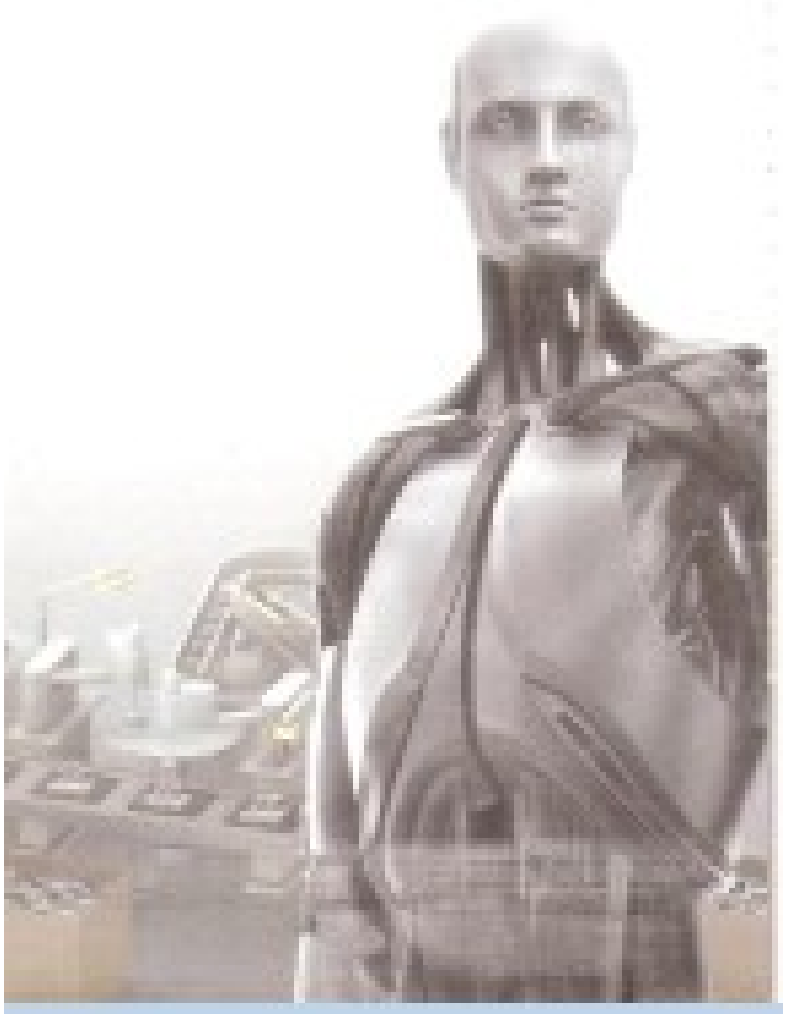
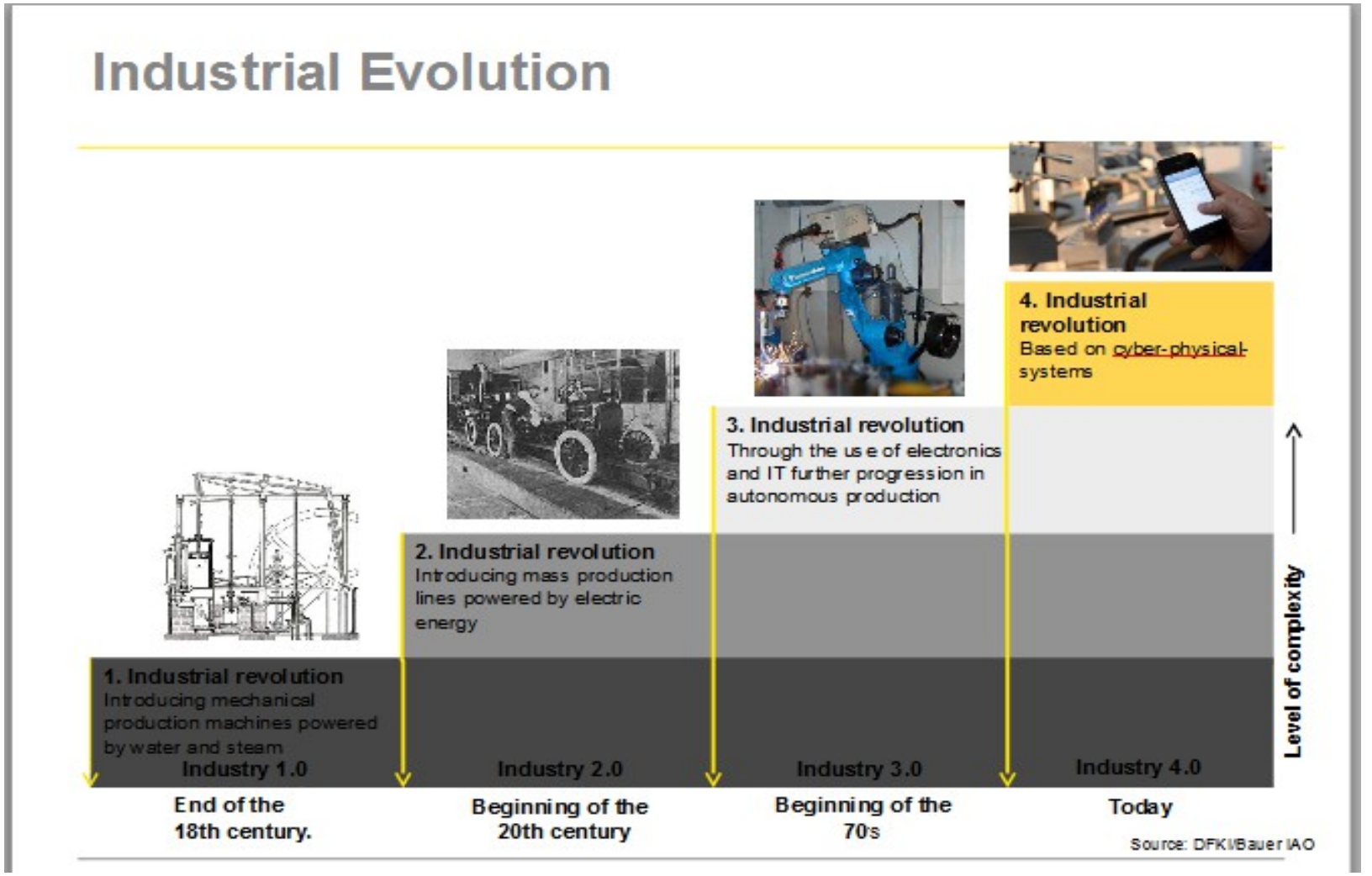
Arcee Automations and Industry 4.0

Industry 4.0

Why It Matters?



Industry 4.0


Industrial Evolution
4. Industrial revolution
Based on cyber-physical-systems
3. Industrial revolution
Through the use of electronics and IT further progression in autonomous production
2. Industrial revolution
Introducing mass production lines powered by electric energy
1. Industrial revolution
Introducing mechanical production machines powered by water and steam
Level of complexity
Industry 1.0
Industry 2.0
Industry 3.0
Industry 4.0
End of the 18th century.
Beginning of the 20th century
Beginning of the 70s
Today
Source: DFKI/Bauer IAO

Smart Manufacturing – Industry 4.0

A collective term for technologies and concepts of value chain organization. Based on the technological concepts of cyber-physical systems, the Internet of Things and the Internet of Services, it facilitates the **vision of the Smart Factory.**

Within the modular structured Smart Factories of Industry 4.0, cyber-physical systems monitor physical processes, create a virtual copy of the physical world and make decentralized decisions.

Over the Internet of Things, Cyber-physical systems communicate & cooperate with each other & humans in real time. Via the Internet of Services, both internal & cross-organizational services are offered & utilized by participants of the value chain.

Industry 4.0 - Definition

Integration or convergence of information technology (IT) and operational technology (OT).

1. Enhance vertical integration, by enhancing the application of scientific and technological advances to the operations such as automation, integration between physical activity and control systems, to increase productivity, quality, speed of response to the request, speed of completion of business operations.

2. Implement horizontal integration, inter-process, chaining of pieces to form a service and finished products to serve customers. Includes technologies from track and trace devices to real time integrated planning with exceution.

3. Digitize products and services to meet the high requirements of customers for reviewing, evaluating and product experience, meeting personalized demands for each customer.

4 components of Industry 4.0

- Cyber Physical system
- Industrial Internet of Things
- Internet of Services
- Smart Factories

Cyber Physical systems

To employ remote access to the production line from virtual private networks, plants will need to establish consistent procedures for user login and authentication, privilege setting, activity recording and linking between protocols and appropriate IT directories and databases.

Protocols will likely need to be configured and disseminated according to universal standards that can be "spoken" by all devices, regardless of manufacturer or function.

Cyber Physical system (contd.)

It is the output of two views

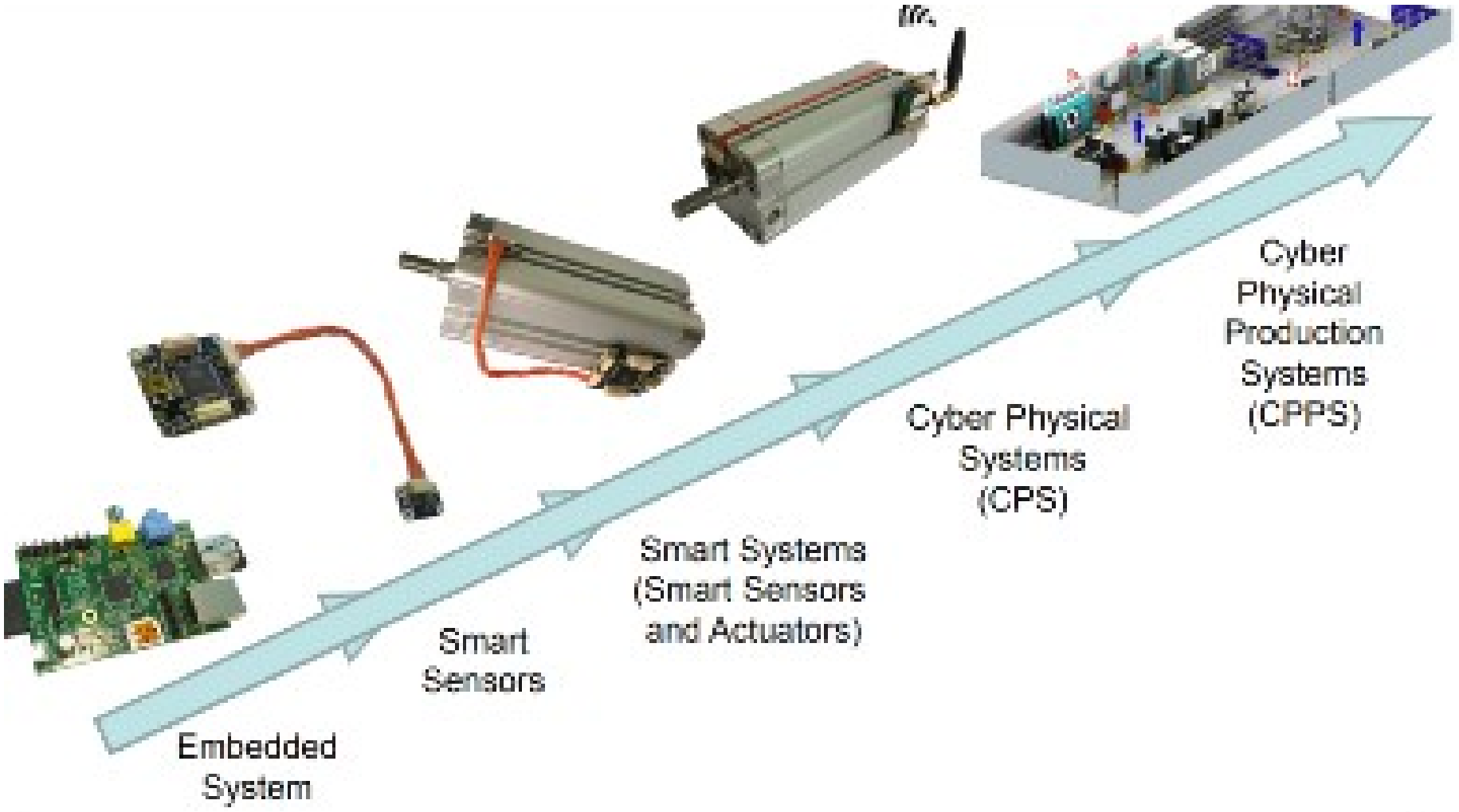
- Cyberizing the physical

  Specify physical subsystems with computational abstractions and interfaces

- Physicalizing the cyber

  Express abstractions and interfaces of software and network to represent physical system dynamics in time

Cyber Physical Integration



Industrial Internet of Things

The IIoT can be defined as a network in which CPS cooperate with each other through unique addressing schemas. Benefits include

1. Communication of Production Data

Manufacturing systems' communication networks will scan for input from the marketplace and use this information to fine-tune production parameters. For example, a company's systems—alerted by higher than expected consumption cases reported in a particular region—could trigger manufacturing lines to increase production and place additional orders of raw material

IIOT (Contd)

2. Optimization to Production Lines

Manufacturers will enjoy greater flexibility as robots, machine vision systems, raw materials inputs and other aspects of the production line are able to communicate with each other directly.

Benefits may include the ability to produce a wider range of component types on a single line, or manufacture smaller lots of particular products—even customized products—more cost effectively.

Internet of Services

The Internet of Services aims at creating a wrapper that simplifies all connected devices to make the most out of them by simplifying the process. It is the customer’s gateway to the manufacturer.

Smart factories

The embedded manufacturing systems are vertically networked with business processes within factories and enterprises and horizontally connected to dispersed value networks that can be managed in real time – from the moment an order is placed right through to outbound logistics. In addition, they both enable and require end-to-end engineering across the entire value chain.

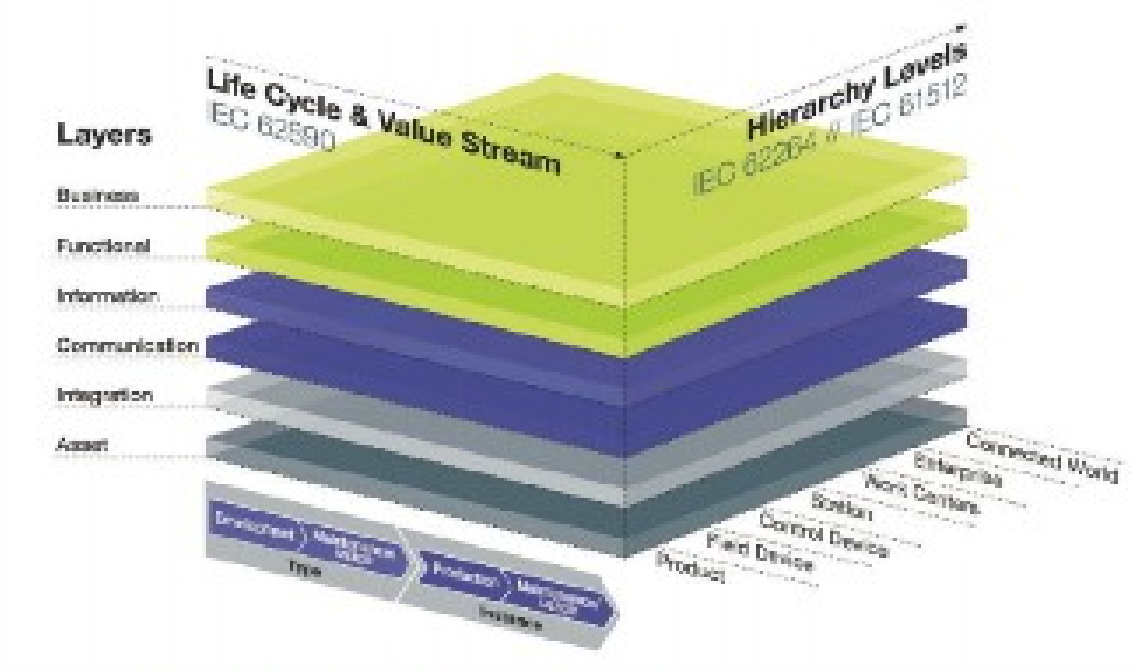
Machine learning plays a significant role in Smart factories

Smart Factories - Machine Learning in Self Healing Systems

Design principles of each industry component

	Cyber-Physical Systems	Internet of Things	Internet of Services	Smart Factory
Interoperability	X	X	X	X
Virtualization	X	-	-	X
Decentralization	X	-	-	X
Real-Time Capability	-	-	-	X
Service Orientation	-	-	X	-
Modularity	-	-	X	-

3 dimensional integration



Source: Umsetzungsstrategie Industrie 4.0, BITKOM, VDMA, ZVEI, April 2015

Standards

- OPC -UA

A specific communications protocol for process control applications

- CoAP and DDS

General-purpose standards for communications and data management.

To ensure end-to-end service quality, IIoT platforms must be able to operate across multiple devices and sensors using different networking protocols and application technologies.

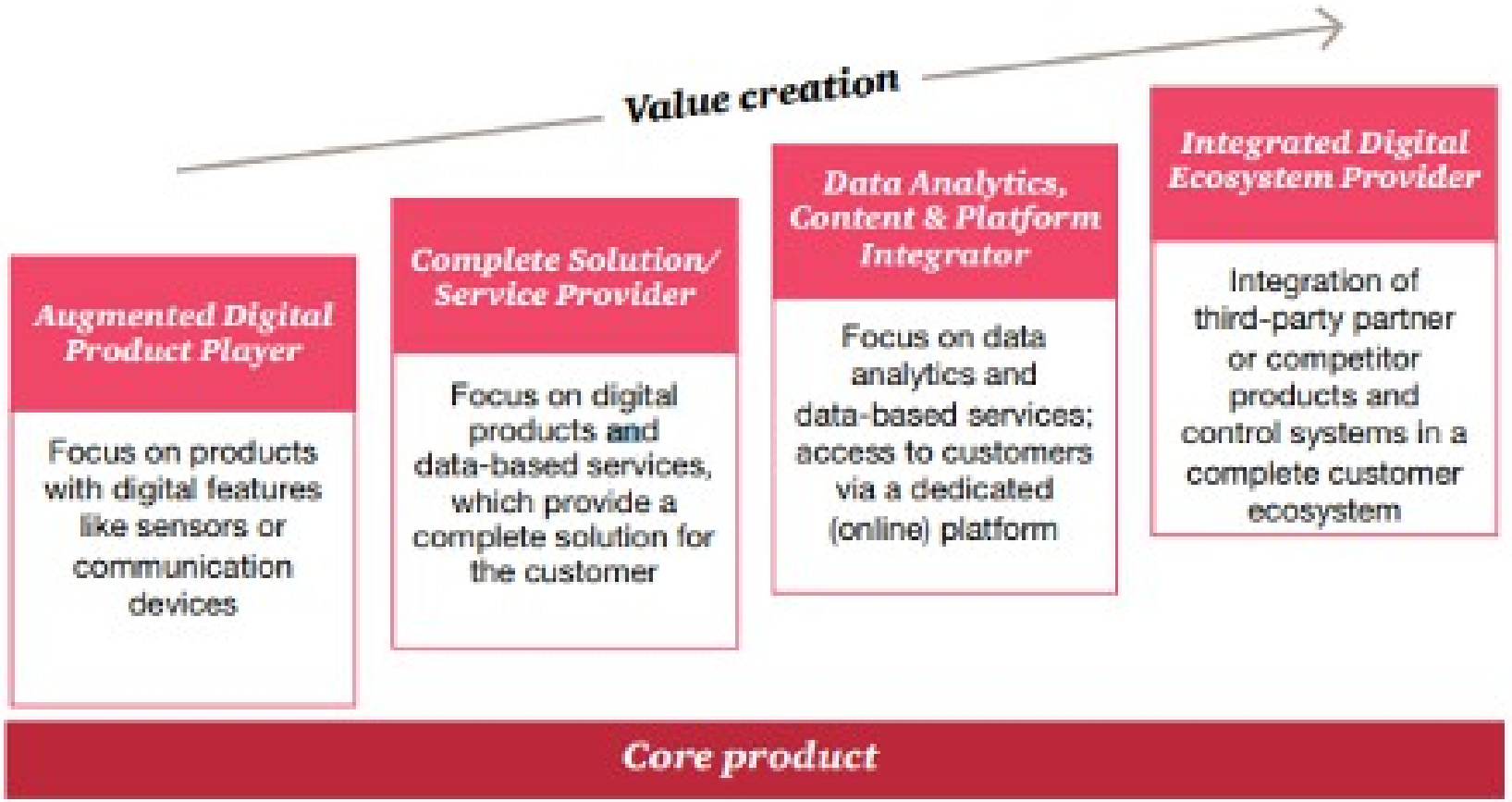
Machine Vision and Industry 4.0

Machine vision will be a critical part of automation systems in Industry 4.0.

As data analytics capabilities progress, the high volume of data accessible through vision equipment will be used to identify and flag defective products, understand their deficiencies and enable fast and effective intervention in the Industry 4.0 factory.

Value creation via complete customer eco system

Industrial companies are moving towards greater digital value creation, from augmented products to serving digital ecosystems



ARCEE Automations in Industry 4.0

- Arcee Automations has enabled Industry 4.0 by providing solutions around IIOT, Advanced Robotics and cyber physical systems to create a smart factory for its esteemed clients.
- As a leading machine vision and Robotics solution provider, Arcee Automations provides products and solutions confirming to the standards of OPC – UA and IEC 61131
- Arcee Automations has in-depth knowledge on Vision Algorithms based on analysis as well as Vision algorithms based on AI (Machine learning)
- Capabilities include Deep Learning networks and SVM