, improving operational efficiencies and effectiveness and creating new revenue streams for businesses.

National Study – COVID-19 Impacts

Deloitte advises that in relation to supply chains:

- COVID-19 has supercharged previous trends
- COVID-19 has exposed the vulnerabilities of many organisations
- The traditional linear supply chain model is transforming into digital supply networks
- Business needs to leverage advanced technologies such as the Internet of Things, artificial intelligence, robotics, and 5G are designed to meet future challenges.



Gold Coast findings support this view in that:

- Whilst conventional supply chains remain, there is an emerging digital supply chain
- Gold Coast organisations are rapidly adopting advanced technologies to improve supply chain resilience

Reference: COVID-19 Managing Supply Chain Risk and Disruption, Deloitte, 2020

National Study – COVID-19 Impacts

PwC advises that:

- COVID-19 has caused significant disruption affecting multiple layers of the supply chain, revealing exposures of the local, national and international supply chains.
- The challenges of complex, international supply chains have been exposed.
- In future, we'll see a focus on building more resilience into supply chains and a shift towards supply chains becoming localised.
- These challenges are not just for the production of goods, services can be equally affected.
- Australia needs to reskill its existing workforce as we face a fundamental shift in the skills required of employees.
- Accelerated digitisation, coupled with remote ways of working, means reskilling and upskilling is required. Prior to COVID-19, 75% of businesses reported they were concerned about shortages of digital skills within their industry.
- While Australia has helped grow its skilled workforce through immigration, we shouldn't rely on this post-COVID-19.

Gold Coast findings support this view in that:

- Workforce is a predominant concern for local businesses
- Gold Coast organisations are rapidly pushing to reduce reliance on imports and become more self sufficient

Reference: Australia Rebooted, PWC 2020

Digital and Smart City Initiatives

Business centric approach

- The feedback from business has indicated a current emphasis on hardware and infrastructure underpinning Digital and Smart City Initiatives. This is critical to enable business adoption of Industry 4.0.

- The opportunity identified, is to leverage the skills and capabilities of businesses using Industry 4.0 technologies.

- While continued investment and support for infrastructure roll-out is critical, the feedback from business has been the opportunity to shift to ‘business centric’ initiatives.

Specialised skills are critical for adoption of Industry 4.0

- This is accelerated by:
  - Changing structure of economy
  - Rate of technological change
  - Industry 4.0 imperatives
  - COVID-19 issues and responses

- Varied business impacts with some significantly

Industries of most rapid job change (% of jobs in next 15 years)

For key Gold Coast industries, most jobs will undergo substantial change, driven by technological changes including Industry 4.0 technologies.

Source: Australian Computer Society

Industry	Jobs changed by technology (%)	Replaceable jobs (%)
Health Care/Social assistance	39	11
Education and Training	34	27
Accommodation/Food Service	32	22
Professional, Scientific/Technical	41	19
Manufacturing	33	30
Information, Media/Telecoms	42	18
Construction	30	25

Skills required to support Industry 4.0

Nearly 50% of Gold Coast respondents and 75% of Australian respondents (PWC study) highlighted a shortage of skills for Industry 4.0 is a concern.

Gold Coast businesses highlighted difficulties finding employees with skills in computer science, software development, data science, mechatronics and coding.

Skills are required to support uptake of Industry 4.0

- Technical
  - -General
  - -Technology specific
- Process Management
  - -Technology integration
  - -Business management and processes

Drill down of Industry 4.0 skills required (next 15 years)

Skills Requirements (in order of importance)

- Software developers-systems
- Software developers-applications
- Data engineers
- Robotic engineers
- Process improvement analysts
- Mechanical engineering
- Electronics
- Data integrators
- Data scientists
- Data analysts
- Cyber security
- Industrial design
- Machinist/welder
- Mechatronics engineers
- Actuarial Mathematics
- Industry specific technologists

Source: Australian Computer Society. Technology Impacts on the Australian Workforce 2020

NOTE: The alignment of this list with Gold Coast requirements is supported by Industry engagement

Key Findings (1)

- The Gold Coast has clusters of Industry 4.0 capability
- The Gold Coast has a number of Industry 4.0 sector leading organisations
- Digitisation and automation is occurring outside the traditional Industry 4.0 sector of manufacturing
- Innovation and R&D is a part of the DNA of Industry 4.0 organisations
- Productivity is the critical ‘P’, to be driven by adoption of advanced technologies
- Push for sovereign supply chain capability
- Organisations such as Advanced Design and Prototyping Technologies Institute (ADaPT) are important local enablers
- Whilst traditional supply chains exist, there is the emergence of the “digital” supply chain

Key Findings (2)

- Lifestyle continues to be an important element in attracting and retaining talent
- COVID-19 has driven a significant change in policy and attitude resulting in growth opportunities for Industry 4.0 adoption and development
- Technology adoption between sectors is occurring through partnership
- Industry is concerned that they will not be able to source the workforce required to support Industry 4.0
- Rapid advancements in technology adoption and workforce requirements makes skills forecasting difficult

Opportunities for Growth

- Developing “digital” supply chain opportunities
- Attract complementary supply chain organisations
- Consider attracting technology hubs or their satellites
- Support collaboration with industry and the education and training sector
- Build a network of Industry 4.0 champions
- Build industry knowledge of Industry 4.0 in sectors with growth potential
- Ensure high quality telecommunications infrastructure for key industrial clusters such as Yatala, Stapylton and Arundel
- Grow the current clusters of Industry 4.0 capability
- Invest further in sectors that would benefit from increased automation and digitisation

Summary

- The Gold Coast has Industry 4.0 capability and sector leading Industry 4.0 organisations
- COVID-19 has fast tracked technology adoption, hybrid sector partnership and a push for a “sovereign” supply chain.
- The conventional supply chain has been joined by the “digital” supply chain which presents further opportunity for the Gold Coast.
- The City has a strong digital city platform to move forward.
- Skills and workforce for Industry 4.0 are a constraint however, present an opportunity for the City and its training sector.

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Appendix A Glossary

Enterprise Resource Planning (ERP): Business process management tools that can be used to manage information across an organization.

IoT: IoT stands for Internet of Things, a concept that refers to connections between physical objects like sensors or machines and the Internet.

IIoT: IIoT stands for the Industrial Internet of Things, a concept that refers to the connections between people, data, and machines as they relate to manufacturing.

Big data: Big data refers to large sets of structured or unstructured data that can be compiled, stored, organized and analyzed to reveal patterns, trends, associations, and opportunities.

Artificial intelligence (AI): Artificial intelligence is a concept that refers to a computer's ability to perform tasks and make decisions that would historically require some level of human intelligence.

M2M: This stands for machine-to-machine and refers to the communication that happens between two separate machines through wireless or wired networks.

Digitization: Digitization refers to the process of collecting and converting different types of information into a digital format.

Smart factory: A smart factory is one that invests in and leverages Industry 4.0 technology, solutions, and approaches.

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Appendix A Glossary

- **Machine learning:** Machine learning refers to the ability that computers have to learn and improve on their own through artificial intelligence—without being explicitly told or programmed to do so.

- **Cloud computing:** Cloud computing refers to the practice of using interconnected remote servers hosted on the Internet to store, manage, and process information.

- **Real-time data processing:** Real-time data processing refers to the abilities of computer systems and machines to continuously and automatically process data and provide real-time or near-time outputs and insights.

- **Ecosystem:** An ecosystem, in terms of manufacturing, refers to the potential connectedness of your entire operation—inventory and planning, financials, customer relationships, supply chain management, and manufacturing execution.

- **Cyber-physical systems (CPS):** Cyber-physical systems, also sometimes known as cyber manufacturing, refers to an Industry 4.0-enabled manufacturing environment that offers real-time data collection, analysis, and transparency across every aspect of a manufacturing operation.