



Digital kickoff for producing industries
Make digital transformation a success

Agenda

- 1** Introduction FIR
- 2** Future of Industry
- 3** Industrie 4.0 Maturity Index

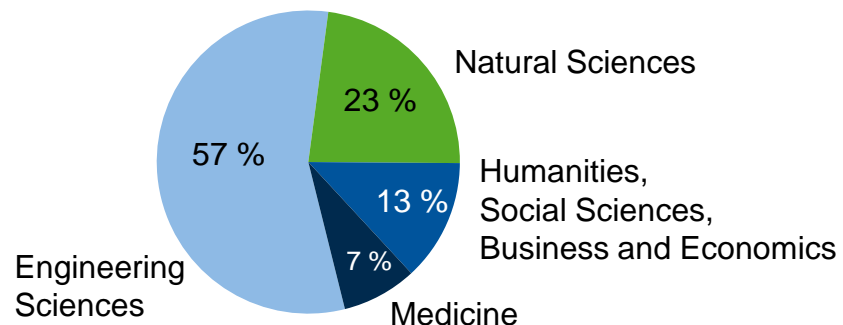
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RWTH Aachen University – One of the Leading Universities in Germany

Facts and Figures

■ Budget:	884 Mio. €
■ External Funding:	354 Mio. €
■ Affiliated Institutes:	66 Mio. €
■ Students:	> 40 Tsd.
■ Professors:	514
■ Institutes, including	260
Large-scale Institutes	22
Fraunhofer Institutes	4
■ Graduate Programs	27

Percentage of Students by Academic Area

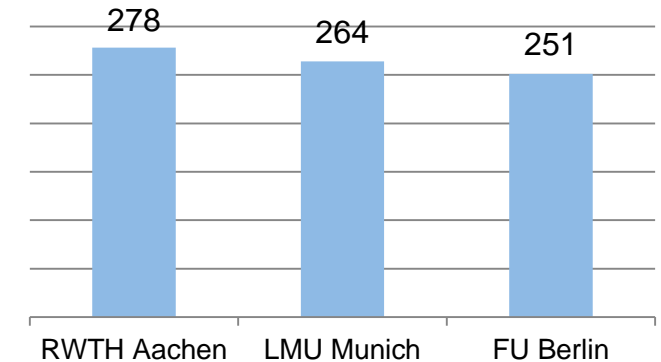


University Rankings 2012

“Wirtschaftswoche” Magazine DFG Ranking: Funding in Mio. €

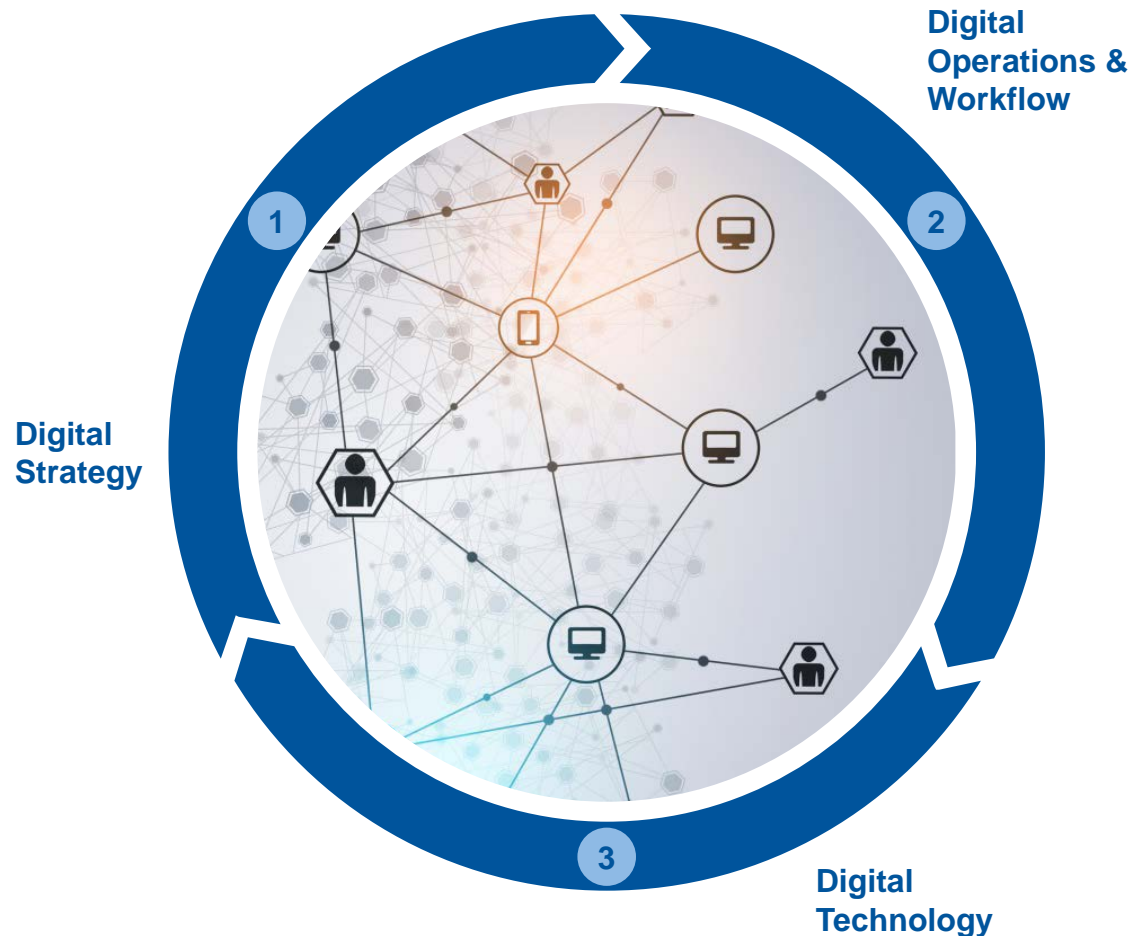
1st Place Mechanical Engineering
1st Place Electrical Engineering
1st Place Industrial Engineering
1st Place Natural Sciences
2nd Place Computer Science

Competitors:
KIT Karlsruhe, TU Darmstadt, TU & LMU Munich



FIR at RWTH Aachen University is focusing three central subjects, a strong focus is on digitized economy

Focus topic: Digitized economy



Key questions

- 1
 - Which opportunities and risks contains digitalization regarding my business model?
 - Which transformation strategy is suitable in order to become a digital leader?
- 2
 - Which potentials are offered by digitalization regarding my business processes?
 - In which way can processes be digitalized and sustainably and efficiently designed?
- 3
 - Which technologies are technically and economically suitable for my digitalization project?
 - How do I introduce new digital technologies systematically into the company?

At a Glance: The Institute for Industrial Management at RWTH Aachen University

Motto

Making use of research. Adding value.

Mission

Research of practice-relevant problems and transfer of innovative organizational and corporate IT solutions for the digital transformation of business & industry

Portfolio

- Approx. 40 publicly funded projects
- Approx. 60 projects with clients from business & industry
- Various technology transfer projects

Staff

- More than 45 academic staff
- 20 regular staff
- 100 student assistants

Topics

- Production management
- Service management
- Information management
- Business transformation



Managing Director
Prof. Dr. Volker Stich







Board of Directors
Prof. Dr. Achim Kampker



Board of Directors
Prof. Dr. Günther Schuh

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Collect, feedback and use data

	Core business	Use of data
 23andMe	<ul style="list-style-type: none"> ▪ Sale of Home-Kits for screening genetic information ▪ Original business model was prohibited by officials 	<ul style="list-style-type: none"> ▪ Online-Platform for health data exchange to analyze illnesses and the causes thereof
 Jawbone	<ul style="list-style-type: none"> ▪ Sale of Fitness-Tracker, including wristband and Smart Clips ▪ Products include Sleep-Tracking, to monitor the sleep 	<ul style="list-style-type: none"> ▪ User data are used for sleeping behavior studies, e.g. influence of earthquakes and terror attacks
 Bosch	<ul style="list-style-type: none"> ▪ Automated cutting machine was designed for big and square gardens ▪ Internet access to install Firmware-Updates Over the Air 	<ul style="list-style-type: none"> ▪ Use created garden maps to optimize the product ▪ In reality gardens are small and contorted, machine was adapted
 Apple Stores	<ul style="list-style-type: none"> ▪ Innovative Products, including Smartphones, Laptops, Desktop-PCs ▪ Apple Stores all over the world 	<ul style="list-style-type: none"> ▪ Collect all assessable data while sale process (first movement, handling, duration, ...) ▪ Analysis to optimize the product

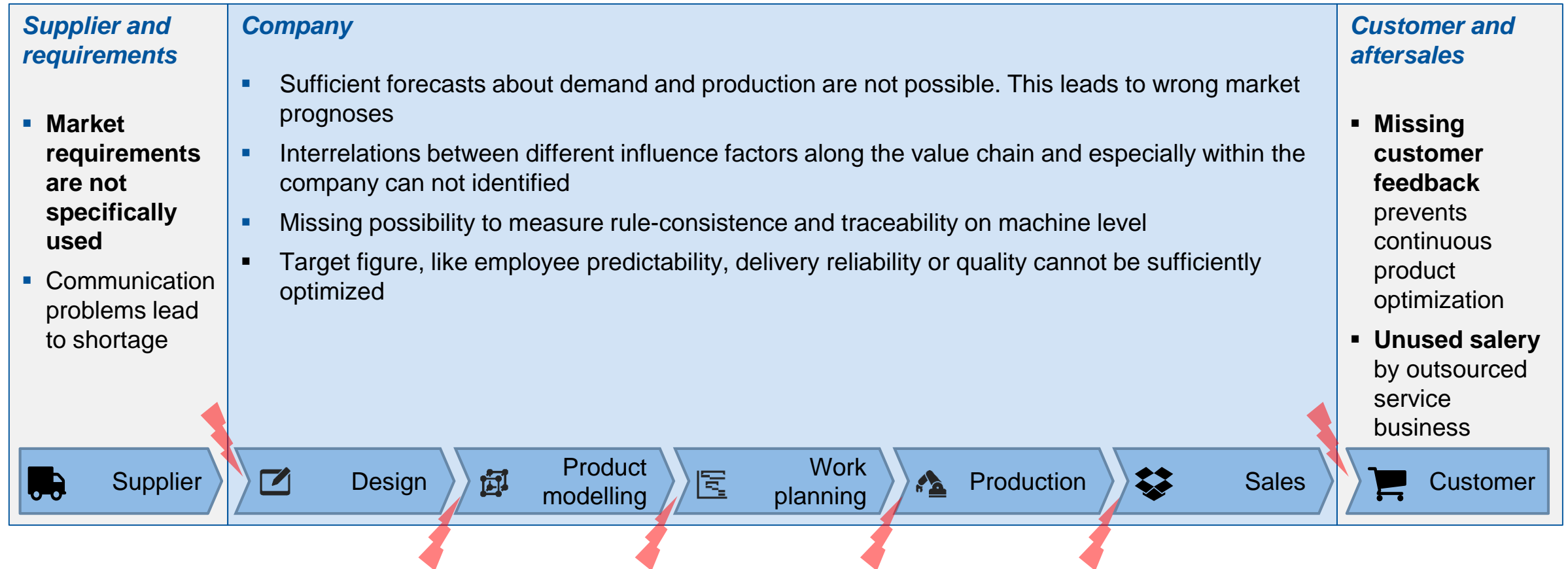
The capability of using data and generate knowledge will different digital champions from losers

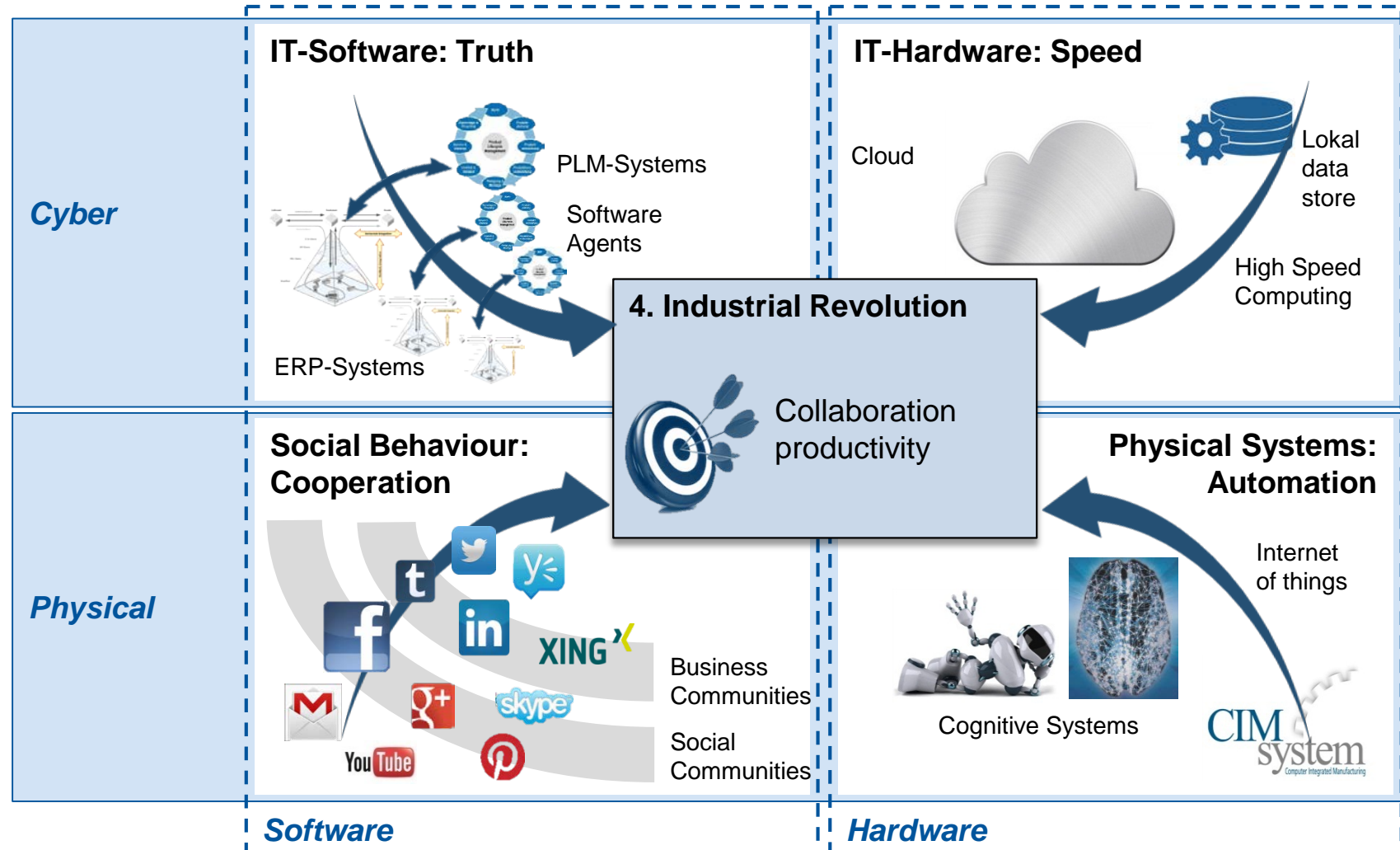


*For **Company success** it's important,
to learn faster than others.*

What does that mean?

Potentials are unused due to missing interfaces and data silos

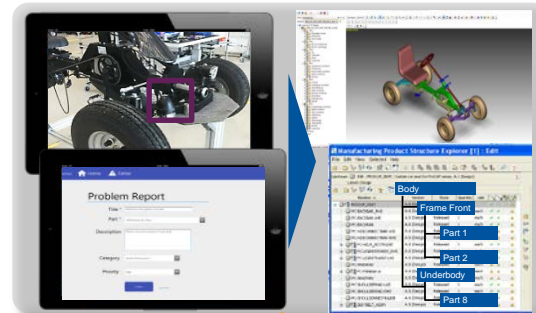




Elements, that influence Industrie 4.0:

- **Single Source of Truth**
Data management to count on accuracy of redundant data
- **Speed**
Capacity of processors and supercomputers enables analysis of high data amount
- **Automation**
The computer involvement automate processes
- **Cooperation**
Social Networks enable information transfer, that goes much further than traditional media (e.g. E-Mail)

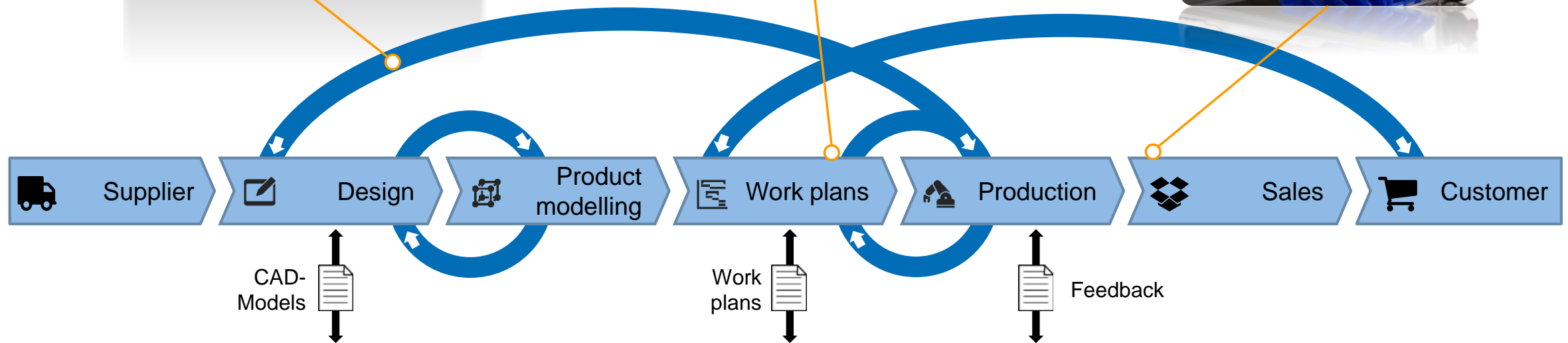
Fast Feedback about producibility



Automated generation of work plans



Use of assistant systems



Digital red thread though the company and supply chain

Single Source of Truth

Agenda

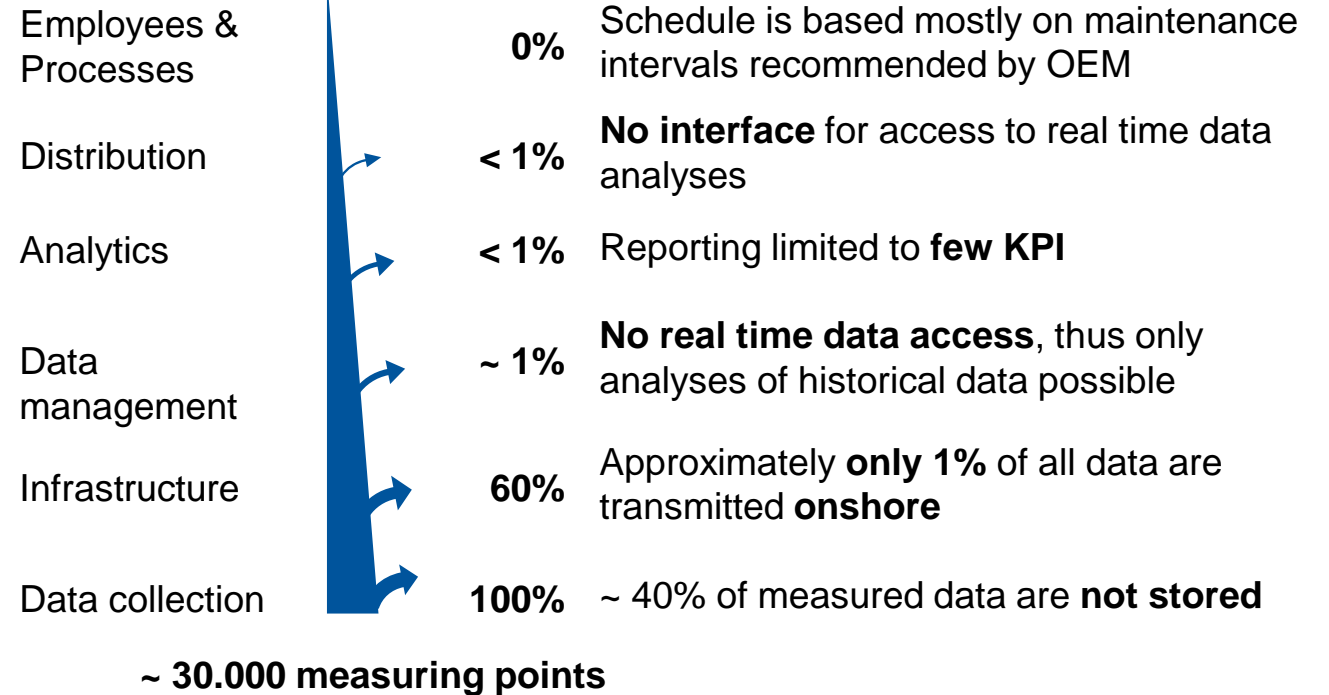
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The goal of Industrie 4.0 is a learning agile company; a mere technology driven approach is not sufficient

Project goal: Development of a predictive maintenance plan based on measured data for an oil platform

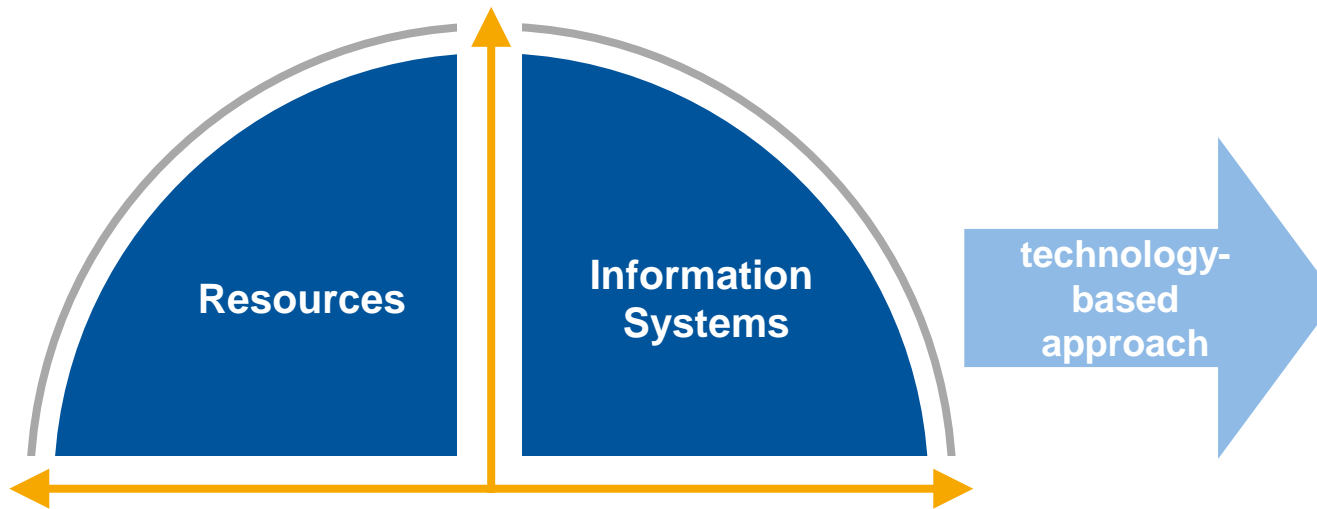


Result: The maintenance plan is mostly based on maintenance intervals recommended by OEM



For the implementation of Industrie 4.0 an integrated consideration of technologies and their organizational and cultural integration in the company are necessary

A successful implementation of Industrie 4.0 in manufacturing companies requires a holistic transformation approach



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a mere technology driven approach is not sufficient**

Project goal: Development of a predictive maintenance plan based on measured data for an oil platform

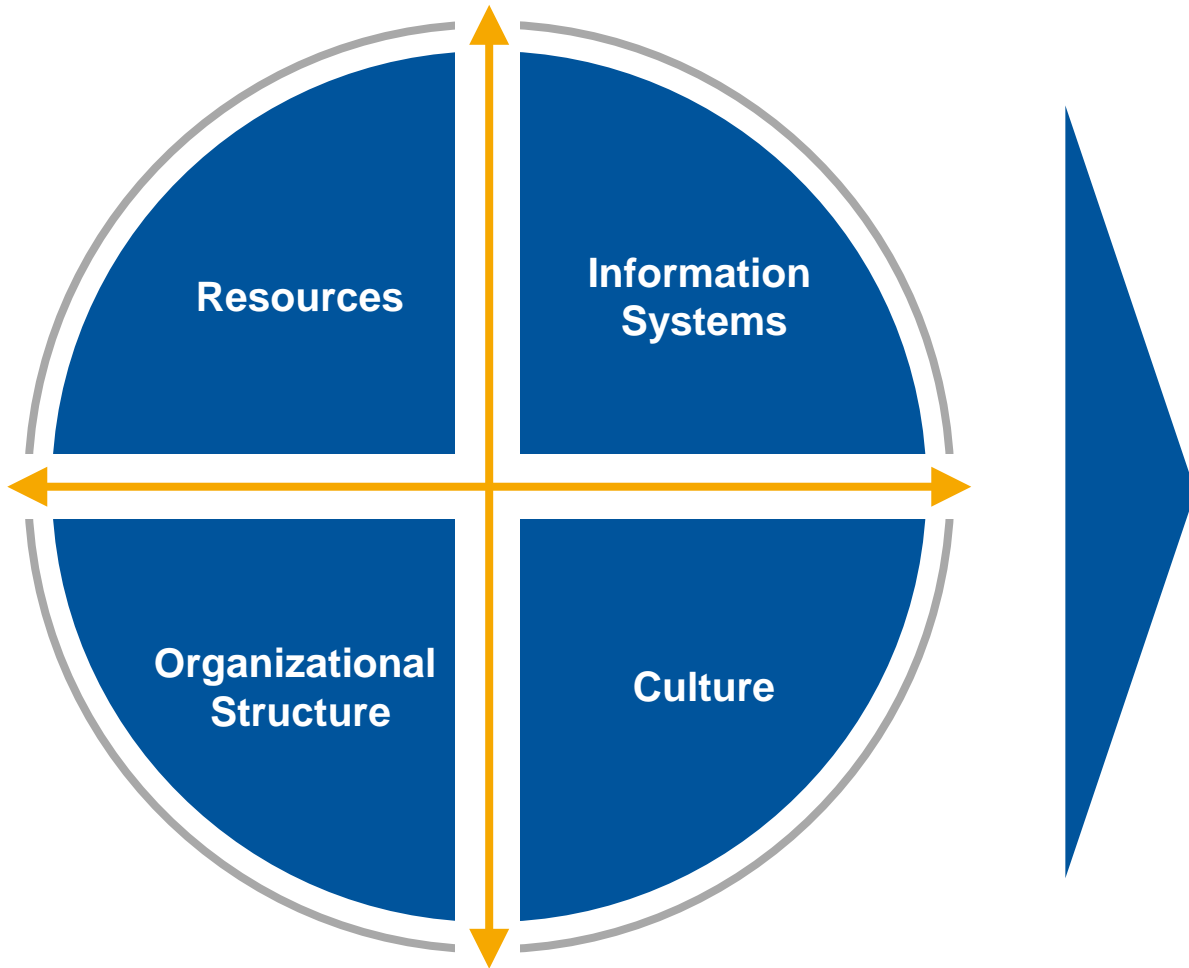
Result: The maintenance plan is mostly based on maintenance intervals recommended by OEM



Employees & Processes	0%	Schedule is based mostly on maintenance intervals recommended by OEM
Distribution	< 1%	No interface for access to real time data analyses
Analytics	< 1%	Reporting limited to few KPI
Data management	~ 1%	No real time data access , thus only analyses of historical data possible
Infrastructure	60%	Approximately only 1% of all data are transmitted onshore
Data collection	100%	~ 40% of measured data are not stored
~ 30.000 measuring points		

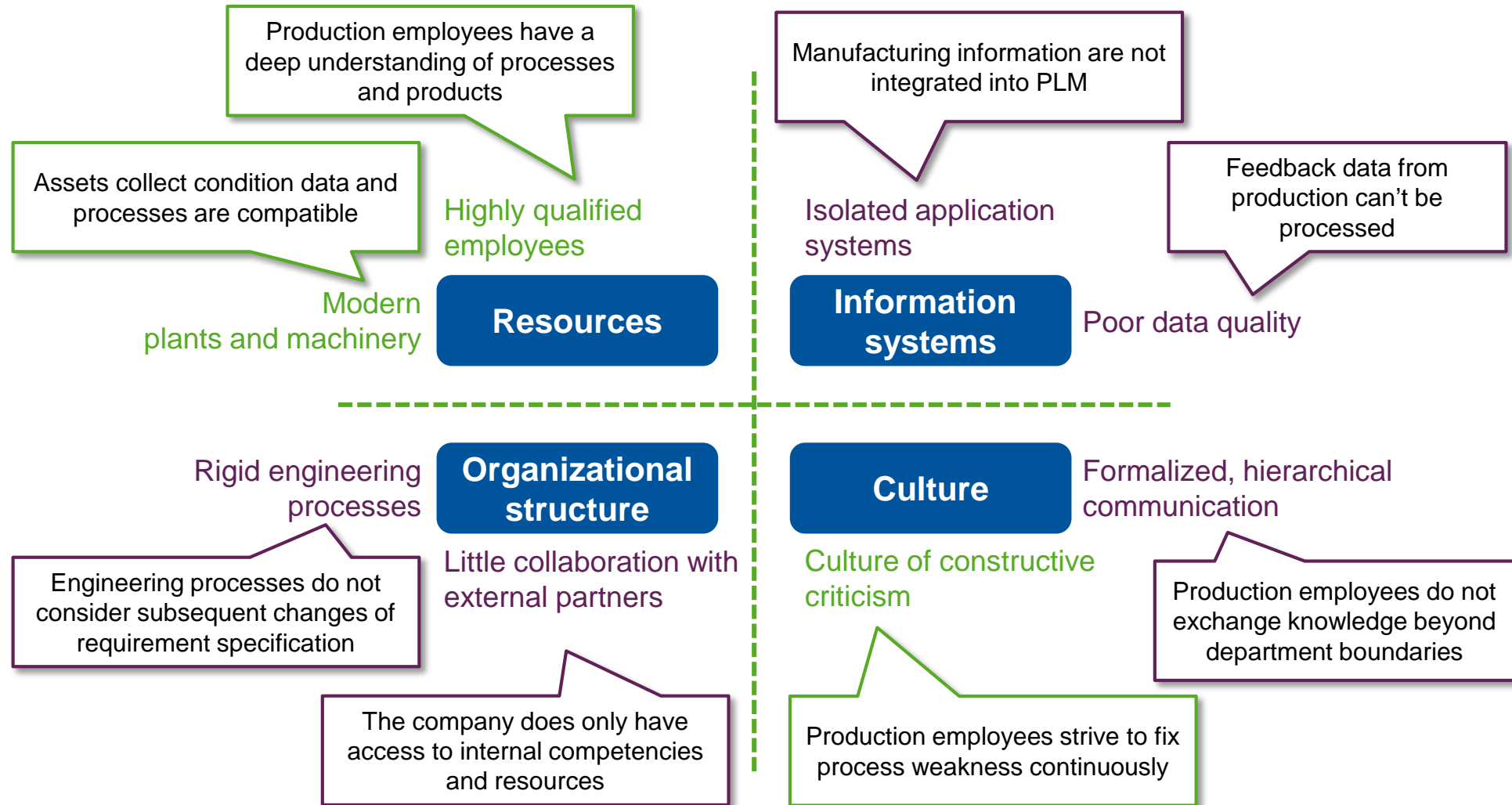
For the implementation of Industrie 4.0 an integrated consideration of technologies and their organizational and cultural integration in the company are necessary

A successful implementation of Industrie 4.0 in manufacturing companies requires a holistic transformation approach

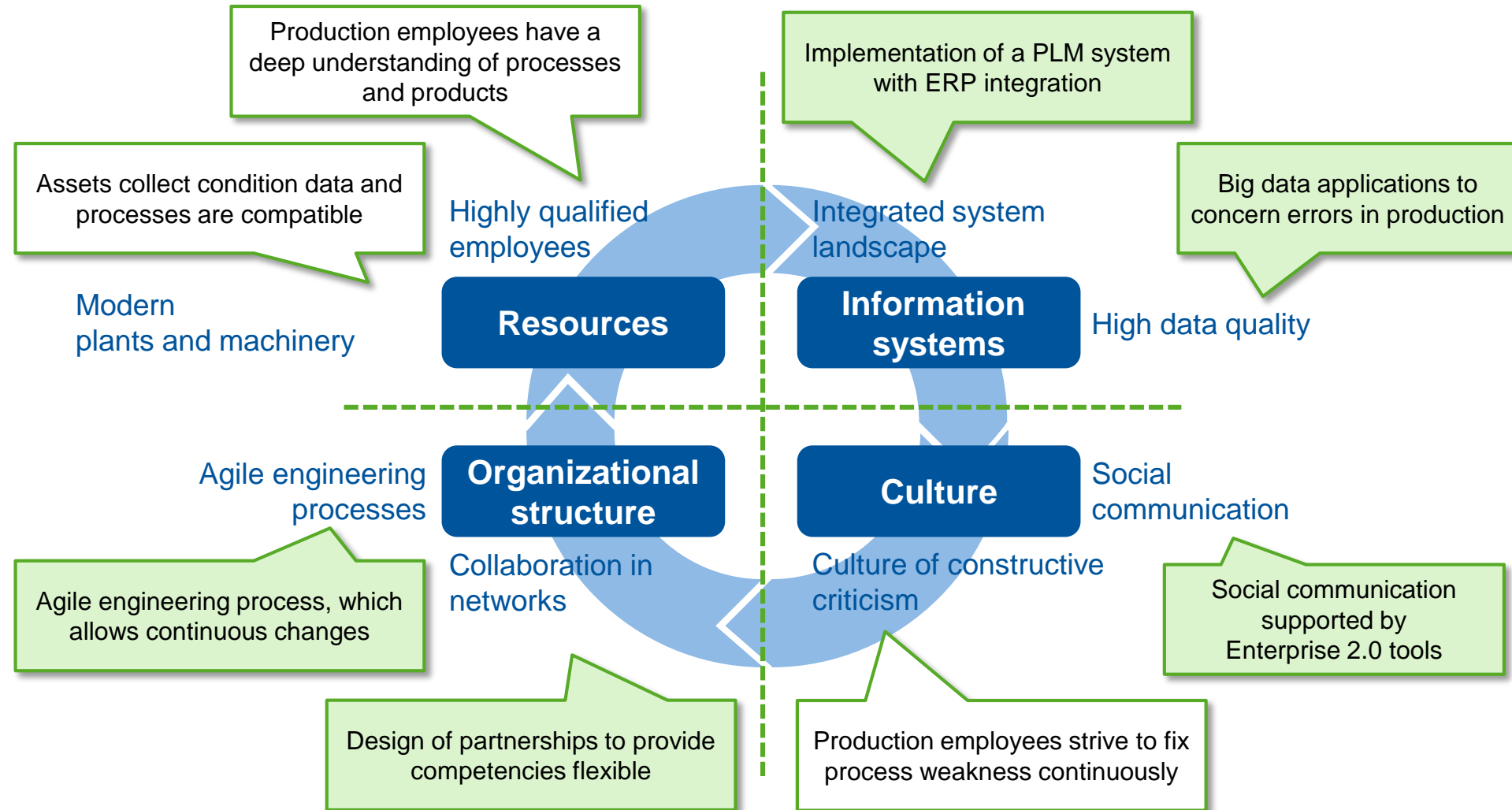


*The **consideration** of resources, information systems, organizational structure and culture enables a **holistic determination** of a company's **Industrie 4.0 maturity level** and allows the derivation of **company-specific fields of action**.*

There are many reasons why the shift towards a learning, agile company fails



For a successful implementation, the entire company structure has to be considered



The Maturity Index is developed by renowned partners from industry and research

Project partners



Industrie 4.0 Maturity Index

Goal

- Companies lack an established strategic framework for determining their current status regarding Industrie 4.0 and deriving measures
- The existing frameworks do not take into account the entire organization, the culture, the resources as well as the interactions between these elements

Approach

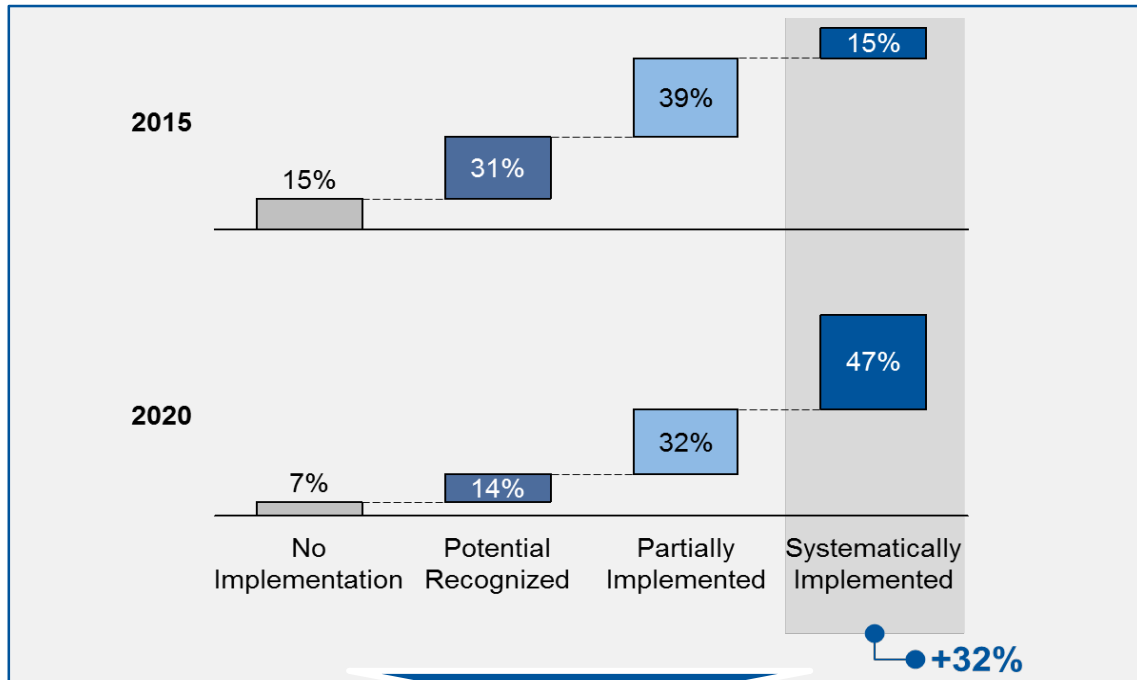
- Development of a maturity model to find out the fields of action with special respect to digitalization potentials and first actions
- Identifying the relevant elements based on the acatech Industrie 4.0 Maturity Index

Result

- The main result is a strategic framework enabling companies to identify their field of action and deriving a company specific Industrie 4.0 roadmap

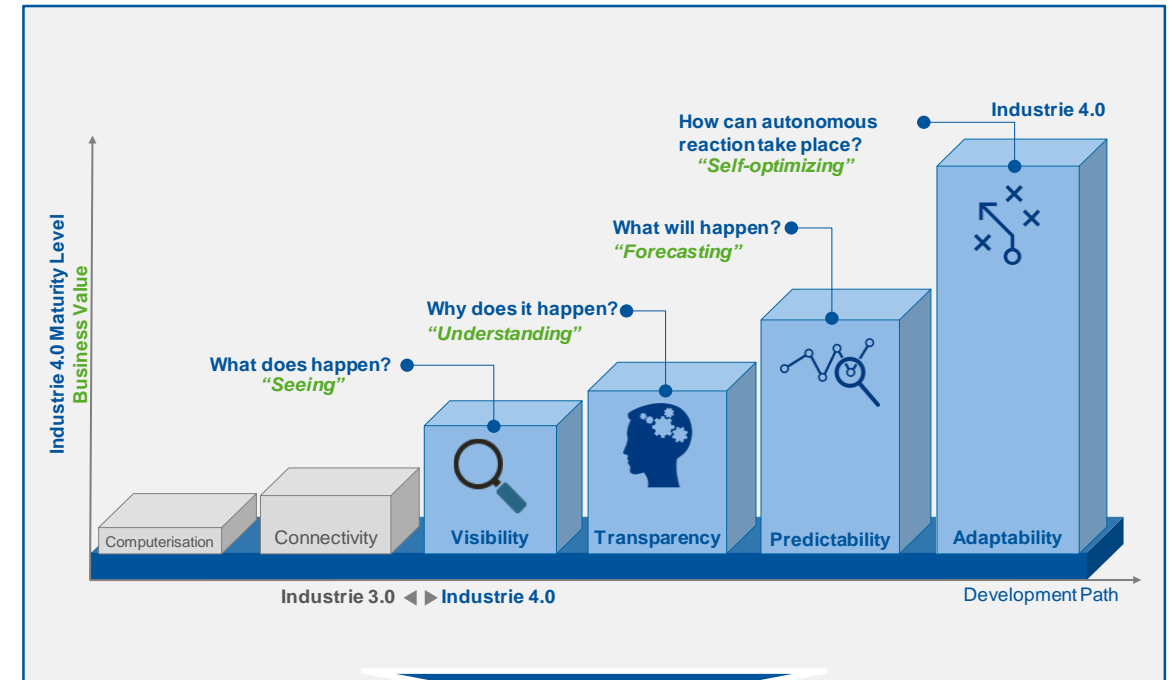
Companies are currently failing with the implementation of Industrie 4.0; the developed approach deduces necessary actions and ensures investments

Planned implementation of Industrie 4.0 in 2020 (State 2015)¹



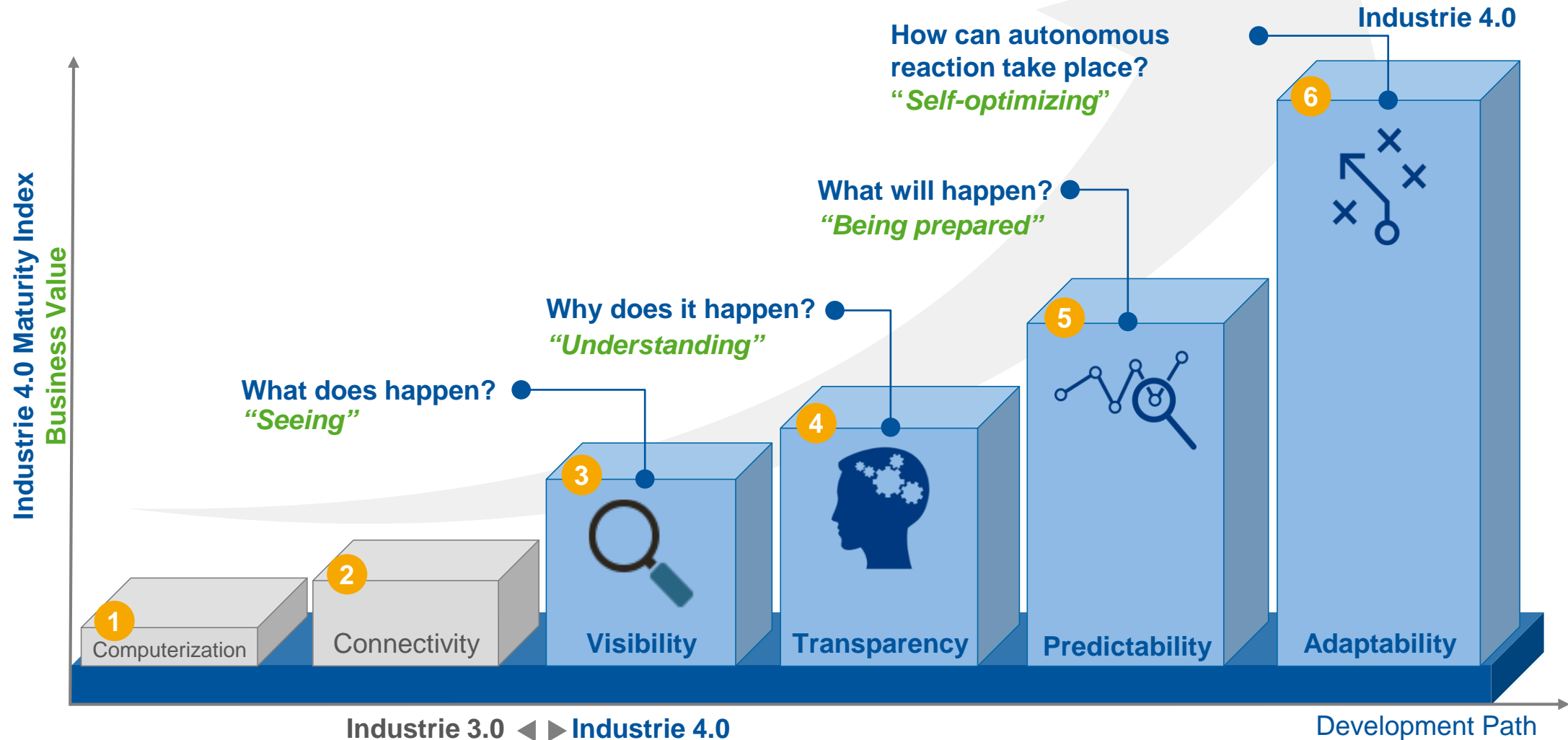
- **Industrie 4.0** was first presented in 2011, a systematic implementation in companies has not been taken place as far as possible until today
- In companies use cases are dominant, but an **end-to-end implementation** is necessary for raising potentials
- Many companies are not aware of the **development path**

Industrie 4.0 Maturity Index

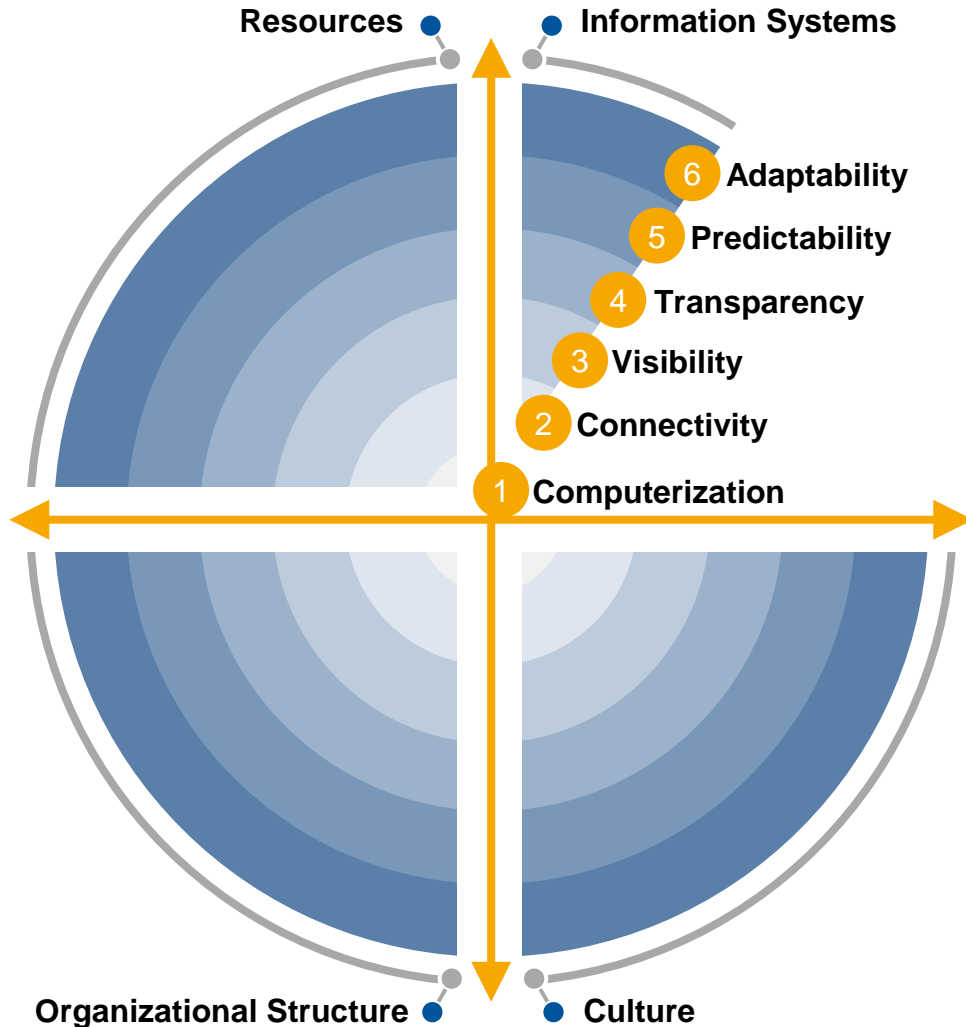


- Companies need a precise **development path** for a **holistic implementation** of Industrie 4.0
- An Industrie 4.0 roadmap is necessary to operationalize the implementation, to **schedule the projects** and to **highlight the modifications of the organization**
- A well-structured roadmap supports **benefit-oriented development** of the company and **enables modalities** to ensure investments







Companies can leverage diverse potentials on the development path to Industrie 4.0 by choosing a stepwise approach



Company development within the structuring forces is based on an Industrie 4.0 development path

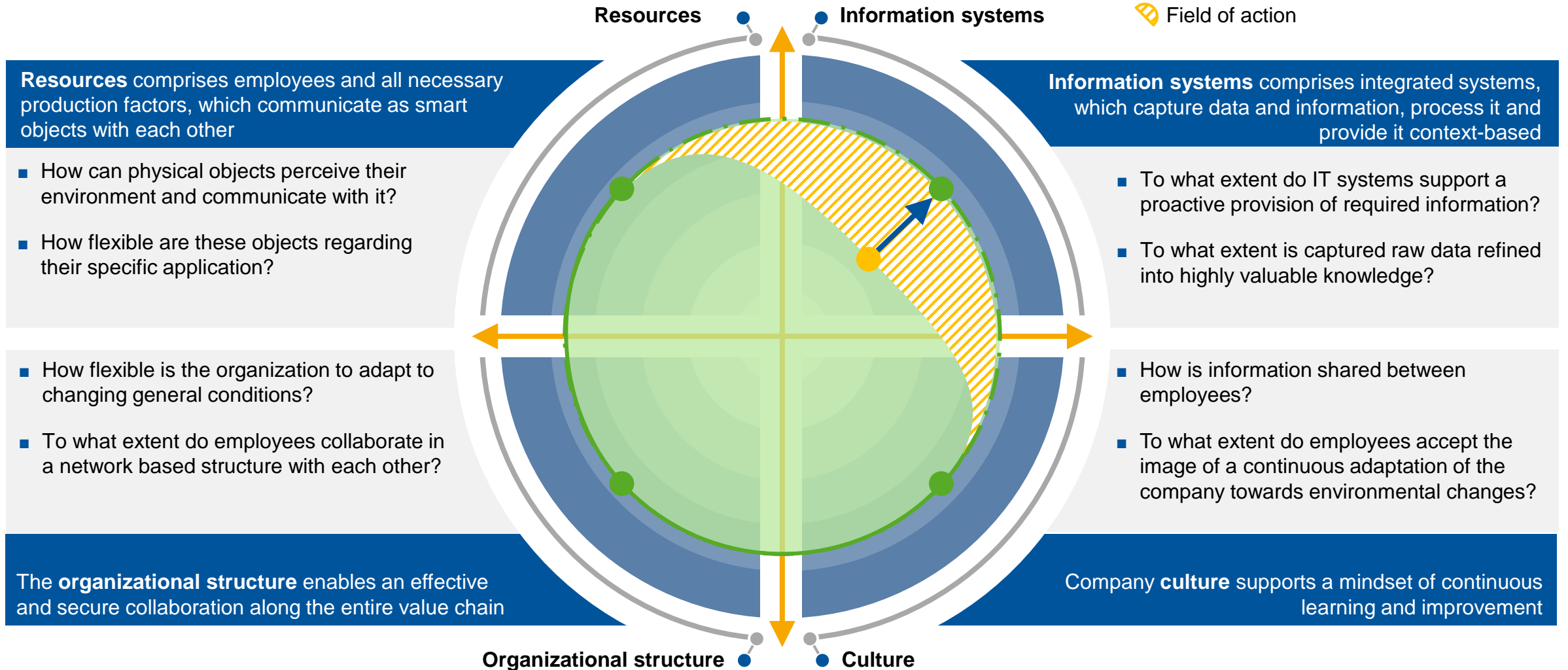


From inside out: Six levels characterize the Industrie 4.0 maturity

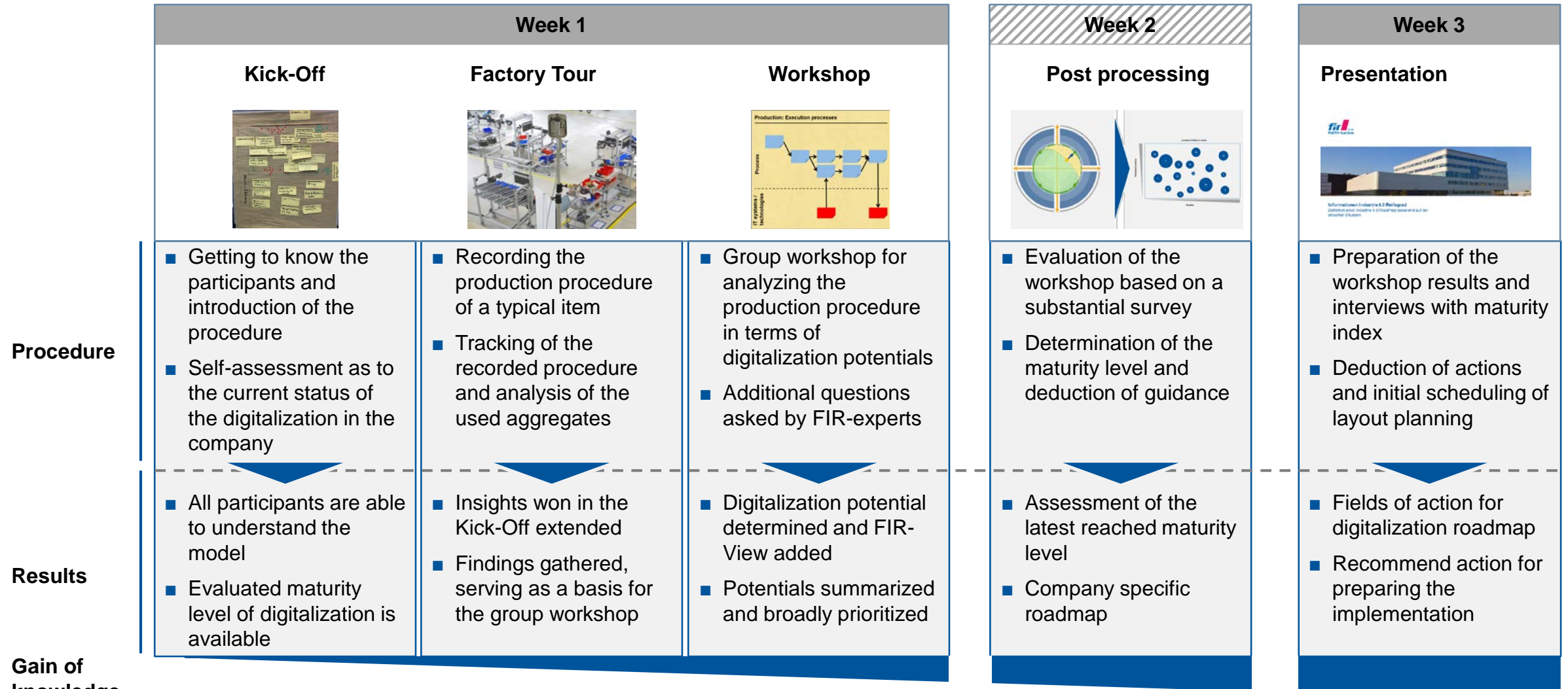
-  1 Tasks are supported by data processing systems
Employees are relieved from repetitive manual activities.
-  2 Data processing systems are structured and linked
Core business processes are reflected in IT Systems
-  3 Companies have a digital shadow
The management takes data-based decisions.
-  4 Companies understand why events happen
Knowledge is discovered through recognition
-  5 Companies know what will happen in the future.
Decisions are made on the basis of future scenarios.
-  6 Companies react autonomously on conditions.
The system controls itself autonomously and is fully viable

The four structuring forces illustrate the fundamental Industrie 4.0 development and are captured by key questions

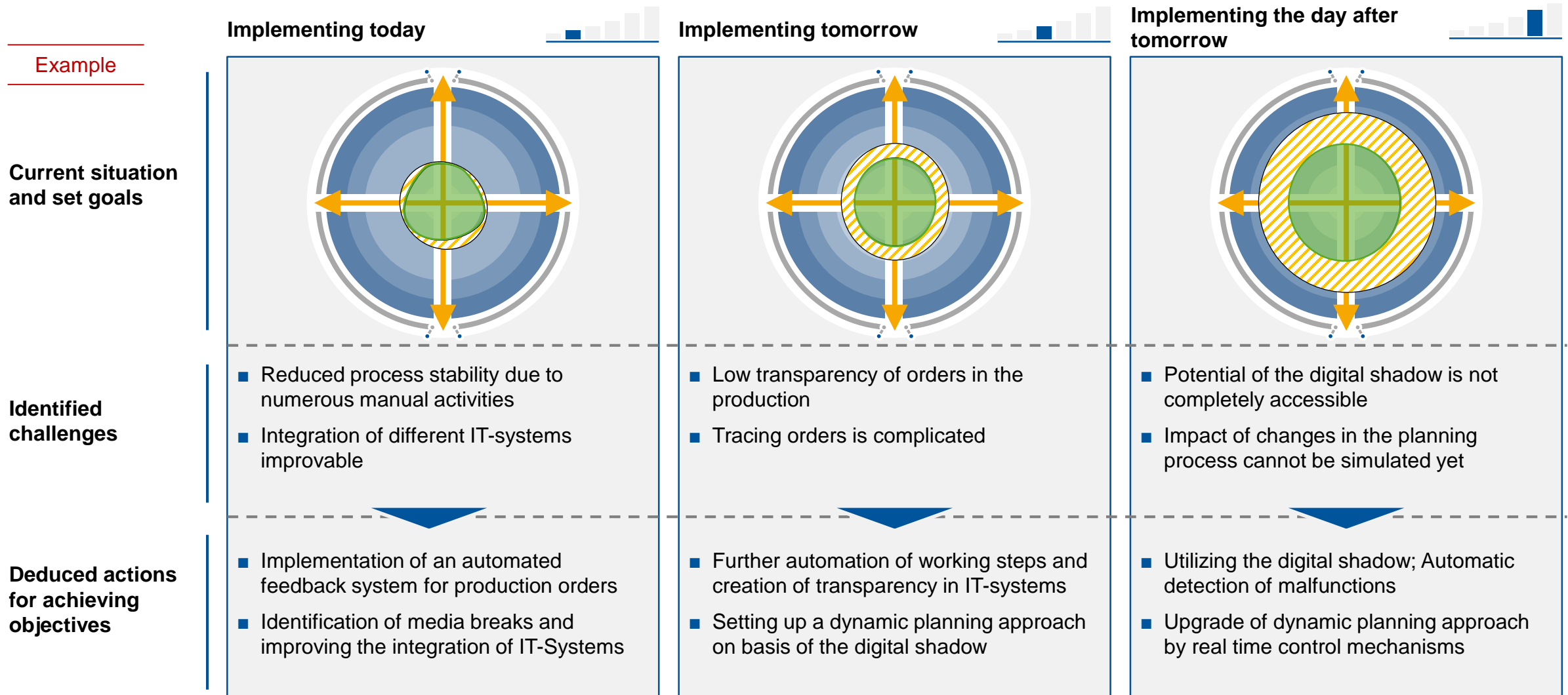
Questions within the structuring forces (examples)



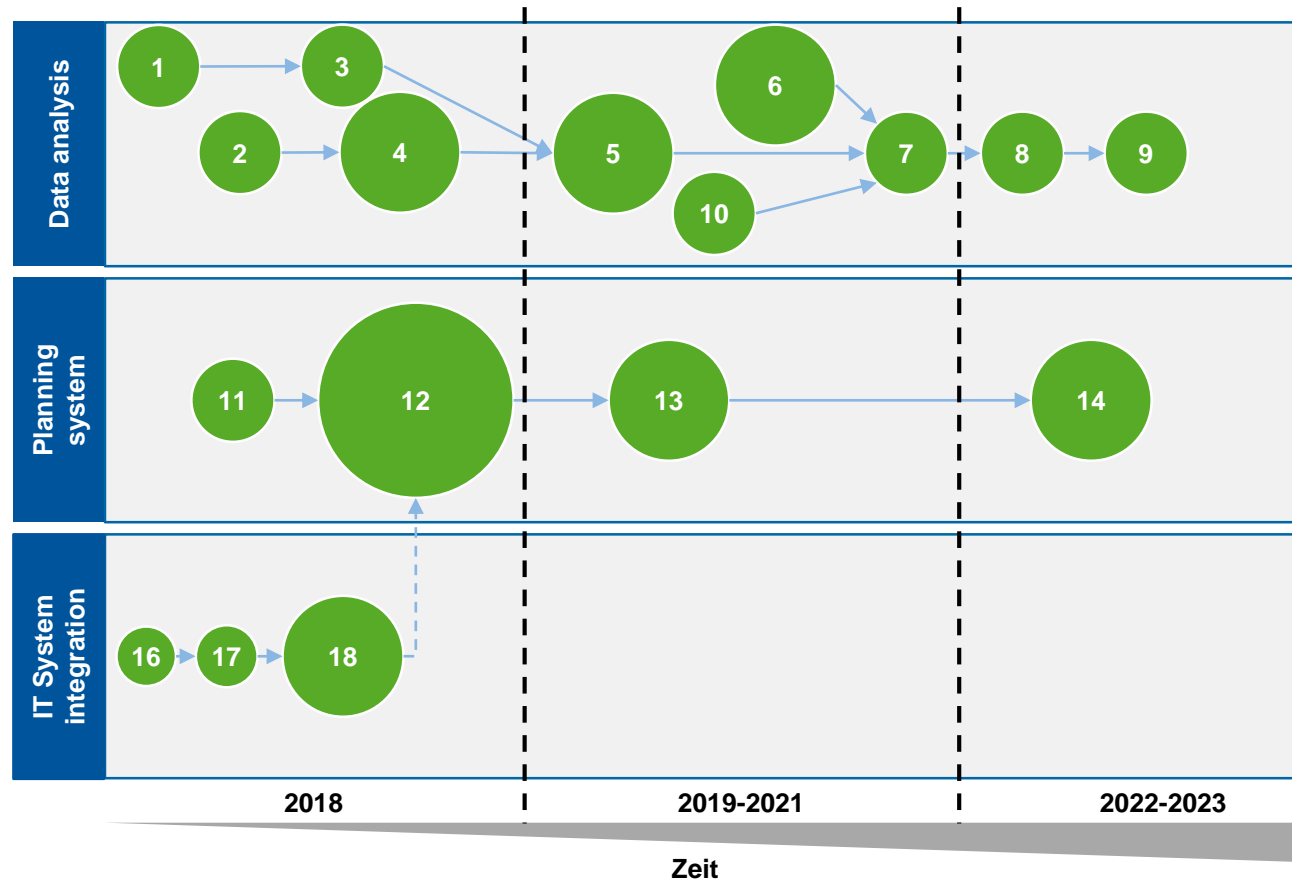
The assessment by means of the I4.0 Maturity Index enables the development of a customized roadmap within weeks and an autonomous implementation



Industrie 4.0 maturity assessment enables the definition of a long term, company specific roadmap of specific actions



Example: Portfolio of identified measures for an exemplary company can be separated by the three clusters



Measures for data analysis:

- 1 Identify of data source with real-time access
- 2 Establish preliminary hypotheses based on MES data base
- 3 Identification of missing data or data access and initiate subprojects
- 4 Prove hypotheses and document identified pattern
- 5 Set up automated data analysis process based on identified patterns
- 6 Install quality in-line sensors with real-time transfer ERP system
- 7 Configure real-time access between ERP and MES (e.g. quality & planning data)
- 8 Integrate maintenance data to data analysis solution
- 9 Implement a business intelligence solution
- 10 Utilize supplier information about raw material

Measures for planning system:

- 11 Identify relevant planning data and prepare APS implementation
- 12 Implement APS
- 13 Feedback detail planning information to SAP
- 14 Integrate supplier information in APS

Measures for IT system integration:

- 16 Identify required and current data and information flow between departments
- 17 Identify and prioritize media disruption in main processes
- 18 Expand bidirectional information flow between ERP and MES system



Area symbolizes employee effort and time expenditure

● In-house Implementation

Three final advises

Think Big, Start Small, Learn Fast

- 1 Start a Top-Down-Program!
- 2 Act methodicaly and set goals!
- 3 Run projects agilely!

Contact

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