Industry 4.0
What does it mean for COVID-era logistics and distribution?

Presentation

The Chartered Institute of Logistics and Transport

STUDIO LOGISTIC
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Introductions

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STUDIO LOGISTIC
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A logistics engineering consultancy focussed on design and analytics.

www.studiologistic.com

Overview

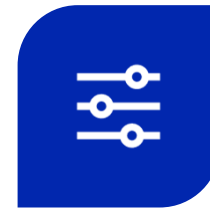INDUSTRY 4.0 –
WHAT IS IT?
SOME HISTORY.

WHAT ARE
CYBERPHYSICAL
SYSTEMS?

FEATURES &
TECHNOLOGY OF
INDUSTRY 4.0

PRACTICAL
APPLICATIONS

TAKEAWAYS

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What is Industry 4.0?

Cyber-physical systems (CPS)

Internet of Things (IoT)

On demand availability of computer system resources

Cognitive Computing

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History of Industries

INDUSTRY 1.0
Mechanization, steam power, weaving loom

INDUSTRY 2.0
Mass production, assembly line, electrical energy

INDUSTRY 3.0
Automation, computers and electronics

INDUSTRY 4.0
Cyber physical systems, internet of things (IoT), networks

1784   1870   1969   Today

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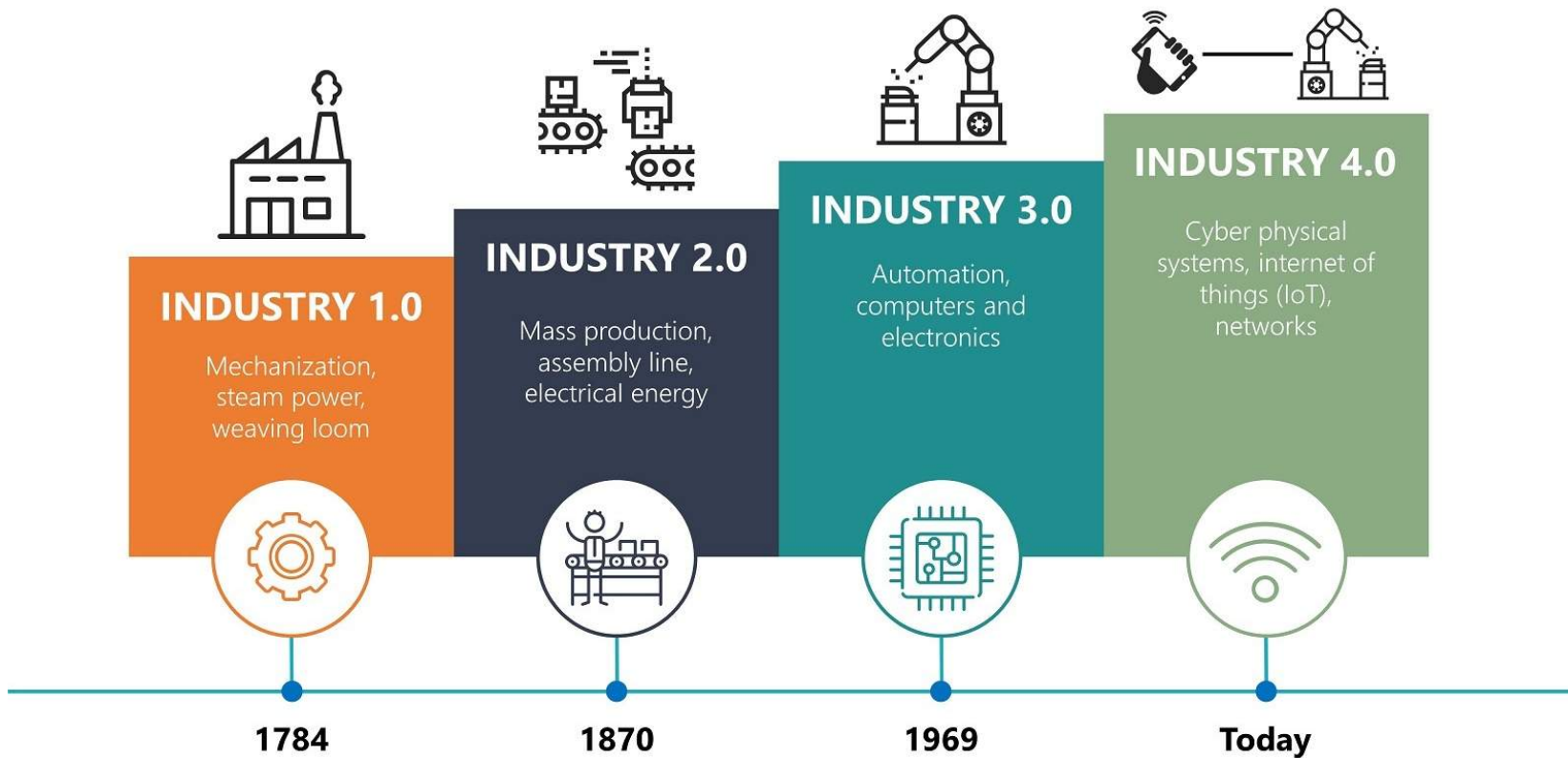
Cyberphysical example: Uber

Uber Information System Actors

- Uber Transport
- Other Road Users
- Payment System
- Uber Platform
- Navigation Systems
- Roads
- Uber Customers
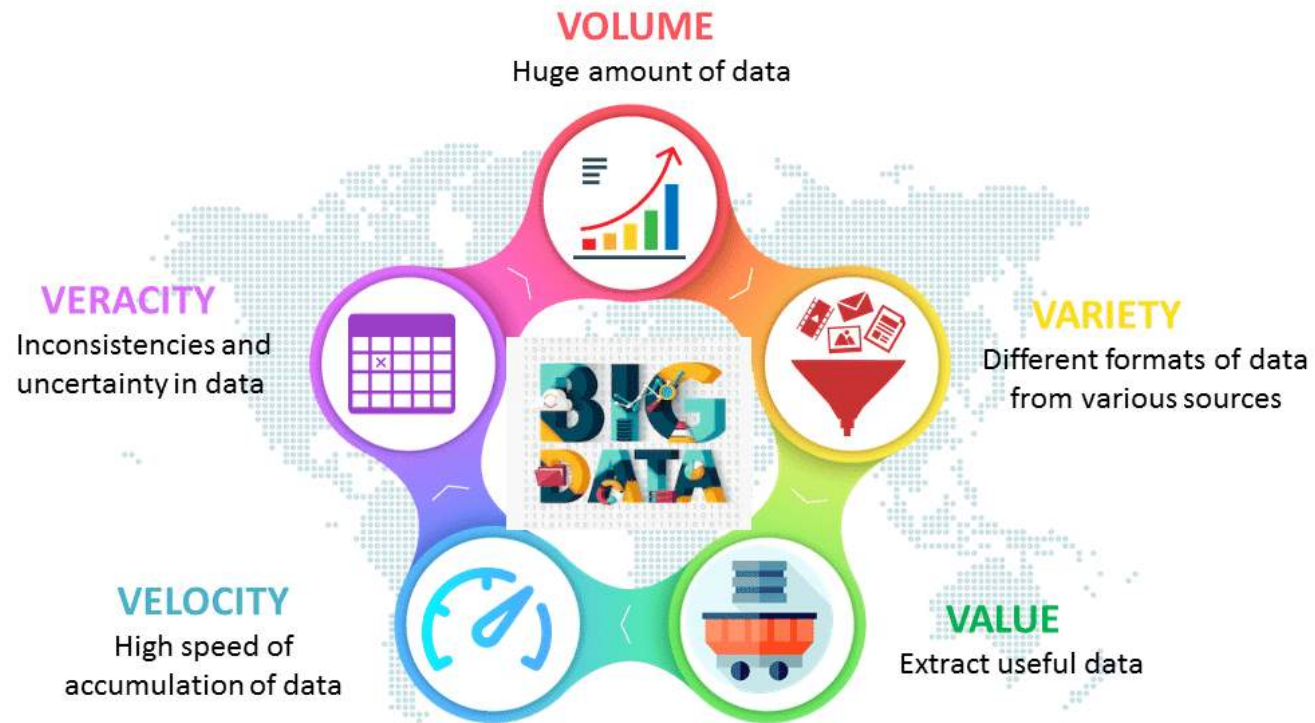- Non-Uber Customers
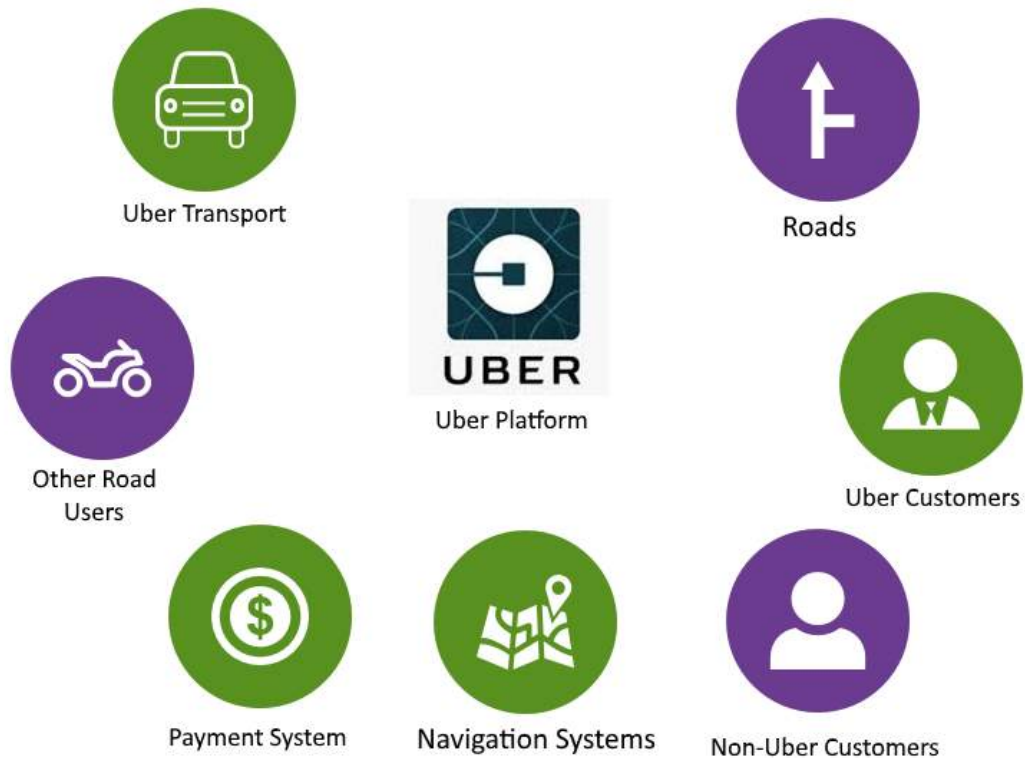
Cyberphysical example: Uber

Key enablers
- Widespread smartphone ownership
- Connectivity everywhere (high availability, low cost)
- Google maps API
- Routefinding
- Predictive demand analytics & load balancing

Key features
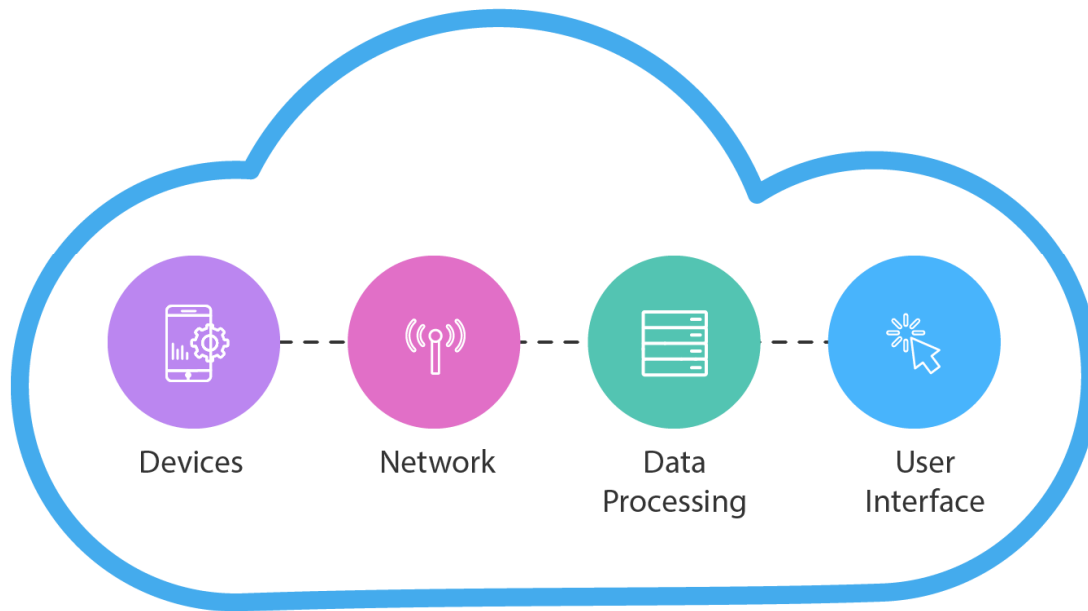- Better service levels
- High asset utilisation
- Lower cost

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Feature: Big Data

VOLUME
Huge amount of data

VERACITY
Inconsistencies and
uncertainty in data

VARIETY
Different formats of data
from various sources

VELOCITY
High speed of
accumulation of data

VALUE
Extract useful data

BIG DATA

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Feature: Industrial IoT (IIoT)

Devices — Network — Data Processing — User Interface

Key features:
- Massive numbers of cheap, connected, long lasting sensors
- Enabled by low energy networking and cheap data processing / storage.
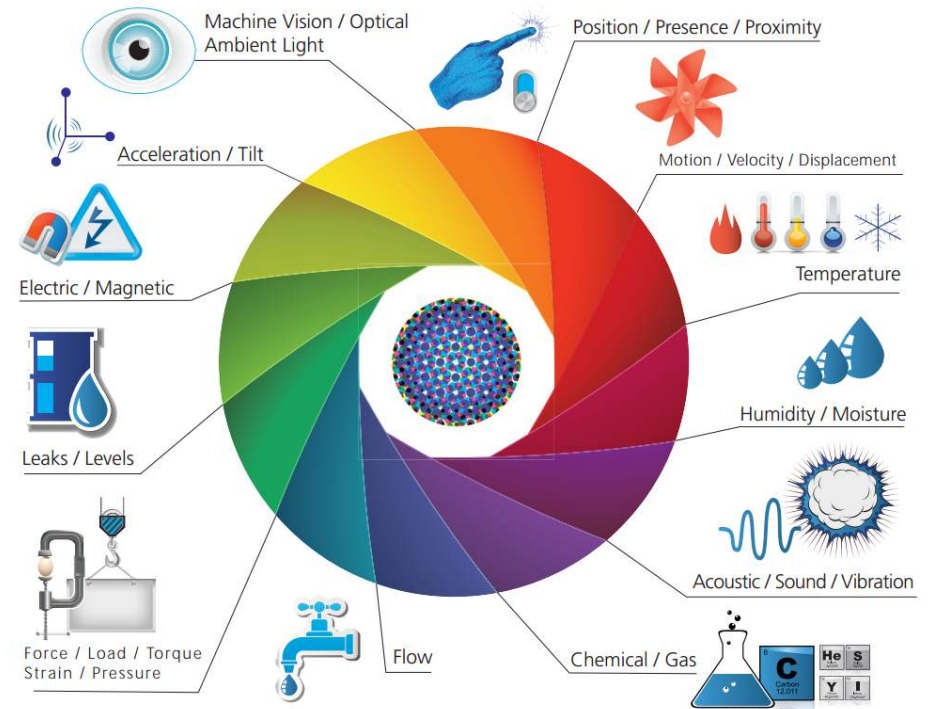- On site (edge) or cloud based data processing.

Sensors

Bluetooth Low Energy (BLE) Beacon
- Temp sensor
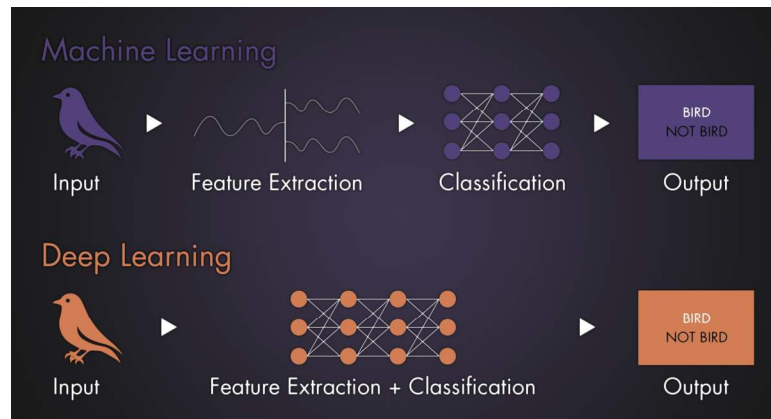- Up to 500m range
- 19 years battery
- IP68
- 57mm diam x 18mm

Sigfox Beacon
- GPS geolocation
- Accelerometer
- 3 years replaceable battery
- 57mm diam x 18mm

Machine Vision / Optical Ambient Light

Position / Presence / Proximity

Acceleration / Tilt

Motion / Velocity / Displacement

Electric / Magnetic

Temperature

Leaks / Levels

Humidity / Moisture

Force / Load / Torque Strain / Pressure

Acoustic / Sound / Vibration

Flow

Chemical / Gas

Feature: Automation, AI, Machine Learning

Machine Learning

Input → Feature Extraction → Classification → Output (BIRD NOT BIRD)

Deep Learning

Input → Feature Extraction + Classification → Output (BIRD NOT BIRD)
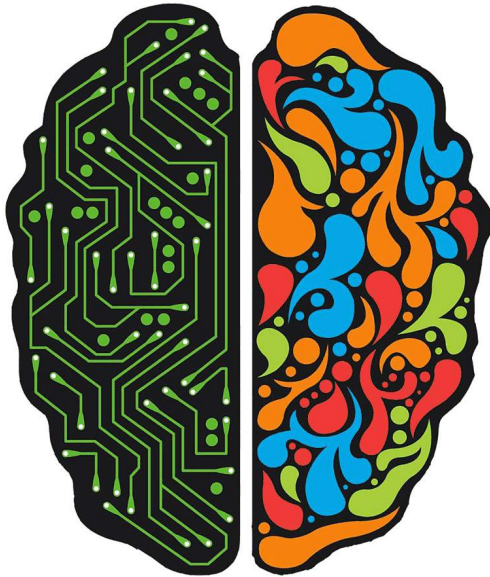
Key features:
- Amazing at pattern recognition
- Can process vast amounts of information quickly
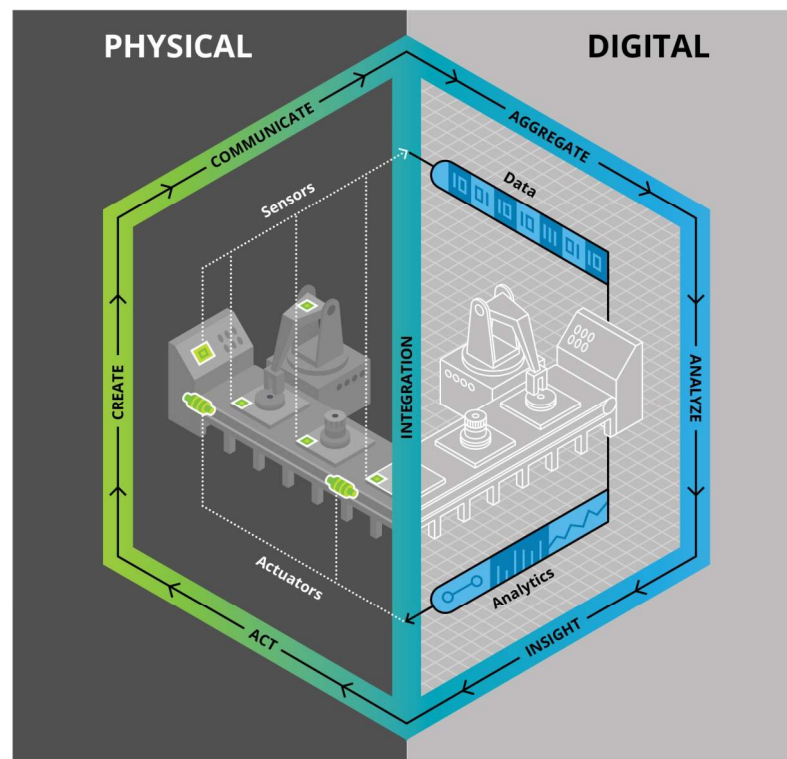- Can forecast outcomes in real time

Feature: Smart Factory

Key features:
- Connected
- Decentralised
- Modular
- Operates across value chains

Feature: Digital Twins

Source: Deloitte University Press.

Deloitte University Press | dupress.deloitte.com
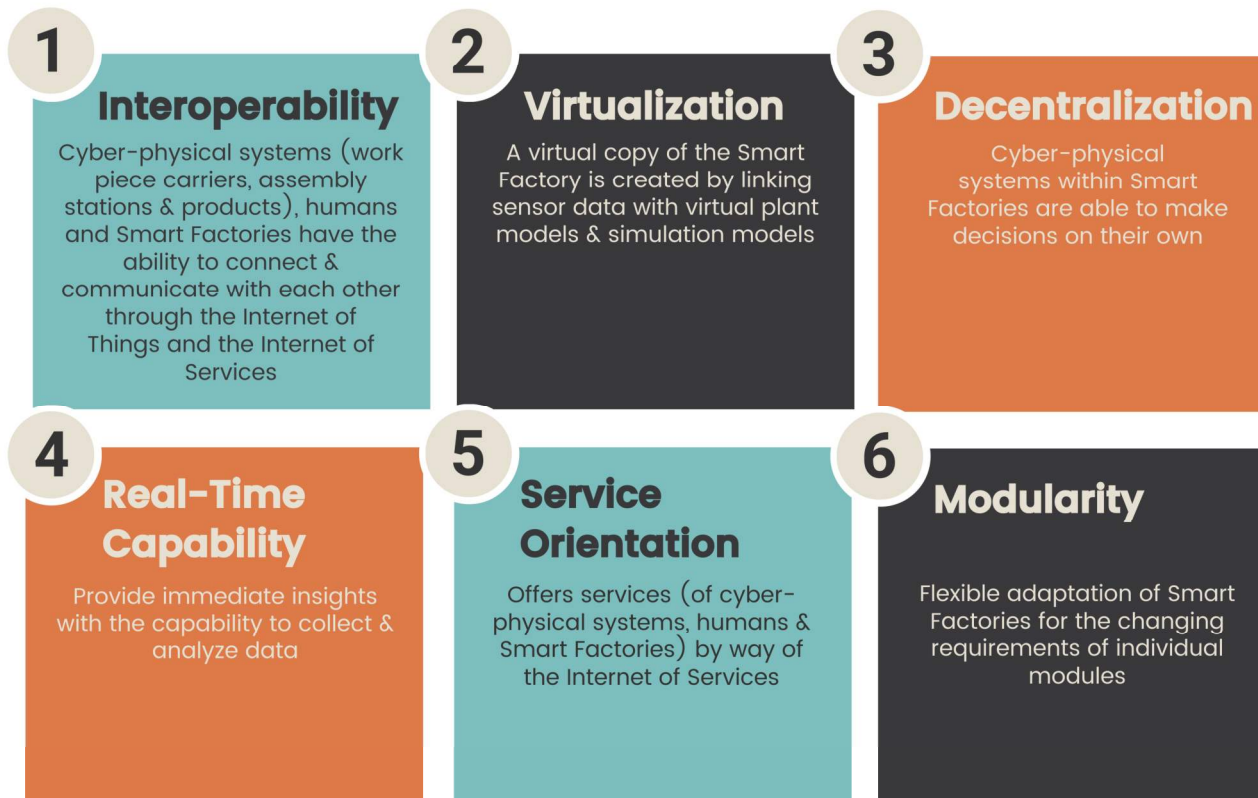
Key features:
- Storing vastly more data about physical components
- Realtime connectivity of digital to physical
- Digital twin can query / intervene in real world

4.0 In Summary
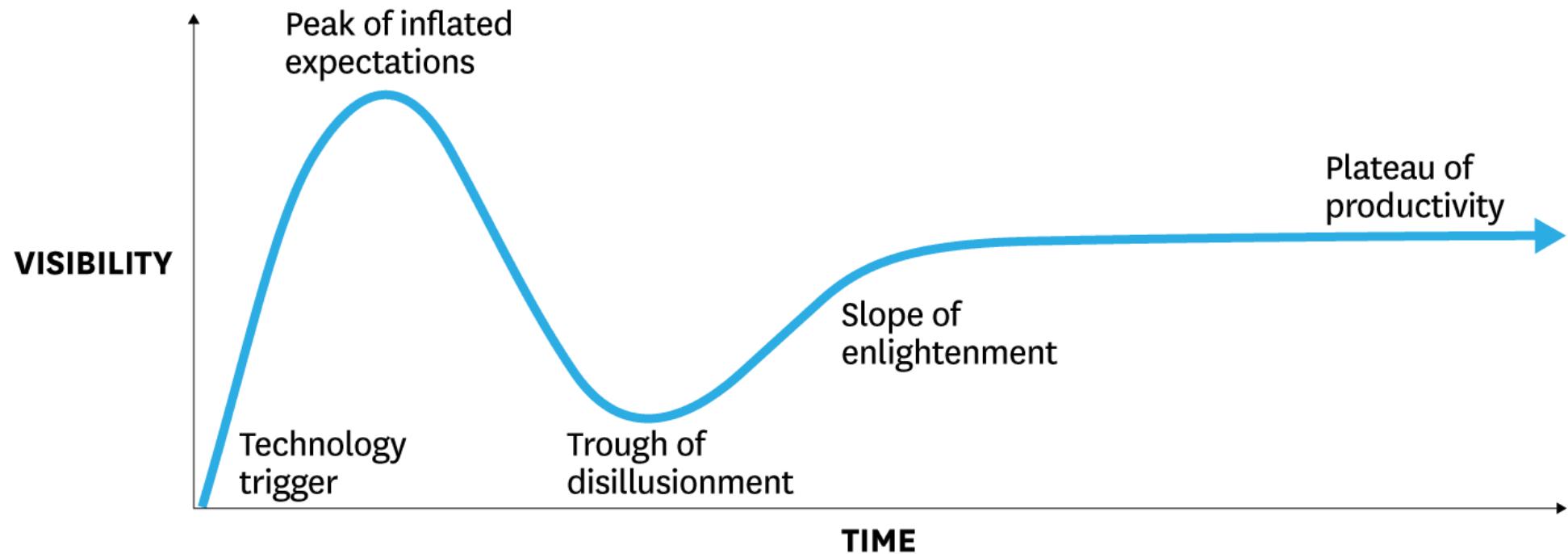
Industry 4.0 is based on six design principles.

These principles support companies in identifying and implementing Industry 4.0 scenarios.

1

Interoperability

Cyber-physical systems (work piece carriers, assembly stations & products), humans and Smart Factories have the ability to connect & communicate with each other through the Internet of Things and the Internet of Services

2

Virtualization

A virtual copy of the Smart Factory is created by linking sensor data with virtual plant models & simulation models

3

Decentralization

Cyber-physical systems within Smart Factories are able to make decisions on their own

4

Real-Time Capability

Provide immediate insights with the capability to collect & analyze data

5

Service Orientation

Offers services (of cyber-physical systems, humans & Smart Factories) by way of the Internet of Services

6

Modularity

Flexible adaptation of Smart Factories for the changing requirements of individual modules

Where are we?

Hype Cycle for Emerging Technologies

- Peak of inflated expectations
- VISIBILITY
- Technology trigger
- Trough of disillusionment
- Slope of enlightenment
- Plateau of productivity
- TIME

Practical: Realtime Order Management

- WMS / WES functionality to reprioritise the order queue using realtime data and predictive/cognitive analytics

- E.g. based on traffic patterns, news events, weather, supply chain partner operations.


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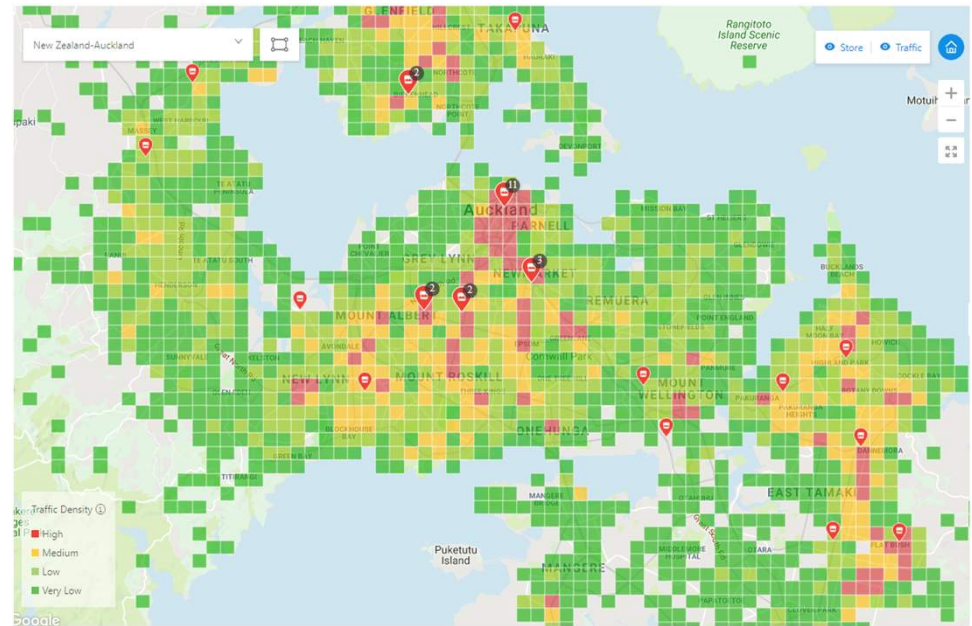
Practical: Process Mining

- Tools that harvest process data and highlight the issues

- E.g. pull out process pathways, events or resources that contribute to delay or bottleneck.

- Can be used to create a digital twin of a business process.

- Simulation and predictive analytics can then interact with it.
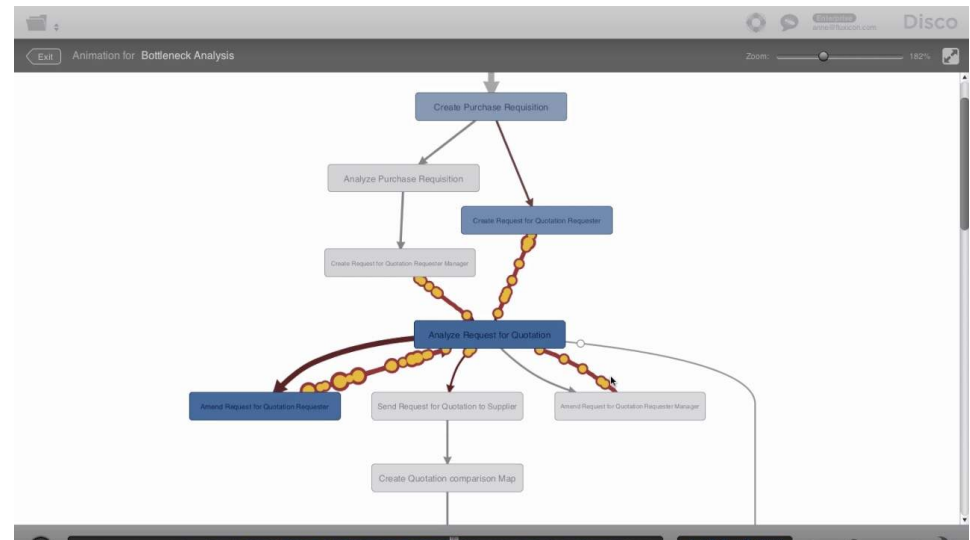
Practical: Realtime Location Systems

- Measure and log the location of *anything* in the supply chain in real time.

- E.g. forklifts, containers, trucks, pallets, SSCCs.

- Analytics for congestion, velocity, proximity. In real time.
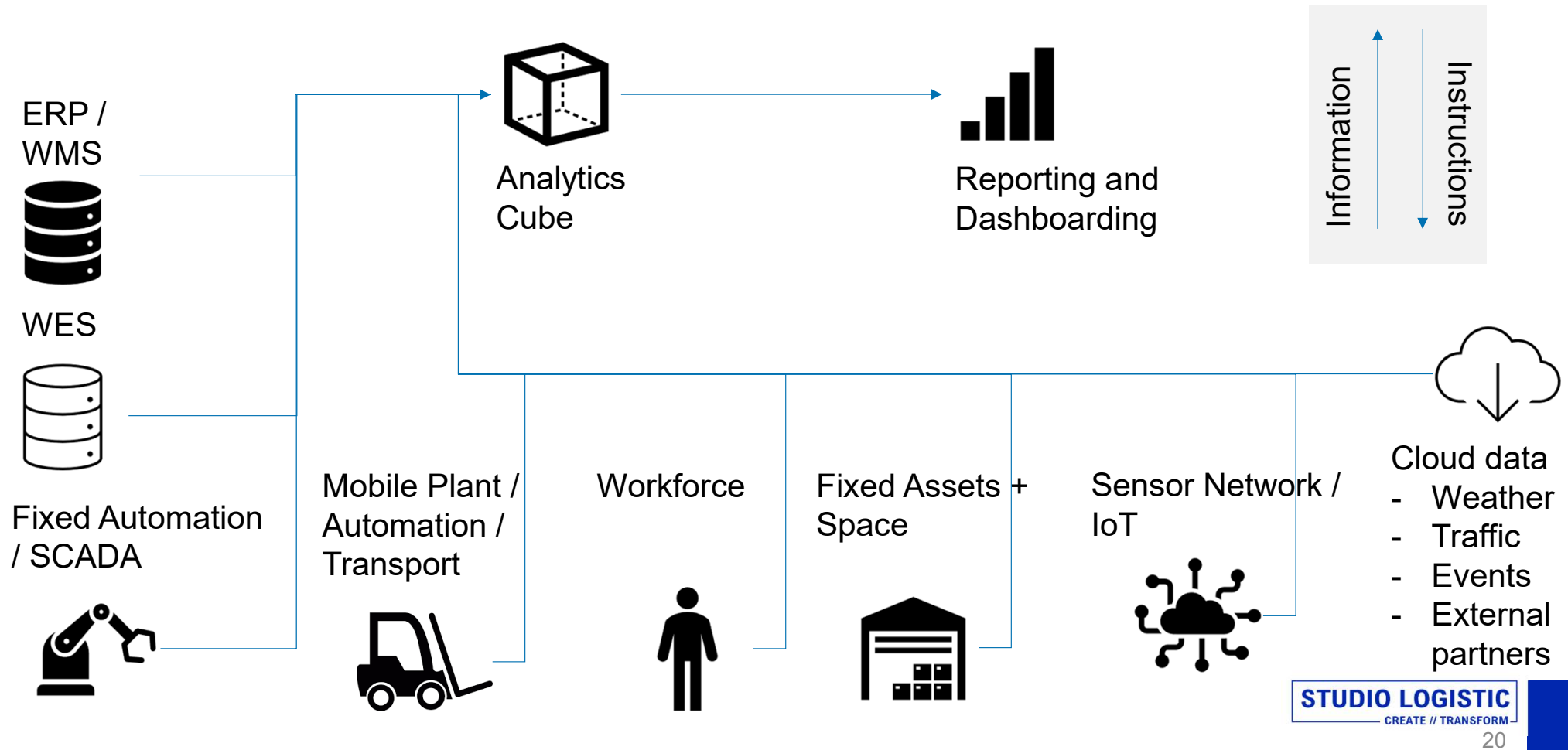
- Recent example: contact tracing for COVID

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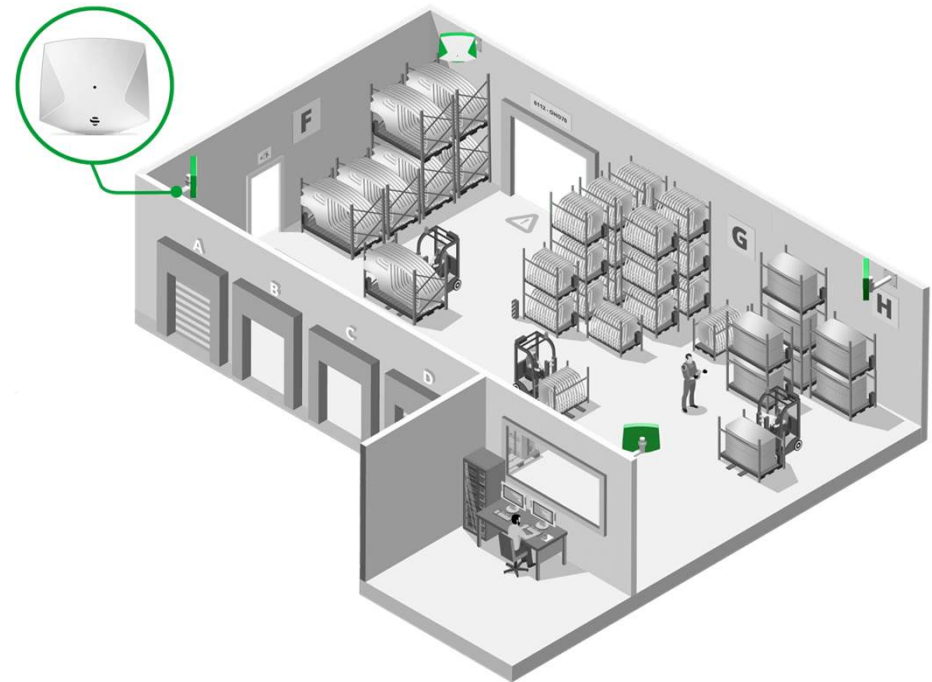
Practical: Generational Design

- AI / ML driven design technology integrated into CAD/BIM technology

- Optimises spatial design to set criteria.

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Practical: Operations IIoT Analytics

ERP / WMS

WES

Fixed Automation / SCADA

Mobile Plant / Automation / Transport

Workforce

Fixed Assets + Space

Sensor Network / IoT

Analytics Cube

Reporting and Dashboarding

Information

Instructions

Cloud data
- Weather
- Traffic
- Events
- External partners

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Practical: Vision Systems
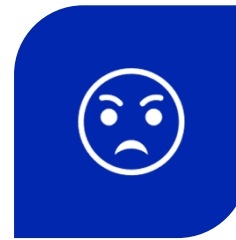
Practical: Cognitive Robotics

Key takeaways

- Guess what?
- Powerpoint generated this slide layout and images for me…
- …from bullet points.

THE TECH IS HERE, AND IT WORKS.

START SOMETHING SMALL.

PICK A PAIN POINT.

EXPERIMENTATION ISN'T COSTLY.

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Questions?

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