What Is Driving Your Digital Manufacturing And Industry 4.0 Transformation?

Prof. Dr. Carl B. Welker

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European Manufacturing
Strategies Summit**

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BLUE PALAIS Centre of Corporate Evolution

Blue Palais.eu   **IUBH School of Business and Management**

Agenda

1. **Times of Change**

2. **The Nature of Digitisation**

3. **The Benefits of Digitisation in Manufacturing**

4. **Things to do to stay ahead of the Game**

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1. **Times of Change**

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4. **Things to do to stay ahead of the Game**

Understanding of Digitisation and I-4.0

Do change + disruption

take place in your

factory

or

somewhere else

on this planet ?
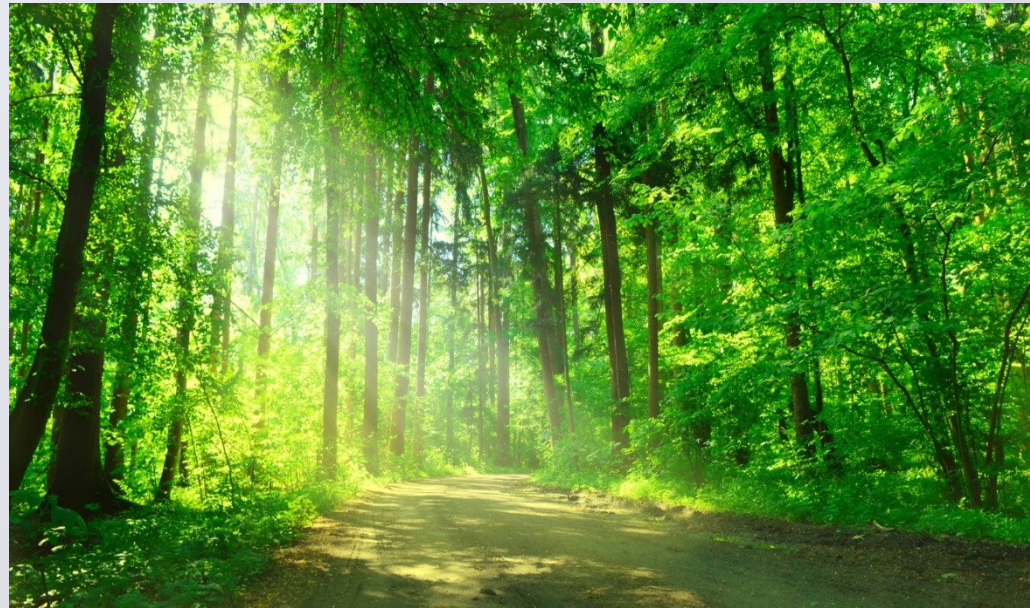
Understanding Digitisation and I-4.0

- **No understanding of what is disruption ?**

- **Disruption skills and attitudes: lacking !**

Understanding Digitisation and I-4.0

- **Too narrow focus on**
  - intra-factory
  - on site
  manufacturing
  topics ?

- **Big Picture + Entrepreneurial momentum: missing !**

- **Too technical, too much IT + Engineering focus ?**

- **Strategic + business momentum ?   Not clear !**

Agenda

The Nature of Digitisation in Manufacturing
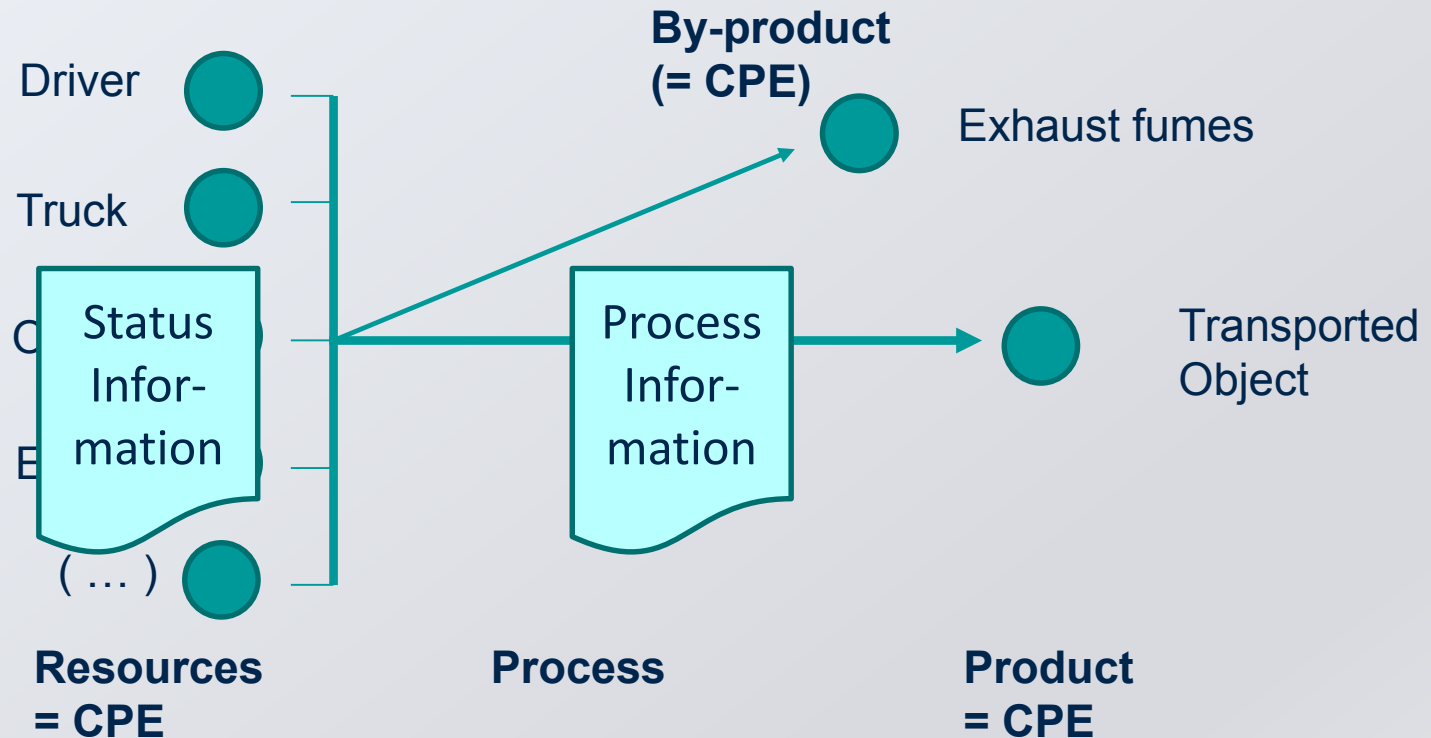
1. Information and Intelligence

- Value of

  Data
  Information
  Knowledge

The Nature of Digitisation in Manufacturing

General Business Model (single process)   **Example: Transport**
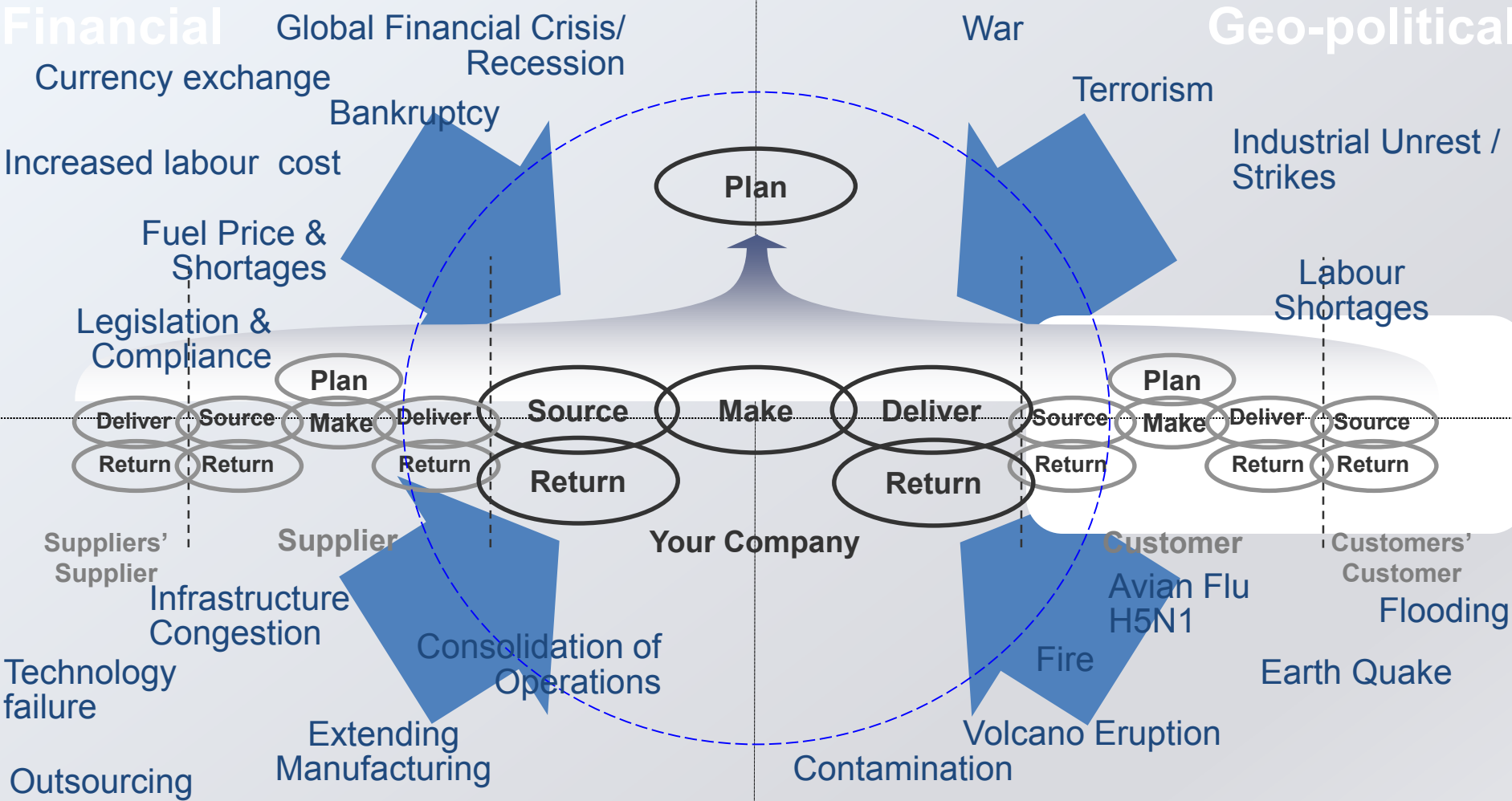
**By-product
(= CPE)**

Driver

Truck

C

E

(…)

Status Infor-mation

Process Infor-mation

Exhaust fumes

Transported Object

**Resources
= CPE**

Process

**Product
= CPE**

General Process Model (Process Chain)

Sources of Uncertainty in Manufacturing

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Financial

Geo-political

Infrastructure

Nature Hazards

Global Financial Crisis/ Recession

Currency exchange

Bankruptcy

Increased labour cost

Fuel Price & Shortages

Legislation & Compliance

War

Terrorism

Industrial Unrest / Strikes

Labour Shortages

Plan

Plan

Source   Make   Deliver

Return   Return

Deliver Source

Make

Deliver

Return Return

Plan

Deliver

Return

Plan

Source

Make Deliver Source

Return Return

Suppliers' Supplier

Supplier

Your Company

Customer

Customers' Customer

Infrastructure Congestion

Technology failure

Consolidation of Operations

Avian Flu H5N1

Fire

Flooding

Earth Quake

Outsourcing

Extending Manufacturing

Volcano Eruption

Contamination

1. Information and Intelligence

- Major purposes
  - Transparency + control
  - Improved decision-making
  - New ideas + innovation

- Managing Uncertainty

- „**Intelligence**" = strategic corporate skill !

2. Virtualisation

- *Replace reality by information and data modelling*
- Objects and processes
- Manifold of data sources
    - Sensors
    - Software apps
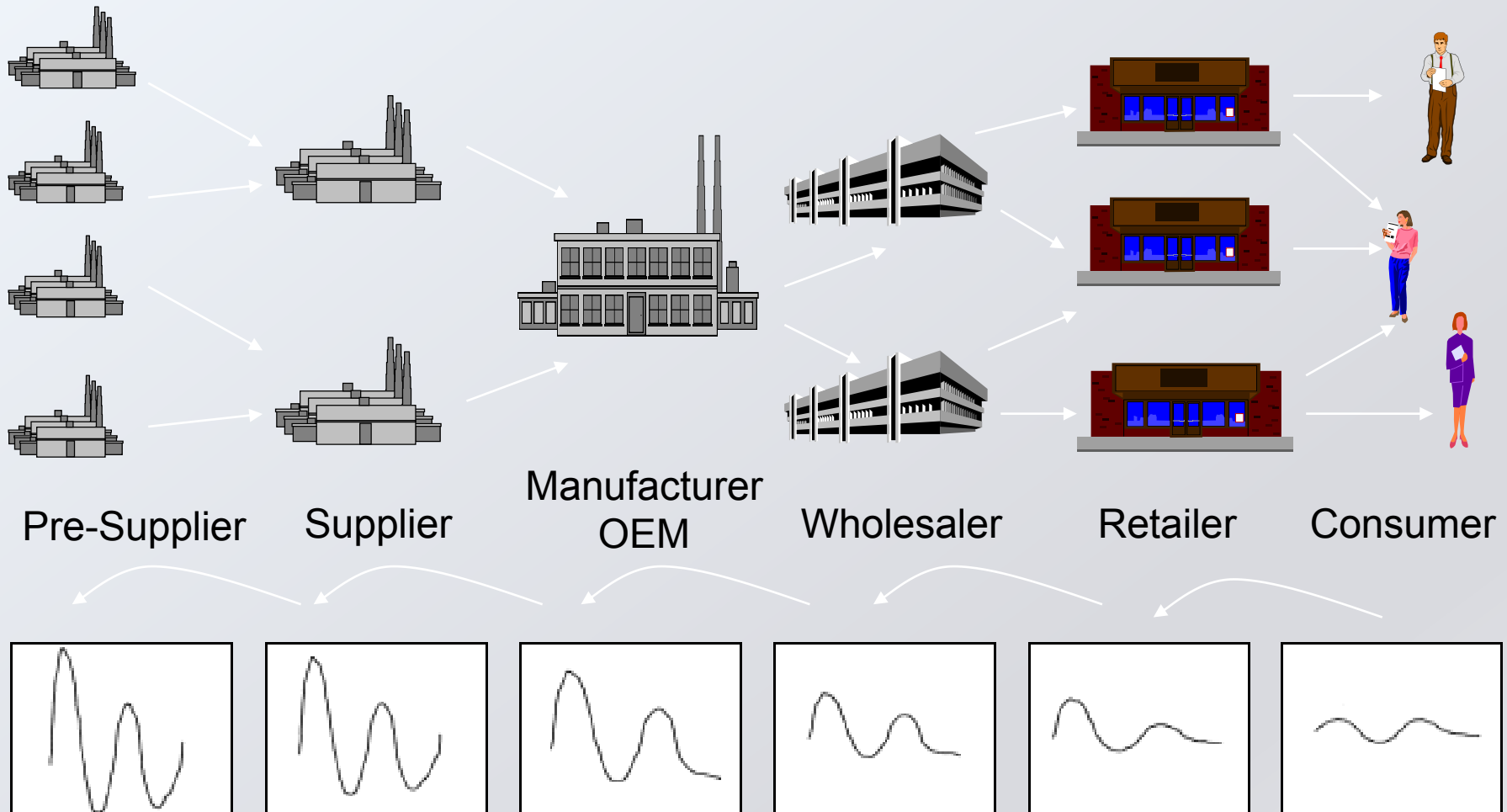   - MES etc.
    - ….
- New applications, e.g. augmented reality

3. Connectivity and Networking

Virtualisation + Linking example – Supply Chain

Pre-Supplier   Supplier   Manufacturer OEM   Wholesaler   Retailer   Consumer

Fluctuation of orders ‚upstream': The Bullwhip Effect

The Nature of Digitisation in Manufacturing

3. Connectivity and Networking

- Connecting all Cyber-Physical Elements

- Overcome time + space barriers
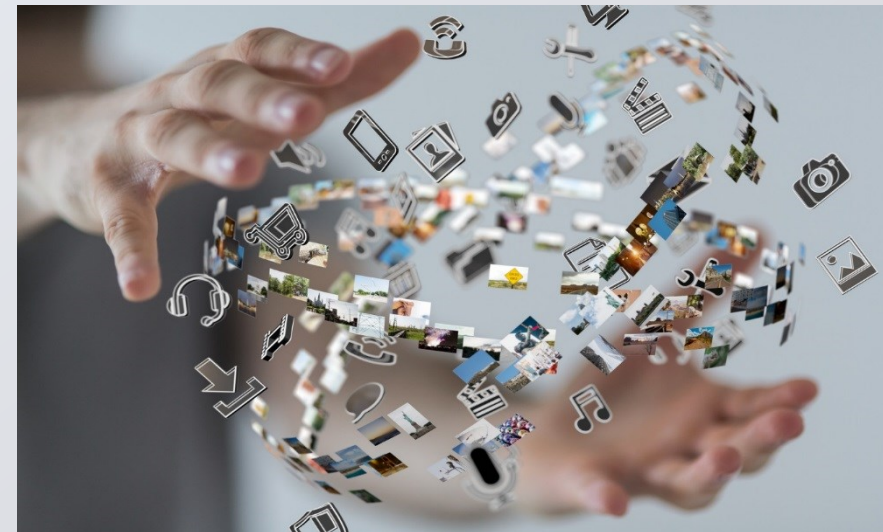
- Connect + interact

- **Total ubiquity, total access**
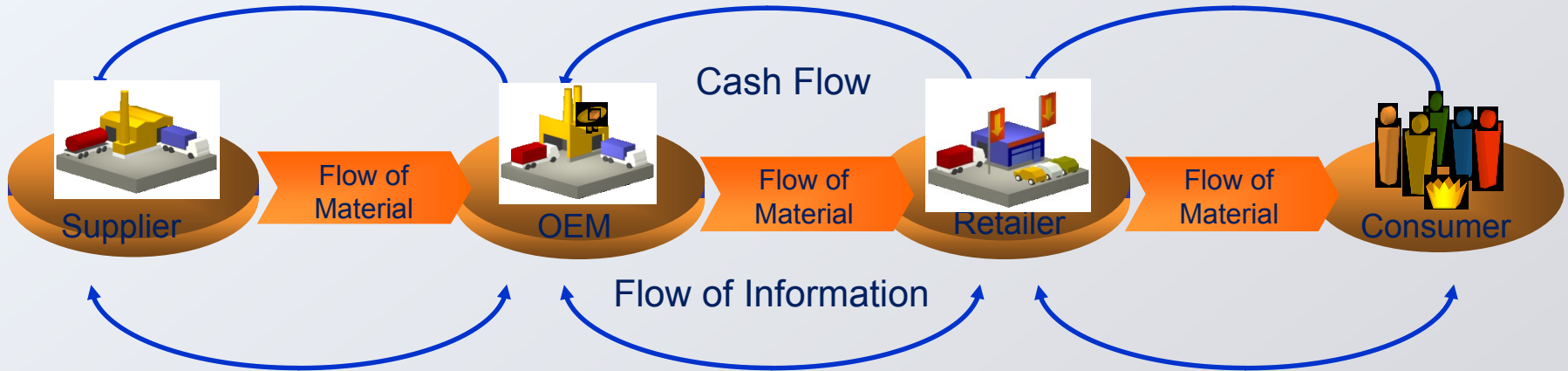
What if <u>no readiness to share </u>information assets ?

4. Integration and Standardisation

Supply Chain Integration

Cash Flow

| Supplier | → Flow of Material → | OEM | → Flow of Material → | Retailer | → Flow of Material → | Consumer |

Flow of Information

➔ Competition of Manufacturing Supply Chains

Cash Flow

| Supplier | → Flow of Material → | OEM | → Flow of Material → | Retailer | → Flow of Material → | Consumer |

Flow of Information

The Nature of Digitisation in Manufacturing

4. Integration and Standardisation

- Elements add to Entities
- Systems approach
    - Synergy
    - Economies of Scale
- Unification / Standardisation

What if <u>access to operations data</u> for the purpose of maintenance and delivery is denied ?

The Nature of Digitisation in Manufacturing

5. Automation

- Rules + algorithms-based complex process chains

- Major motifs:

    - Speed

    - Reliability / Q-control

    - Cost efficiency

What if <u>complexity / inpredictability levels are too high</u>
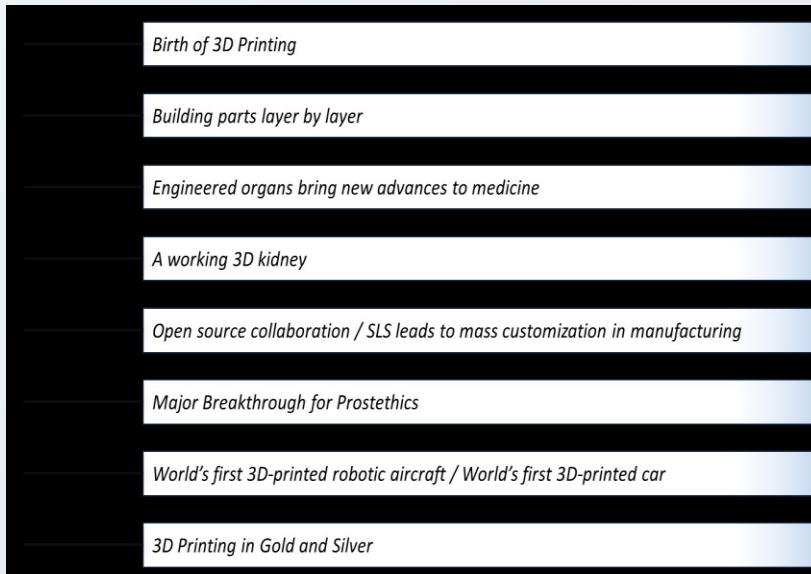=> standard algorithms + automation fails

6. Enable => Innovate

- New processes enabled
- Process Re-engineering
- New business models
- Entrepreneurial skills at work
- New Strategic positioning

3 D Printing

Birth of 3D Printing
Building parts layer by layer
Engineered organs bring new advances to medicine
A working 3D kidney
Open source collaboration / SLS leads to mass customization in manufacturing
Major Breakthrough for Prostethics
World's first 3D-printed robotic aircraft / World's first 3D-printed car
3D Printing in Gold and Silver

3D Printing will be mainly used for:
- High value products
- Highly customized products
- Low volumes

Examples are:
- *Prototypes*
- *Prostethics*
- *Spareparts*
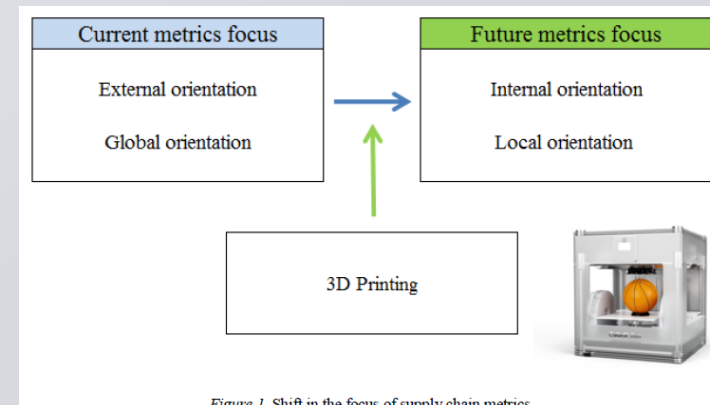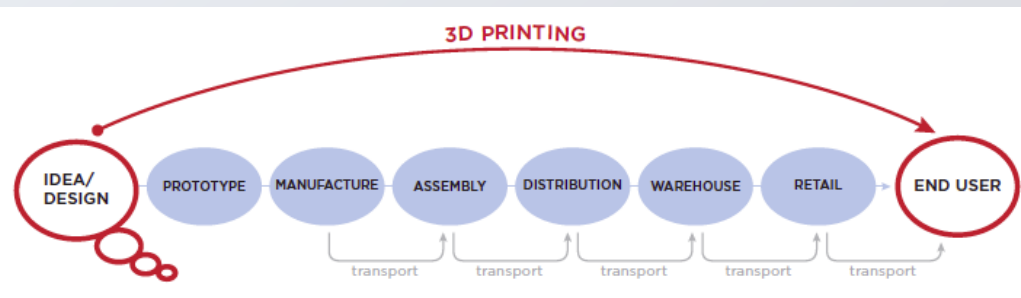- *Customized / individualized products*

3D PRINTING

IDEA/ DESIGN → PROTOTYPE → MANUFACTURE → ASSEMBLY → DISTRIBUTION → WAREHOUSE → RETAIL → END USER

transport · transport · transport · transport · transport

STREETSCOOTER

Current metrics focus	Future metrics focus
External orientation	Internal orientation
Global orientation	Local orientation

3D Printing

Figure 1. Shift in the focus of supply chain metrics.

Agenda

The Benefits of Digitisation in Manufacturing

**What is Driving your Digital Manufacturing
and Industry 4.0 transformation ?**

$\Rightarrow$ **Where´s the Competitive Advantage ?**

$\Rightarrow$ **What to Achieve ? Where´s the proven Benefit ?**

$\Rightarrow$ **How to justify Investments ?**

The Benefits of Digitisation in Manufacturing

Objectives supported by Digitisation

… seen from a strategic position

The Benefits of Digitisation in Manufacturing

Objectives supported by Digitisation:

➢ <u>Meta Objective</u>: **Long term Survival,** i.e. **Sustainability**

The Benefits of Digitisation in Manufacturing

Objectives supported by Digitisation:

➢ <u>Meta Objective</u>: Long term Survival (i.e. sustainability)

➢ **Security – Safety - Stability**

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The Benefits of Digitisation in Manufacturing

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➢ **Adaptability („Flexibility")**

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➢ **Power: Independence and Autonomy**

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➢ **Size <= Growth   <= Surplus / Profits   <= Efficiency + Productivity**

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- **Attractiveness for all Stakeholders**

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➢ **Quality**

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➢ Quality

➢ **Speed**

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- Attractiveness for all Stakeholders

- Quality

- Speed

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Is THAT New ?

BUT :   What´s really new –   technology ?

➢ Virtualisation – Network – Automation   ✓

2 crucial drivers

➢ more **data** (Big Data)

    => **new applications** – usage of information

➢ **internet**, wireless   => Information **everywhere available**
                        => **unlimited mobility** of all CPEs

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What Is New ?

That´s New: Entrepreneurial Spirit, Innovative Momentum
=> Real Strategic Impacts

1. **Big Data –   21st Century Gold**

2. **„Intelligent" Hardware + Service Strategy**

3. **Self Service / On-Demand Principles**

4. **Internet: Ubiquity +   Space/Time Independence**

5. **Batch size 1 / Total Mass Customisation**

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What Is New ?

1)   **Big Data – the 21st Century Gold**

> ➢ **New applications and usage** for data
> => new **markets** and **willingness to pay** for data

➢ Data deliver triggers for **automation**
=> Impacts: productivity, cost reduction, process quality, independence

➢ More **transparency**: Benchmarks + Control => Security

➢ **Agility and Acceleration** => faster / better decisions + plannings

➢ More Information: more **opportunity for improvements**

➢ Stimuli information: **new ideas** generated

What Is New ?

2)   **„Smart" Hardware and CPE**

➢ Make all **products „smart" and „intelligent"**:
add IT interface and connect to valuable information

➢ **Generate new functionalities**,
create new user benefit with *valuable information + apps*

➢ Service abonnements = Δ **business model** => customer loyalty

➢ **Offensive Service Strategies**

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What Is New ?

3) **Apply Self-Service Principles**

➢ Self-services: Shift **workload** and **responsibility** over to customer

➢ On-Demand (KANBAN)

➢ **Self-Service + Automation**   **=> Cost reductions**
          => Customer autonomy

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What Is New ?

4) Web Ubiquity – Independence in Space and Time via Total Connectivity

➢ **Decentralisation** of activities and CPEs (e.g. **3-D-printing**)

➢ **Full mobility** of all activities and CPEs

➢ **Integration** and **Standardisation impacts**: **Power for your Organisation**

➢ **Swarm Power mobilises unknown potentials, energies, capacities**
e.g. crowdfunding, shitstorm, R&D contributions, intra- and inter-firm collaboration, m2m machine parks / robot farms

➢ **Unlimited geographical Reach** (Globalisation)

➢ **Volume and Size impacts:** => *economies of scale*

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What Is New ?

5) **Customizing**

➢ Customised Product and Order Spezifications including Delivery Service !

➢ Variety towards 1,000,000

➢ Batch size down to 1

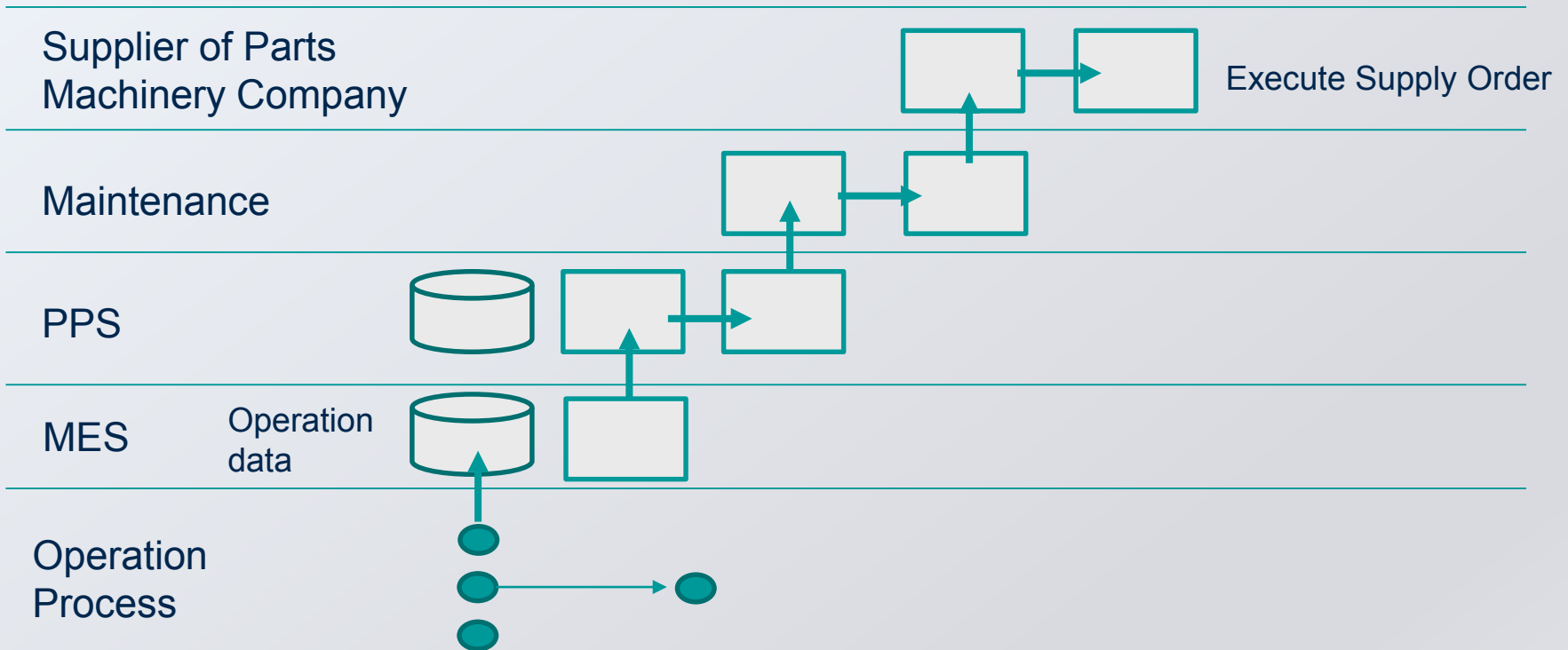➢ **=> Adaptability (Flexibility)**

The Benefits of Digitisation in Manufacturing

Example:

Maintenance   Order Workflow Automation - Real Time

The Benefits of Digitisation in Manufacturing

Supplier of Parts Machinery Company — Execute Supply Order

Maintenance

PPS

MES — Operation data

Operation Process

The Benefits of Digitisation in Manufacturing

Example: Maintenance   Order Workflow Automation - Real Time

Features and Advantages:

➢ Early and fast detection of break-down cases

➢ Exchange of failing parts prior to break-down

   => Avoid or Reduce Down Times

➢ Early and optimised Scheduling of Spare Part Manufacturing and

   Delivery and Repair Processes

➢ Automation – also within inter-corporate workflow !!

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Managerial Consequences

3 Considerations:

1. **Analyse potential Disruption in your + related industries**

2. **Evaluate Change + Digitisation Options**

3. **Build your own Digitisation Roadmap**

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Thank you for your attention !

Take Action !

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