

# **Smart Data – THE driving force for industrial applications**

Norbert Gaus | European Data Forum Luxembourg, November 16, 2015

# The world is becoming digital – User behavior is radically changing based on new business models

**Newspaper,  
books**



**Online media**



**Cinema**



**Video  
on demand**



**Telephone booth**



**Smart phone**



**Writing letters**



**Social media**

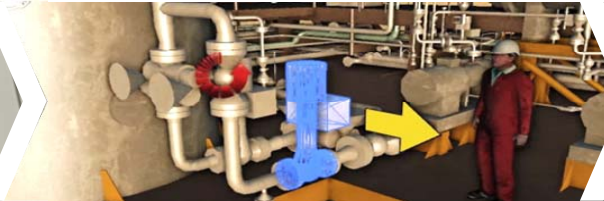


**This takes place also in industrial environments –  
Considering installed base, lifetime and processes**

**Manual machine  
configuration**



**Virtual  
commissioning**



**Large  
power plants**



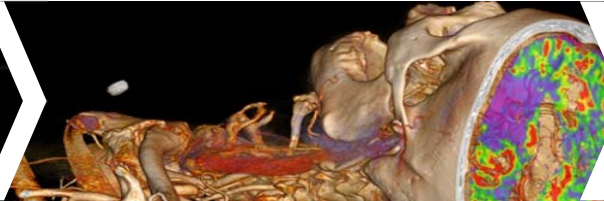
**Virtual  
power plants**



**X-ray  
photography**



**Digital image  
and analysis**



**Fixed  
maintenance  
intervals**

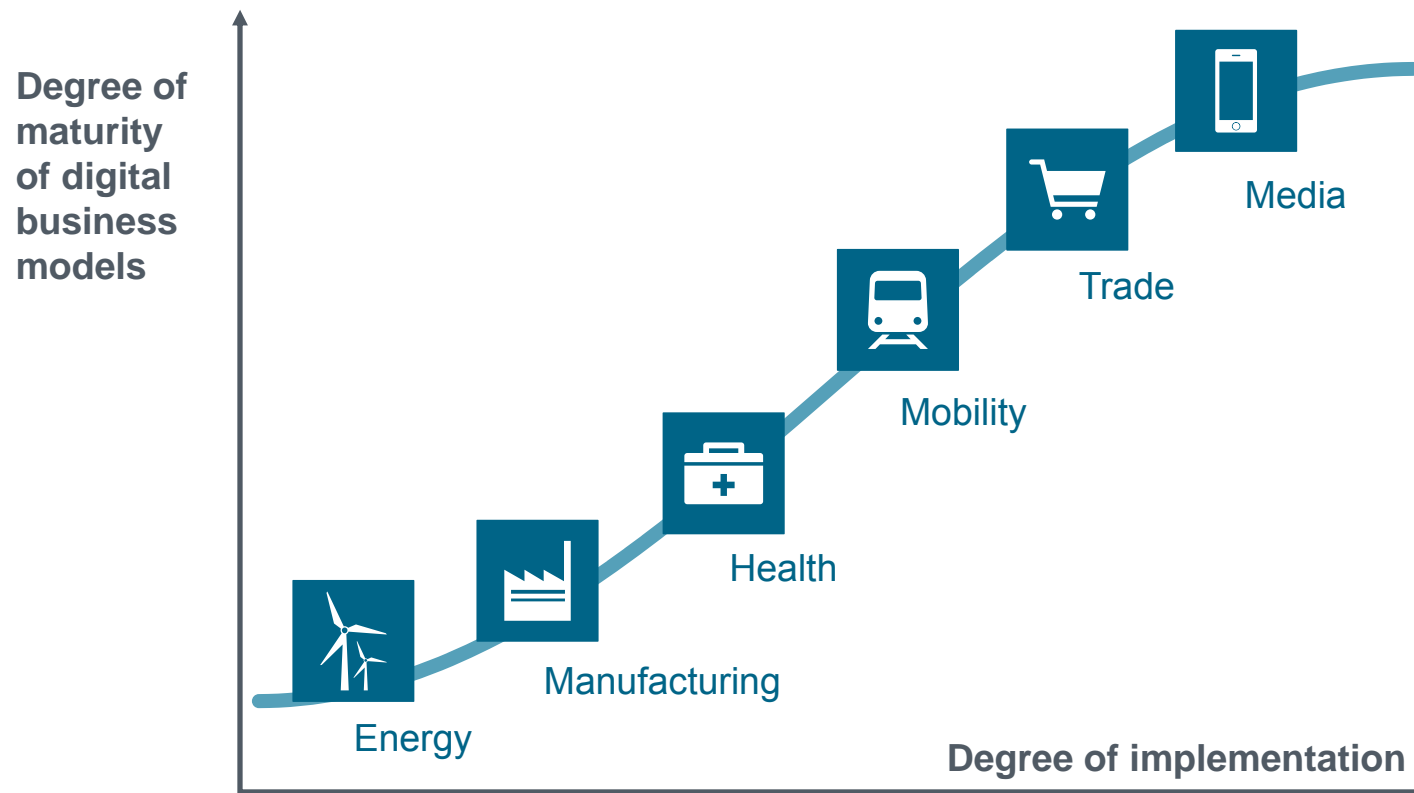


**Predictive  
maintenance**





## What is happening in the B2B environment, and how does this help to create new business opportunities?

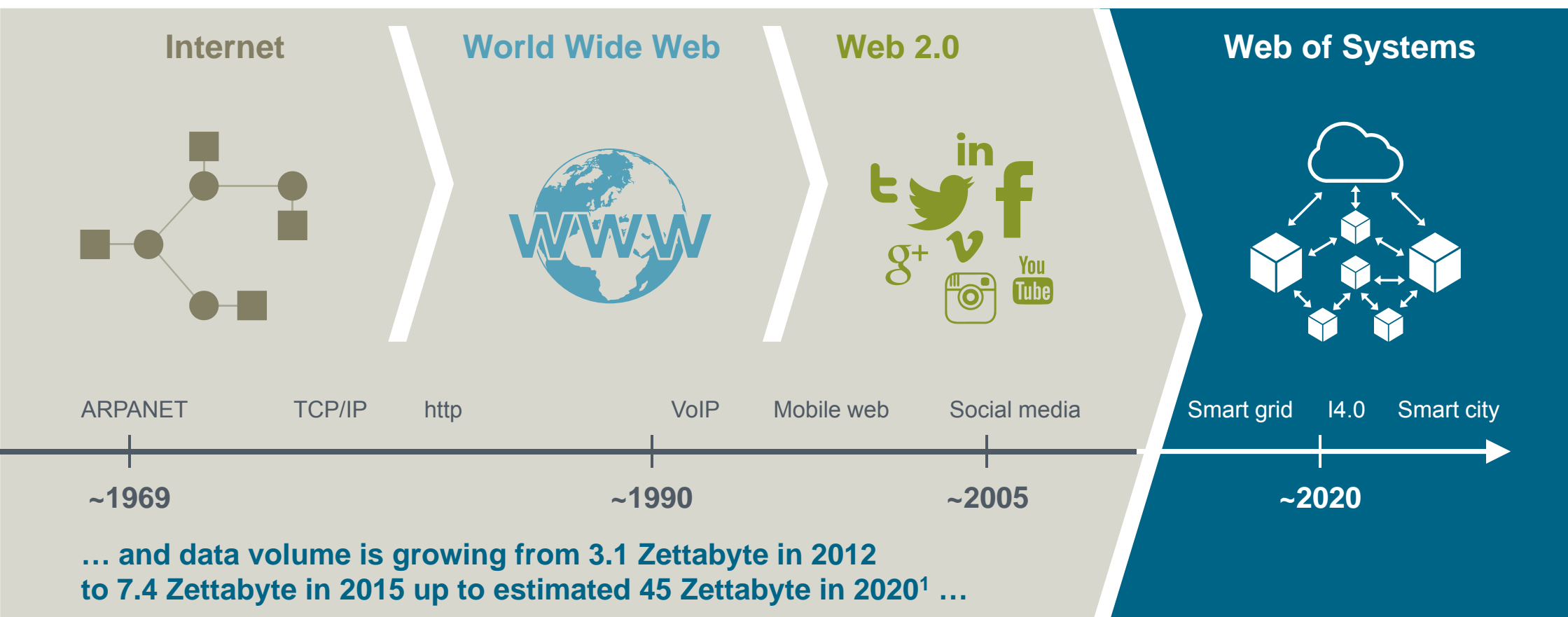


**We are seeing  
an increasing  
digitalization  
of industries**

Source: Accenture

Unrestricted © Siemens AG 2015

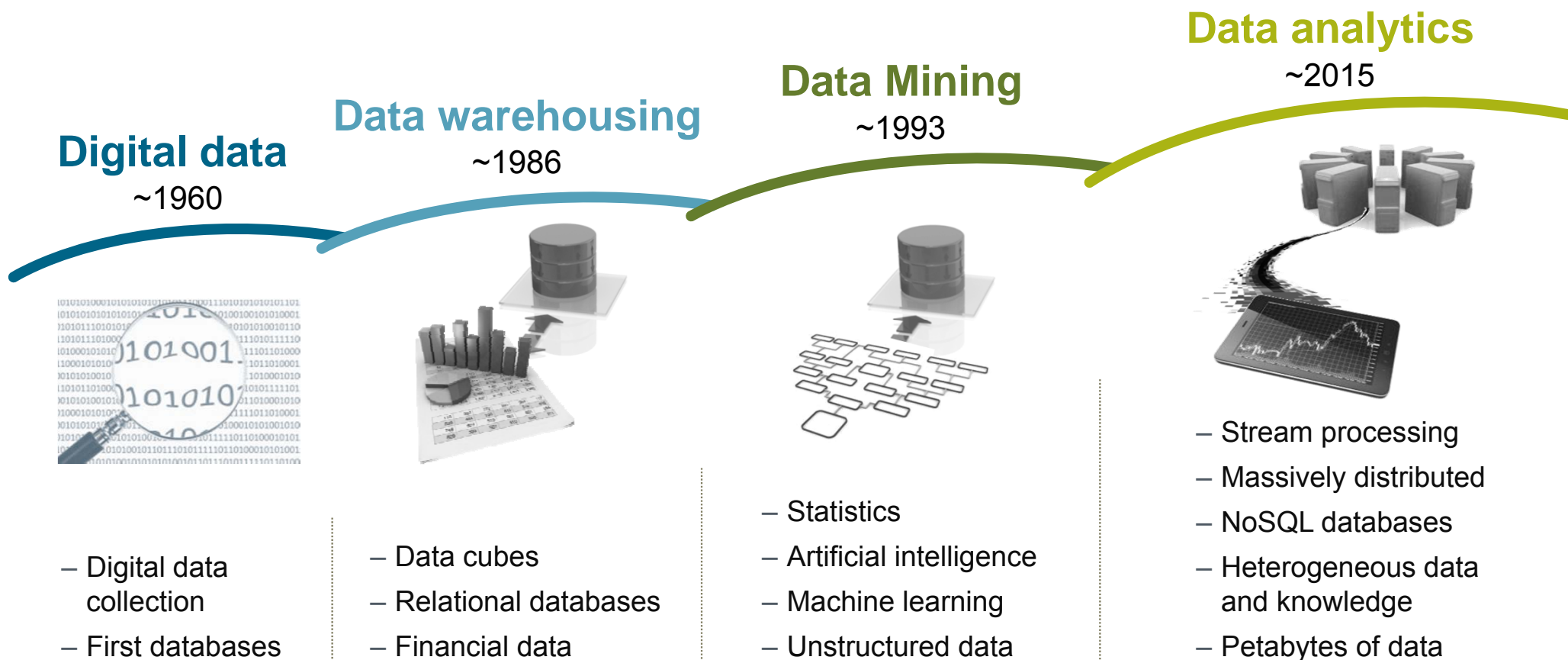
## From the Internet to the Web of Systems



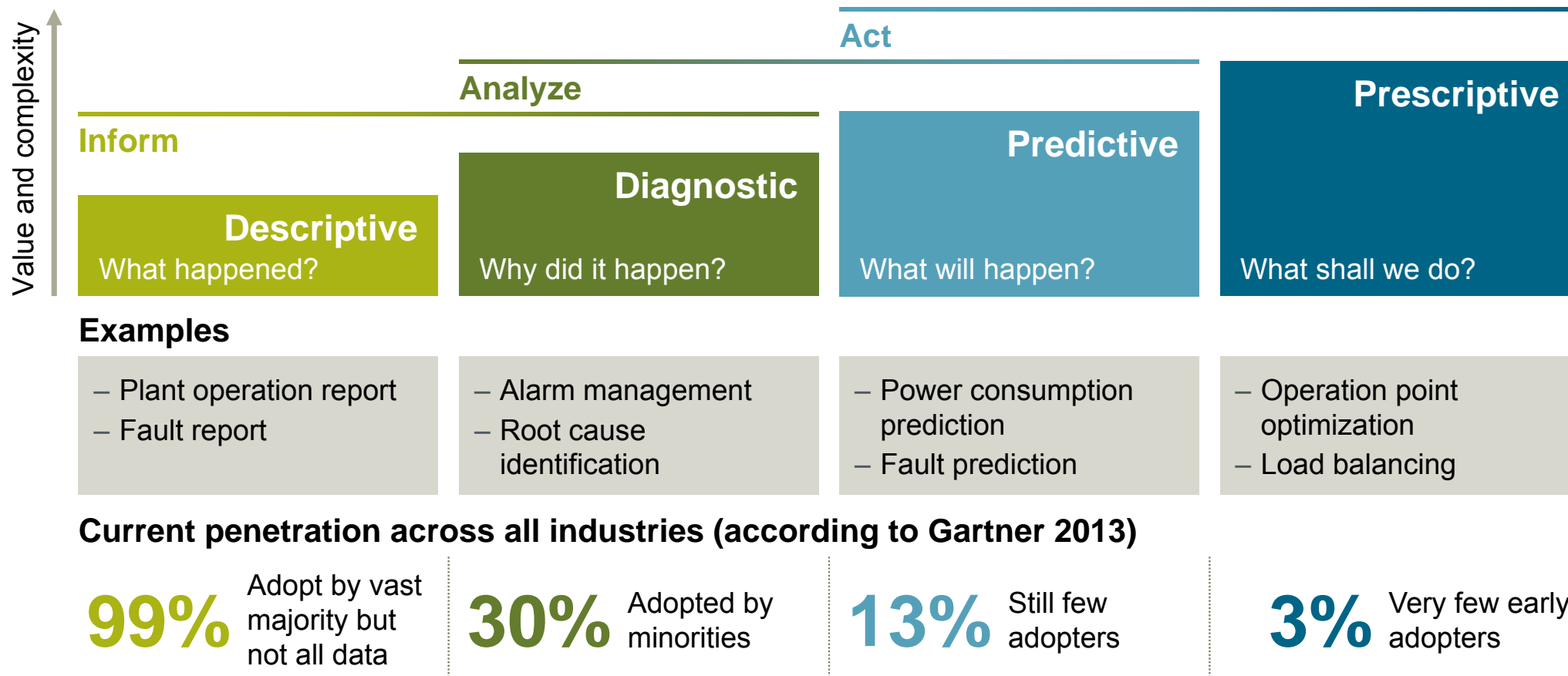
(1) Zettabyte = 1,021 Byte; Source: Oracle, 2012

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# The Evolution of Data analytics

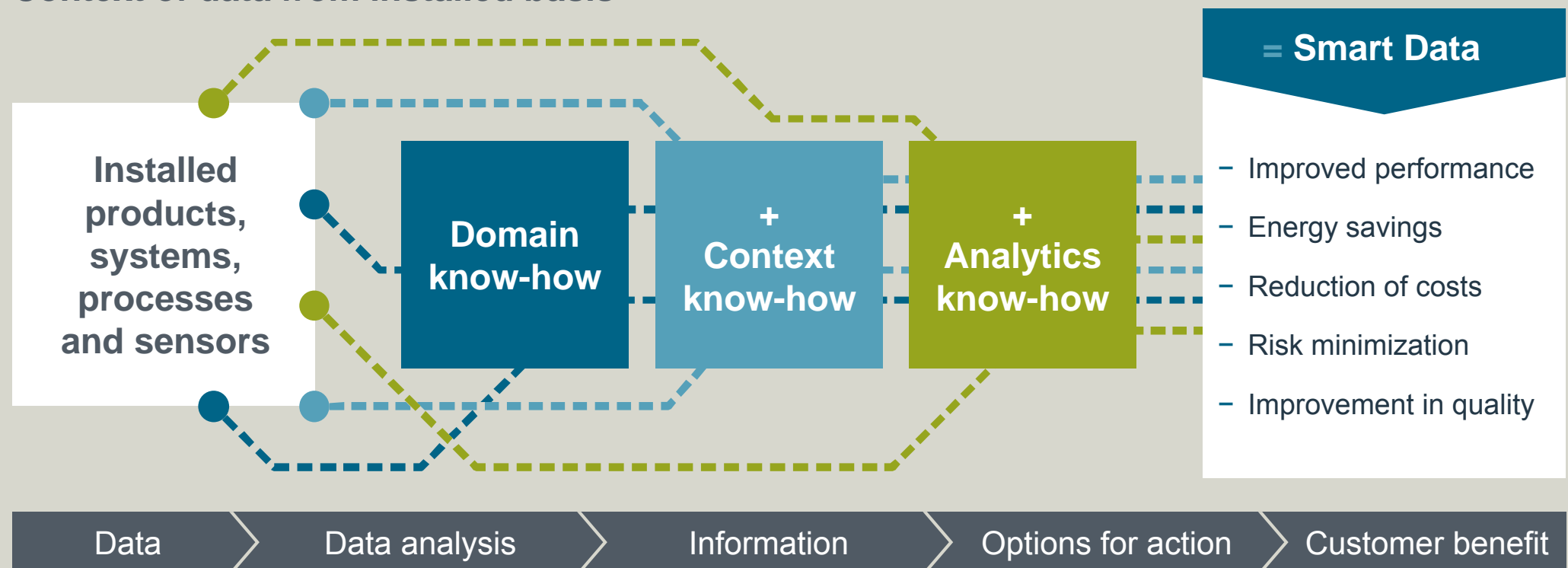


## Focus of data analytics is changing – From description of past to decision support



## Siemens Approach „Smart Data“ – A basis for the development of new business models

### Context of data from installed basis





## Smart Data to business example – Optimization of gas turbine operation



### Energy System

- Market drivers
- Customer needs
- Product cycles

### Gas Turbines

- Mechanical Engineering
- Thermodynamics
- Combustion chemistry
- Sensor properties

### Autonomous Learning

- Neural Networks
- Smart Data Architecture processes data from 5,000 sensors per second

### Results

Reduced NOx Emissions

Extension of service intervals

Domain  
know-how



Context  
know-how



Analytics  
know-how



Smart  
Data

Siemens

## Smart Data to business example – Optimization of wind parks (Project ALICE)



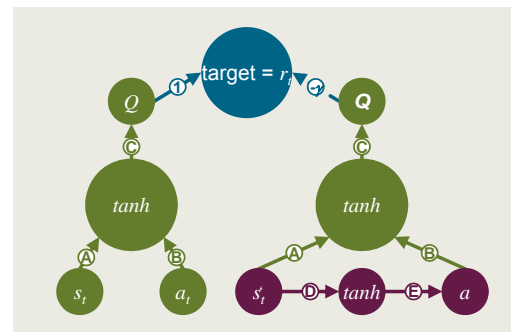
### Wind Power

- Market drivers
- Customer needs
- Aerodynamics
- Meteorologies



### Wind Turbines

- ~12,000 installed
- Mechanical Engineering
- Sensor properties
- Controller design



### Autonomous Learning

- Neural Networks
- Robust policy generation despite very noisy data

### Result

1% increase of annual energy with optimized control policy

Domain  
know-how



Context  
know-how



Analytics  
know-how



Smart  
Data

Siemens

## Smart Data to business example – Health check for CERN's Large Hadron Collider



### Automation Infrastructure

- Market leader in industry automation
- Strong presence in all business areas



### Autom. Components

- Complex: Hundreds of SCADA systems and SIMATIC control systems



### Rule and Pattern Mining

- >1 terabyte of operational data generated per day
- Detect fault patterns

### Result

Early warnings  
to increase  
Operating Hours

Domain  
know-how



Context  
know-how



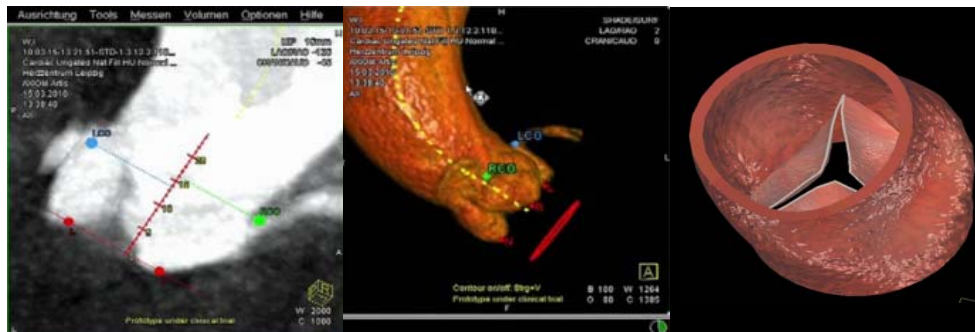
Analytics  
know-how



Smart  
Data

Siemens

## Smart Data to business example – Image-guided diagnosis and therapy for heart valves



### Healthcare Ecosystem

- Cost/effectiveness
- Accurate diagnosis/therapy
- Less invasive surgery

### Imaging Scanners

- Robotic imaging
- Interventional imaging
- Low radiation
- Reconstruction and fusion

### Machine Learning

- Image databases
- Fast machine learning
- Identify relevant structures

### Results

Industry wide unique feature that automates workflow and guides the surgeon

Applied to thousands of valve implants

Next generation in the pipeline

Domain  
know-how



Context  
know-how



Analytics  
know-how



Smart  
Data

Siemens



## Smart Data to business example – Condition Monitoring for Water Supply Networks



### Levee Building

- Hydrology
- Geology
- Weather forecasting

### Levee Sensors

- Pressure
- Temperature
- Geometrical deviation



### Neural Networks

- Time Series Data Management
- Anomaly detection (Slipping)

### Result

“Effectiveness of levee reinforcement has to be increased by a factor 4 which is impossible without innovation.”

Peter Jansen,  
Waternet

Domain  
know-how



Context  
know-how



Analytics  
know-how



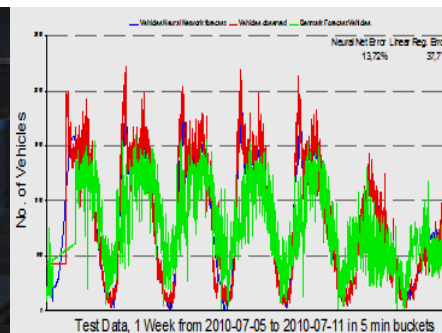
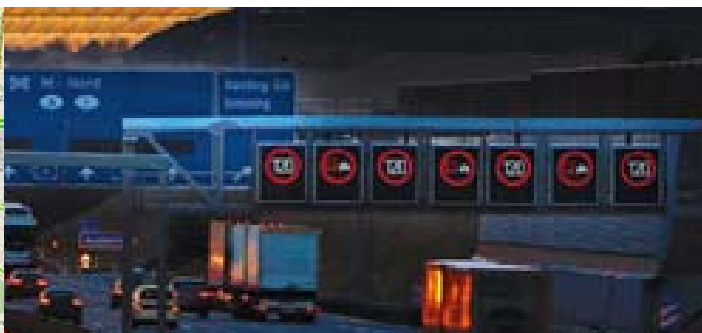
Smart  
Data

Siemens + customer

Siemens



## Smart Data to business example – Advanced Traffic Forecast from Floating Car Data



### Traffic Management

- Traffic Flow Models
- Traffic Planning

### Traffic Sensors

- Induction Loops (traffic lights and guidance systems)
- GPS and Car Data

### Neural Networks

- Time Series Data
- Traffic Forecasting
- Optimization of Traffic Flow

### Objective

Highly accurate traffic forecast

Improve short-term traffic prediction by combining data sources

Domain  
know-how



Context  
know-how



Analytics  
know-how



Smart  
Data

Siemens + customer

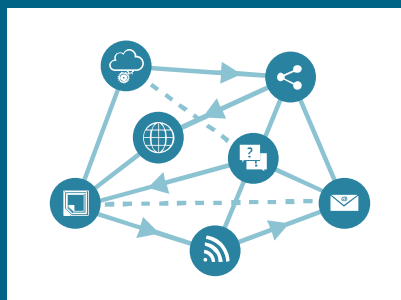
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## Smart Data to business examples – Lessons learned

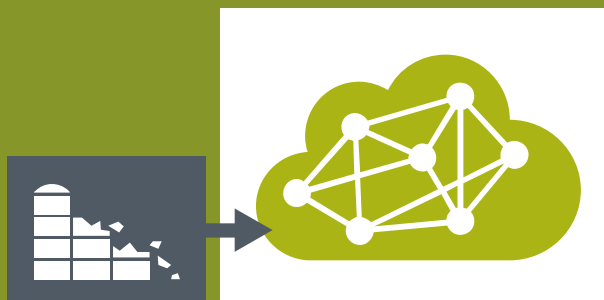
- **For all use cases/business cases** the data value stream needs to be specifically designed or adapted due to varying data types, data amount, data quality, data sources, data models: „**One-size-doesn't-fit-all**“
- Based on today's technologies the **combination of analytics know-how and application know-how** can generate **new business and value add** (smart data to business examples)
- **New technologies need to be developed** e.g. in the areas of multicore computing and cloud computing, but also new mathematics for analytics are necessary (artificial intelligence, neural networks ...)
- **The combination of different data from different data sources** (e.g. customer data + Siemens data) and their common analysis leads to advantages for both partners e.g. floating car data combined with Siemens traffic management systems data
- **Security and data protection need to be integral** part of all technical solutions along the data value chain (data value stream)

## What is needed to foster the European Big Data Economy? – Lessons Learned

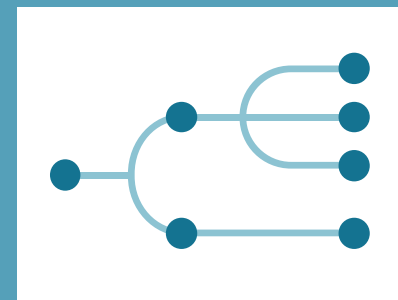
### Experimental mindset



### Breaking silos



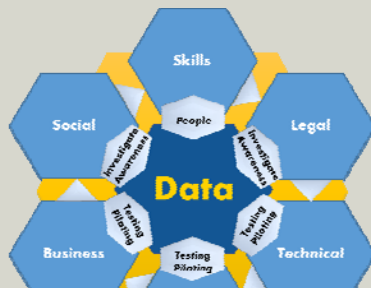
### Skill & Technology development



# The Big Data Value Association aims to strengthen the European Big Data Economy on four different levels

## Innovation Spaces

... to foster experiments in cross-domain and cross-sector settings



## Lighthouse Projects

... to enable large scale demonstrations covering the complete value chain /network



## R&I Projects

... to push skill and technology development in the prioritized strategic directions



## Coordination and Support Actions



## Siemens focuses on Electrification, Automation and Digitalization ...

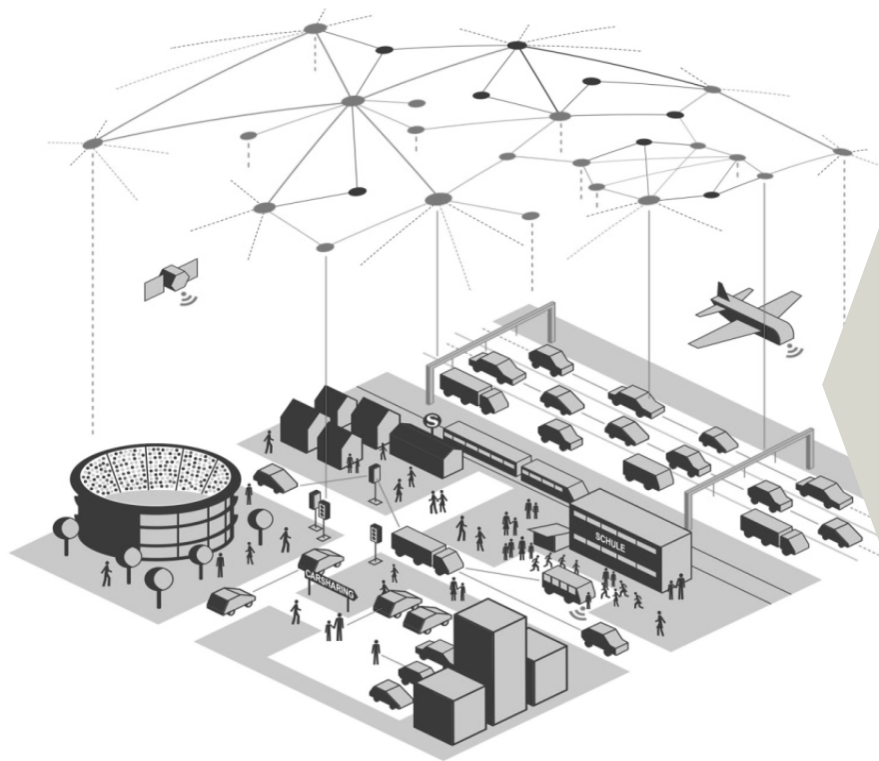
### Digitalization



### Automation



### Electrification



### Enablers

- **Sensors and connectivity**
- Computing power
- Storage capacities
- **Data analytics**
- **Networking ability**

... and is actively picking up on new technological developments



The background of the slide features a light blue gradient with a series of white, vertical, wavy lines that create a sense of motion and depth. The Siemens logo is positioned in the top left corner.

**SIEMENS**

# Thank you

Norbert Gaus | European Data Forum Luxembourg, November 16, 2015