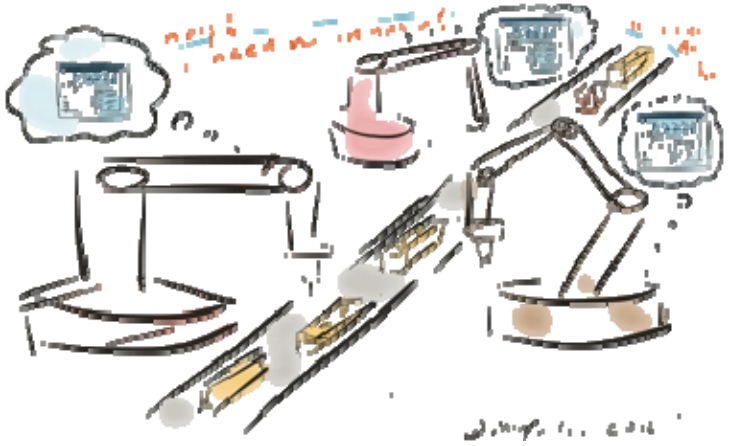
Factories of the Future: Implications for Automation



Professor Duncan McFarlane

Distributed Information & Automation Lab

Institute for Manufacturing, CUED

IFM Open Day

May 2017

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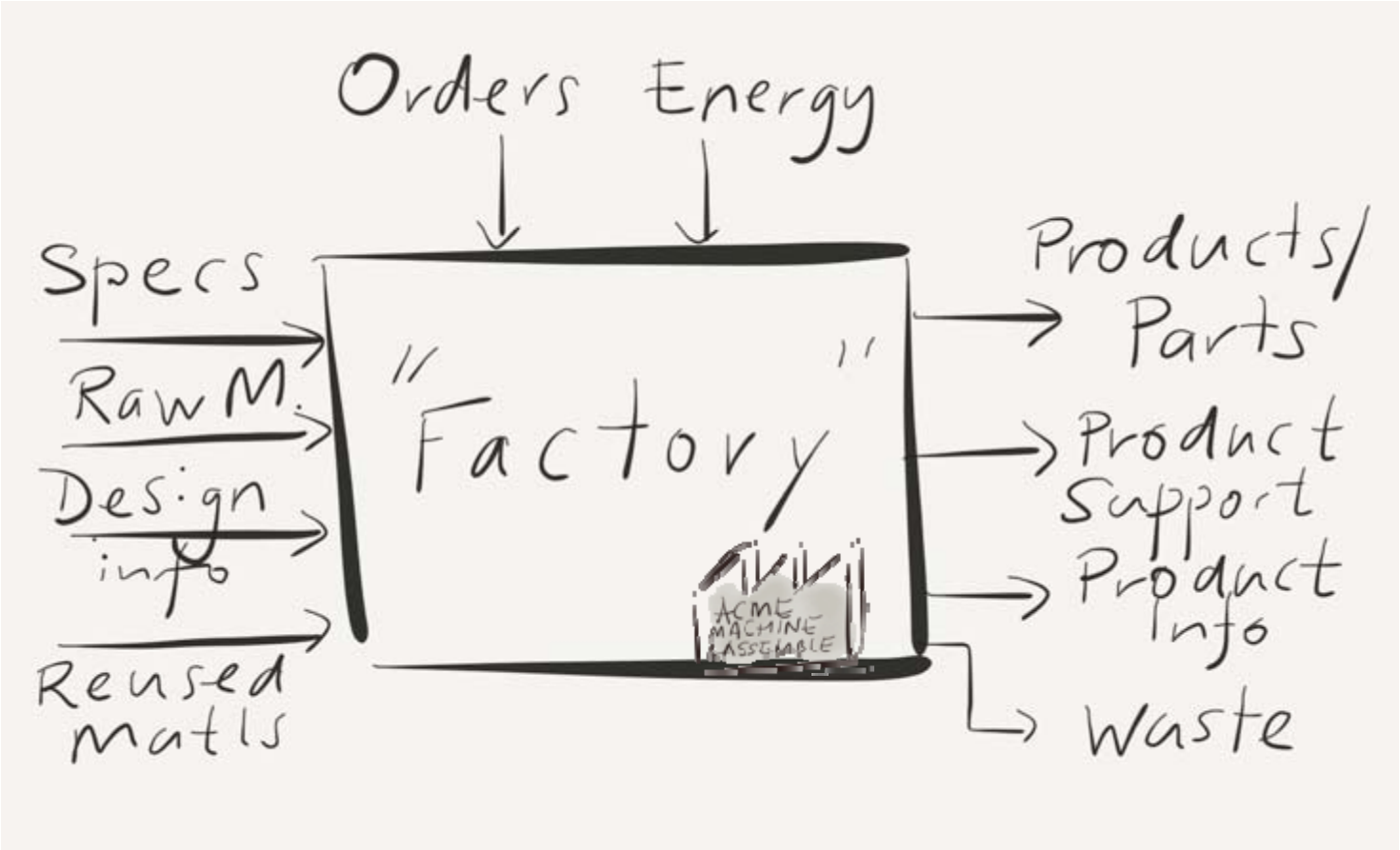
FACTORIES OF THE FUTURE?

“Factory” Model



…… more productive, resilient, sustainable etc

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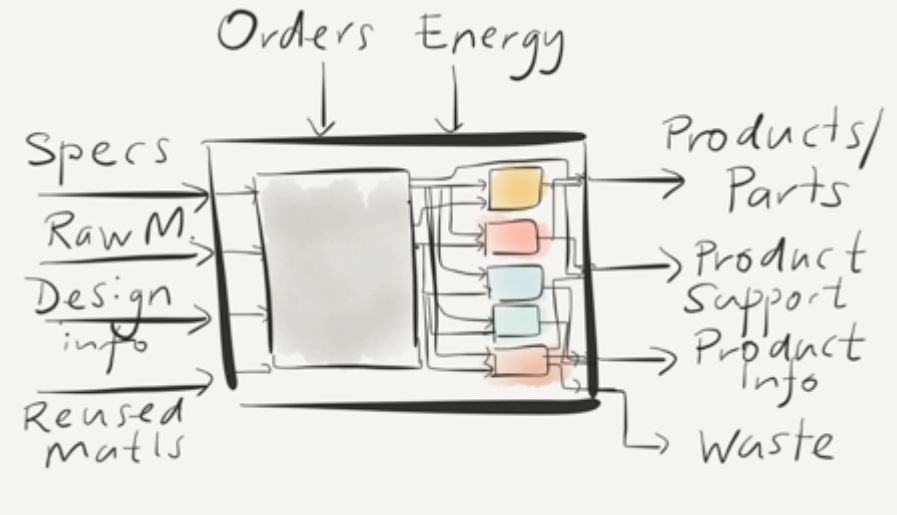
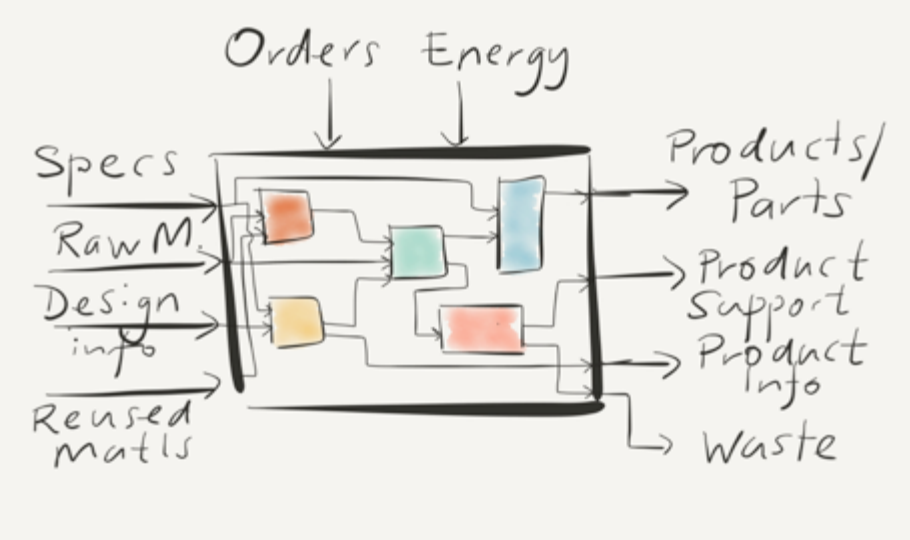
Alternative “Factory” Models

Late customization:
e.g. phones, consumer packaging, bicycles





Distributed Production:
e.g. Computing devices, domestic appliances, spare parts

“Not a Factory” Factory Models

Source: Homebase UK

Source: www.construction-robotics.com

Production in a remote / mobile / small scale / one off manner

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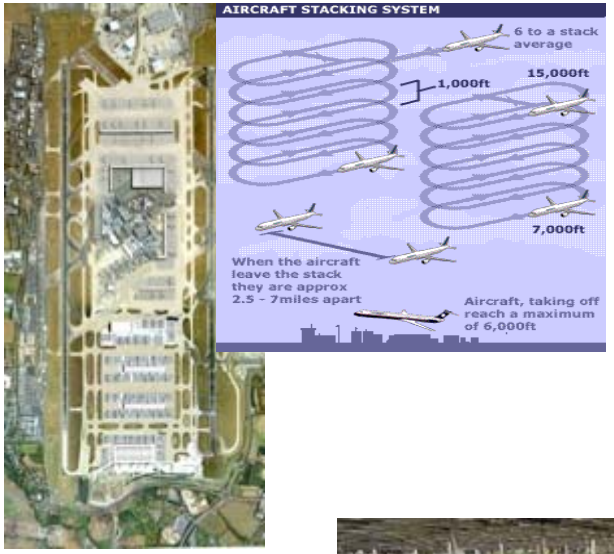
"Factory-Like" Environments



Non Production operations with resource constraints / cost thresholds / quality targets / customer service levels

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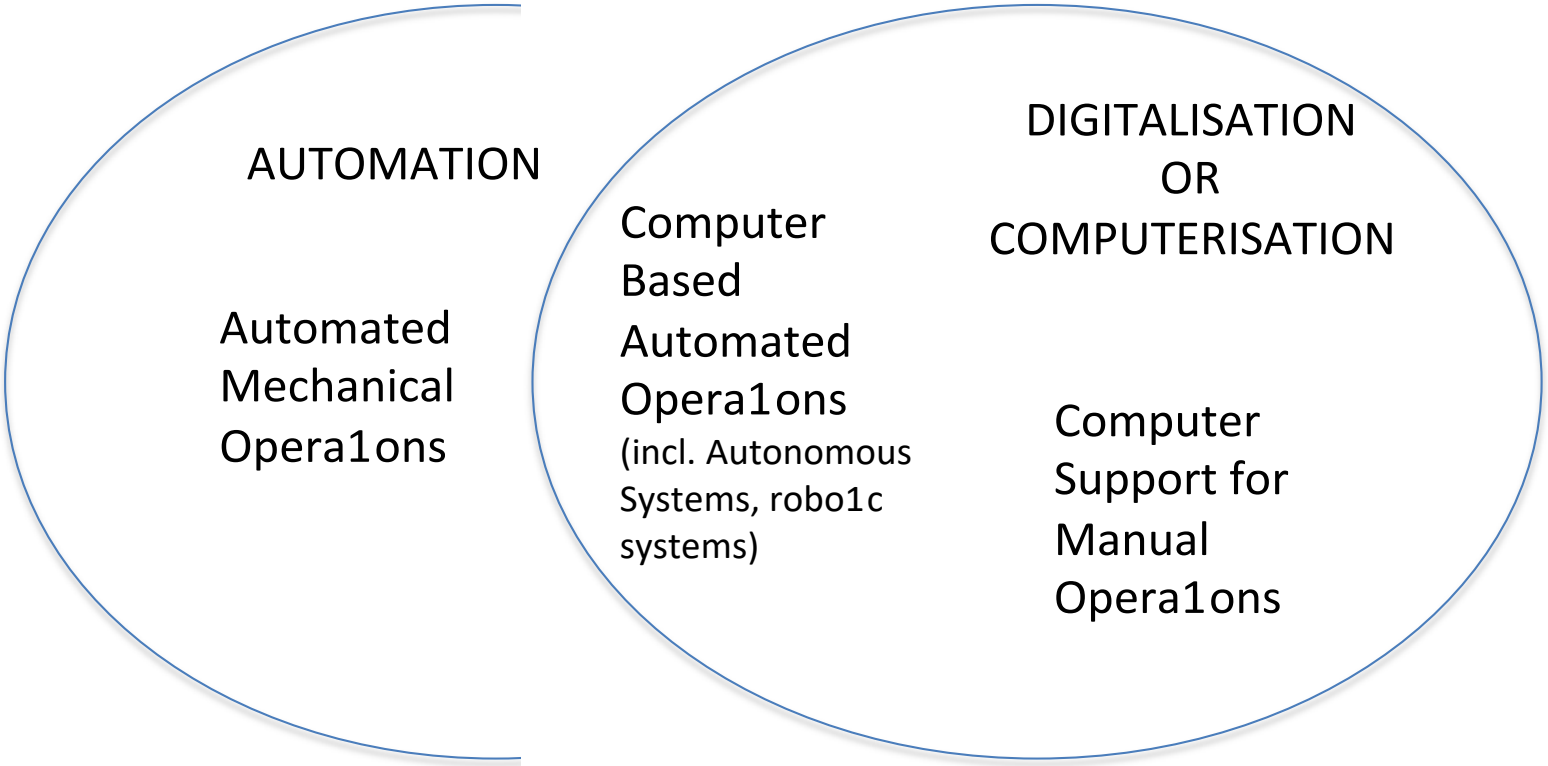
CHALLENGES FOR AUTOMATION?

Automation & Digitalisation



Automation Requirements?

IMPROVING TODAY'S MANUFACTURING

- More Productive
- Resilient
- Sustainable

AUTOMATION REQUIREMENTS

- automated production
- Asset performance monitoring
- Fast detection of disruption
- Dynamic process management
- Energy & emissions measurement & control
- Material monitoring

e.g. DISTAL
•distributed control based on multi-agent systems
•real-time production status
•Built in disruption handling

Automation Requirements?

EMERGING MANUFACTURING

- Specialised
- Customised/customer oriented
- Localised / distributed
- Services

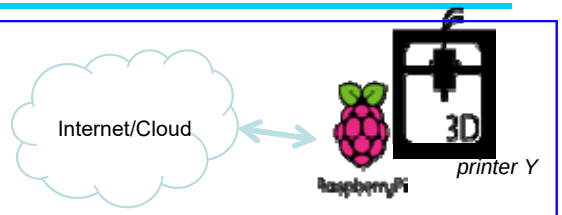
AUTOMATION REQUIREMENTS

- Flex, adapt production
- automated set up

- Product/order tracking
- Control 4 customisation
- X value chain comms

- Production management decoupled locations
- Logistics and production coordinated

- Information coupled to physical system



eg OPTIMOS PRIME
Integration of 3D printing with conventional production environments

Outputs

- *Smart wrapper on 3DP systems*
- *Distributed cloud based control architecture*

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WHERE DOES DIGITAL MANUFACTURING, INDUSTRIE 4.0, INDUSTRIAL IOT FIT IN?

Digital Manufacturing: Scope and Terms?

DIGITISATION: The application of digital information [from multiple sources, formats, owners] to address key societal challenges in areas such as health, education, government, transport, commerce, manufacturing.

DIGITAL MANUFACTURING: The application of digital information [from multiple sources, formats, owners] for the enhancement of manufacturing products, processes and services.

i.e. The digitisation of manufacturing products, processes, supply chains and services

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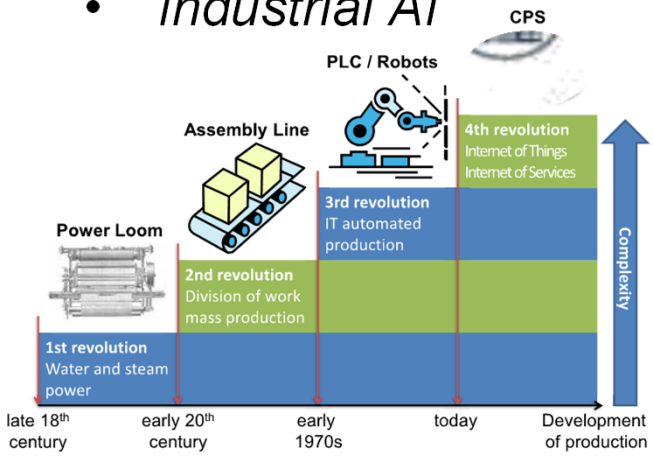
Whats New? What's Not?

NEW !

- Internet is ubiquitous
- Network many devices / objects / data sources
- Cloud computing
- *Mobile, personal computing*
- IT Services -> IT Strategy
- Information sharability across value chain
- Order Information Orientation
- Customer involvement

NOT NEW

- Lots of sensors
- Lots of data
- Data analytics
- Simulation
- *Industrial AI*



[Some] Global Initiatives related to DM

Made in China 2025:

Broad Chinese blueprint for future manufacturing drawing heavily on robotics and IoT at its centre.

Industrial Internet Consortium/IIoT:

The **Industrial Internet** is the integration and linking of big data, analytical tools and wireless networks with physical and **industrial** equipment

Smart Process Manufacturing :

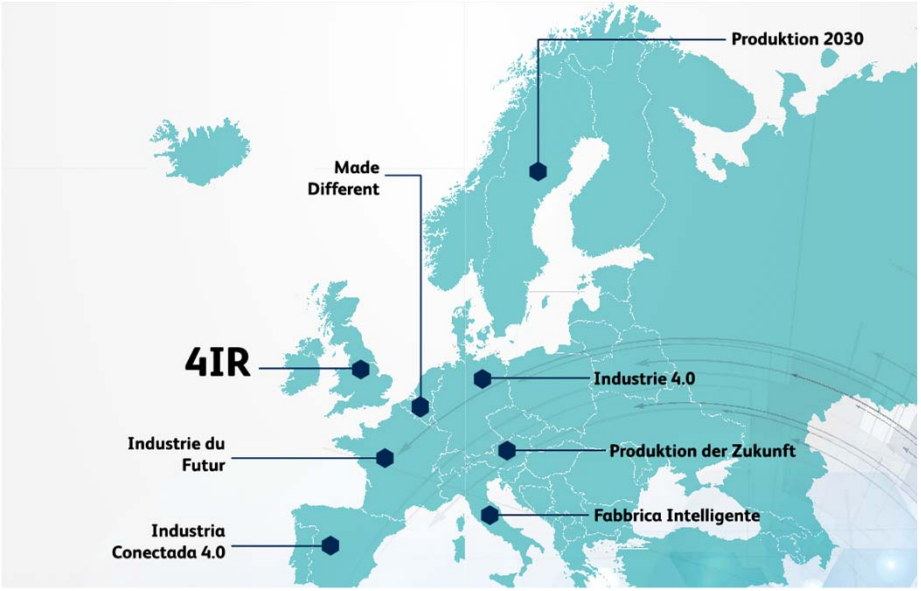
US: role of ICT in integration, data intelligence and innovation.

Robot Revolution Initiative:

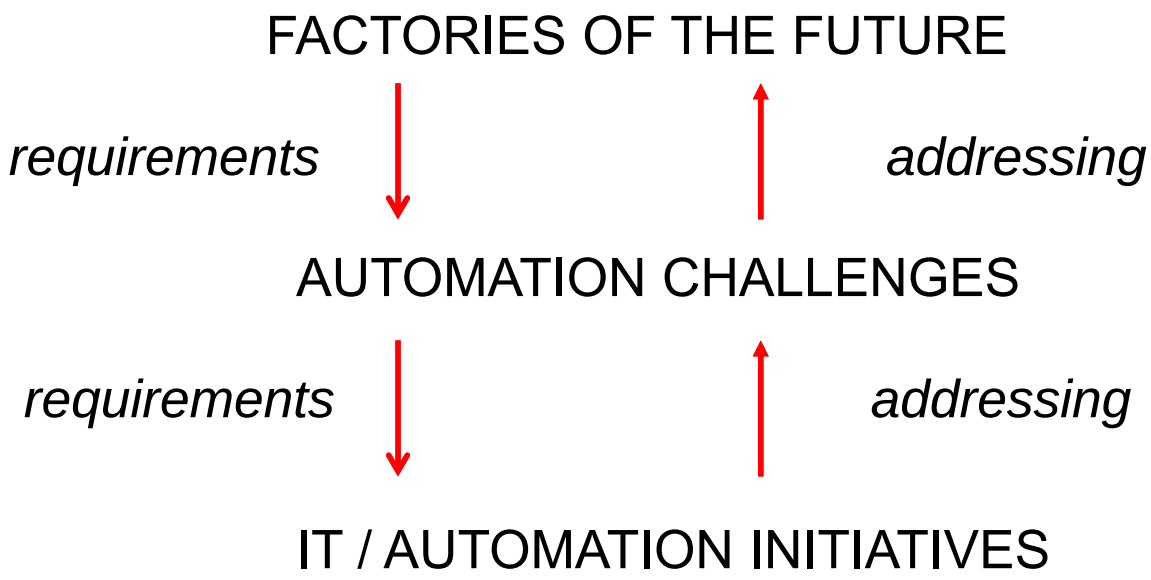
Japanese response to IIC and I4.0 in robotic and IoT development

Industrie 4.0:

high-tech strategy of the German government, which promotes the computerization of manufacturing



IT/Automation Initiatives for FoF?



Discussion Questions

- Do you see the distribution of your production operations changing significantly in the near future?

- Are you considering wholesale updates to the IT systems supporting your production processes and products?

- Are digital manufacturing initiatives such as Industrie 4.0 addressing your IT and automation concerns?