BIG DATA IN MANUFACTURING TOWARDS SMARTER PRODUCTION

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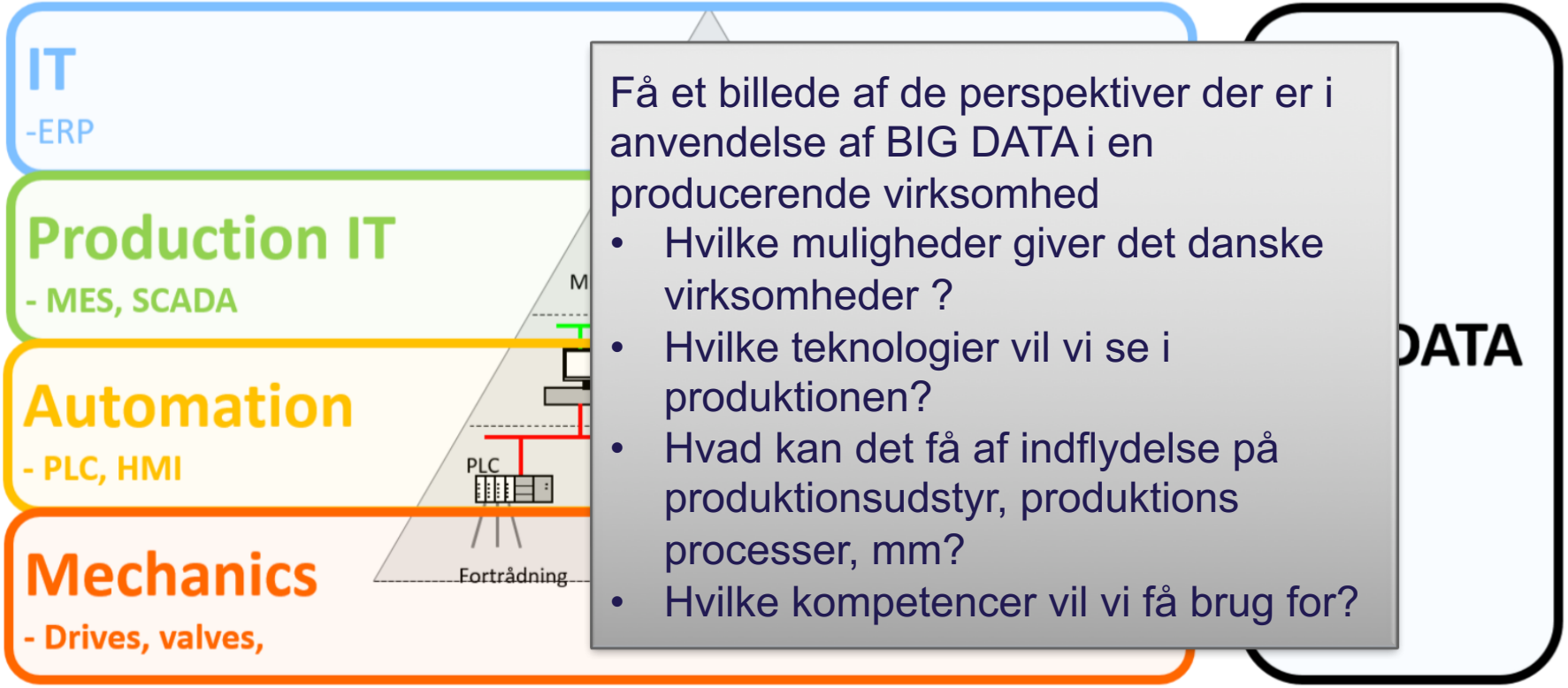
Big Data in Manufacturing



Få et billede af de perspektiver der er i anvendelse af BIG DATA i en producerende virksomhed

- Hvilke muligheder giver det danske virksomheder ?
- Hvilke teknologier vil vi se i produktionen?
- Hvad kan det få af indflydelse på produktionsudstyr, produktions processer, mm?
- Hvilke kompetencer vil vi få brug for?

Agenda

What is Big Data in Manufacturing?

- The value of Big Data in Manufacturing

Why should we make production smarter?

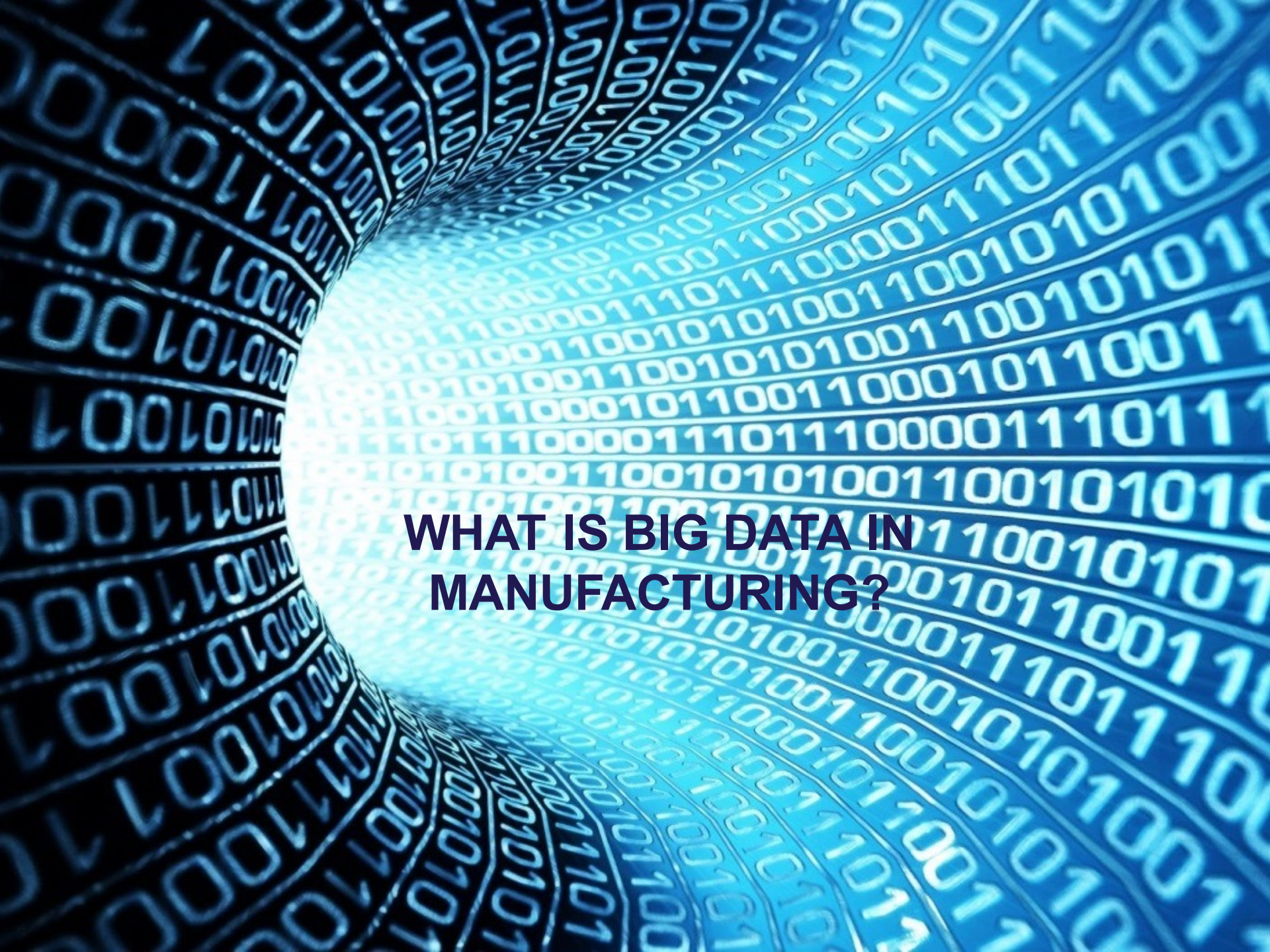
- From Industry 4.0 towards Smart Production
- Opportunities for Danish industry

How can we approach the digital transformation?

- What are the new technologies and competencies needed?
  - Data Science
  - Approaches

What are the main takeaways?

- Digital transformation is more than Big Data and IoT
- Smart Production and MADE

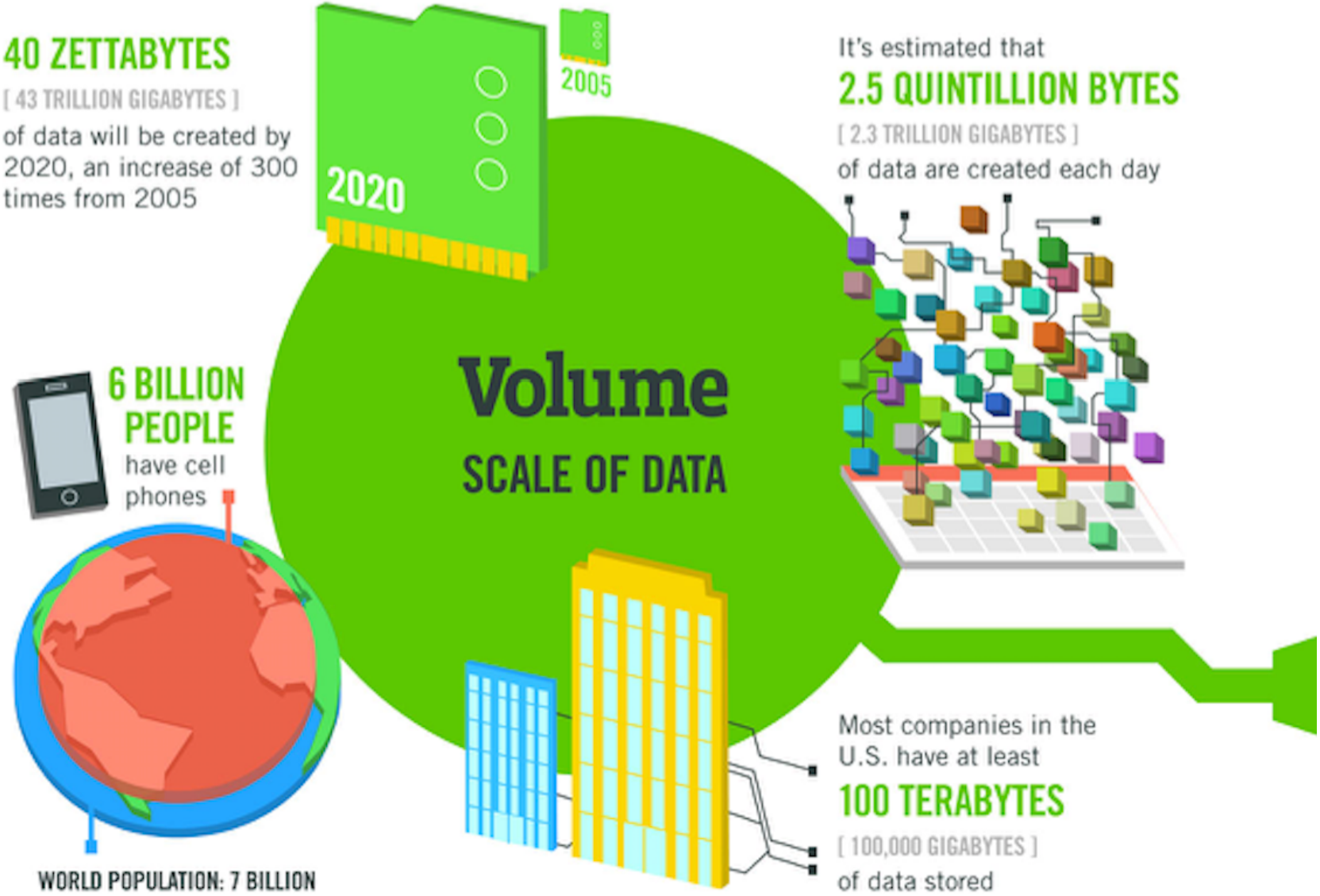


WHAT IS BIG DATA IN MANUFACTURING?

Big Data in Manufacturing

https://en.wikipedia.org/wiki/Big_data

- Big data is a term for data sets that are so large or complex that traditional data processing applications are inadequate.
- Challenges include analysis, capture, data curation, search, sharing, storage, transfer, visualization, querying and information privacy.
- The term often refers simply to the use of predictive analytics or certain other advanced methods to extract value from data, and seldom to a particular size of data set.
- Accuracy in big data may lead to more confident decision making, and better decisions can result in greater operational efficiency, cost reduction and reduced risk.



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Variety

DIFFERENT FORMS OF DATA

As of 2011, the global size of data in healthcare was estimated to be

150 EXABYTES

[161 BILLION GIGABYTES]

By 2014, it's anticipated there will be

420 MILLION WEARABLE, WIRELESS HEALTH MONITORS

4 BILLION+ HOURS OF VIDEO

are watched on YouTube each month

30 BILLION PIECES OF CONTENT

are shared on Facebook every month

400 MILLION TWEETS

are sent per day by about 200 million monthly active users

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The New York Stock Exchange captures

1 TB OF TRADE INFORMATION

during each trading session

Modern cars have close to

100 SENSORS

that monitor items such as fuel level and tire pressure

Velocity

ANALYSIS OF STREAMING DATA

By 2016, it is projected there will be

18.9 BILLION NETWORK CONNECTIONS

– almost 2.5 connections per person on earth

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Veracity

UNCERTAINTY OF DATA

1 IN 3 BUSINESS LEADERS

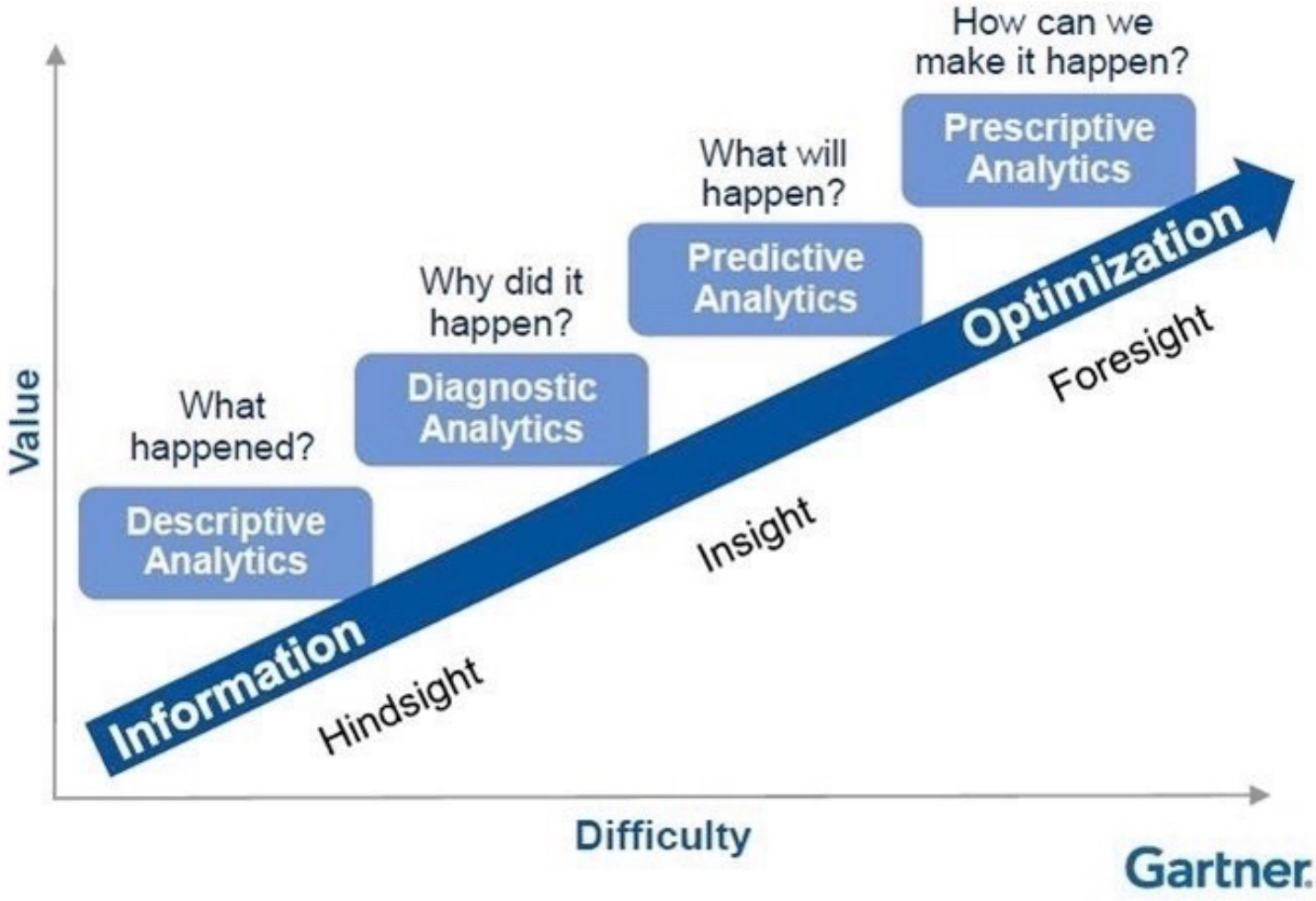
don't trust the information they use to make decisions

Poor data quality costs the US economy around

$3.1 TRILLION A YEAR

in one survey were unsure of how much of their data was inaccurate

The Fifth “V”: Value from Big Data and Analytics



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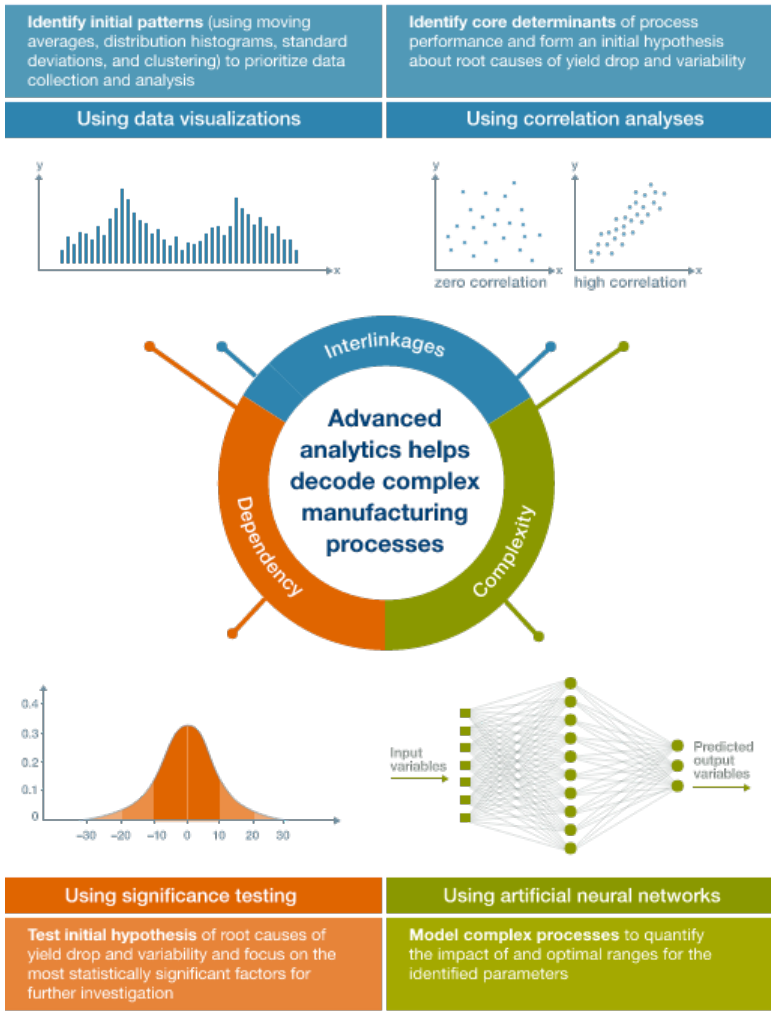
Ten ways how big data can improve manufacturing

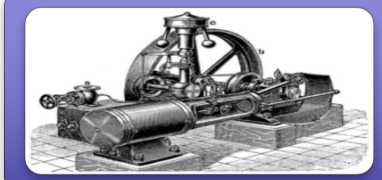


- Increasing the **accuracy**, **quality** and **yield** of production.
- Better **forecasts** of product demand and production (46%), **understanding** plant performance across multiple metrics (45%) and providing **service** and support to customers faster (39%) are the top three areas big data can improve manufacturing performance.
- Integrating advanced analytics across the **Six Sigma** DMAIC (Define, Measure, Analyze, Improve and Control) framework to fuel continuous improvement
- Greater **visibility** into supplier quality levels, and greater accuracy in **predicting** supplier performance over time.
- Measuring **compliance** and **traceability** to the machine level becomes possible.
- Selling only the most profitable **customized** or build-to-order configurations of products that impact production the least.
- Breaking quality management and compliance systems out of their **silos** and making them a corporate priority.
- Quantify how daily production impacts **financial performance** with visibility to the machine level.
- Service becomes strategic and a contributor to customers' goals by monitoring products and **proactively** providing **preventative maintenance** recommendations.
- **Accelerating** the integration of IT, manufacturing and operational systems making the **vision of Industrie 4.0** a reality.

Source: McKinsey & Forbes, 2014

WHY SHOULD WE MAKE PRODUCTION SMARTER?

The fourth industrial revolution



FIRST Industrial Revolution

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

SECOND Industrial Revolution

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

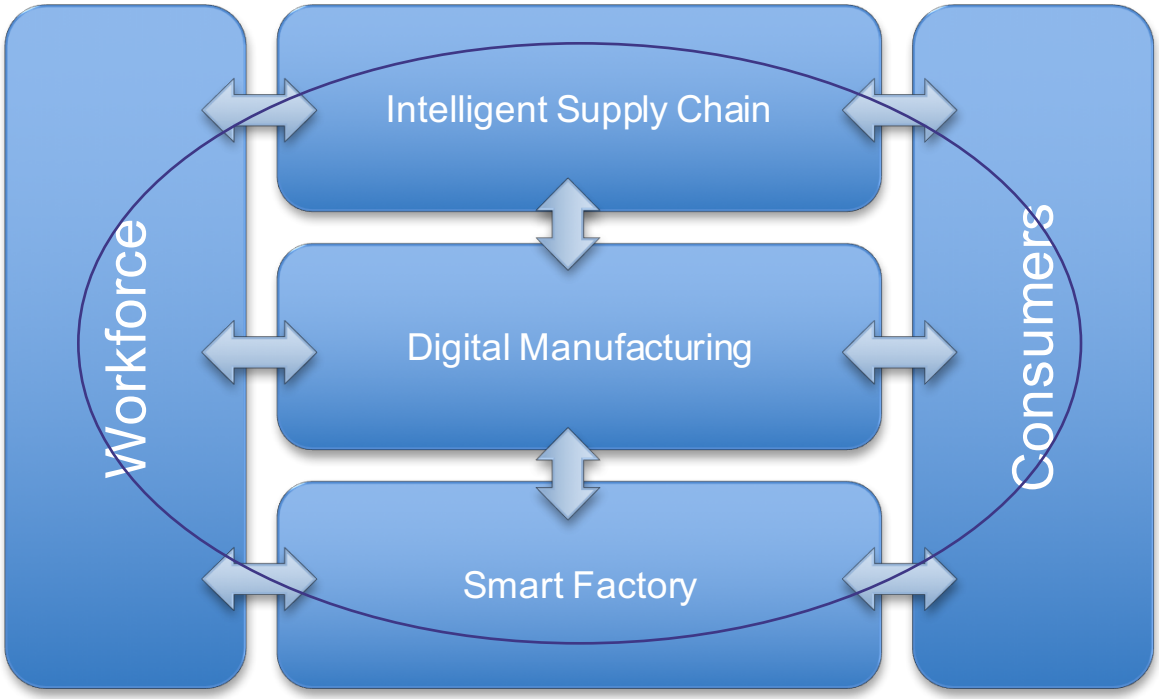
THIRD Industrial Revolution

- Use of electronic and IT systems that further automate production

FOURTH Industrial Revolution

- Production technology, advanced materials, automation and digitalization

Conceptual Framework for Smart Production



Three central use cases

Digital Manufacturing

- E2E digital integration of engineering across the entire value chain
- Connected products

Smart Factory

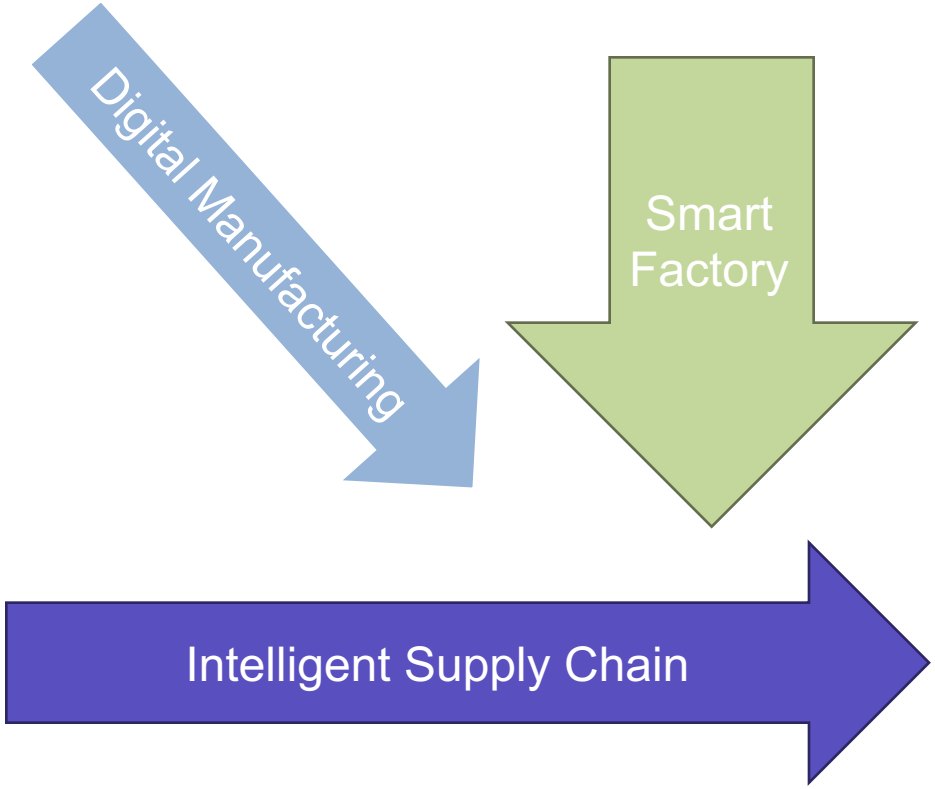
- Vertical integration and networked manufacturing systems
- Connected processes

Intelligent Supply Chain

- Horizontal integration through value networks
- Connected organizations

NEW COMPETENCIES

Millennial Consumers and Workforce



Millennials:
Connected mobile devices
Digital natives

“Why would I want a car?”
“I want services, not products”
“I see no point in a permanent job”

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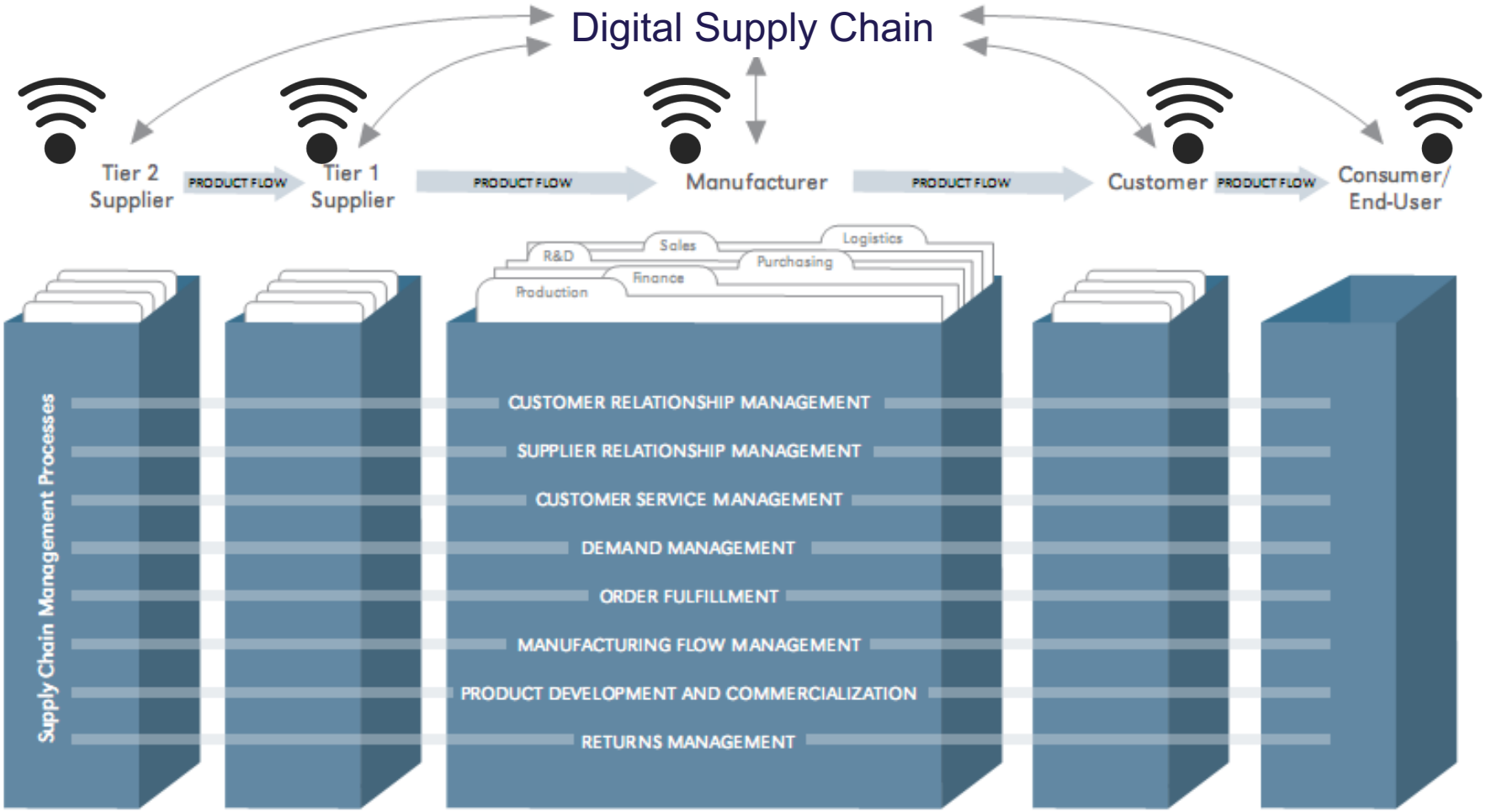
Smarter Supply Chain of the Future?

Source: Adapted from Lambert, 2008



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HOW CAN WE APPROACH THE
DIGITAL TRANSFORMATION?

Hypothesis: Digital Transformation

Kagermann, Wahlster & Helbig, 2013

- The journey towards the future of digital manufacturing will be an **evolutionary process**
- Current basic technologies and experience will have to be **adapted** to the specific requirements of manufacturing engineering and **innovative solutions** for new locations and new markets will have to be **explored**
- Achieving the benefits from digital manufacturing is a long-term endeavor and will involve a gradual experimental learning process involving both **technology**, **systems** and **management** processes
- For a company it will be key to ensure that the value of existing manufacturing systems is **preserved**
- At the same time, it will be necessary to come up with migration strategies that **deliver benefits and productivity** from an early stage.

AAU Smart Production Laboratory

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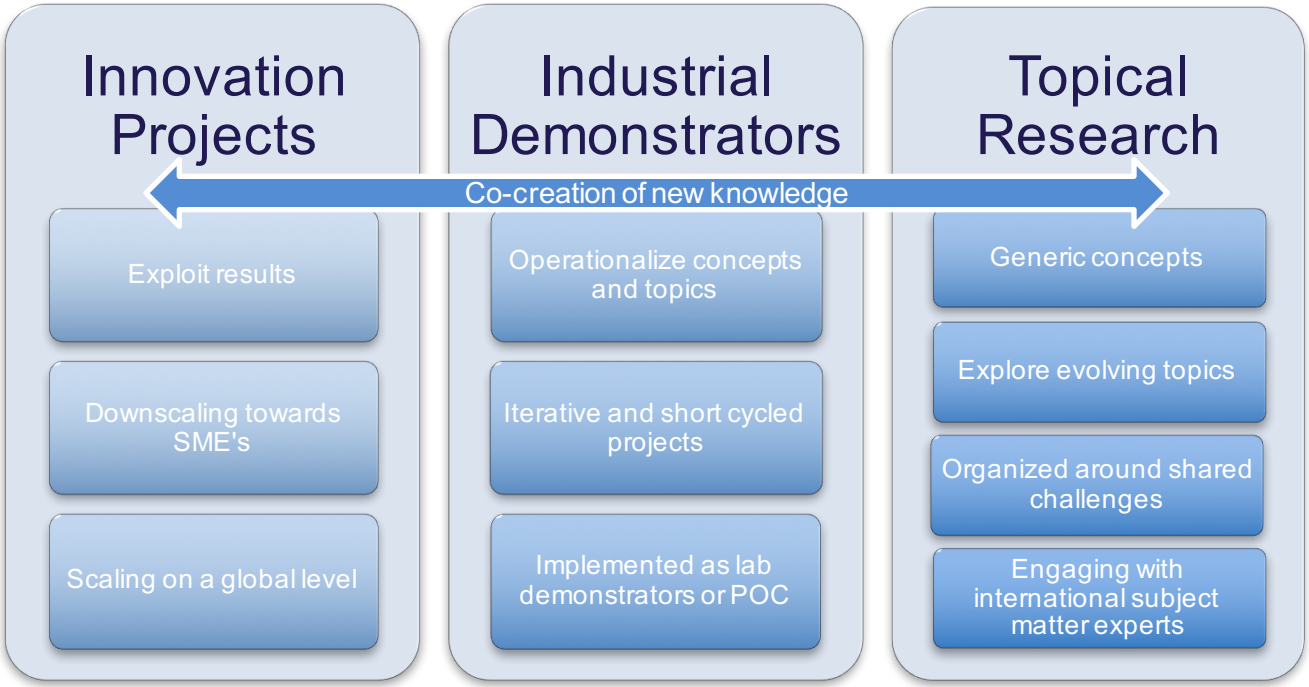
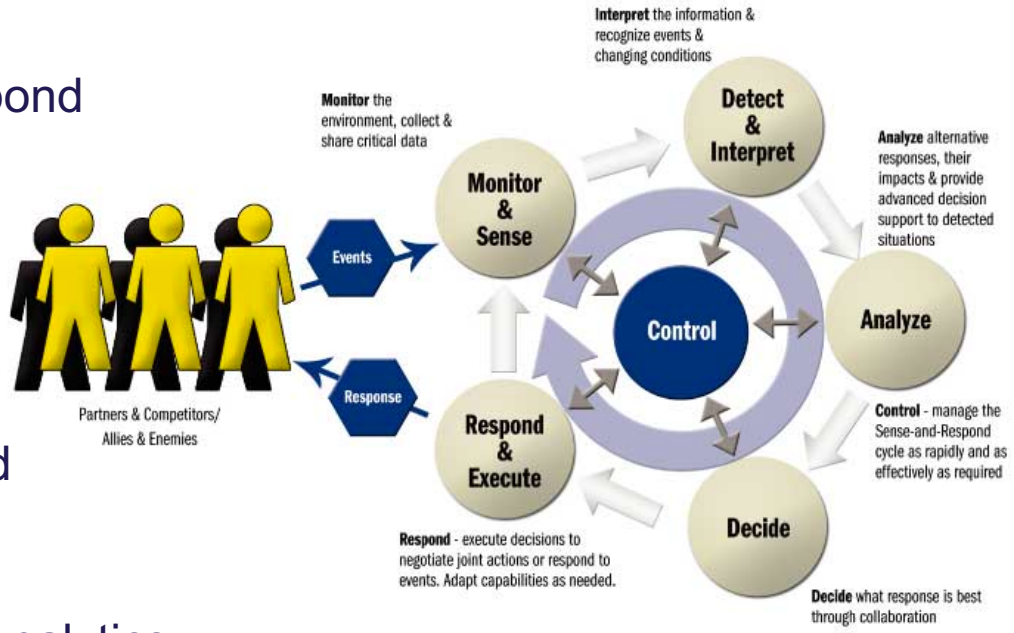
Engagement Model for MADE Research and Innovation



MADE Project: Closing the loop

- Challenge
  - Developing sense and respond capabilities



- Solutions
  - Acquisition of customer and production data
  - Activating production data
  - Supply chain visibility and analytics

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Reflections from the back of the theater

- Digital transformation is more than
  - Big Data
  - Internet of things
  - …
- We don’t want to talk about
  - Failed IT projects
  - Security and trust
  - …

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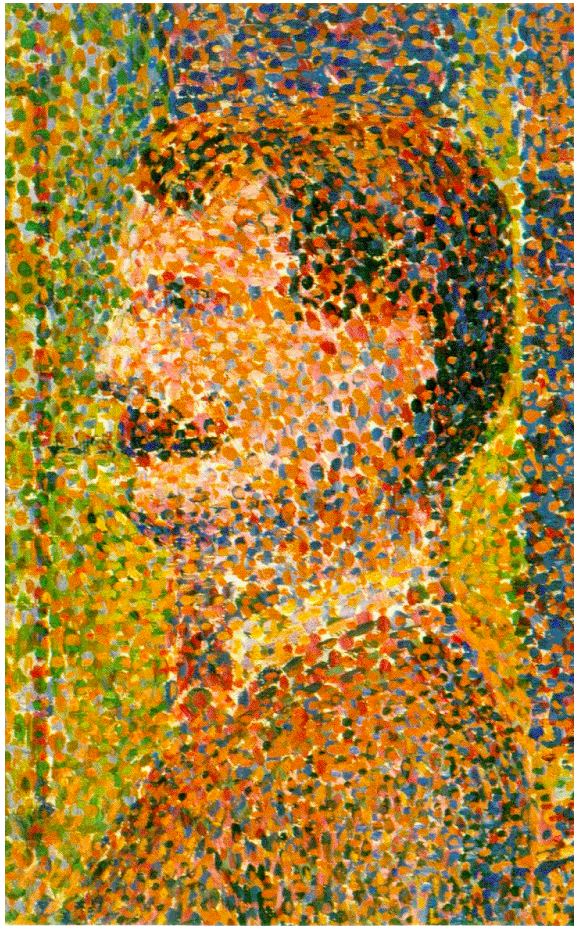
Thanks for your Attention



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