



Manufacturing & Emerging Technologies

Automation, Robotics, Augmented reality, Virtual reality, 3D Printing

Daniel Gronowski – CCIC, May 2019

LinkedIn

“Industry 4.0” search results:

- 33,480 people (43,425 now)
 - 425 in Australia
- 742,222 companies
- 1,732 jobs

The image shows a LinkedIn search results page for 'Industry 4.0'. On the left, a profile for Clive Milham is visible, with statistics: 86 profile views, 97 post views, 60 followers, and 7 recent visitors. Below the profile are sections for 'Your communities' and 'Hashtags', including #startups, #venturecapital, and #automotiveindustry. The main content area features a post by Ben Carroll, Minister for Industry and Employment at the Victorian Government, with the text 'Forget Jurassic World, Creature Technology Company is bringing back the dinosaurs in Port Melbourne. A world leader in animatronics their creations are being used...'. The post includes a video player and shows 13 likes, 1 comment, and 792 views. On the right, there is an 'Add to your feed' section with recommendations for Mark Cuban, Simon Sinek, and National Disability Insurance Agency. A search results overlay on the bottom right shows 33,480 results, listing profiles like Clive Milham, Innes Willox, Paul Mason, and Craig Hilton with their titles and connection counts.

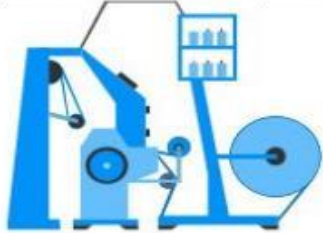
Industry 4.0 – What is it?

The 4th Industrial Revolution Is Upon Us.

FROM INDUSTRY 1.0 TO INDUSTRY 4.0

FIRST INDUSTRIAL REVOLUTION

Introduction of mechanical production facilities with the help of water and steam power



1784

First mechanical loom

SECOND INDUSTRIAL REVOLUTION

Introduction of a division of labor and mass production with the help of electrical energy

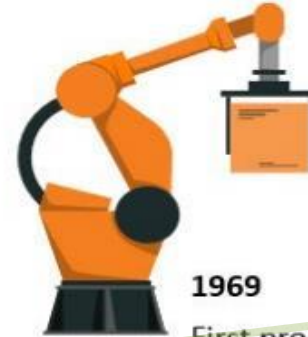


1870

First assembly line

THIRD INDUSTRIAL REVOLUTION

Use of electronic and IT systems that further automate production



1969

First programmable (PC)

FOURTH INDUSTRIAL REVOLUTION

The Digital Connected World

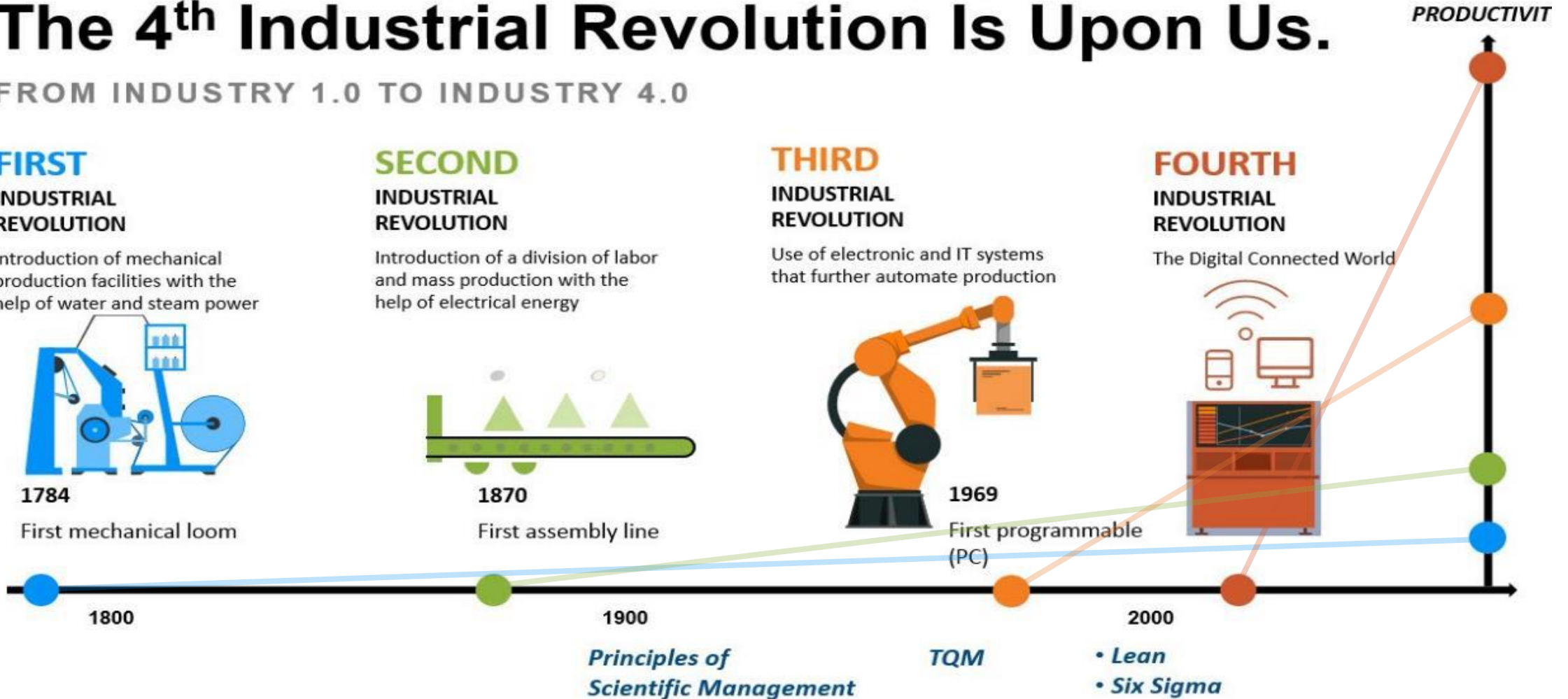


2000

- Lean
- Six Sigma

Principles of Scientific Management

TQM



Automation Trends

Automation of both digital and physical systems

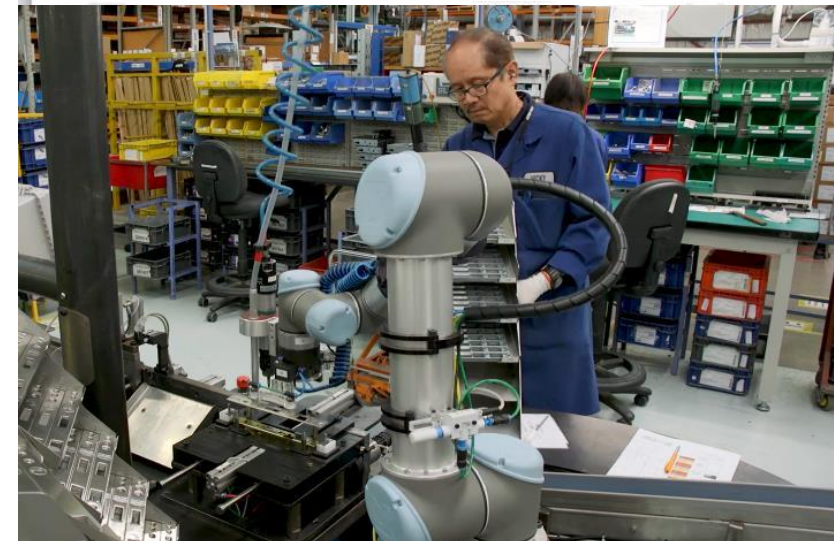
- Combination allows for smarter machines
 - better safety (No need for cages)
 - autonomous decision making (navigation and collision avoidance)
- Increased simplicity to set up and program
- Lower cost and more flexible

Automatic data collection with advanced sensors,

- Barcode readers, RFID etc for tracking goods
- Machine utilisation for process improvement
- Sensors in products enables new business models

Digital design linked directly to manufacturing

- Enabled by cost effective short production runs
- Allows for mass Customisation to increase customer value



Automation - Examples



- Collaborative robotics (Cobots)

- Useful for simple unskilled tasks such as pick and place, packaging, labelling etc
- The Robot People / Universal Robotics, Omron / TM, local suppliers (Sydney)
- Can also be programmed for more difficult tasks - Robotics Systems (Newcastle)

- Sensors and data collections (Automated realtime data)

- Can be applied to optimise machine utilisation, energy, maintenance etc
- Movus (QLD) – Fitmachine magnetic machine health sensors
- NSW govt energy efficiency grant (\$50,000 for energy monitoring equipment)

- Automated Warehousing

- Everything from automatic material selection for MFG to fully automated transport
- Robotics batching for assembly (ABC Manufacturing)
- Toyota Materials Handling – Autonomous forklift
- Automated Robotic Vehicles (Small drone vehicles <500kg)

Augmented and Virtual Reality

- Virtual or immersive mixed reality environments
 - Virtual reality environments with or without VR glasses
 - Tracking of objects and environments (Xbox Kinect, Microsoft hololens)
 - Use of mobile applications for viewing and scanning
- Can often be directly created from existing CAD/CAM designs
 - Most major CAD suppliers link to an AR/VR tool
 - Laser and image scanning to CAD model automation
- Combination with machine vision technologies
 - Automatic recognition of parts and assemblies
 - Tracking of individual within an immersive space



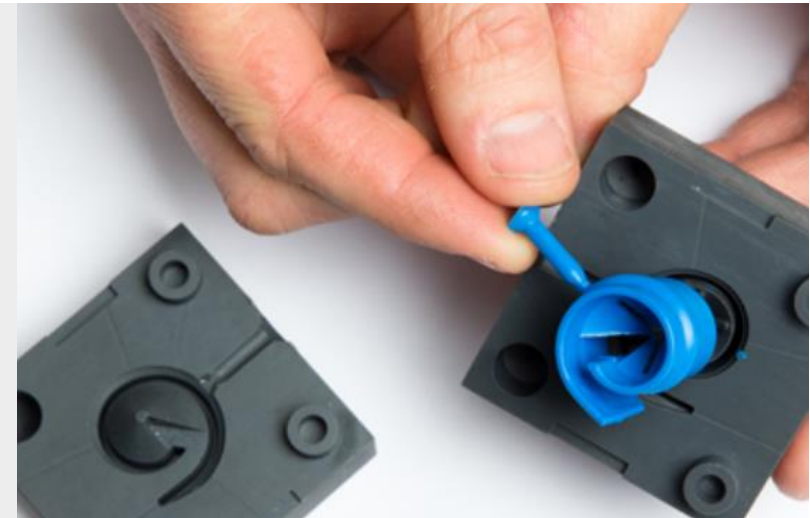
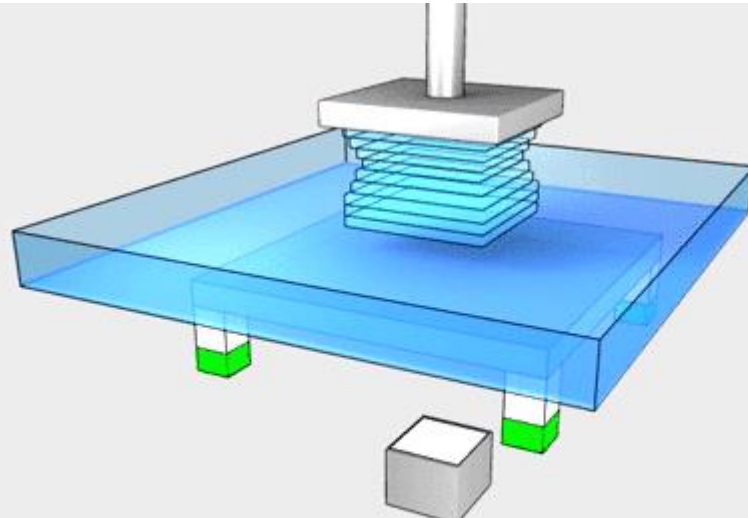


AR and VR - Examples

- Training environments
 - Flying Doctors immersive training
 - Mining safety training (UNSW iCinema)
- Product visualisation and design
 - Showing customers designs in place
 - Testing design ergonomics, form and function
 - Helimods – Scanning, digitisation and 3d modelling to test form and function
- Field repairs and servicing manuals
 - Utilises existing CAD models for disassembly and visualisation
 - Integration of sensor data into imagery
 - Leap technologies -

Additive Manufacturing (3D Printing)

- Adding material than subtracting material
 - (e.g. bricklaying Vs CNC machining)
- Benefits
 - Great for innovation and prototyping, production runs of 1
 - Can create intricate shapes for improved performance
 - Allows for physical realisation without expensive tooling
- Challenges
 - Material properties and costs
 - Speed of production
- Cheap Fast and effective materials
 - Polymer filaments
 - UV cured plastics
 - Ceramics
- Slower and more expensive equipment
 - Metals (e.g. titanium laser sintering)
 - Large scale (concrete for buildings)



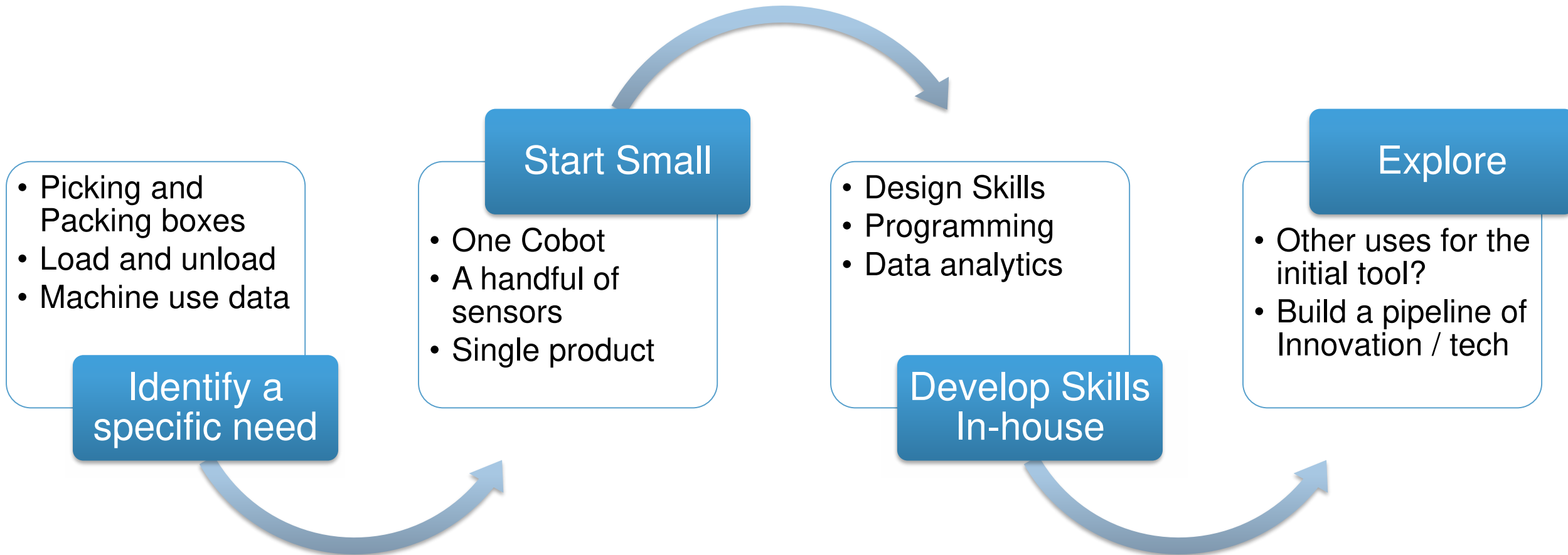
3D Printing - Examples



- **Rapid Prototyping**
 - Simplest form of adoption
 - Allows for rapid iteration of molds, part geometries,
 - Any polymer metal printer could enable sacrificial casting into metal
- **Medical Devices and Dental**
 - Asiga (UV cured polymer), Worlds first affordable high res 3d printer (Sydney Based)
 - Used for dental (Invisalign, veneers etc) and Custom jewellery
 - Both high value, highly customised applications
- **New part geometries and improved performance**
 - Allows for intricate shapes and designs not available to traditional machining and casting
 - Value uplift > speed and efficiency
 - Rocketlabs (NZ) creates 3D printed high efficiency rocket engines



Tips for exploring new technologies



Thank You and Questions?

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