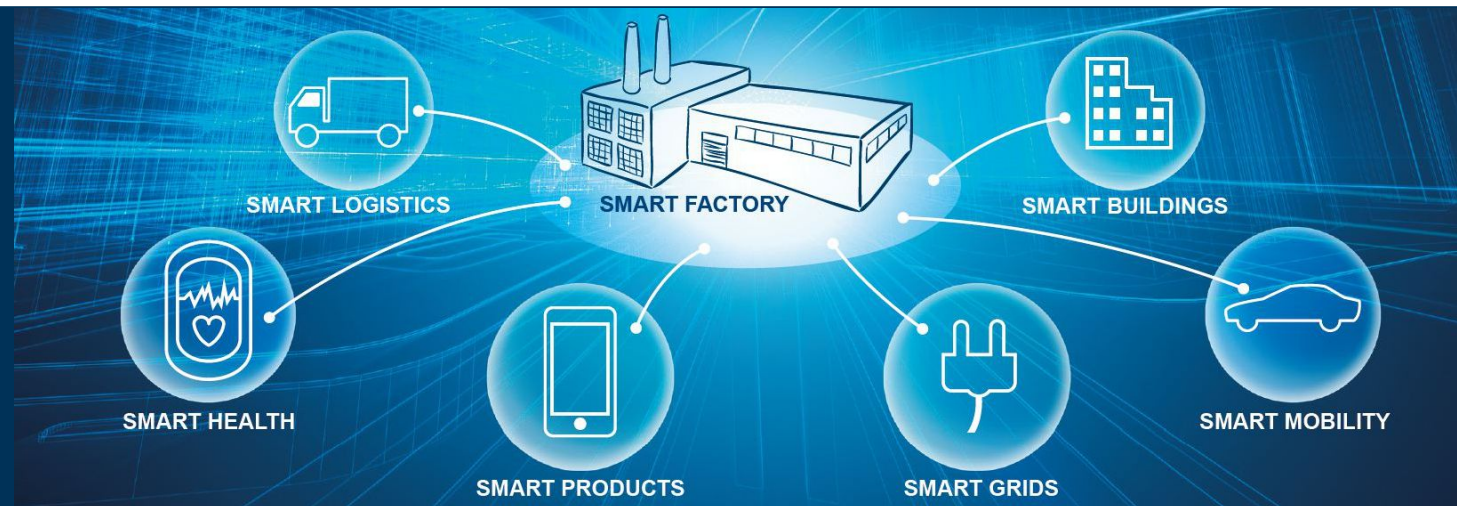




Industry 4.0

General Introduction and „Next/Best Practices“ of Smart Logistics

May 8, 2015





UNITY

The UNITY Consulting Approach

优尼特咨询方式

UNITY [ˈju:niti]; unity with clients to create bespoke improvement:

优尼特 [younite] 优尼特与客户共同为其量身打造改善方案:

Consulting & Innovation;
科技创造与管理咨询;

Overall management expertise;
全面的管理专业知识;

Team spirit in project work;
项目中积极的团队合作精神;

Think ahead, enable, execute.
事先规划, 指导客户, 共同实施。

Our Spirit, Your Success!

我们的精神为了您的成功!

■ Customer Benefit 客户利益

Sustainable increase of the clients' success through innovative processes and business models
通过创新的流程和商业模式让客户利益得到可持续的增长

■ Clients 现有客户

Big multi-nationals and small and medium sized enterprises, more than 1.000 client projects since 1995
大型跨国集团和中小型企业,
自从1995, 已有1000多个客户项目。

■ Execution 执行

From the initial concept to the successful execution
从最初的方案设计到最终的成功执行

■ Locations 公司所在地

Branch offices and project sites throughout the world
分公司和业务遍及全球

■ Heinz Nixdorf Institute 海因茨尼克斯多夫研究所

Strong ties to science and research
与德国尖端科研单位紧密结合

■ Facts 数据

Founded: 1995
成立: 1995

Employees worldwide: 200
员工来自世界各地: 200

Driving Success with the Four-level Model

四级模型引导走向成功



Four-level Model of Future-oriented Corporate Management
面向未来的企业管理四级模型

Cooperation with Universities 和大学的合作

- UNITY cooperates with the Heinz Nixdorf Institute of the university of Paderborn as well as with numerous universities.
优尼特和帕德博恩大学的海因茨尼克斯多夫研究院以及其他大专院校紧密合作
- Our engagement takes the form of lectures, seminars, workshops, and joint projects. 合作的方式包括授课，学术讨论，工作组和合作项目。



HEINZ NIXDORF INSTITUTE

University of Paderborn
Product Engineering
Prof. Dr.-Ing. Jürgen Gausemeier

UNITY at acatech – National Academy Science and Engineering 优尼特与德国国家工程科学院

- UNITY plays an active part in several areas at acatech, e.g. “Product Development and Production” and “Healthcare Technologies”
优尼特积极参与德国工程科学院项目，例如“产品开发与生产”和“医疗技术”
- UNITY is member of the acatech senat 优尼特是德国工科院的参议员



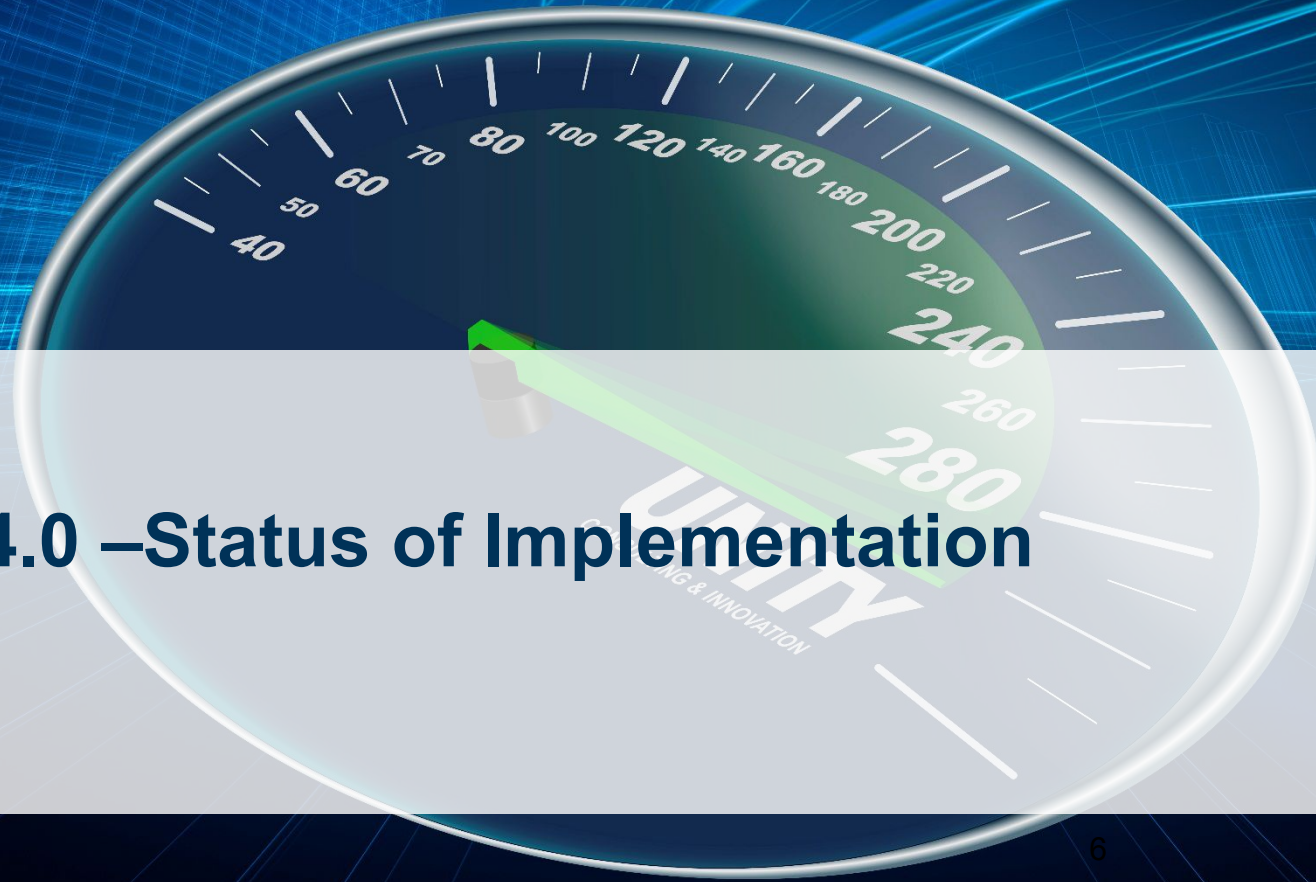
Research Projects 研发项目

- UNITY invests in Research Projects, e.g. ADISTRA, InZuMech, VireS, SMART EM.
优尼特投资参与多个研发项目，例如ADISTRA, InZuMech, VireS, SMART EM.
- UNITY is a core company in the Ministry of Research and Technology’s Leading-Edge “Intelligent Technical Systems East Westphalia-Lippe (it’s OWL)” Cluster.
优尼特是德国研发与尖端科技部门it’s OWL组织的核心成员

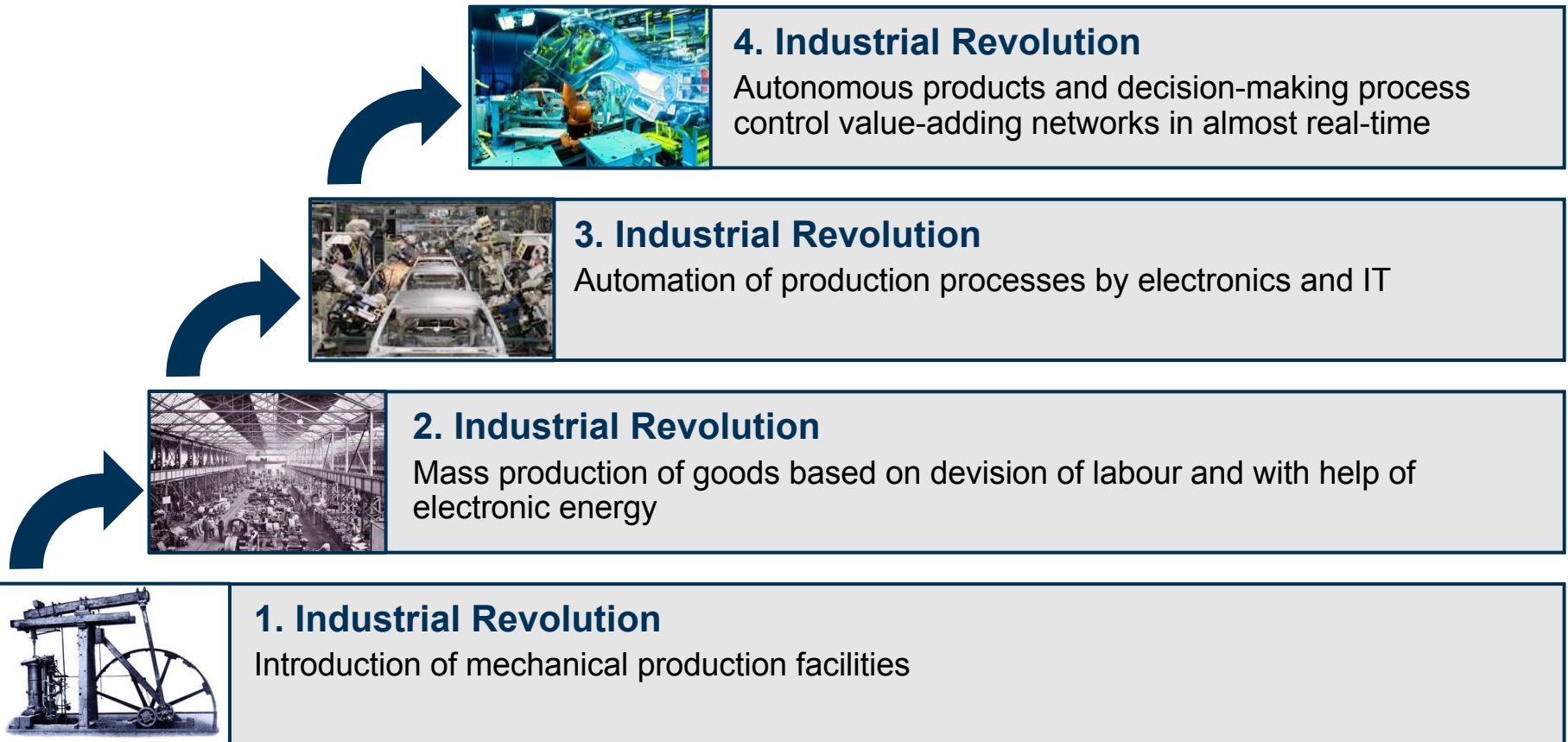
UNITY creates future.

In the Technology Network:
Intelligent Technical Systems OstWestfalenLippe, Germany






Industry 4.0 –Status of Implementation



Each industrial revolution caused a productivity improvement and was accompanied by fundamental social changes

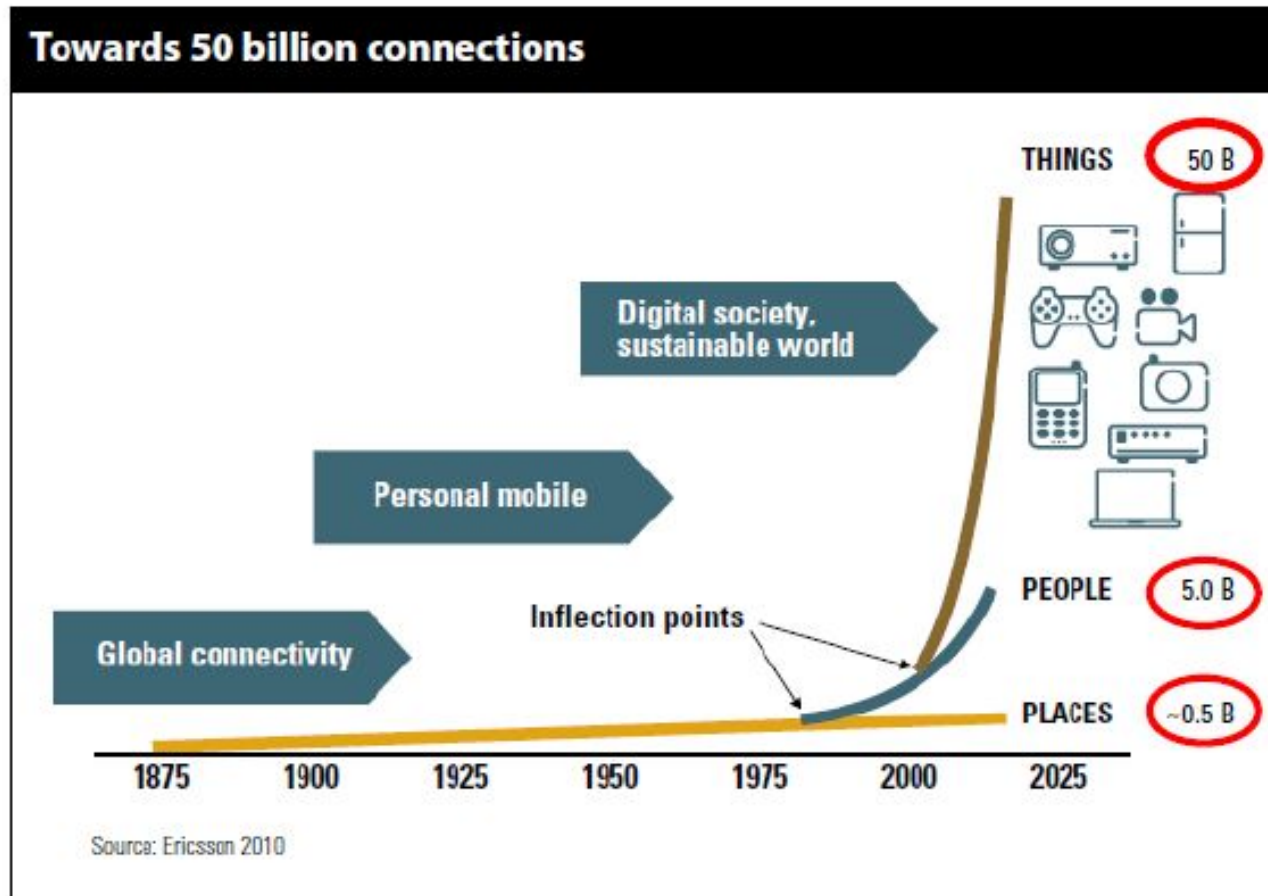
- In this new world we have the capability to analyze far more data, much more quickly
- With big data we'll often be satisfied with a sense of general direction rather than knowing a phenomenon in every detail
- We move away from search for causality. Big data is about WHAT now WHY



Big data's ascendancy represents three shifts in the way we analyze information that is transforming how we understand and organize society and business

How will interconnectedness change?

The IP-capability of technical devices increasingly influences everyday's life



It took a 100 years to implement 500 million landline phones, but only 20 years to spread 5 billion mobile phones. Threw the interconnectedness of devices¹⁾ an increase towards 50 billion connections is expected.

¹⁾ Per household there will be 25 interconnected devices

42

The average age of a company: 42

According to Christensen well established companies are not capable of change

Well established companies again and again fail to react successfully to disruptive innovation

Performance improving (“sustaining”) innovation

(Improvement-innovation): Replace old products with new and improved versions.

Example: the next VW Gold



Efficiency improving innovation

(Process-innovation): Offering the same solution for the same customers for a cheaper price (“**Low-end disruptions**”) Example: Walmart chain or Toyota “just in time”



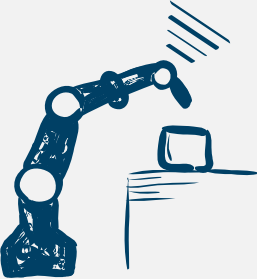
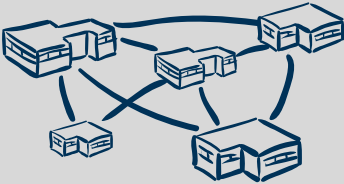


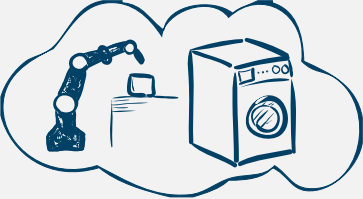
Market creating innovation

(Disruptive business model innovation): Transformation of existing (complex or expensive) solutions in such a radical manner that a new market is created (a new type of customer). Result of a cost reducing technology with a business model. Example: PC instead of mainframe-computer



“Digitalization in the manufacturing will have a disruptive effect every bit as big as in other industries that have gone digital such as office equipment, telecoms, photography, music, publishing and films”

- *The Economist* 04.21.12

Intelligent Automation and Machines	Individual Configuration and Delivery	Augmented Services and preventive Maintenance	Smart Products	Virtual Production Sites
				
Machines learn the optimal working parameters and pass them on to their “ social ” networks	New value-added networks enable a paradigm shift (customer, supplier,...)	Improved multimodal cooperation's with the machines by an extended view onto the real plant	Products are identifiable, localizable , know their history , the current state as well as the process steps towards the final production state and across their life cycle	Digital models (virtualization) of the production systems support the design and allow simulation in real-time

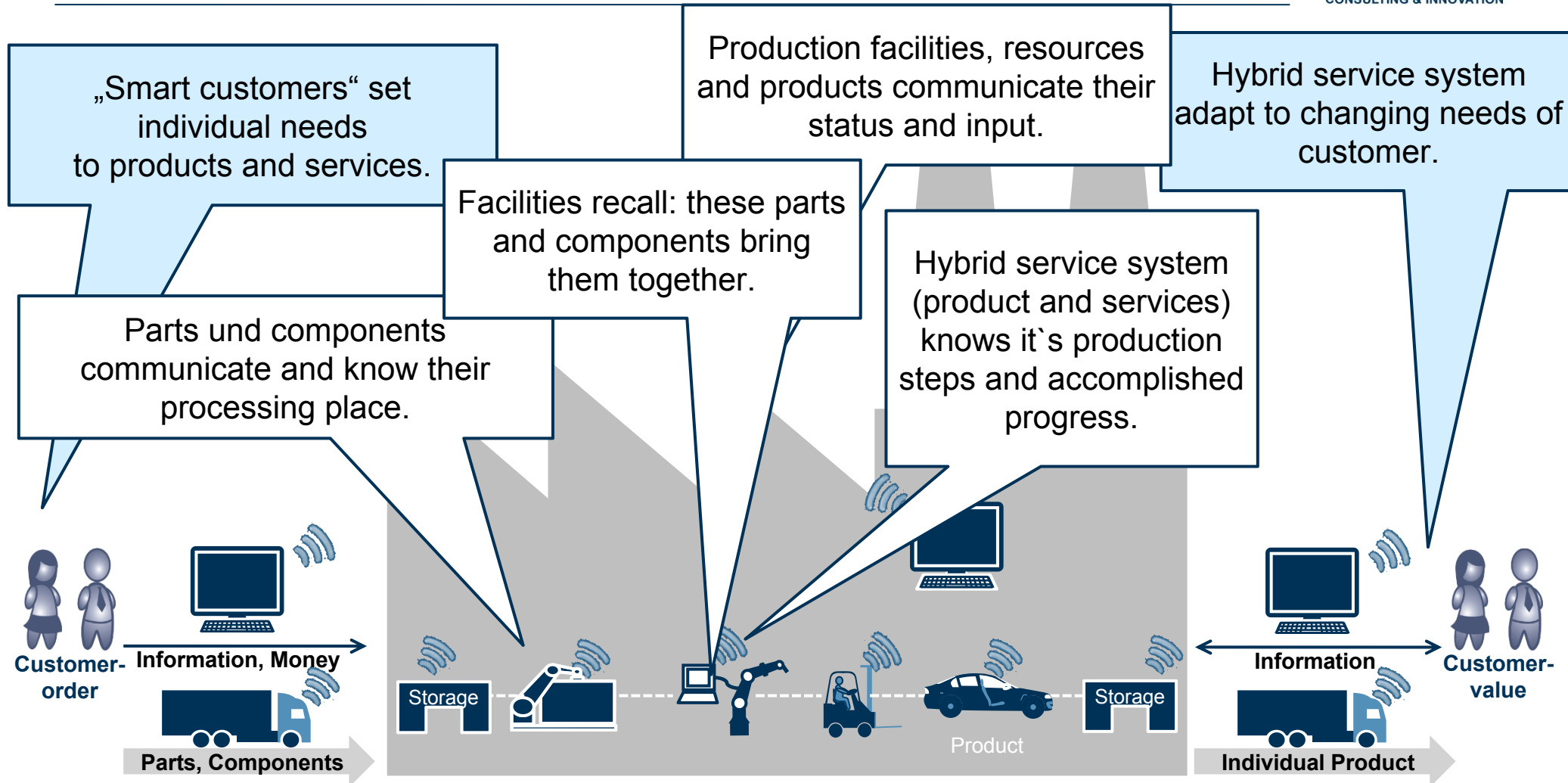
Industry 4.0 will result in smart products and smart factories due to the networking of intelligent machines and products.



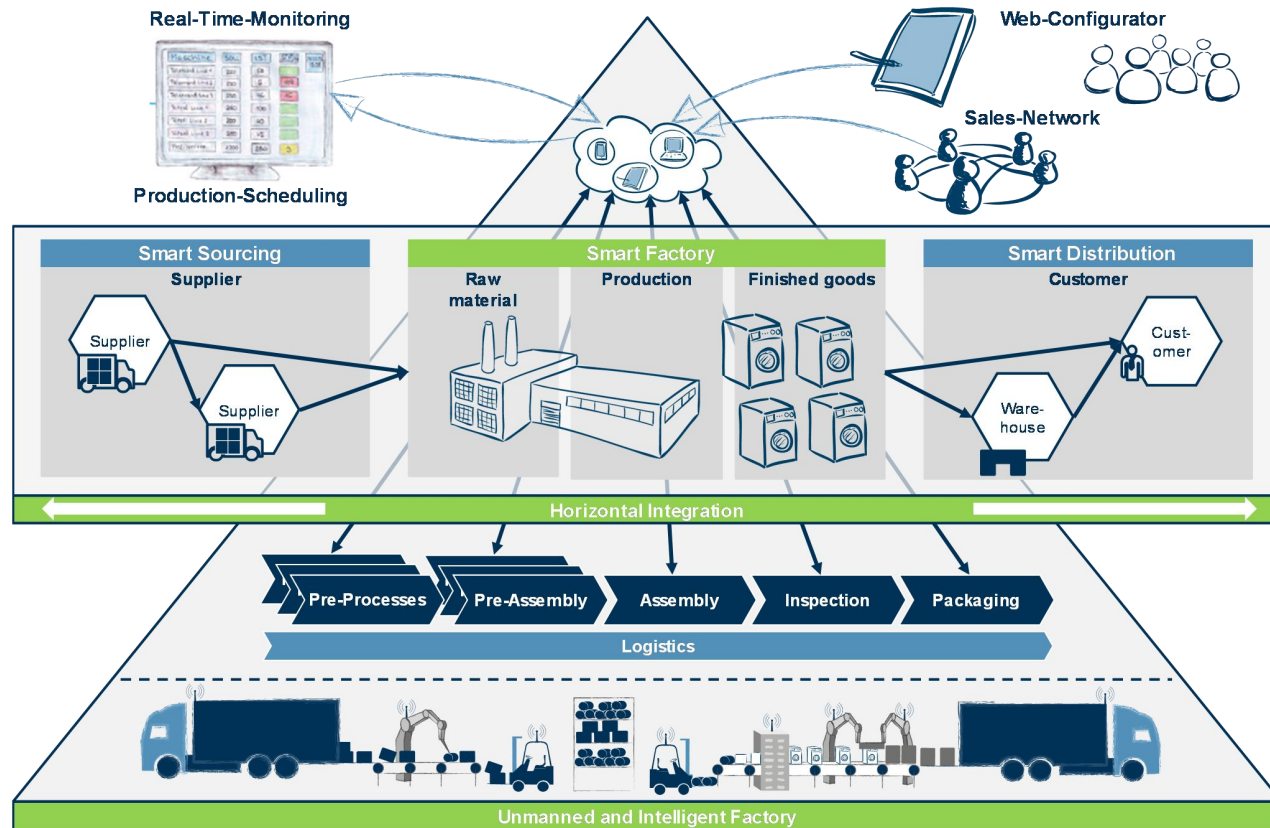
Smart Logistics - Single Source of Truth, Trends in Supply Chain

Industry 4.0

Definition and Characteristics (UNITY and Heinz-Nixdorf-Institution)



Industry 4.0 means intelligent and flexible control of IT-based, inter-communicating and acting machines, products and services along the entire product- customer- lifecycle.



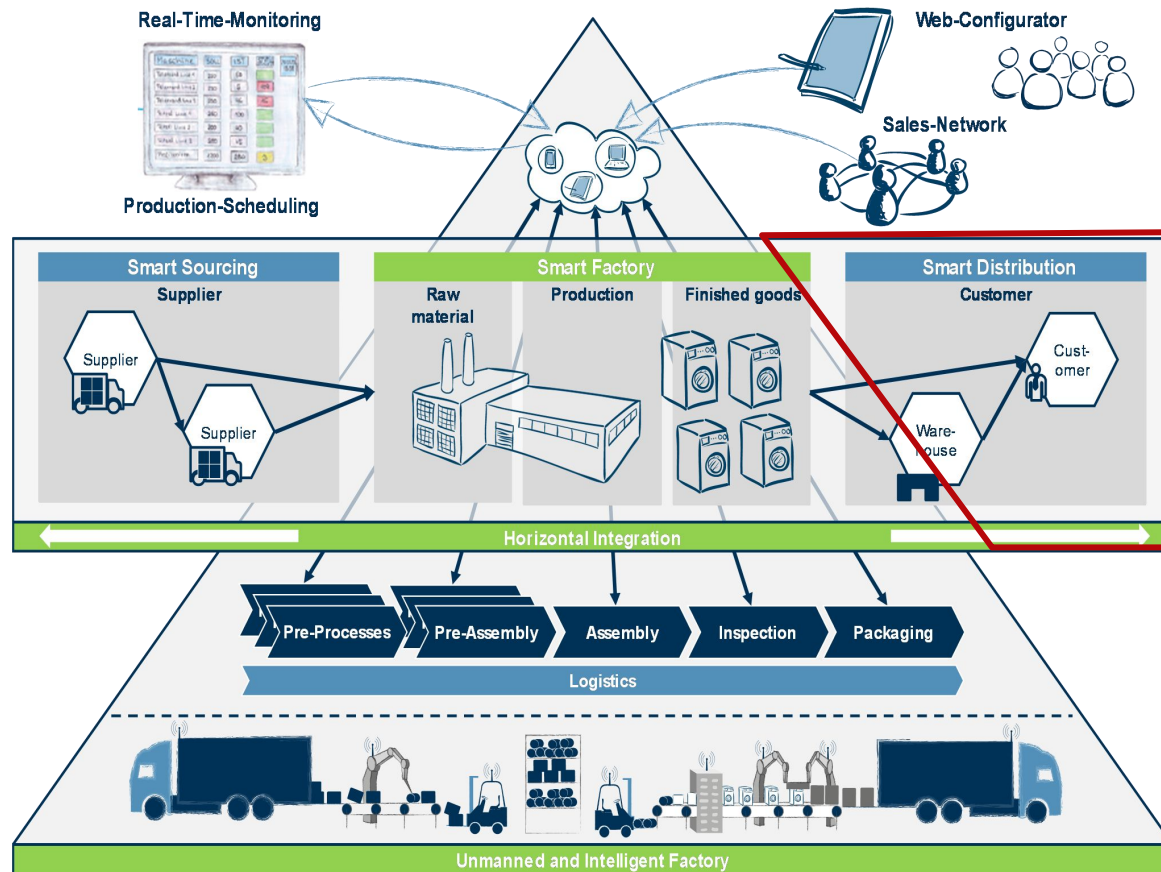
■ Vertical Integration

- } Integrated product design and manufacturing system
- } Product configuration via internet by customer
- } Self-controlled production by intelligent and automatized equipment solutions
- } Smart product in its service environment

■ Horizontal Integration:

- } Optimization of supplier network integration and scheduling
- } Real-Time-Monitoring of overall performance

The approach of Industry 4.0 enables the manufacturing of individual and customized products at the costs of mass production by a smart factory with high automation and efficiency.



Solution principle for Big Data

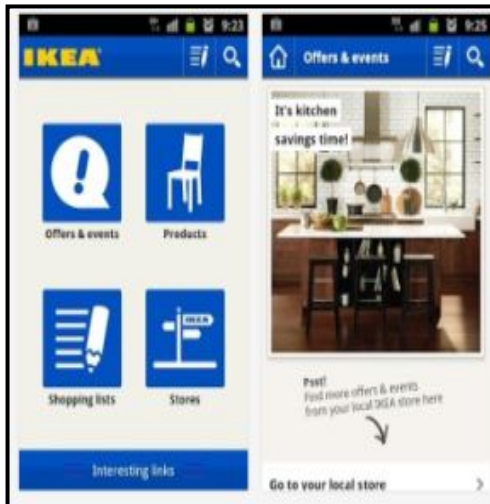
- lead time is longer than the customer expectations
- E.g.: We have a delivery time of 8 weeks but we promise our customer changes within 20 days before the delivery
- To adjust the reaction time appropriately to the demands of the customer, one has to introduce new processes:
- Consumption analysis
 - } Market research
 - } Market testing
 - } Personalized website advertisement
 - } When am I „Out of Stock“?
 - ... will be answered by advanced data analysis and simulation technologies

Customer demand to configure and a fast delivery! We have to anticipate the new demands of the customer: Predictive Analytics!



IKEA App as a result on the changing customer demand

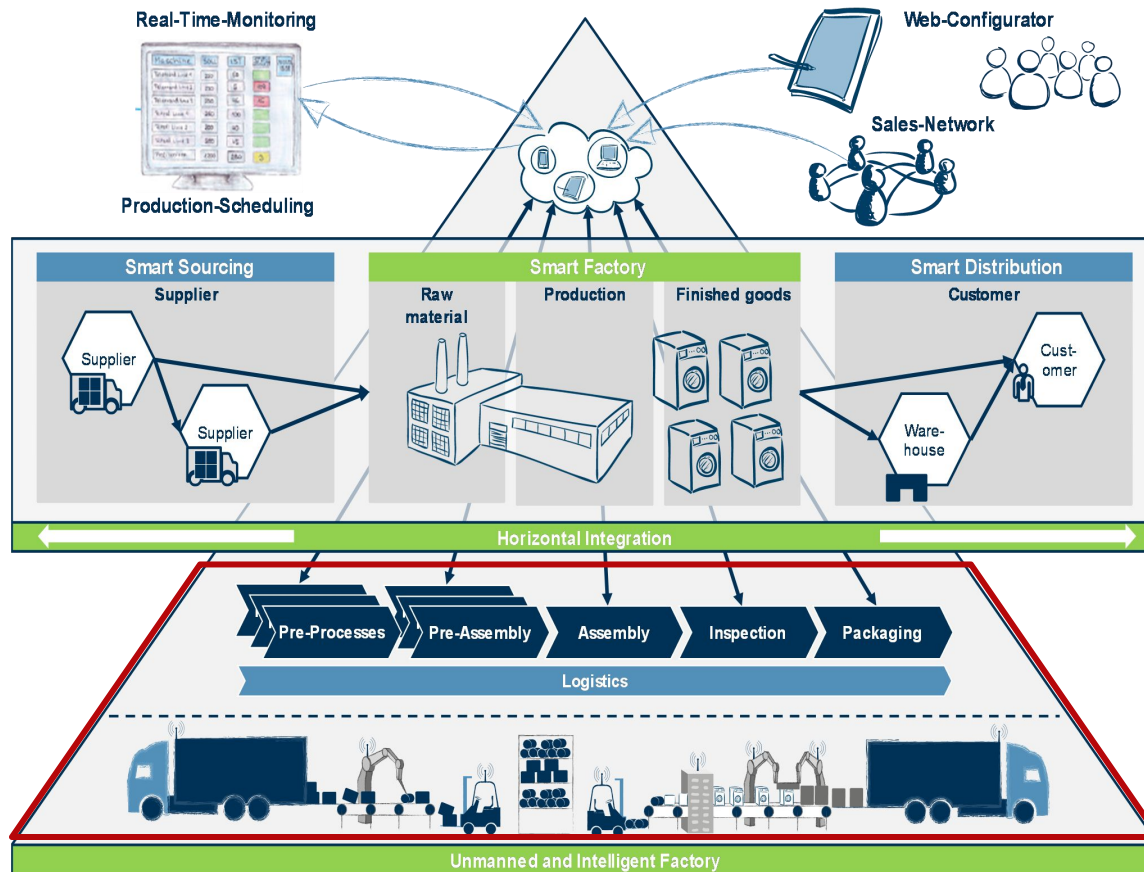
- Information about products and innovations (fast and free of charge)
- Paperless overview including assessments about the shape, colour and fitting accuracy
- App accessible on every kind of mobile device
- Augmented Reality: 3D-Function for a virtual positioning of IKEA furniture in the living room of the customers
- Real purchasing experience from home
- Individual configuration by the customer



Big Data – The glimps into the livingroom

- Gathering and analyzing of BigData via innovative technologies
- App collects e.g. information about the needs and purchase behaviour of certain customers
- Purchase behaviour can be anticipated
- Better advertisement of innovations and product favourites through directly aimed marketing

Smart Distribution allows an easy, cheap and individual way to inform and consult costumers. Big Data and Predictive Analytics may therefore either be used to improve the company strategy or the range of goods.



No Industry 4.0 without certain process standards of basic standards and methods

■ Lean Production

- } Avoidance of waste and improved value creation
- } Key data quantifies current and desired situation

■ Material flow simulation

- } The simulation ensures that the facility succeeds with the production targets

■ CAD/CAM

- } Offline-programming as the prerequisite for higher plant efficiency

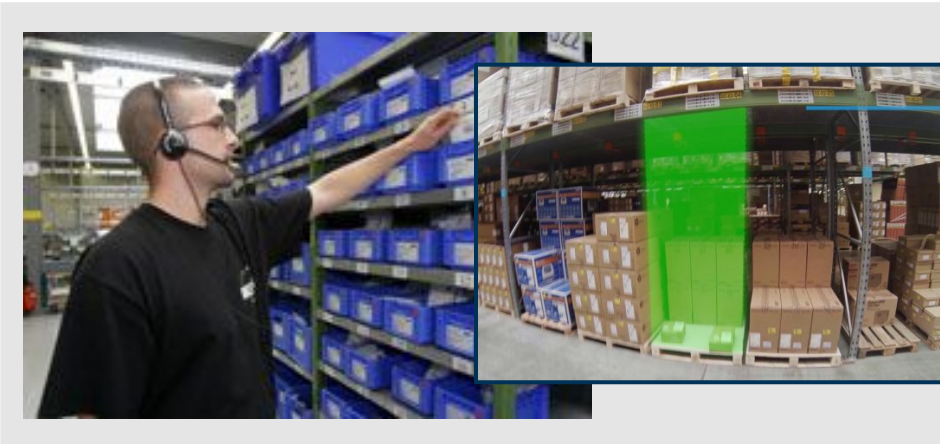
■ PLM

- } Digital product- und Prozessdata is available

■ ...

Implementation of Industry 4.0 requires excellent standards and methods

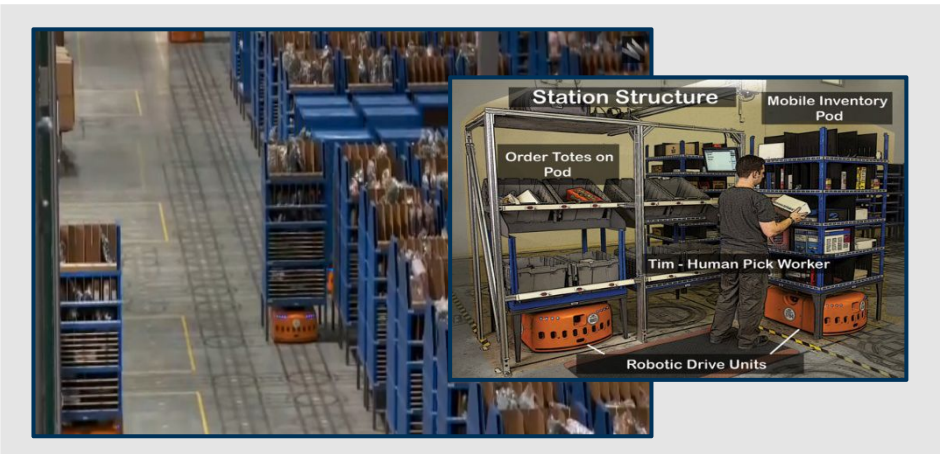
Pick by Vision



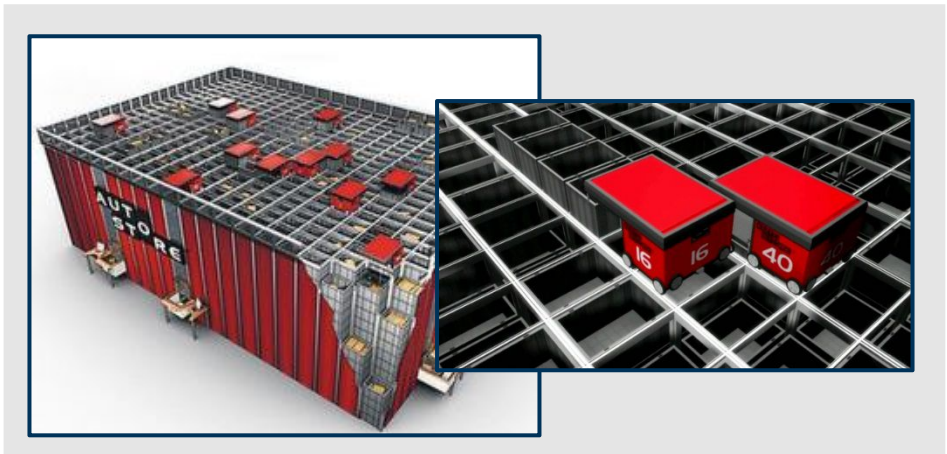
Exos Skelett

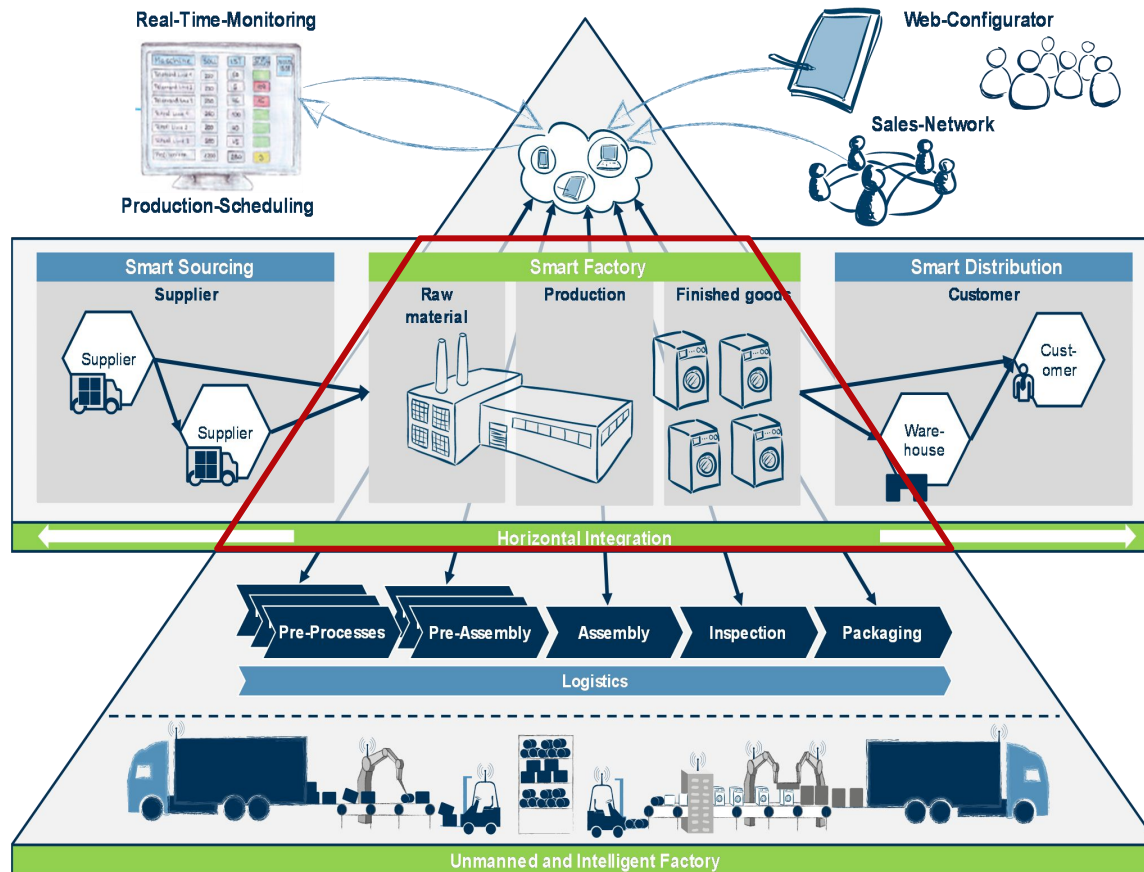


Robotic Drive Units



Auto Store





It is possible to control complexity if enough knowledge is available:

■ Organize autonome units

- } E.g.: „manufacturing of industrial motors“ demand control of A-parts based on realtime interface between sales and supplier

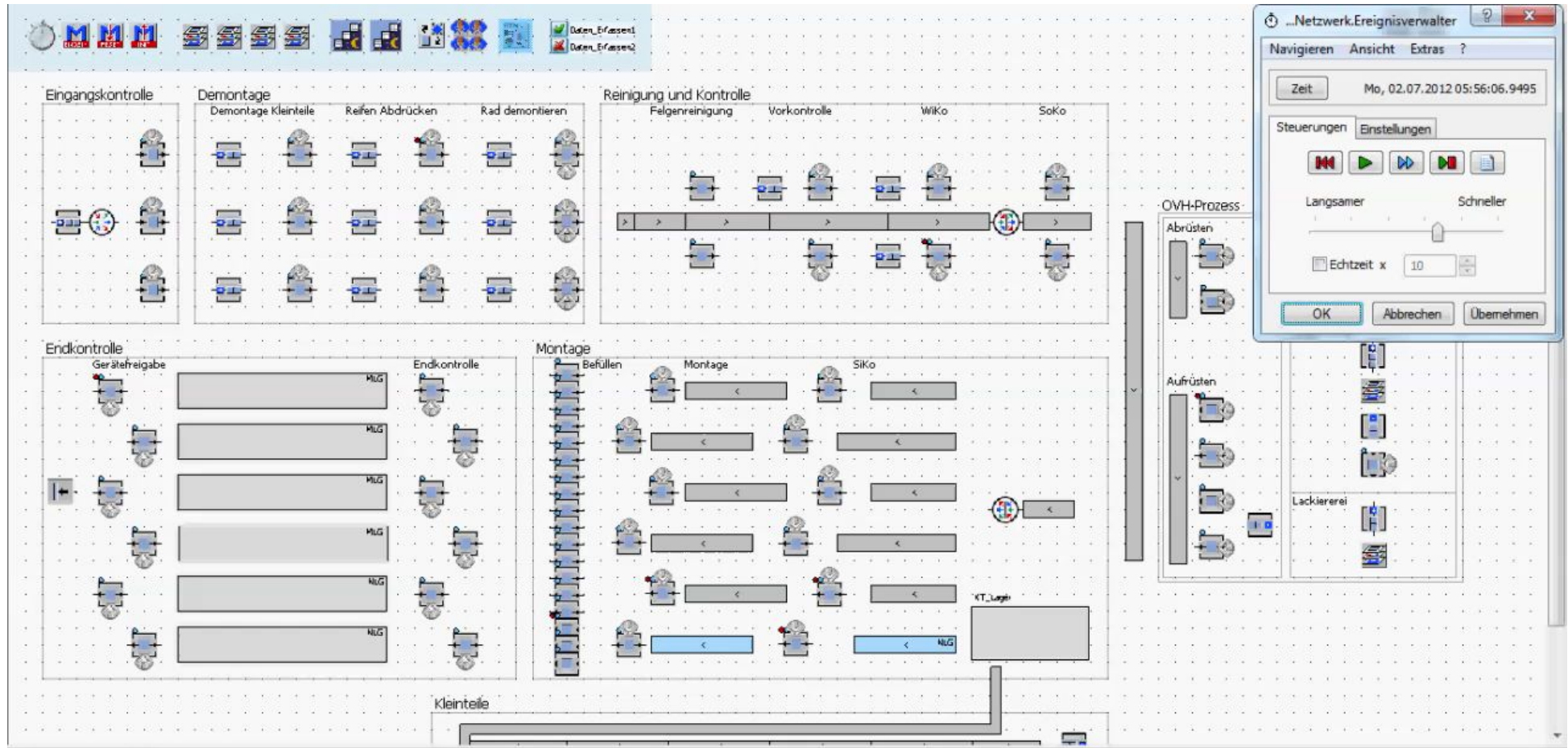
■ Decentralized control e.g. eKanban

- } Recognition of Kanban cards via barcode reader
- } Realtime information everywhere

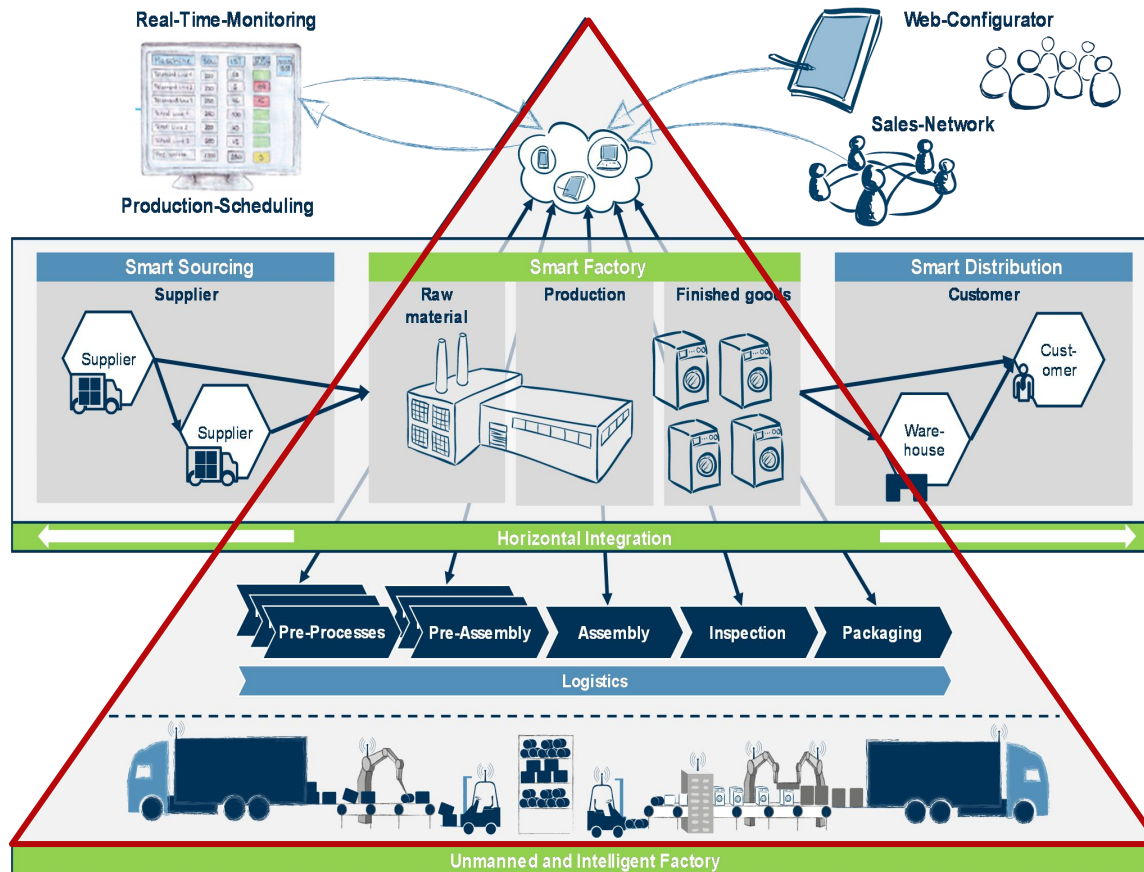
■ Automized transportation

- } „Fewer forklifts“ is a trend
- } Cleanliness as motivation
- } Low Budget Driver-less Transport Systems (DTS) are available with a payback of <12 months

Data consistency is technologically possible: Picking in Small loading Devices (SLD), SLD on carrier, carrier on an autonom DTS – The quantity and location is known in real-time



UNITY AG has more than 10 years of experience in the digitalization and simulation/validation of production and supply chain designs.



MES* and APS are prerequisite

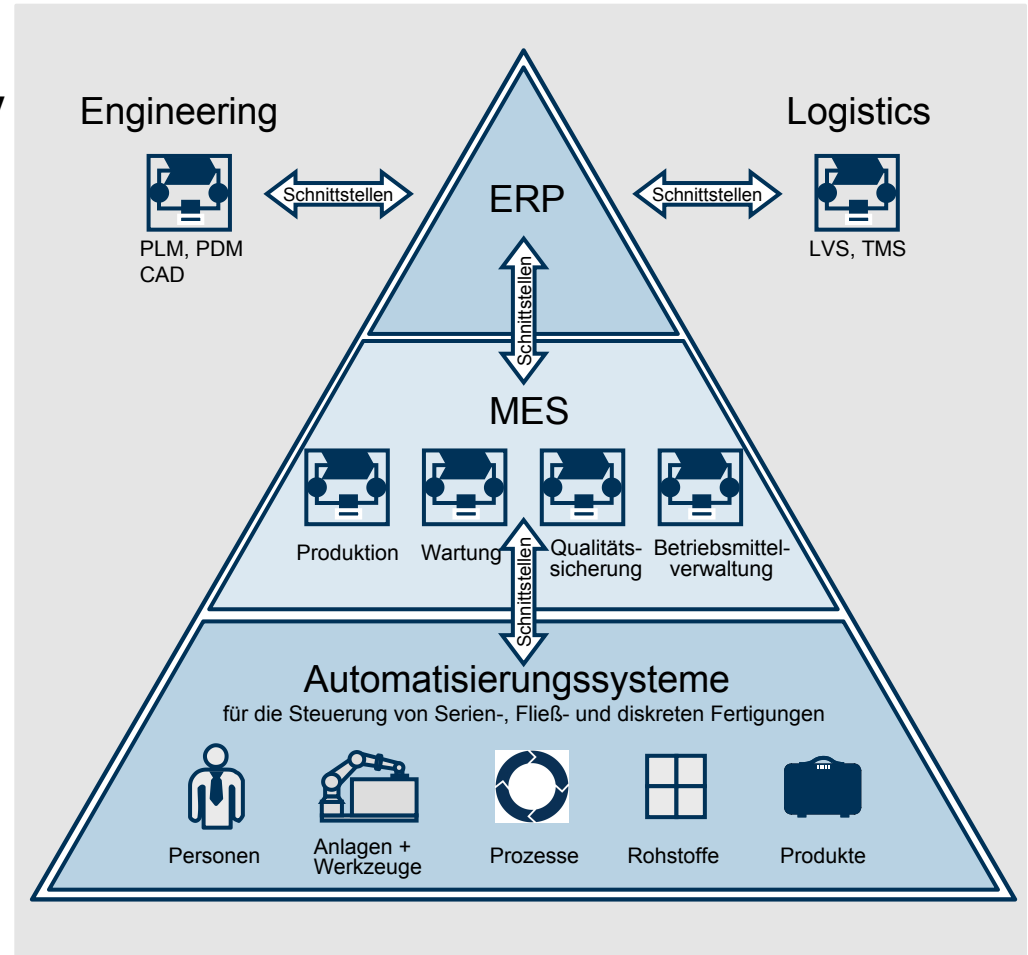
- Consistency from Office Floor (ERP) to the Shop Floor (machine control level) for precise control/reporting/monitoring
- Minimal batchsize via universal receiver etc.
- Consistent interaction with PLM (e.g. part structure resolution) to show changes
- Implement SCEM (Supply Chain Event Management) if something goes wrong, one has to change the ad hoc of the production of other products, which are producible on the basis of already existing components (assistance system of manufacturing)

*Manufacturing Execution Systeme are information portals in a plant. They create the interface between the manufacturing level with the automation technology and the management level with the ERP-System

Measurable advance of companies using the MES System within 3 years: 400% higher improvement of profitability. This was measured more than 10 years ago.

Source: „The MES Performance Advantage: Best of the Best Plants Use MES“; by Julie Frazer (Industry Directions Inc.), 1999-2002

- Information portals within a plant
- Interface between assembly and management level
- Realtime monitoring of the production
- Data processing with direct effects on the manufacturing
 - } Floor data collection (FDC)
 - } Material Flow Registration (MFR)
 - } Human resources time recording system
- Direct link between machine tools and material management

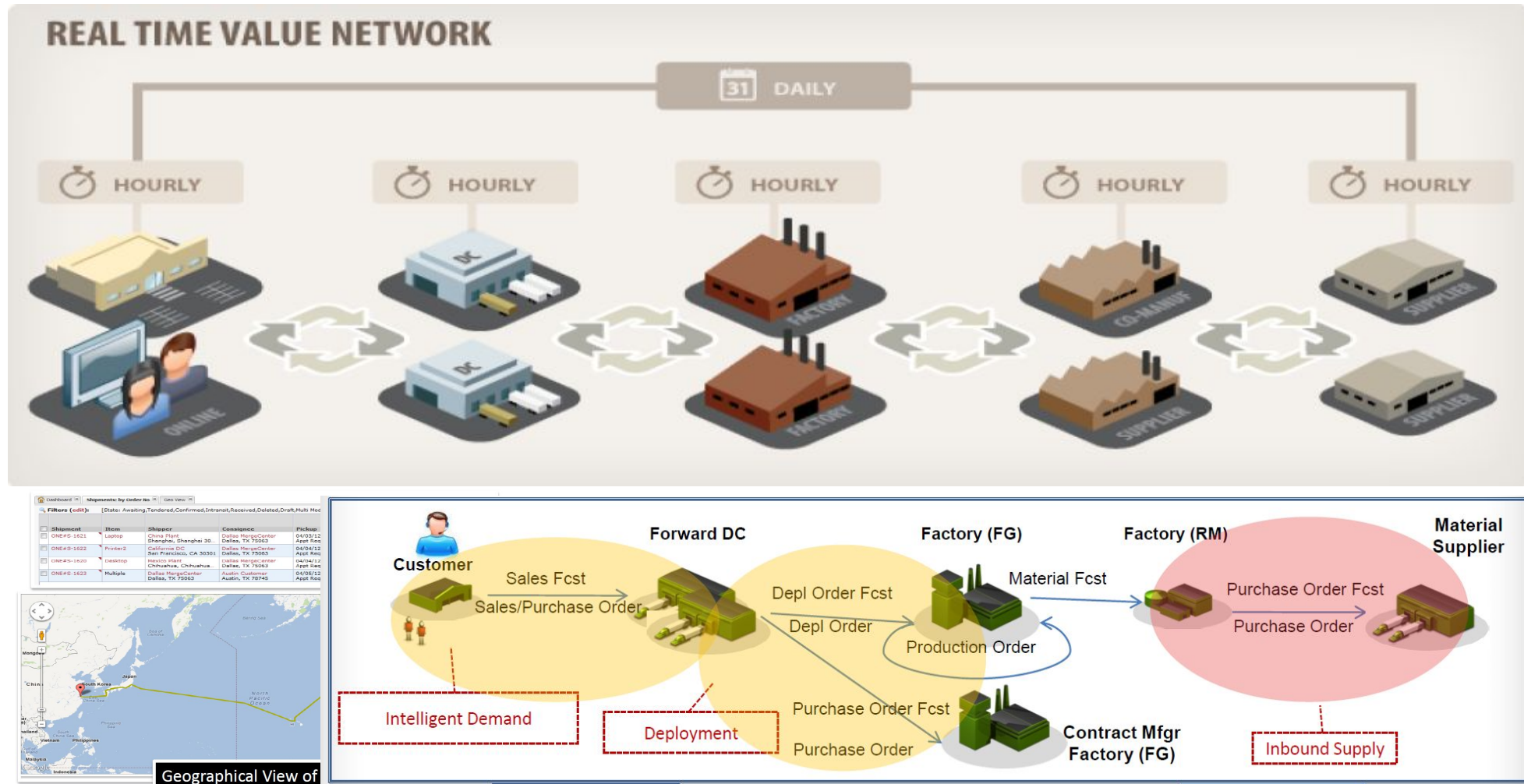


Quelle: www.mes-matchmaker.com

The smart production uses the connected fields within the smart factory for an efficient management with benefits affecting the complete value chain.

Real time information exchange in entire supply chain

"Single version of truth"



Concurrently manage Demand, Supply and Capacities. Can be any transaction such as shipments, orders, containers, inventory etc.

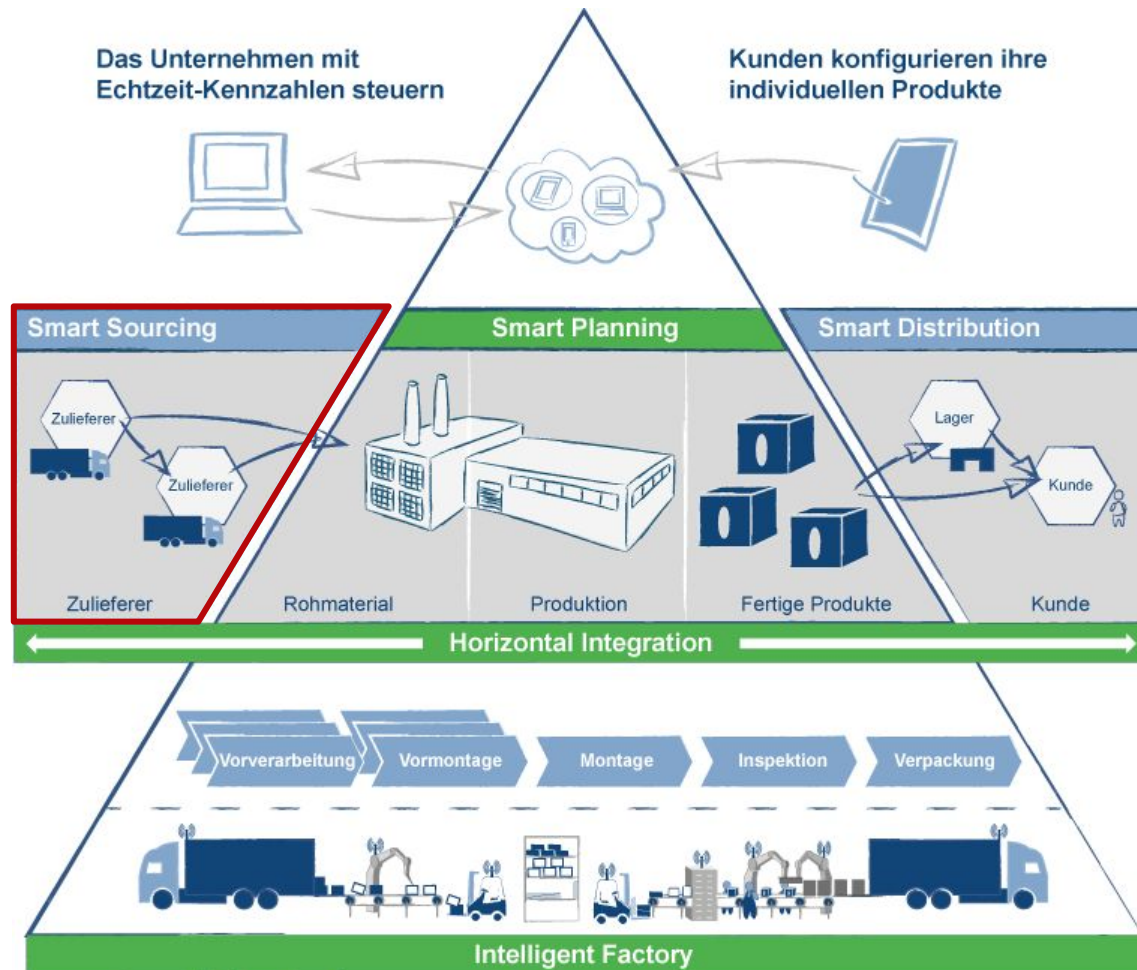


Equipping the shop floor
with **sensors**

An automated detection
of the direction of the
material flow with laser-
scanners, to gather the
flow multidimensional

An approach has to be
cheap and flexible
applicable

**Plan-deviations are automatically identified and the information are
transmitted to the detailed planning system**



Interpreter as the research priority

- Interconnection of an interpreter (smart platform) to connect the supplier to different ERP systems
- Consistent RFID implementation (Tier 1, Tier 2, Tier 3) for carriers and components (Track&Trace)
- Realising of a rolling „virtual“ storage (Availability with time reference, e.g. transport times)
 - } Attention: absolutely correct Track&Trace system is a prerequisite: Where are the components, when are they available at the assembly line
 - } Further on it would be good to know the progress of supplier components within the manufacturing process to get an idea when the components are planned to be available

**Even two mobile phones are not capable of a direct connection.
Data plat forms with intelligent interpreters are the key to success.**



Description

Using their highly precise weighing systems, Mettler Toledo created a smart logistic system, which measures the stock of certain goods using an innovative weight measurement hardware in combination with an intelligent software.

Organizational implications

- Due to fewer human errors, the follow-up cost will decrease and lesser resources have to be allocated
- The software allows a centralization of stock data

Effect for the customer

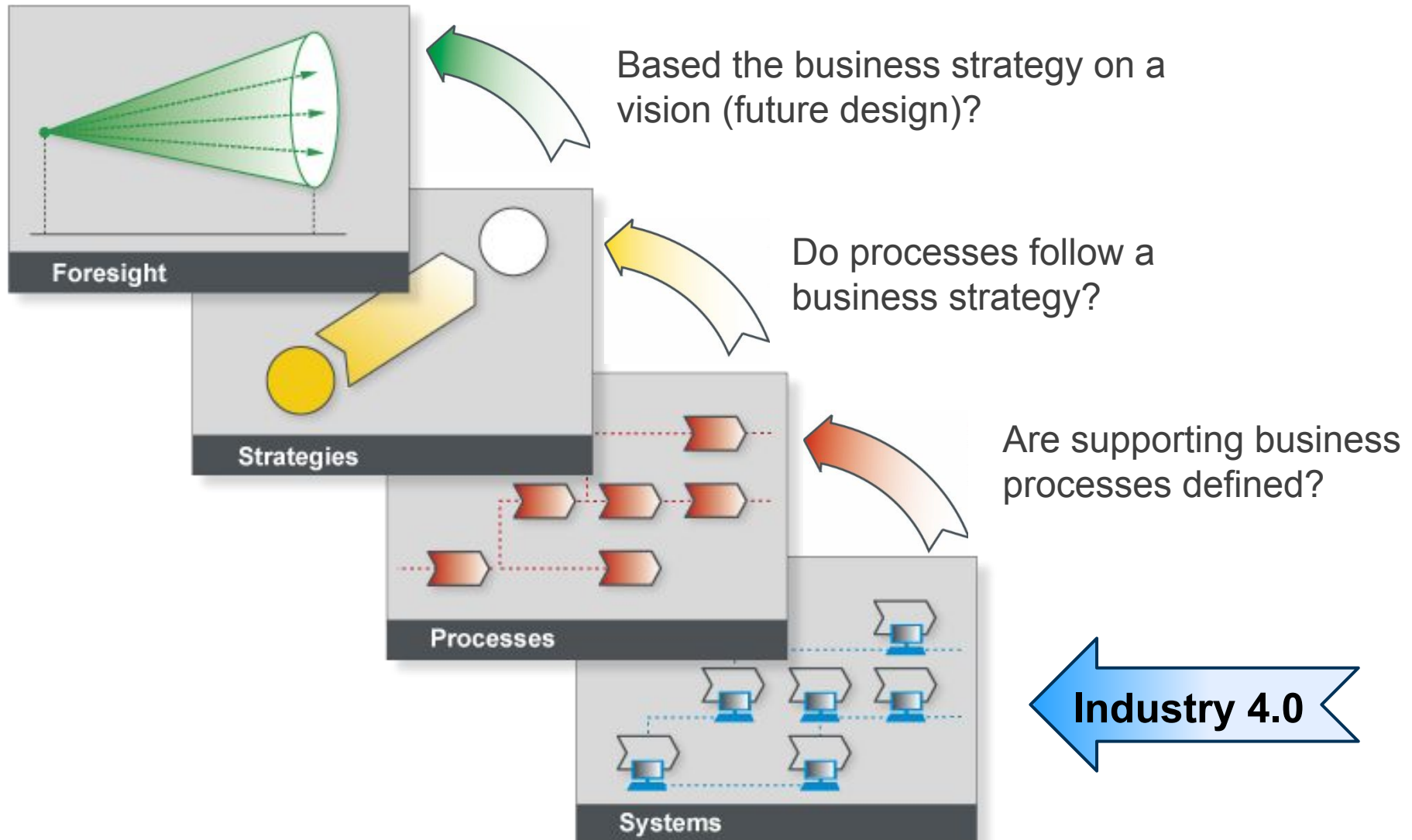
- Improved picking efficiency
- Fewer human errors
- Weighing data traceability

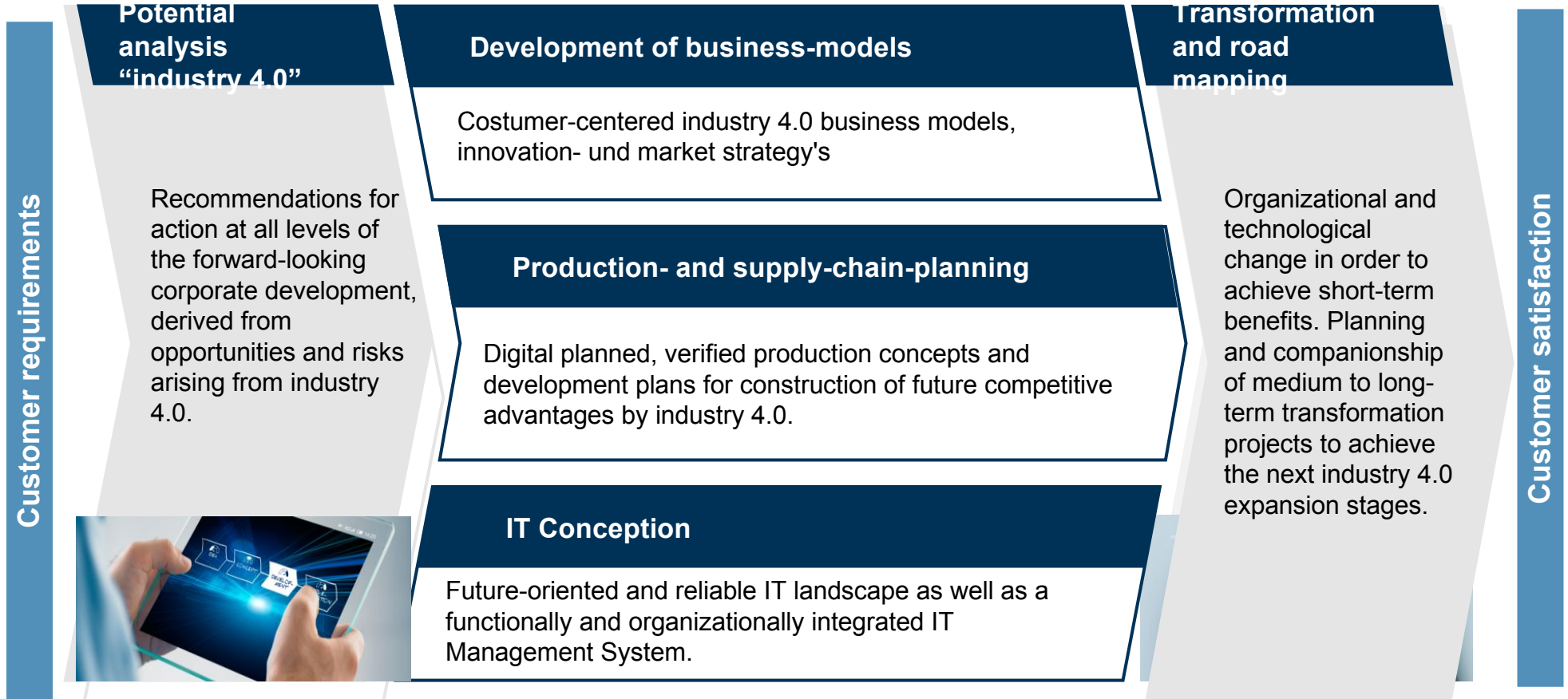
Process implications

- Stock of certain goods, which could hardly count quantitatively, can be controlled more effectively
- Constant and automated verification of stock

Future Logistics Hardware in combination with intelligent software will independently verify and evaluate stock data using innovative techniques.

Driving Success with the Four-level Model





The fulfillment of customer requirements and improving their own performance is the focus of all industrial activities



Industry 4.0 Strategy

After learning the great potential of new business opportunities and efficiency improvements adopting industry 4.0, the participants will practice in exercises how to develop a corporate strategy implementing it.



Smart Logistics

The Internet of things and services – Industry 4.0 – approach will fundamentally improve efficiency within the supply chain network of producing companies. Intelligent planning tool could ensure your reliable logistics network in the future.



Smart Service

In the future, Web-based and physical services will be combined in order to meet the needs of individual consumers. Participants of this seminar will learn the key to the competitive success of smart services, which is entailed in the way they are customized to provide benefits to individual consumers.



Systems Engineering

„SMART Engineering“ requires a interdisciplinary, networked, intelligent approach of the product engineering process. In this course, participants will learn consistent methods, process IT-solutions all about “Systems Engineering”, which is established as an interdisciplinary approach.



Smart Factory

Industry 4.0 focuses on the value chains used by manufacturing industry to make Smart Products and the interactions between human beings and machines. A combination of knowledge inputs and exercises provide an overview of digital factory planning and internet in shop floor.



Network Planning

„SMART Network Planning“ determines the minimum cost path from a selected location to other locations within the network. It identifies cost drivers and critical processes ,therefore, faster and safer decision in all areas of the network



Smart IT Infrastructure

IT Management and IT Manager are the future drivers of Enterprise Business Development. Key elements of a “CIO 4.0 Agenda” are e.g. Future Service models, EAM and of course IT security concepts.

Thank You for Your Attention!

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