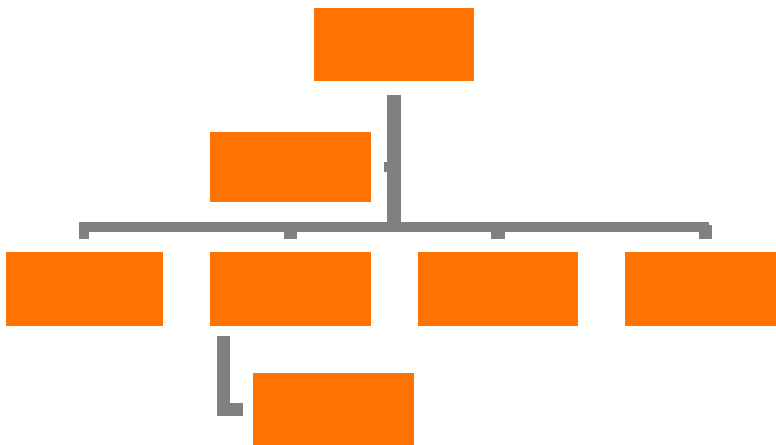


KUKA

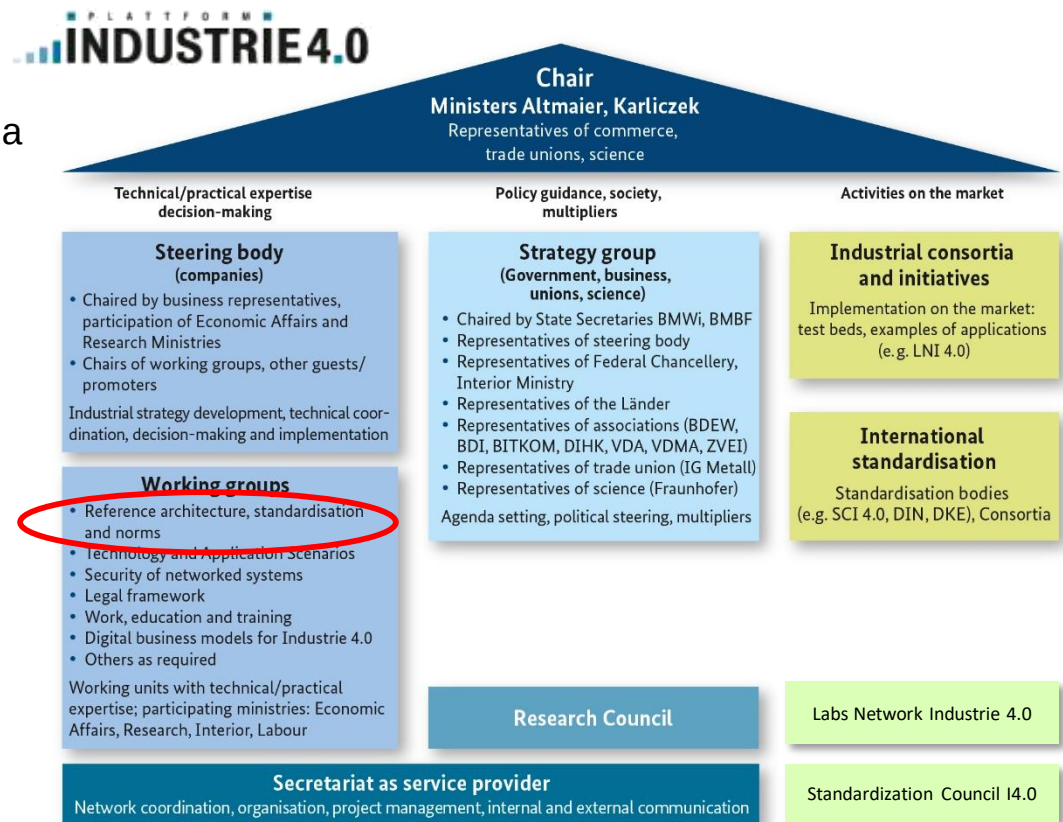
Ressourcen sparen, Effizienz steigern, Umwelt schonen durch Digitalisierung, IoT und Industrie 4.0



Heinrich.Munz@KUKA.com
Lead Architect Industry 4.0

Industry 4.0 was invented in Germany

- Industry 4.0 is one of ten „Future Projects” of the German Government
 - 1000 Mio. € grants
 - Controlled by the German Government
 - Supervised by Chancellor Angela Merkel (visited KUKA in 03/15)
 - Minister for Economic Affairs & Energy Altmaier
 - Minister for Education & Research Karliczek
- KUKA is a member of the “Reference Architecture and Standardization” working group (Heinrich Munz)



Source: BMWi, Status: March 2018

KUKA Robotic Product Portfolio

Application-
modules



Controllers

Robots

Software

Customer
Services

Robots for payloads from 3 to 1.300 kg



Light Weight Robot (LWR)
 „iiwa“ „iisy“
 for Human Robot Collaboration (HRC)
 “CoBots”



Small robots
 „Agilus“

Low
 payload

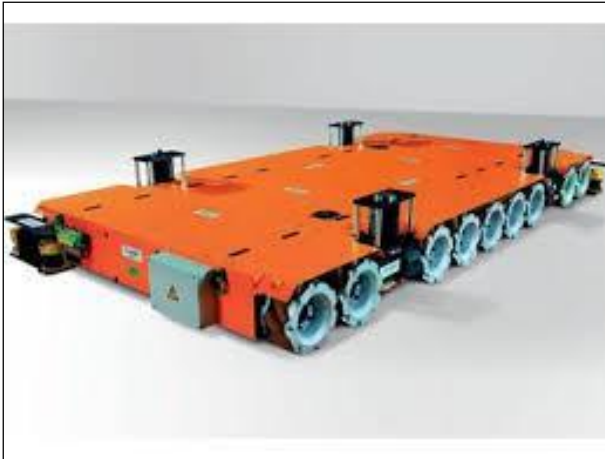
Middle
 payload

High
 payload

Highest
 payload
 „Titan“

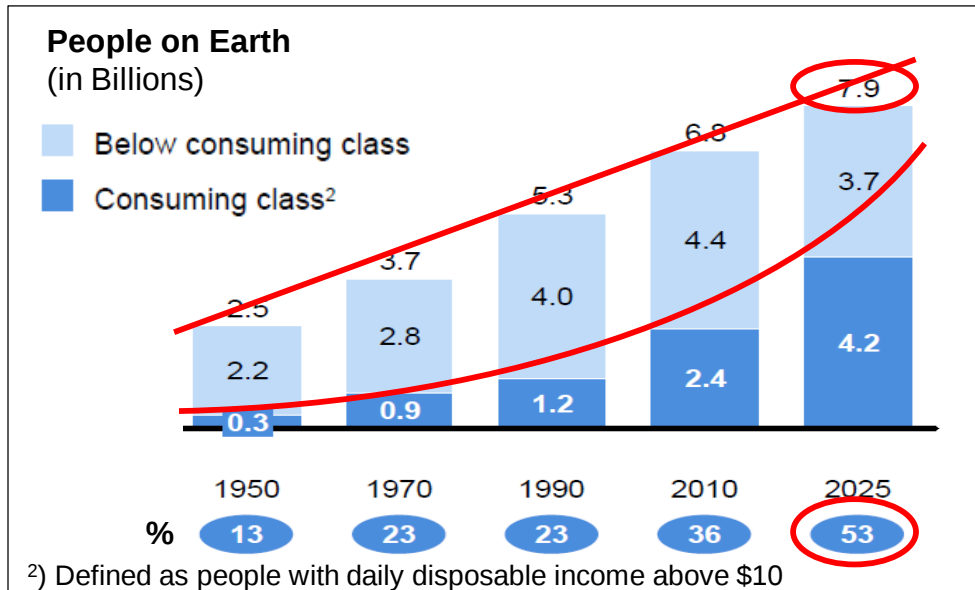
Special
 mechanics

KUKA Mobile Products

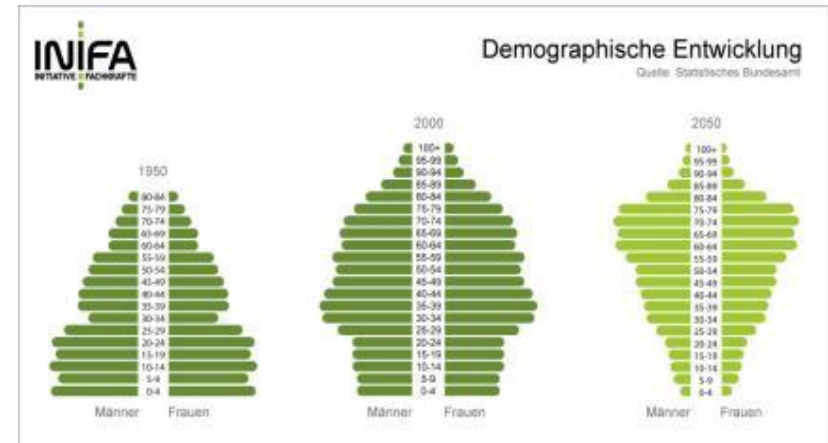


- Mobile products, machines and tools are a very important part of Industry 4.0

Why Industry 4.0? Challenges of the future

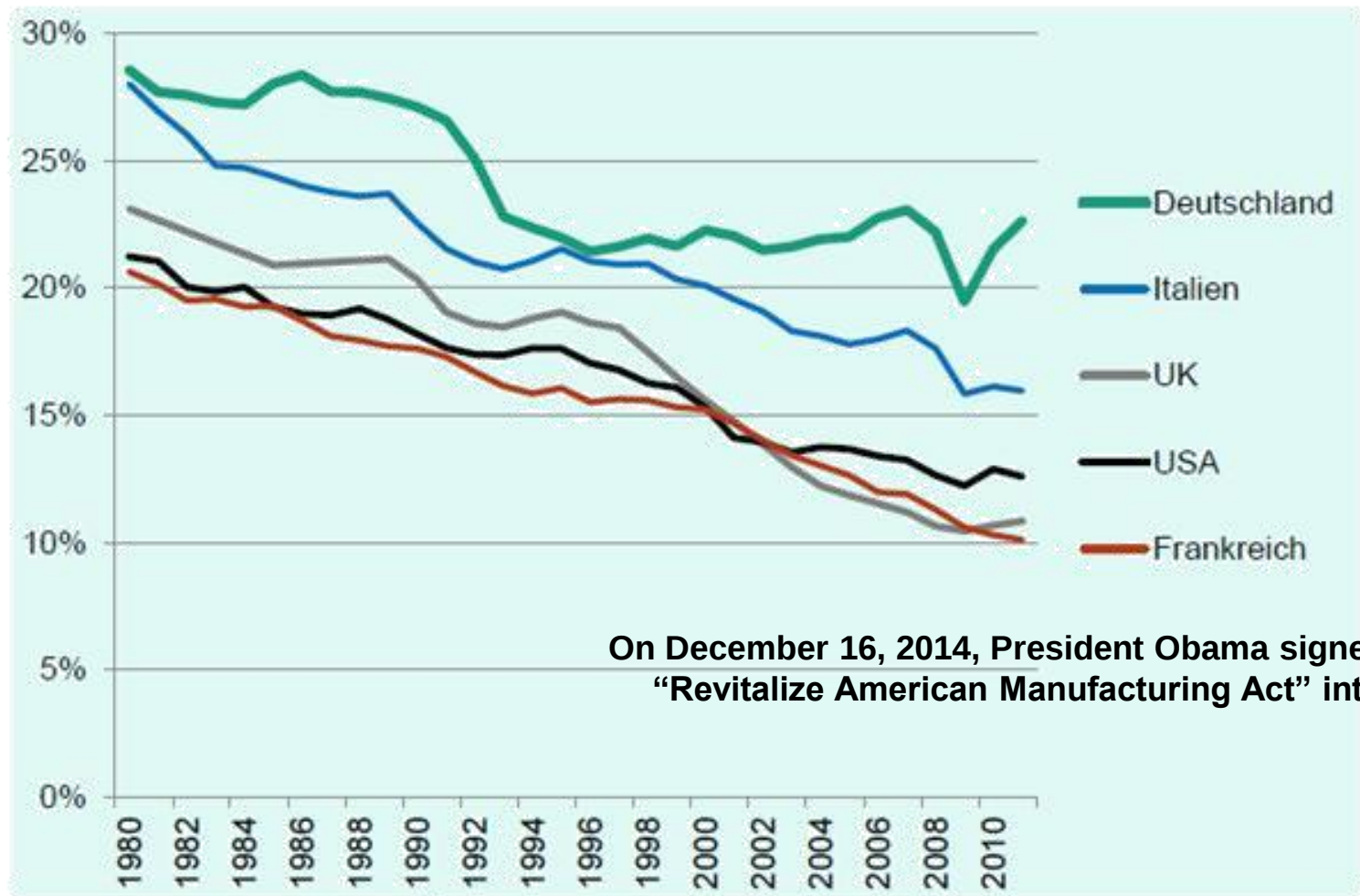


Source: McKinsey: Urban world: Cities and the rise of the consuming class



- In 2025 there are ~8 Billion people on earth, >half of them in the „Consumer-Class“
- People are getting older, in Germany we are getting less
- Consequences for Germany: Keep automated manufacturing in Germany, export products, export manufacturing technologies and manufacturing know how
- Robots and other machines as assistant systems for humans (Human Robot Coop.)
- Information sources and decision helpers through IT-systems like Smart Devices

Why Industry 4.0? Countries must Revitalize Manufacturing

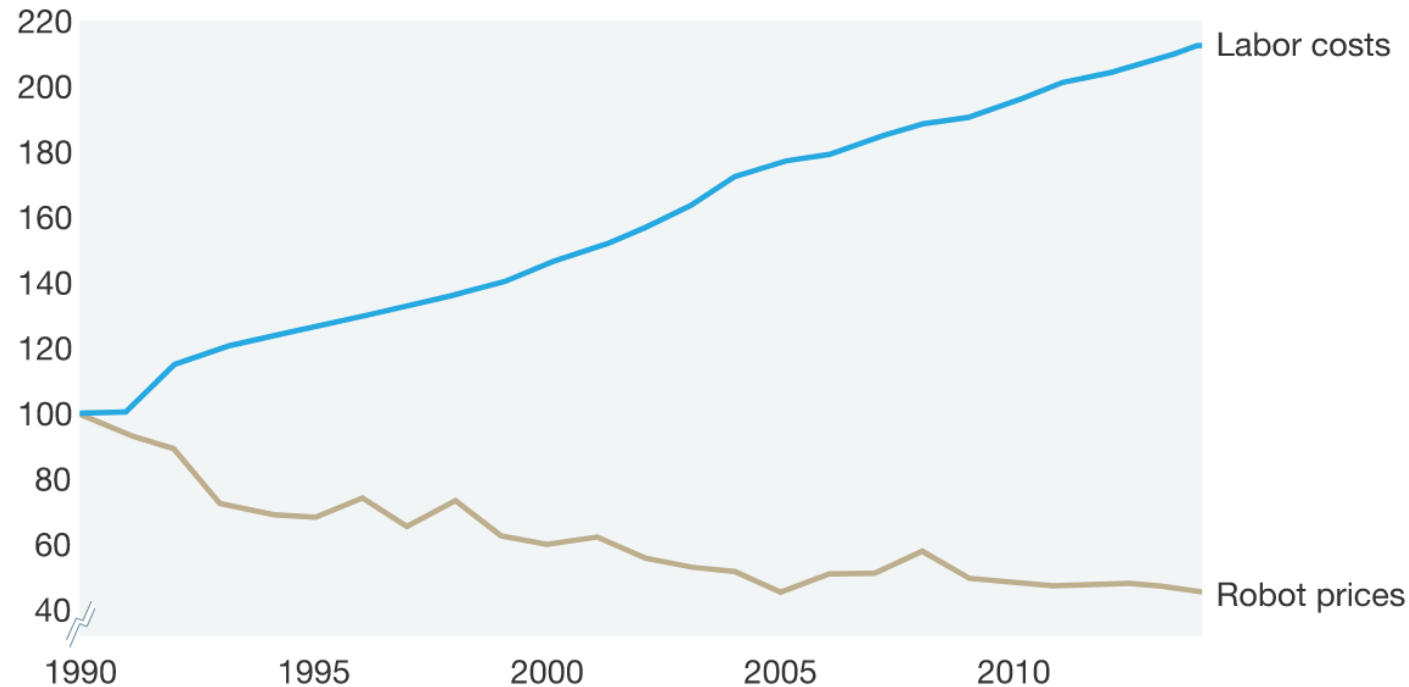


On December 16, 2014, President Obama signed the “Revitalize American Manufacturing Act” into law

Quelle: UNData: Gross Value Added Manufacturing/Total Gross Value Added

Why Industry 4.0? Big Price drop on Industrial Robots → Full Automation

Index of average robot prices and labor compensation in manufacturing in United States, 1990 = 100%



Source: Economist Intelligence Unit; IMB; Institut für Arbeitsmarkt- und Berufsforschung; International Robot Federation; US Social Security data; McKinsey analysis

- Mechanics easily can be copied
- Huge competition, especially in the low price segments

Megatrends Change the World



Globalization



Automation



Digitalization

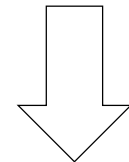
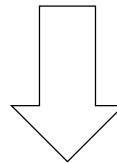
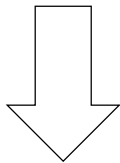
- Everything that can be digitized, will be digitized !
- Everything that can be connected, will be connected !
- Everything that can be automated, will be automated !

“Digitalization”

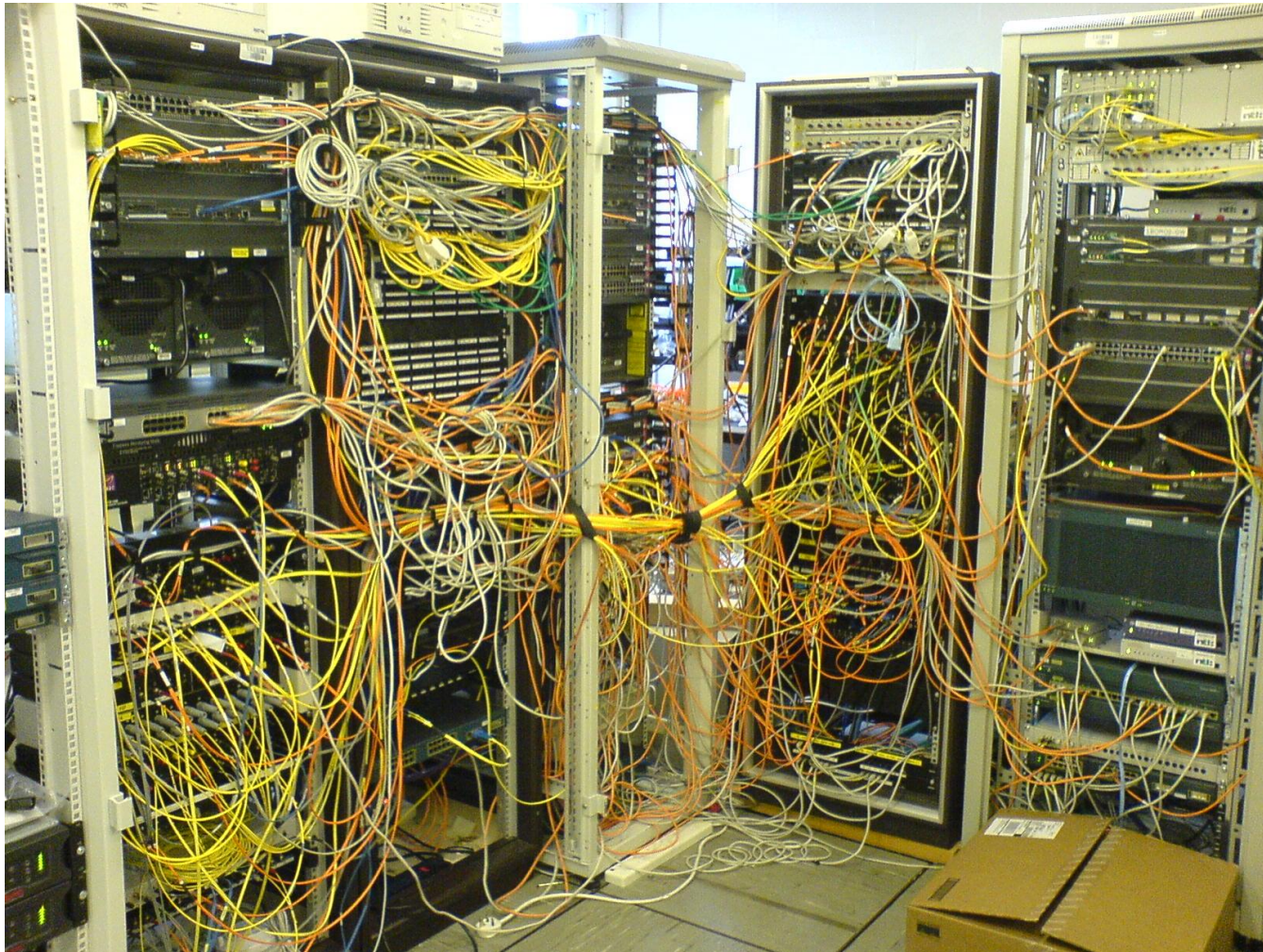
“Internet of Things”

“Industry 4.0”

Everything that can be digitalized, will be digitalized !



Everything that can be connected, will be connected !



Everything that can be automated, will be automated !



Digitalization

Insurances

Lawyers,
Judges, Courts

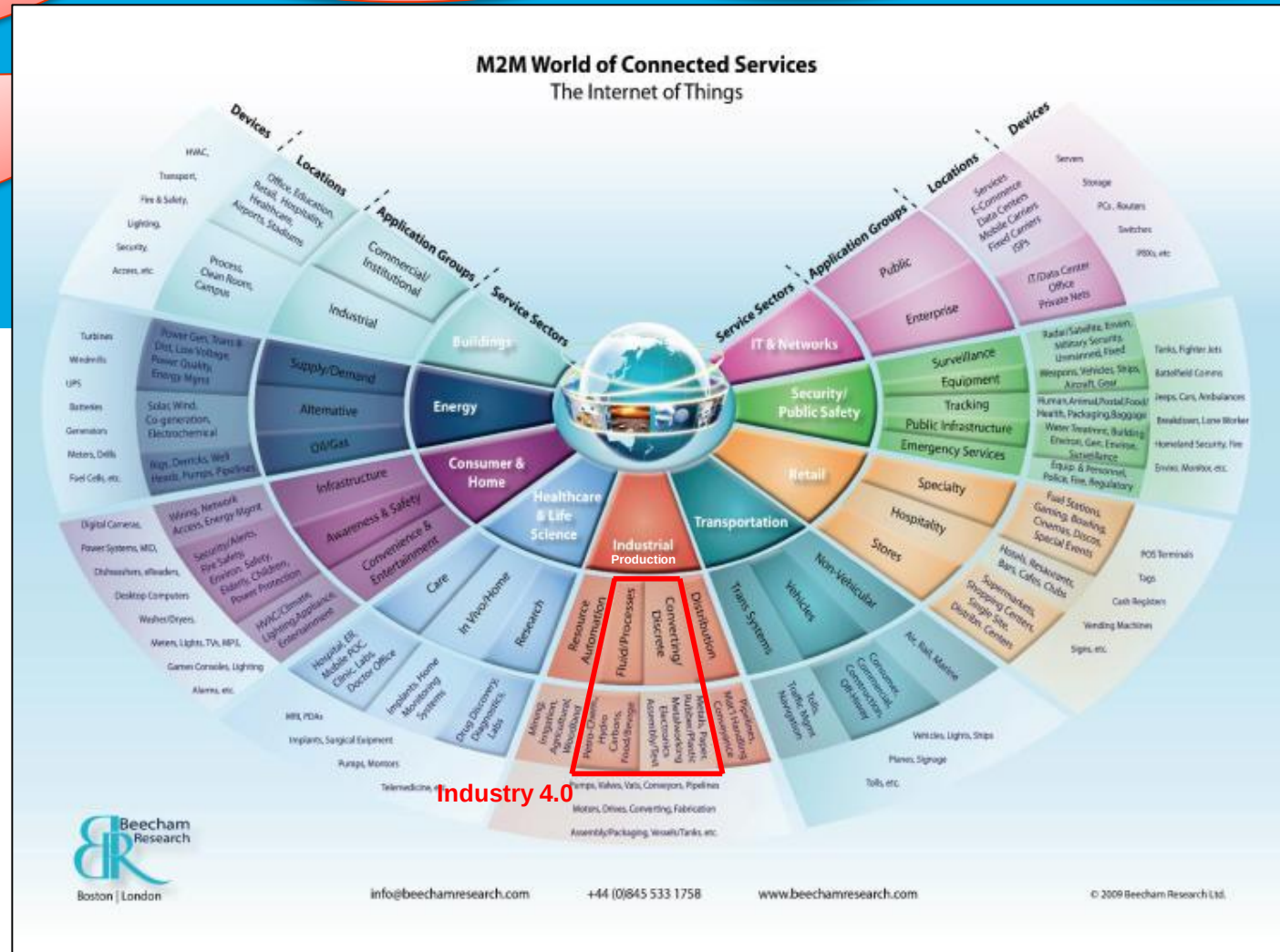
Chemical,
Pharma

Administrations

Retail

Banks

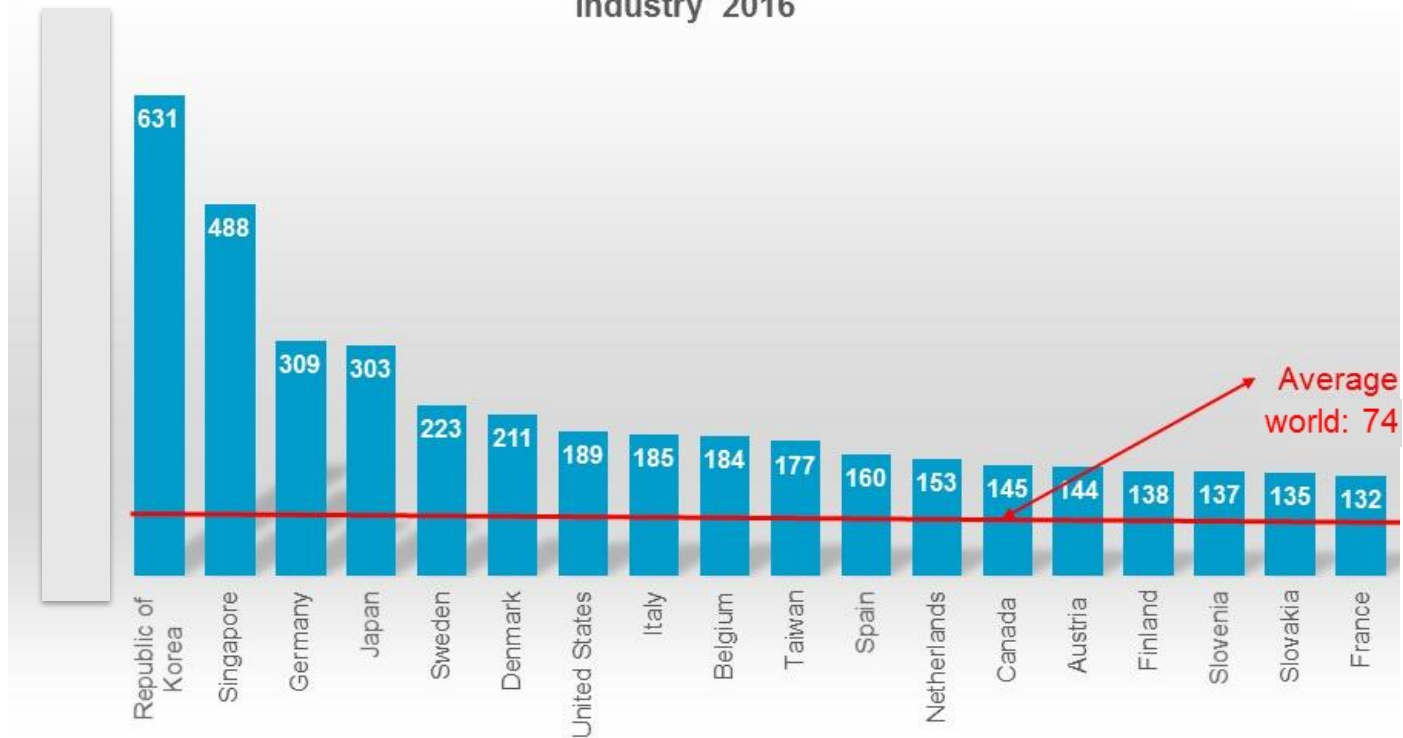
- The IoT is just a subset of Digitalization
- Industry 4.0 is just a subset of the IoT



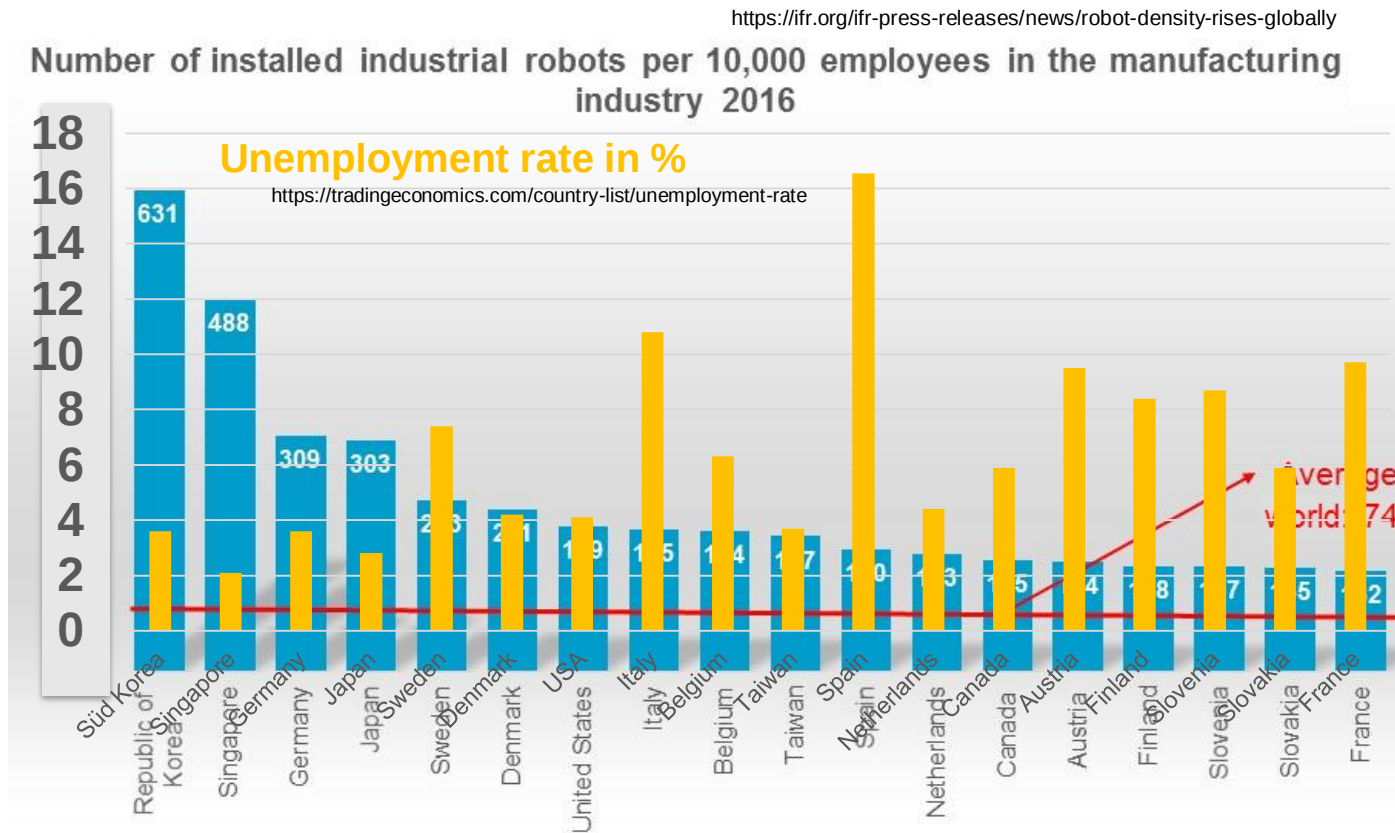
Robots & Full Automation create Jobs !

<https://ifr.org/ifr-press-releases/news/robot-density-rises-globally>

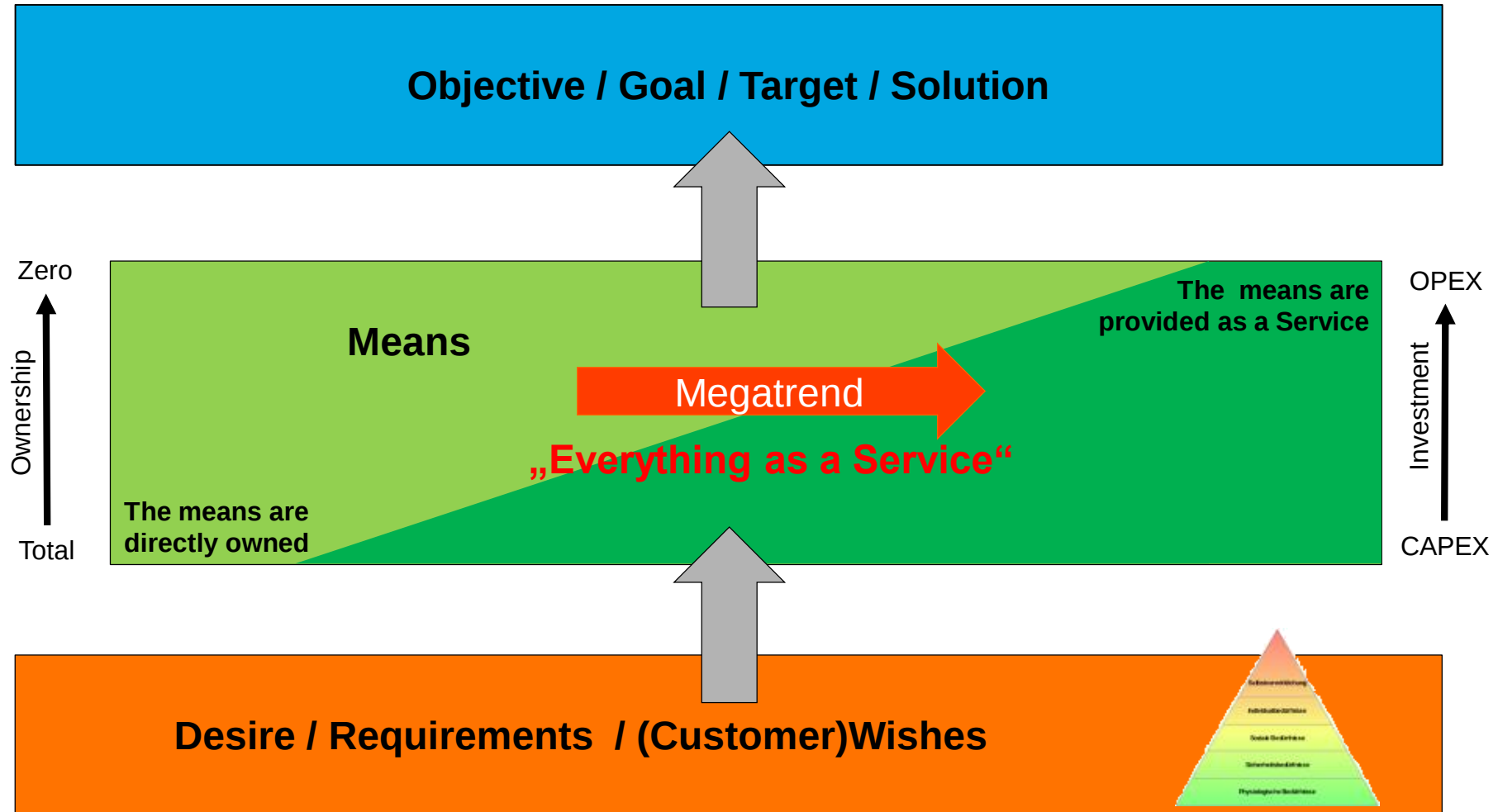
Number of installed industrial robots per 10,000 employees in the manufacturing industry 2016



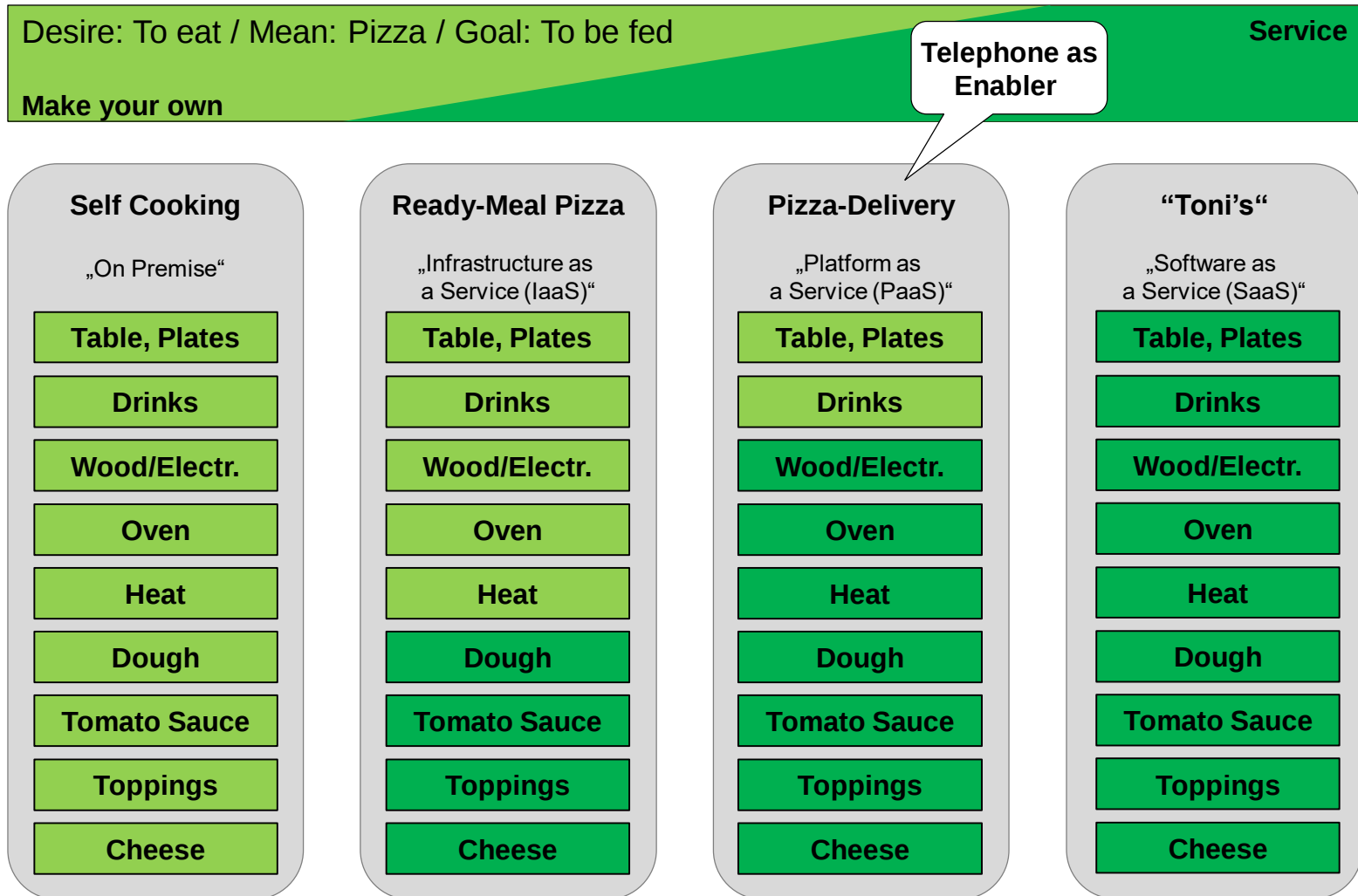
Robots & Full Automation create Jobs !



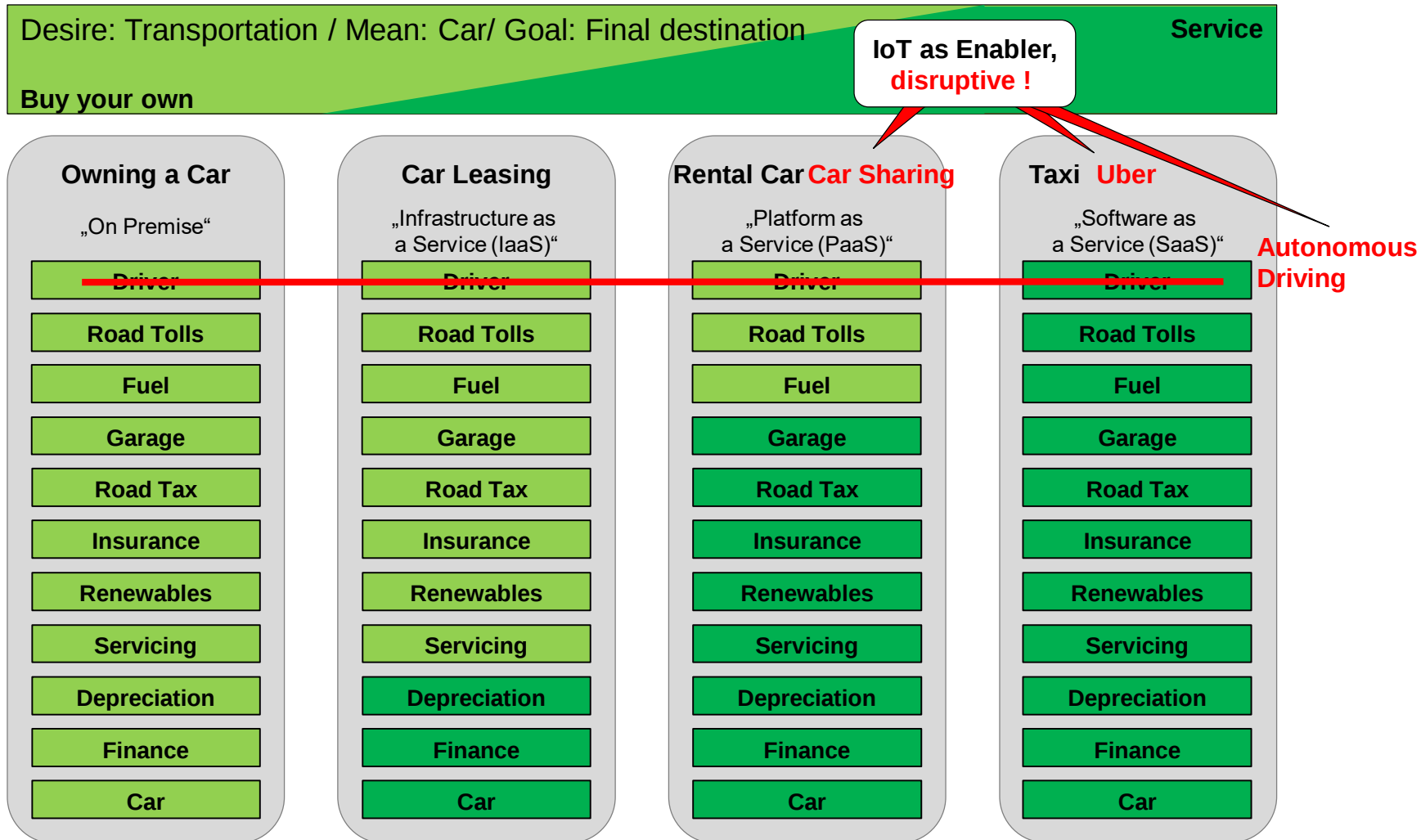
Megatrend: Use instead of own = Everything as a Service



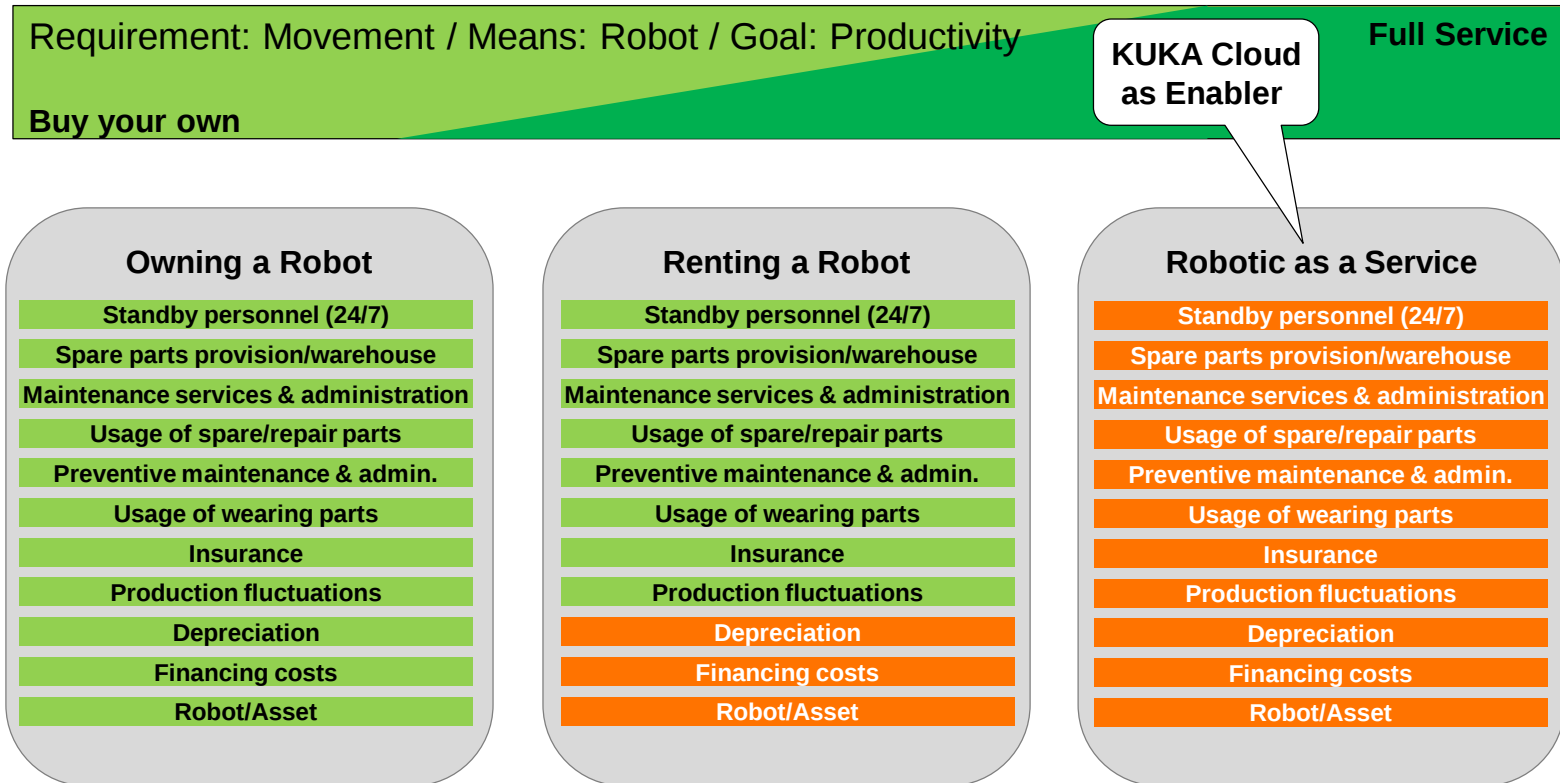
Example: „Pizza as a Service“



Example: „Car as a Service“



New Business Model: „Robotic as a Service“

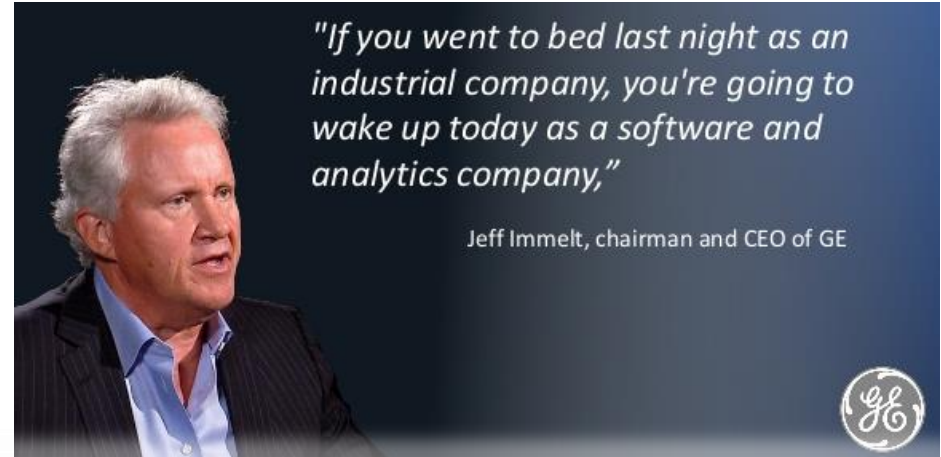


Megatrend: Software is Eating the World...

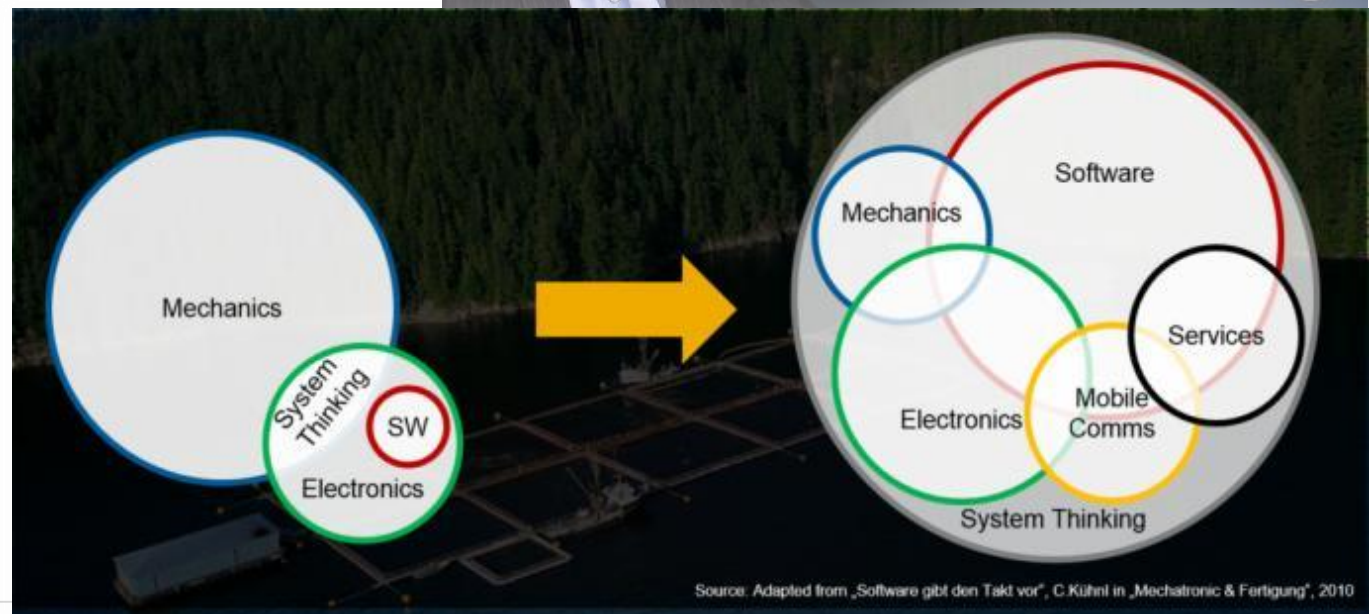
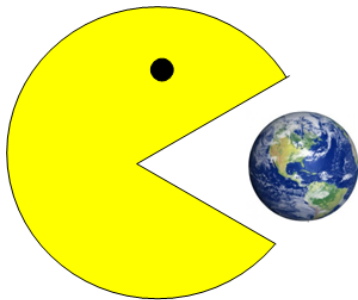


Mark Andreessen, founder of Netscape & renowned VC, 2011 in the WSJ

“Software is eating the world, in all sectors.
In the future every company will become a software company”



Jeff Immelt, chairman and CEO of GE



Megatrend: Software Defined Everything

- “Software Defined...”
 - ...Networks”
 - ...Storage“
 - ...Data Center“
 - ...Radio“ (SDR)
 - ...Cars“
- } **IT-Topics**

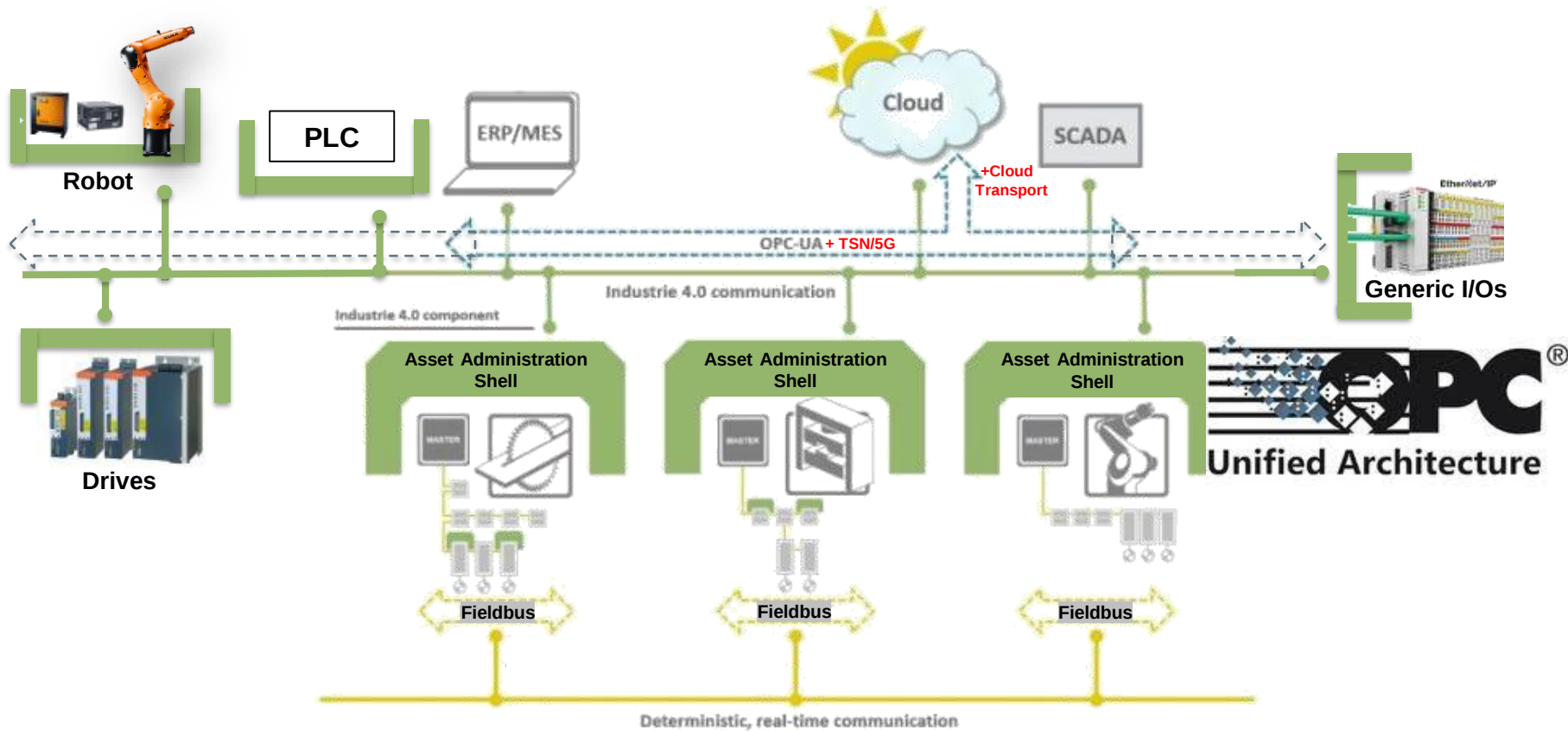


Tesla-Email vom 25. Oktober 2015

Es ist unser Anspruch, unermüdlich an der Weiterentwicklung des Model S zu arbeiten. Mit der Softwareversion 7.0 und der Erweiterung der Autopilot-Funktionen ist uns jetzt ein weiterer wichtiger Schritt in diesem Bestreben gelungen. Das aktuelle Software-Update nutzt die einzigartige Kombination aus Kameras, Radar, Ultraschallsensoren und Daten, um das Model S in der Fahrspur zu halten, einen Spurwechsel durchzuführen und die Geschwindigkeit an die Verkehrslage anzupassen.

Am Zielort scant das Model S die Gegend nach einem freien Parkplatz und führt auf Ihren Befehl hin den Längsparkvorgang eigenständig durch.

Megatrend: Software Defined Machines



- All automation devices and machines have their semantic self description in the Asset Administration Shell using the Industry 4.0 M2M standard OPC UA

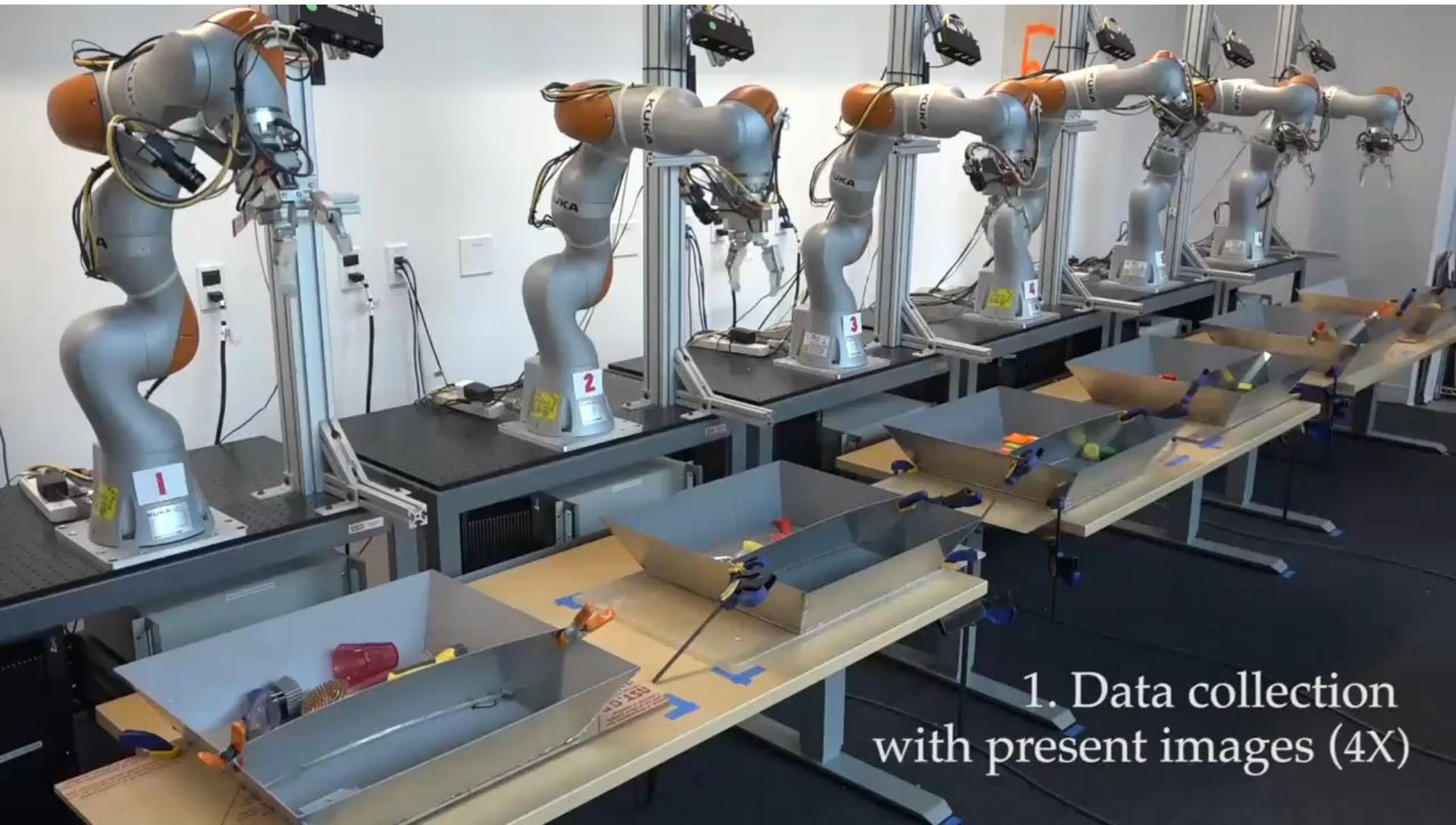


Intelligente Matrix-Produktion

https://www.youtube.com/watch?v=ol_vrpc-n2E



<https://www.youtube.com/watch?v=Pyb7kBCKxJc>



<https://www.youtube.com/watch?v=WR5WUKXUQ8U&feature=youtu.be>

Megatrend: „Platformization“ in the Cloud

Examples for Platform-based business:

- Apple iTunes, later App Store (“Mother” of all Platforms)
- Facebook, Amazon, Ebay, Google, WhatsApp, SnapChat, Flickr, Netflix, Spotify, LinkedIn, ...
- **“Shareconomy”** and **“Prosumers”** are based on platforms
 - Uber: Biggest Taxi company without a single car
 - Airbnb: Biggest hotel chain without a single hotel
 - Wikipedia: Biggest library without a single book
 - Open Source on Github, etc.: Biggest Software source Code Collection
 - Solar Panels on private houses (Producer + Consumer)
- **Distributed Ledgers** like Blockchain, IOTA, ...
 - The “Mediators” are getting obsolete, i.e. Currencies without Banks (Bitcoin), Land Registers, any Administration, Smart Contracts, etc.

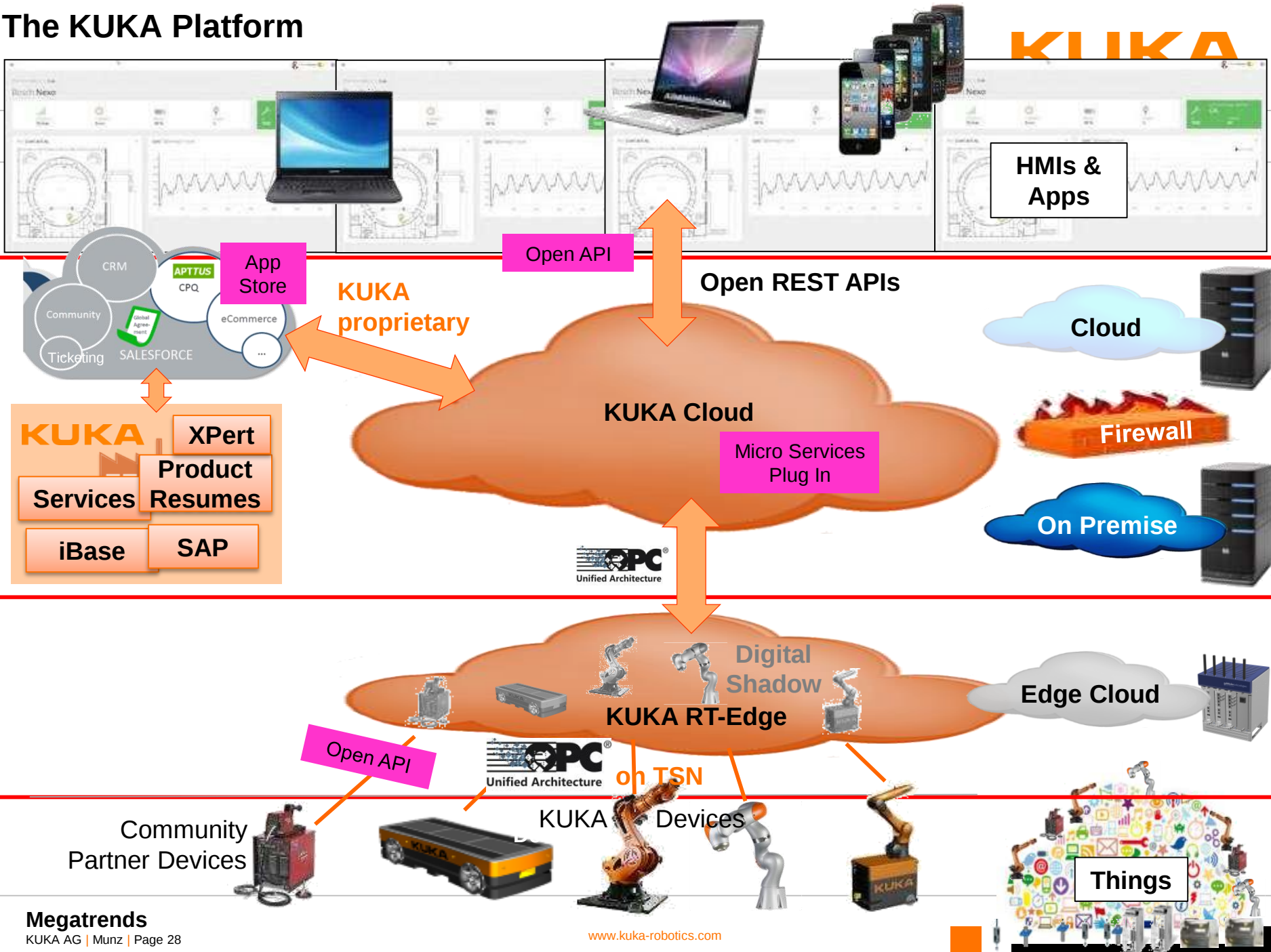


UBER

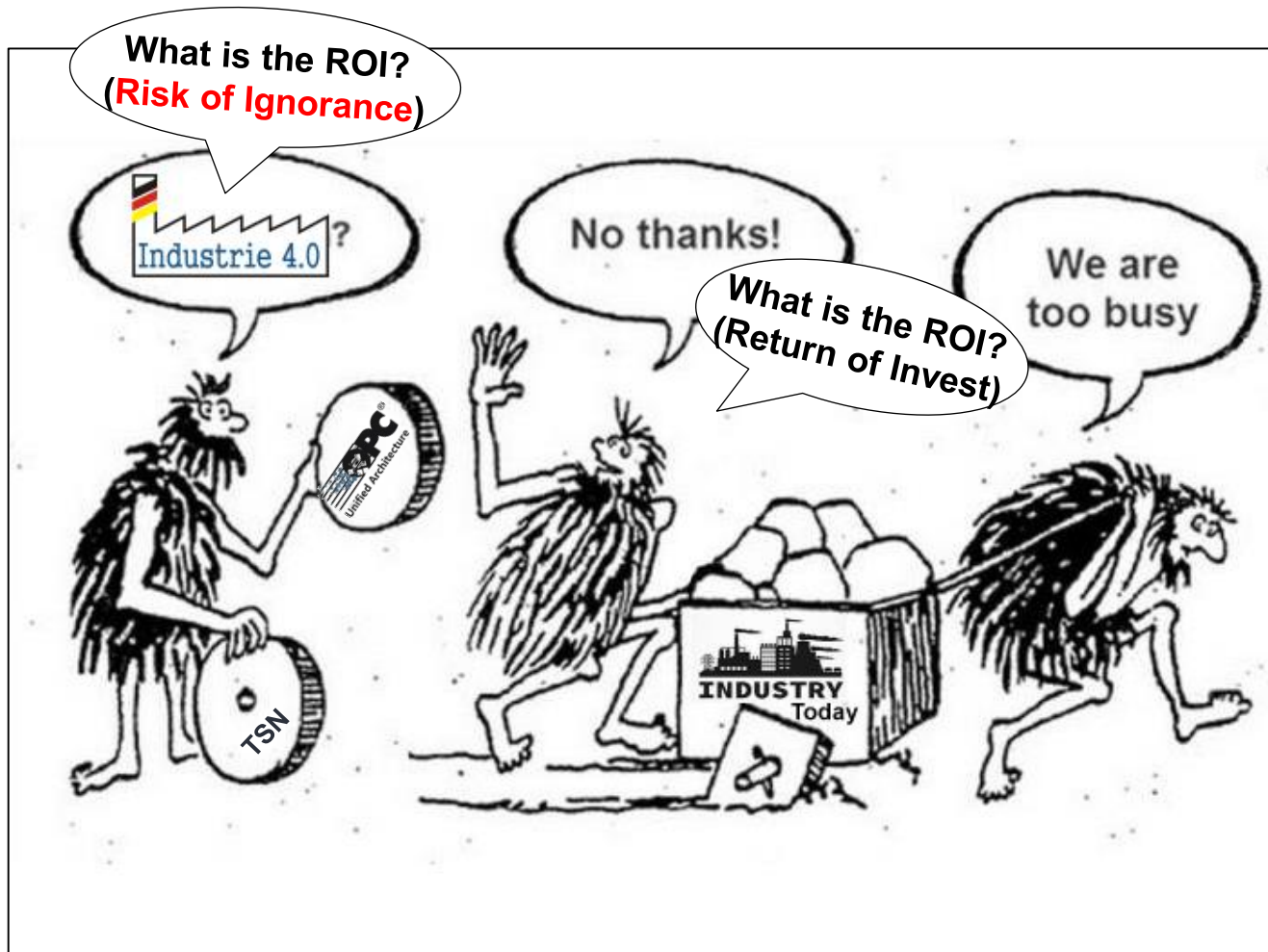


WIKIPEDIA
The Free Encyclopedia

The KUKA Platform



Don't ask for ROI, ask for ROI!



Thank you for your attention!