

4차 산업혁명 독일 전문가 초빙 세미나

4차 산업혁명과 미래전략

(The 4th Industrial Revolution and Our Future Strategy)

| 일시 | 2017년 11월 2일(목), 09:30~11:30

| 장소 | 국회 의원회관 제8간담회실

프로그램

❖ 세미나 개요

- 일시 : 2017.11. 2.(목), 09:30~11:30
- 장소 : 국회의원회관 제8간담회실
- 주최 : 민주연구원 / 프리드리히 나우만재단 / 국회신성장산업포럼
- 언어 : 영어(순차통역)
- 참석대상 : 국회의원 및 보좌진, 일반인 누구나

❖ 주제 및 연사

- 주제 : **인더스트리4.0 - 제조업의 혁신적인 변화**
(Industry 4.0 - Revolutionary Changes in Manufacturing)
- 연사 : **볼프강 도르스트(Wolfgang Dorst)**
- Bitkom(독일 정보통신산업협회) 4차 산업혁명 담당 부서장

❖ 진행순서

- 개 회 : 기관소개, 발표자 및 참가자 소개(5분)
- 인사말 : **김민석** 민주연구원 원장(5분)
라스 안드레 리히터 프리드리히 나우만재단 대표(5분)
김진표 국회의원/국회신성장산업포럼 대표(5분)
- 발표 및 토론(100분)
 - 좌장 : **김병관** 국회의원
 - 발표 : **볼프강 도르스트** Bitkom 4차 산업혁명 담당 부서장(40분)
 - 지정토론 : **김인숙** KDI 초빙연구위원(20분)
 - 질의응답 및 자유 토론(40분)

연사 및 기관 소개

1 연사 약력(볼프강 도르스트, Wolfgang Dorst)

- 현재 독일 Bitkom 4차 산업혁명 담당 부서장(Head of Industrial Internet at Bitkom)을 맡고 있음

* **Bitkom(Germany's digital association; 독일 정보통신산업협회)**: SW개발, 정보통신, 제조, 디지털미디어사로 구성된 협회로, 2,300여개 디지털 기업, 1,000여개의 중소기업, 300여개의 스타트업이 가입되어 있음



- Labs Network Industrie 4.0 e.V. (대기업과 산업계 협회, 중소기업, 실험실을 연결하기 위한 글로벌네트워크 프로젝트)의 이사(a board member)
- 독일 연방정부의 디지털서밋 (Digital Summit) 산하의 Plattform Industrie 4.0 전문가로 Bitkom을 대표하고 있음
 - * **디지털서밋(Digital Summit)** : 독일 메르켈수상과 IT부문 대표 정상들이 만나는 10년 이상 된 회의로 디지털경제 핵심 아젠다를 수행하는 것이 목표
 - * **Plattform Industrie 4.0(정책설계 소통플랫폼)** : 중소기업, 협회, 노동계가 함께 4차 산업혁명의 밑그림을 그릴
- 2013~2015년간 Bitkom, VDMA, ZVEI가 진행한 'predecessor initiative'를 공동으로 설립. 그 이전에는 독일 연방정부의 Research Alliance에서 Industrie 4.0(4차 산업혁명) working group의 저자 모임의 멤버 역임함
- Wolfgang Dorst | Head of Industrial Internet | Bitkom e.V.

Wolfgang Dorst is Head of Industrial Internet at Bitkom. He is a board member of the Labs Network Industrie 4.0 e.V. and represents Bitkom as an expert in the PLATTFORM INDUSTRIE 4.0 that is part of the Digital Summit of the Federal Government. He is co-founder of the predecessor initiative, which was conducted from 2013-2015 by Bitkom, VDMA and ZVEI. Previously, he

was a member of the Authors team of the Working Group Industrie 4.0 at Research Alliance of the Federal Government.

Dorst worked more than 10 years as a market developer for strategic projects in the ICT industry. He led complex projects in Berlin in technological and political regulation and coordinated activities in the energy sector and in the public sector with a longstanding focus on Healthcare. He worked closely with solution partners and engaged themselves already then in the IT Summit. Wolfgang Dorst looks back to more than 30 years of experience in the IT and communications market – many years of which in sales and technical functions. Prior to joining Bitkom he worked at Oracle, Sun Microsystems, Cisco Systems, Amdahl and Digital Equipment. Starting point of the career makes the apprenticeship as skilled worker and electrical engineering studies.

2 프리드리히 나우만재단(Friedrich Naumann) 소개

Friedrich Naumann
STIFTUNG FÜR DIE FREIHEIT

프리드리히 나우만재단은 1958년 설립된 독일의 비영리 정책연구기관이다.

재단은 정책연구와 시민교육을 통해 개인의 자유와 책임의식을 고취하며 시장경제원칙, 법치주의 그리고 인권발전을 도모한다는 활동목표를 가지고 있다. 이 같은 자유주의원칙을 전파하기 위해 재단은 세미나, 컨퍼런스 등을 개최하고, 출판사업 및 국내외 정치 동향을 분석하고 있다. 지난 50여 년간 재단은 세계 70여 개국에 진출, 활동해 오고 있다.

국내 활동

프리드리히 나우만재단 한국사무소는 1987년부터 국내 활동을 시작했다. 주요 활동분야는 크게 지방자치와 시장경제의 발전 및 한반도에 중점을 둔 지역안보로 요약할 수 있다. 한양대학교 지방자치연구소와 더불어 지방정부로의 권한 이양을 지원하고 있으며, 경남대학교 극동문제연구소 및 제주평화연구원과 함께 동북아 안보 체제 구축에 기여하고 있다.

북한 내 활동

нау만재단 한국사무소는 또한 통일과 유럽통합을 이끈 독일의 경험을 바탕으로 남북대화 활성화에 기여하고 있다. 2002년부터 북한의 경제 발전과 근대화를 지원하고 있으며,

시장경제, 도시 개발 및 재생가능 에너지 개발 분야의 지식 전파에 힘써오고 있다.

동아시아 역내 협력

프리드리히 나우만 재단은 ‘아시아 자유민주협의회’ 와 ‘아시아 경제자유 네트워크’ 등의 단체를 통해서 자유주의를 추구하는 역내 싱크탱크, 정치인들이 함께 모여 다양한 토론과 강연 등을 진행하고 있다.

3 국회신성장산업포럼 소개

1. 구 성 (총 13名)

□ 인적구성(의원)

- 공동대표 : 김진표(더불어민주당), 홍영표(더불어민주당, 환경노동위원회 위원장)
- 연구책임의원 : 홍익표(더불어민주당, 산업통상자원위원회 간사)
- 회원의원 / 가나다順
 - 더불어민주당(11名): 김병관, 김영진, 김진표, 박광온, 백재현, 백혜련, 신동근, 전해철, 홍익표, 홍영표, 황희
 - 자유한국당(2名): 김광림, 김성태

※ 준회원 및 「신성장포럼」 연구반(반장:) 구성
산업통상자원위원회 위원, 중기중앙회, 산업연구원 신성장산업연구실,
관련 업계(포스코, 삼성, LG, 현대차), 학계
이낙연 전남도지사, 원희룡 제주지사 등 지자체장

2. 비전

□ 대한민국 100년 먹거리를 책임지는 신성장산업정책 입안

3. 운영목표

- ① 선도적으로 미래의 먹거리를 창출하는 신성장산업
- ② 든든한 일자리를 창출하는 신성장산업
- ③ 경제발전과 환경보전이 공존하는 신성장산업

4. 논의주제

- ☐ 게임산업, 제2의 벤처붐 조등 등 정보통신 분야 지원정책개발연구
- ☐ 전기차, 수소차 등 미래자동차 산업과 파생산업 정책연구
- ☐ 융합소재, 탄소 및 고분자소재, 나노소재, 바이오, 생화학소재산업 발전대책 수립 및 정책개발연구
- ☐ 환경산업, 기후변화, 환경정책 연구
- ☐ 환경 친화, 신재생에너지산업(태양, 풍력, 바이오, 폐기물, 수소에너지 등) 및 차세대 전력산업 연구 및 지원방안 강구
- ☐ 제조 혁신 스마트 제조기반산업(스마트공장, 디지털제작, 지능형 생산시스템 등) 지원정책연구
- ☐ 제조업과 서비스 융합-IT융합기반산업(사물인터넷, SW융합, 스마트시티, 가상현실 등), 바이오헬스케어산업 지원정책개발
- ☐ 차세대성장 동력사업 발굴, 주요성과 분석 및 조기정착 지원 등
- ☐ 지역별 성장동력사업 활성화 행사(지자체 행사와 연계/지자체의원 준회원 영입 추진)

목차

■ 프로그램

■ 연사 및 기관소개

■ 목차

❖ 발표문

● 인더스트리 4.0 - 제조업의 혁신적인 변화 1

볼프강 도르스트(Wolfgang Dorst)

Bitkom(독일 정보통신산업협회) 4차 산업혁명 담당 부서장

❖ 토론문

● Scientific Dialogue in INDUSTRY 4.0 41

김인숙 KDI 초빙연구위원

발 표 문

인더스트리4.0 – 제조업의 혁신적인 변화

볼프강 도르스트(Wolfgang Dorst)

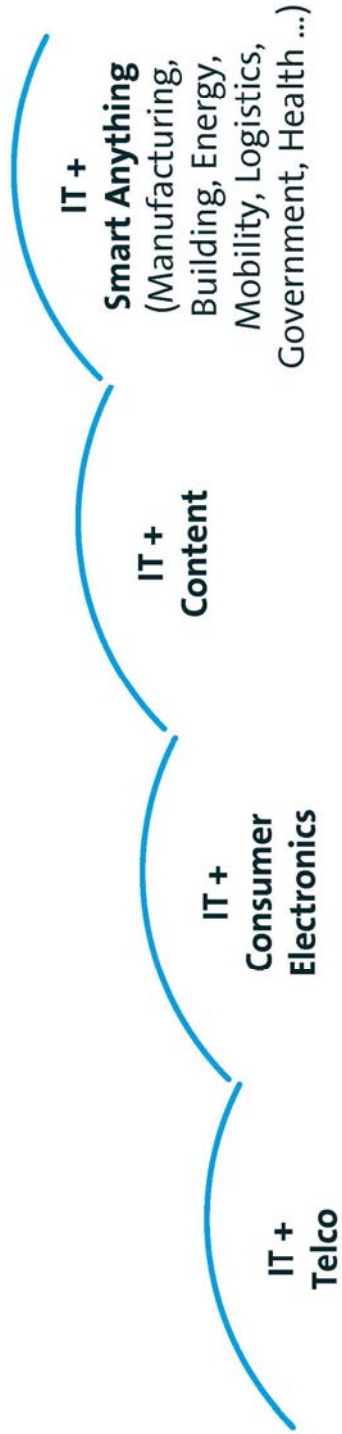
Bitkom(독일 정보통신산업협회) 4차 산업혁명 담당 부서장

DEGREED ENGINEER

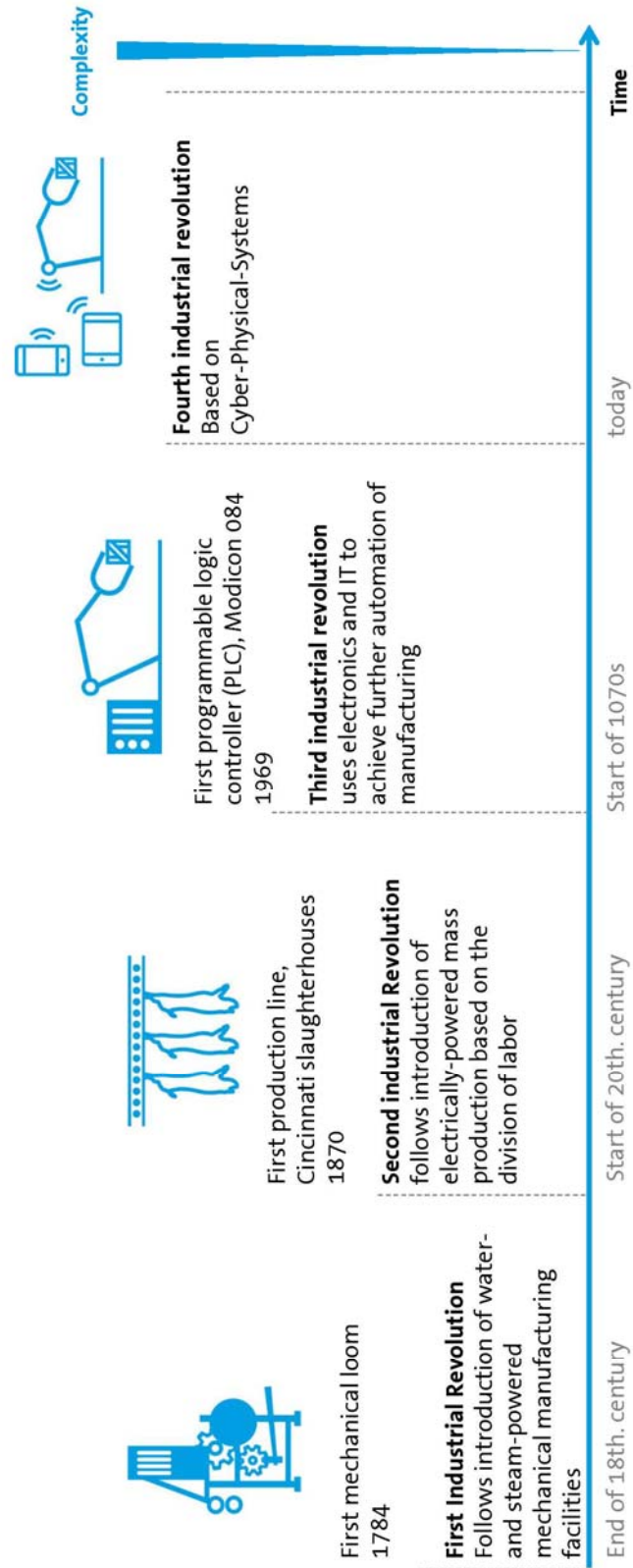




Four waves of convergence

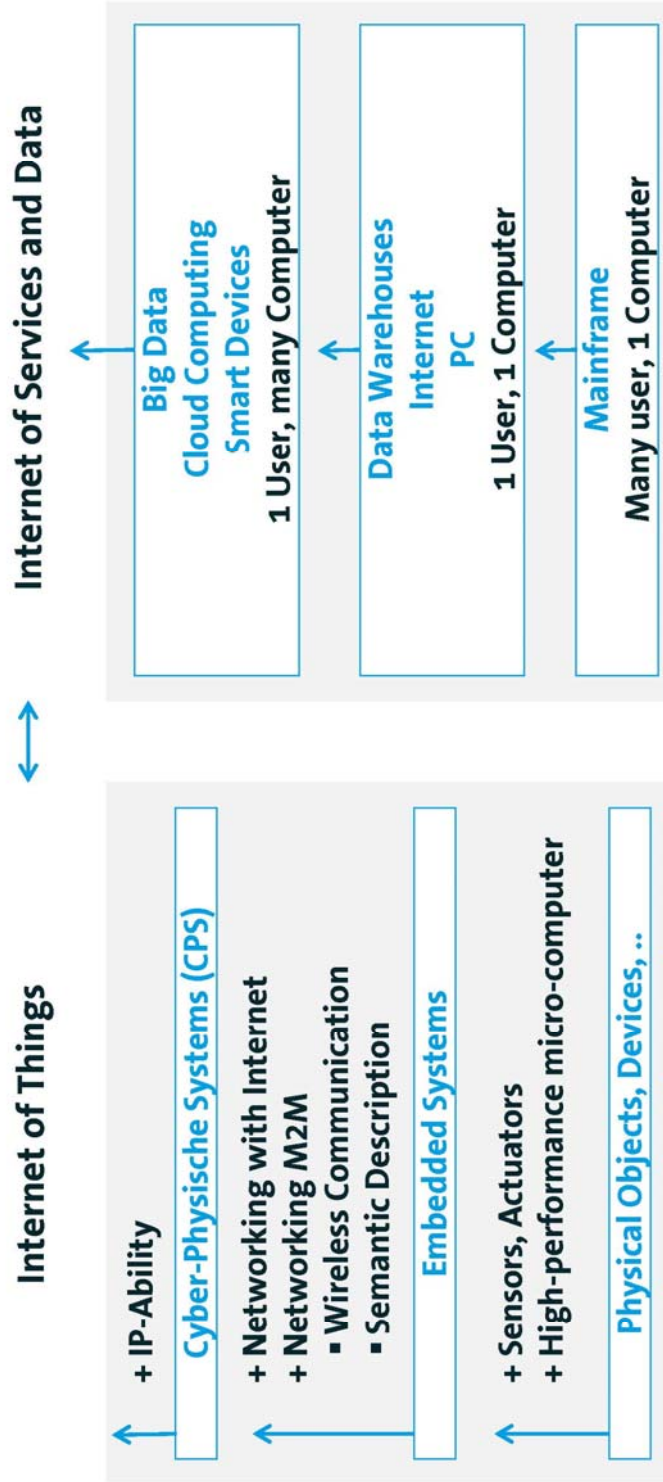


From Industrie 1.0 to Industrie 4.0



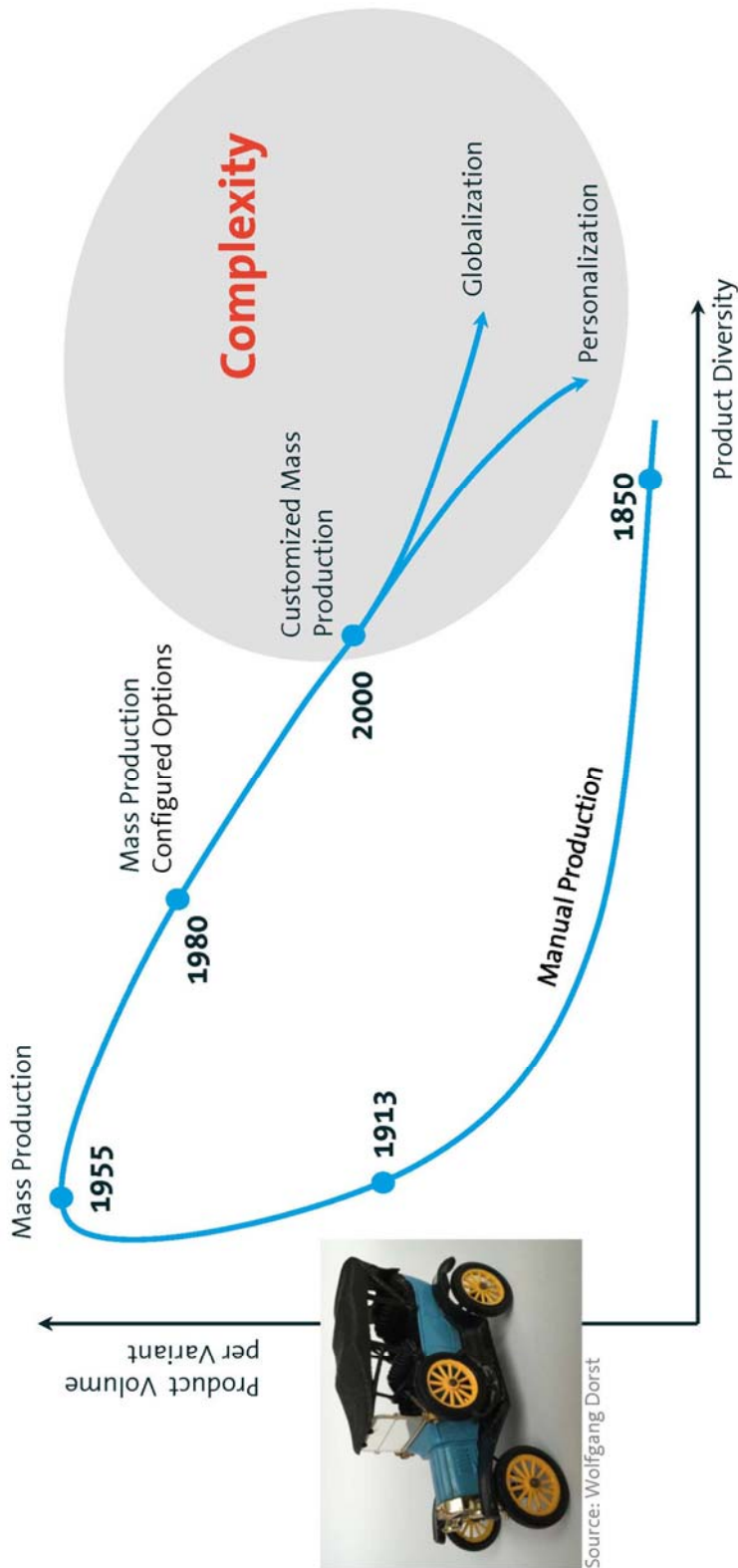
3 Source: DFKI/Bitkom

Innovation driver: two convergent technology developments



4 Quelle: Forschungsunion Wirtschaft – Wissenschaft

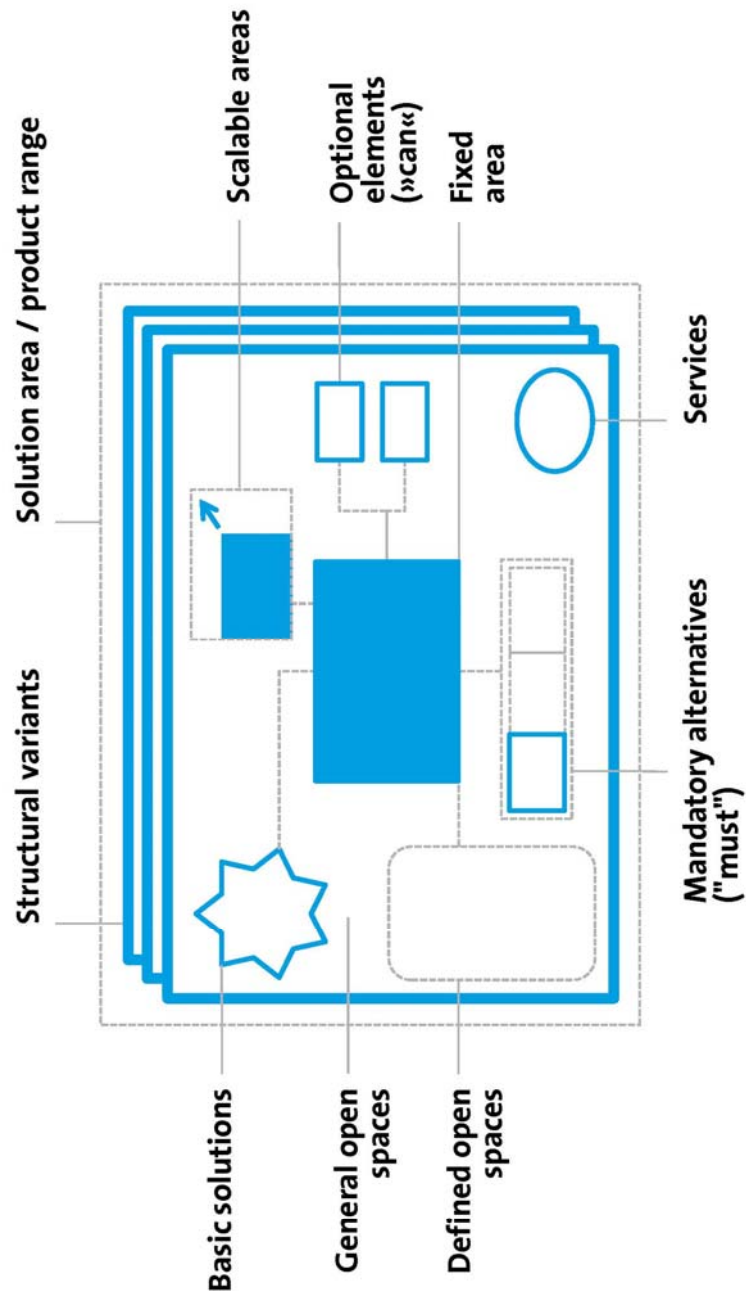
Motivation Individualization



Source: Wolfgang Dorst

5 Source: Bauernhansl, ten-Hompel, Vogel-Heuser: Industrie 4.0 in Produktion, Automatisierung und Logistik“, Springer Vieweg, 2014

Model of product structure with degrees of individualization



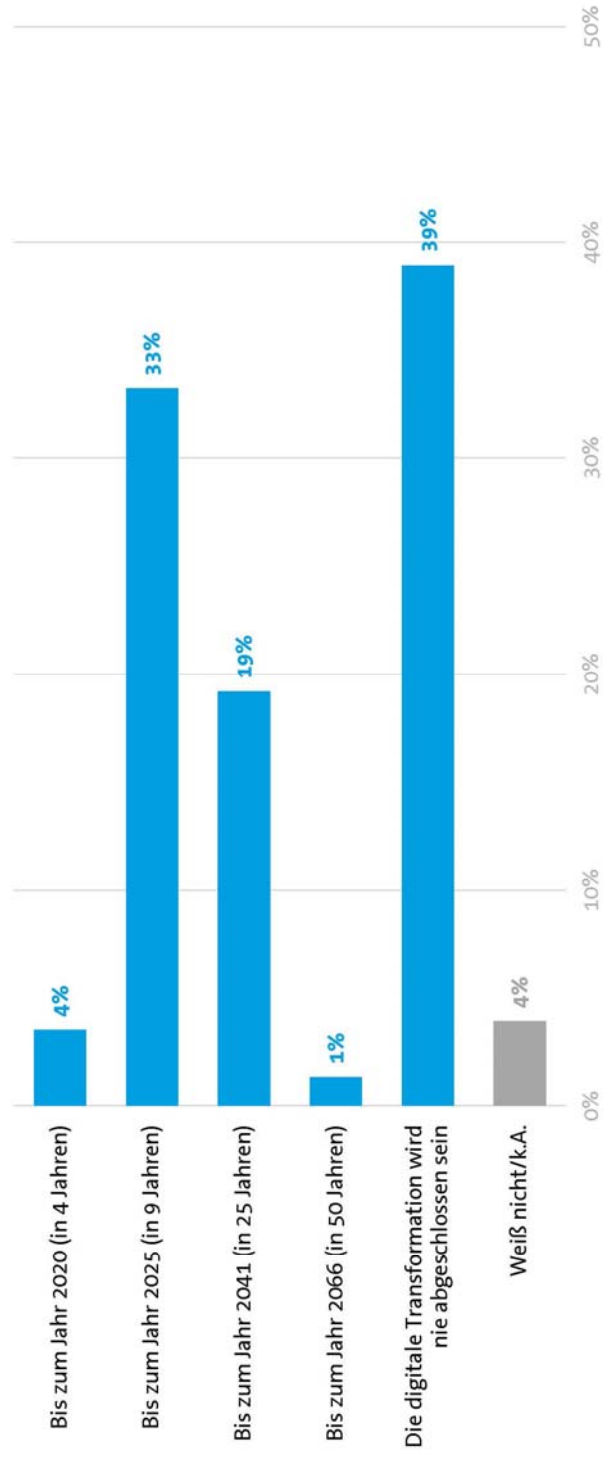
6 Source: Prof. Lindemann, Maurer, Individualisierte Produkte, 2006; Bitkom

Impetus for Industrie 4.0



Digitale Transformation der Wirtschaft

Wann meinen Sie, wird die digitale Transformation der deutschen Wirtschaft weitgehend abgeschlossen sein?



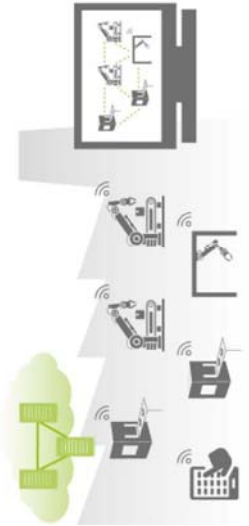
8 Basis: all ICT-Enterprises | Source: Bitkom Research, 50. Branchenbarometer

Four important aspects of Industrie 4.0

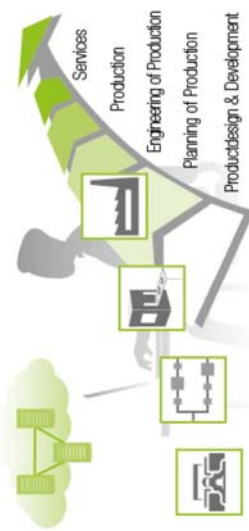
Horizontal integration via value-added networks



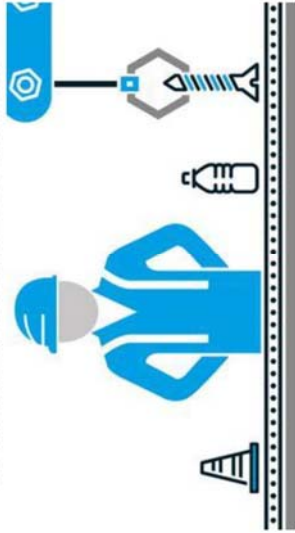
Vertical (integration and networked production systems)



Digital consistency for the engineering throughout the whole value-added chain



The human being as a conductor for added value



9 Source: Plattform Industrie 4.0 / Implementation Strategy Industrie 4.0 Report on the results of the Industrie 4.0 Platform, April 2015

Definition Industrie 4.0

The term industry 4.0 represents the fourth industrial revolution, **a new level of organization and control of the entire value chain** across the lifecycle of products and production systems.

This cycle is based on the increasingly **individualized customer requirements** and extends from the idea to consider the order from the development and production, the delivery of a product to the end customer to recycling, including the related services (e.g. engineering, simulation, production, logistics).

Base is the **availability of relevant information in real time** through networking of all entities involved in the value creation and the **ability to derive the optimum value flow at all times from the data** .

Real-time optimized and self-organizing, **enterprise-wide value networks** will arise by connecting people, objects and systems dynamically. These can be optimized according to various criteria such as cost, availability and resource consumption.

¹⁰ Source: Plattform Industrie 4.0, 2013

Standards



**»The nice thing about
standards is that you have so
many to choose from.«**

**Andrew Stuart Tanenbaum,
Computer Scientist**

¹¹ Source: michaklootwijk - fotolia.com

Wallet
WeChat Pay

Quick Pay

Balance
¥13.68

Cards

Powered by Tencent

| | | |
|-----------------|---------------|-----------------|
| Transfer | Mobile Top Up | Wealth |
| QQ Coins | Utilities | Public Services |
| Card Repay | Red Packet | Go Dutch |
| Tencent Charity | | |

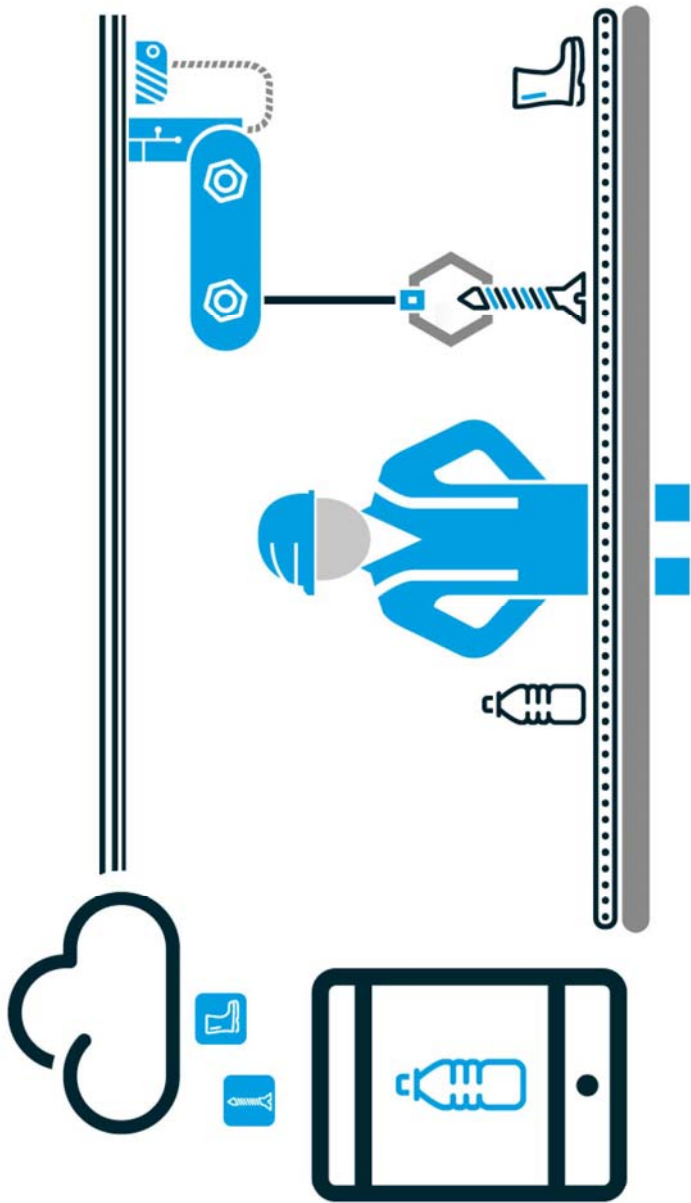
Integration of Applications

Digital Twin

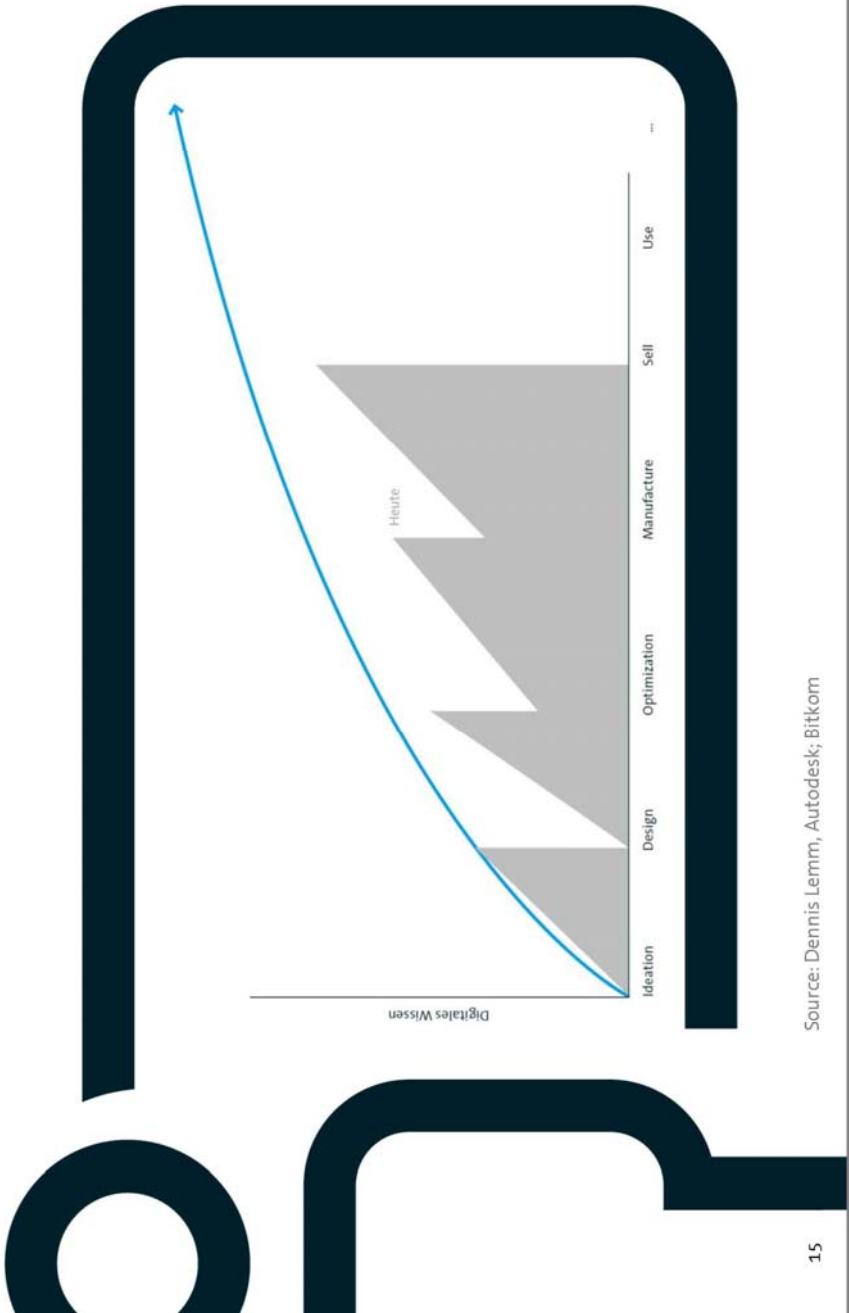
Characteristics of the real world for the information world



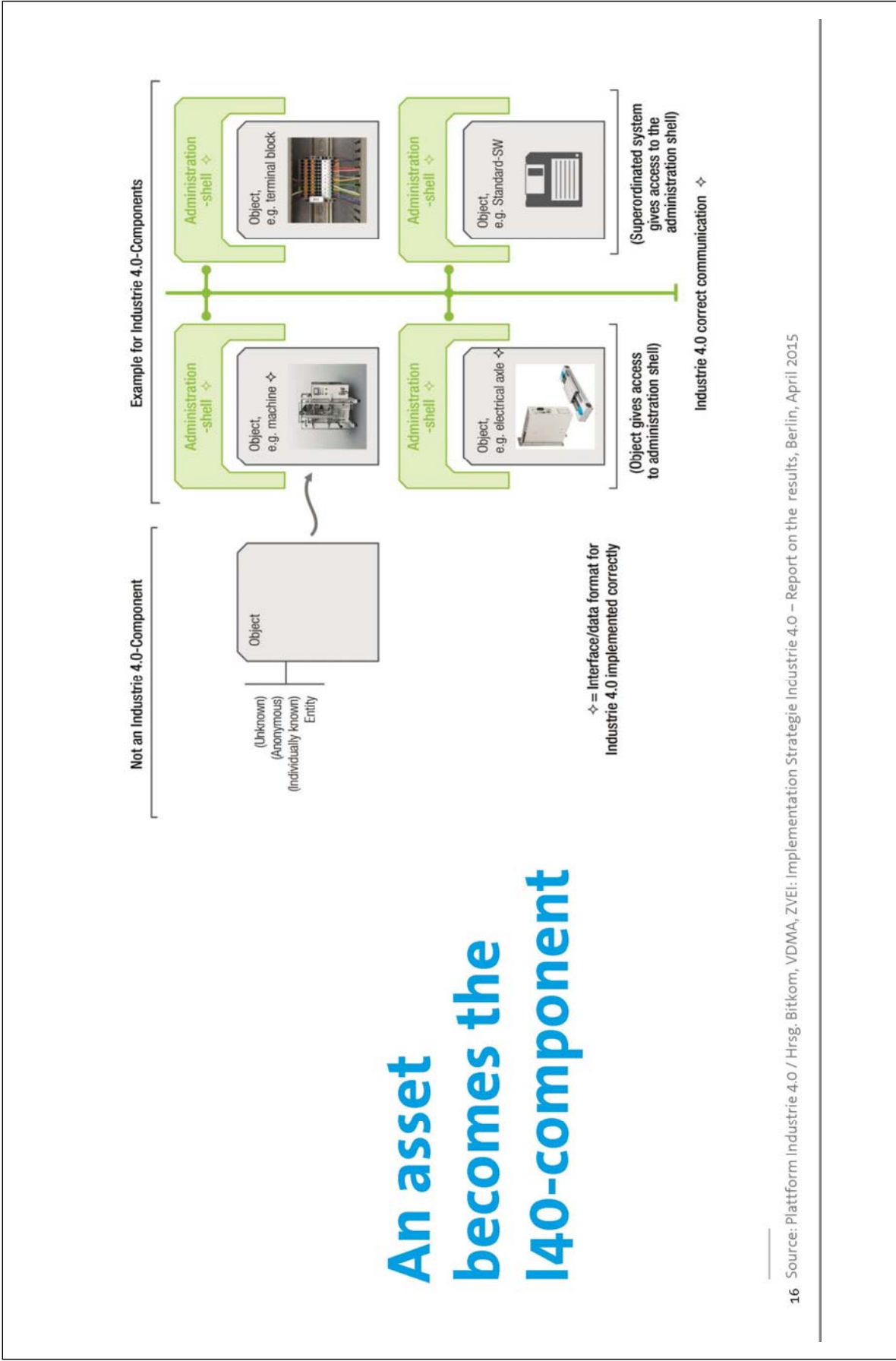
Embed objects into the world of information



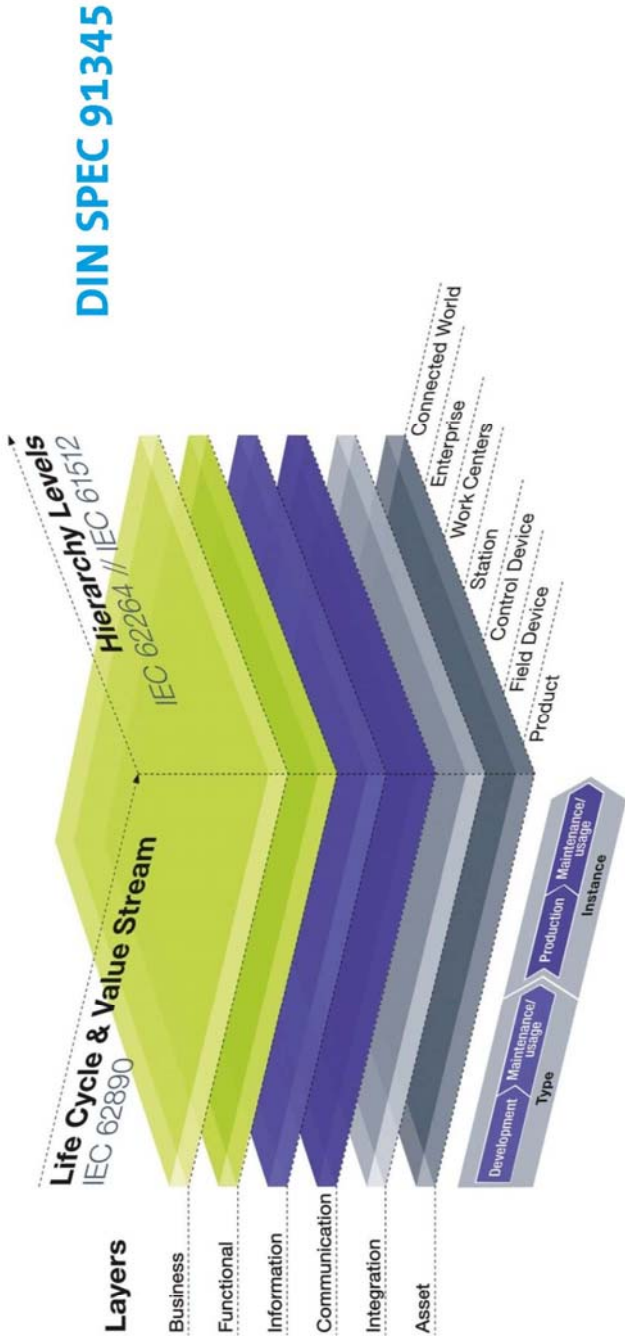
Digital Knowledge



Source: Dennis Lemm, Autodesk; Bitkom

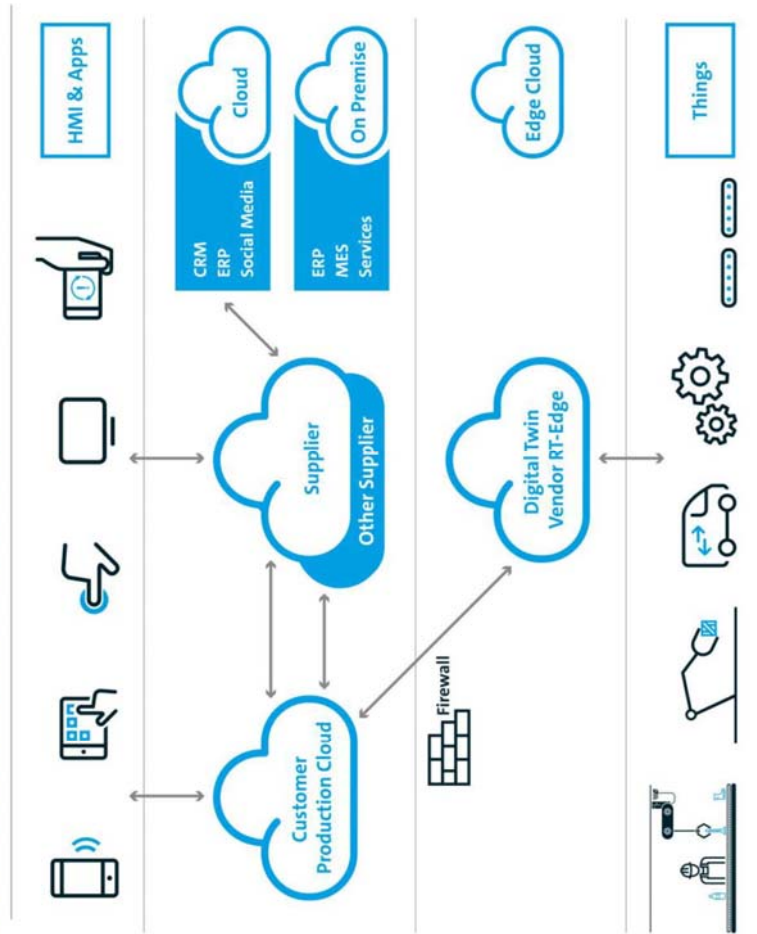


Referenzarchitekturmodell (RAMI 4.0)



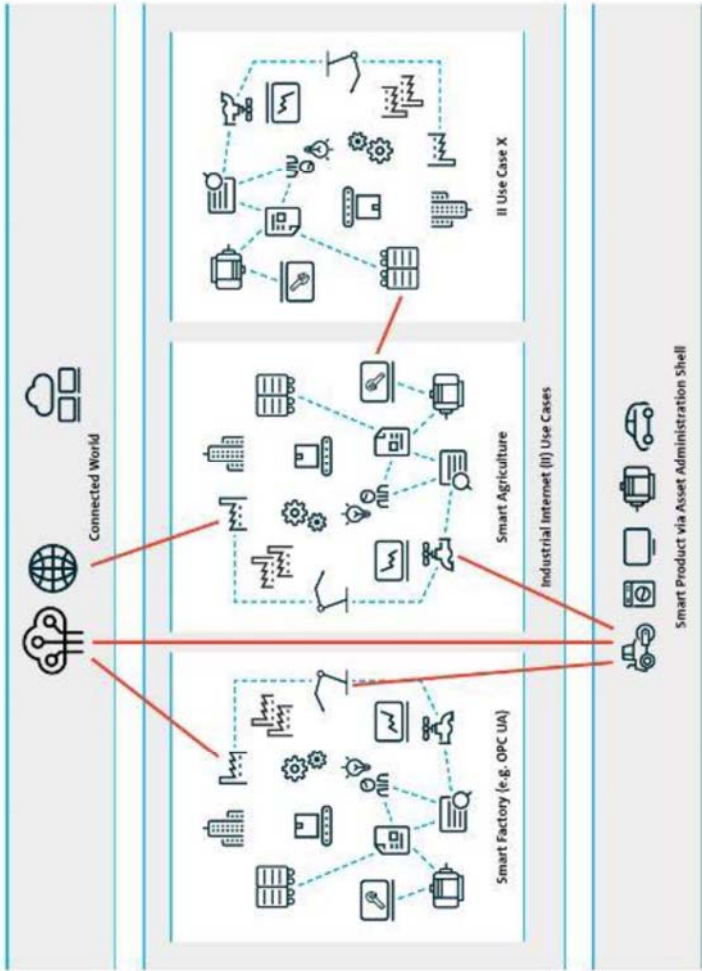
17 Source: Plattform Industrie 4.0 / Hrsg. Bitkom, VDMA, ZVEI: Implementation Strategie Industrie 4.0 – Report on the results, Berlin, April 2015

From Product to Connected World



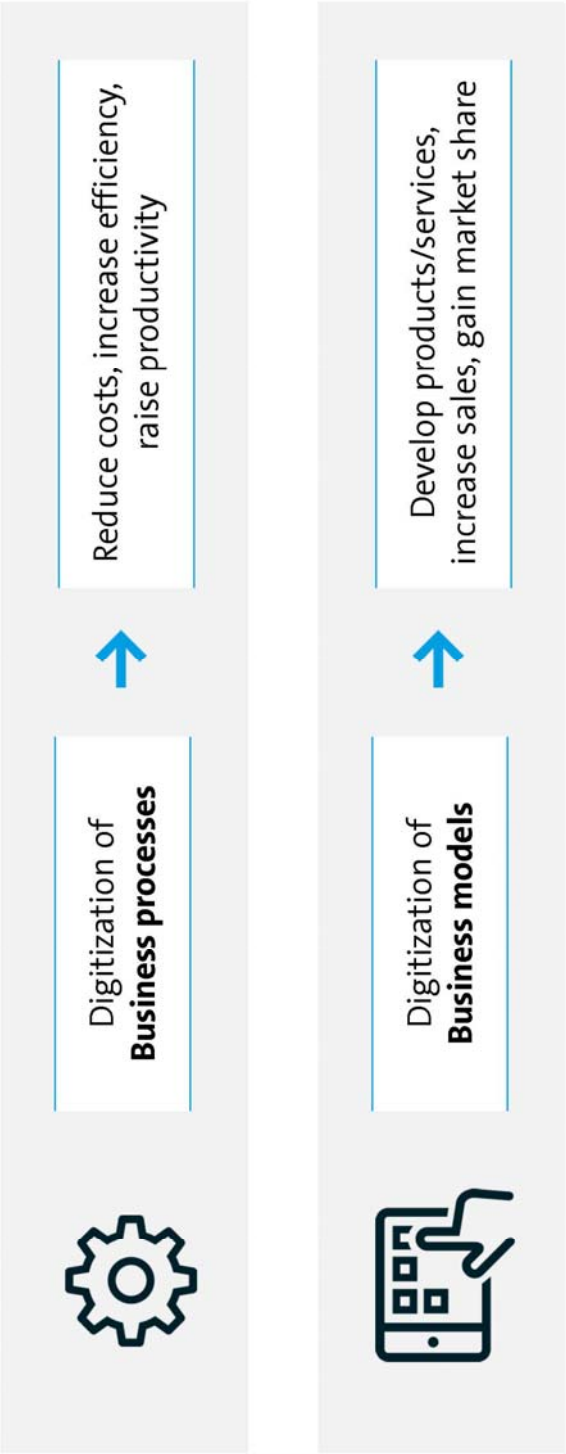
Source: Heinrich Munz, KUKA AG, Bitkom

Communication pattern in Smart Factory and Smart Agriculture



Source: Plattform Industrie 4.0, Dr. Alexander Willner, Bitkom

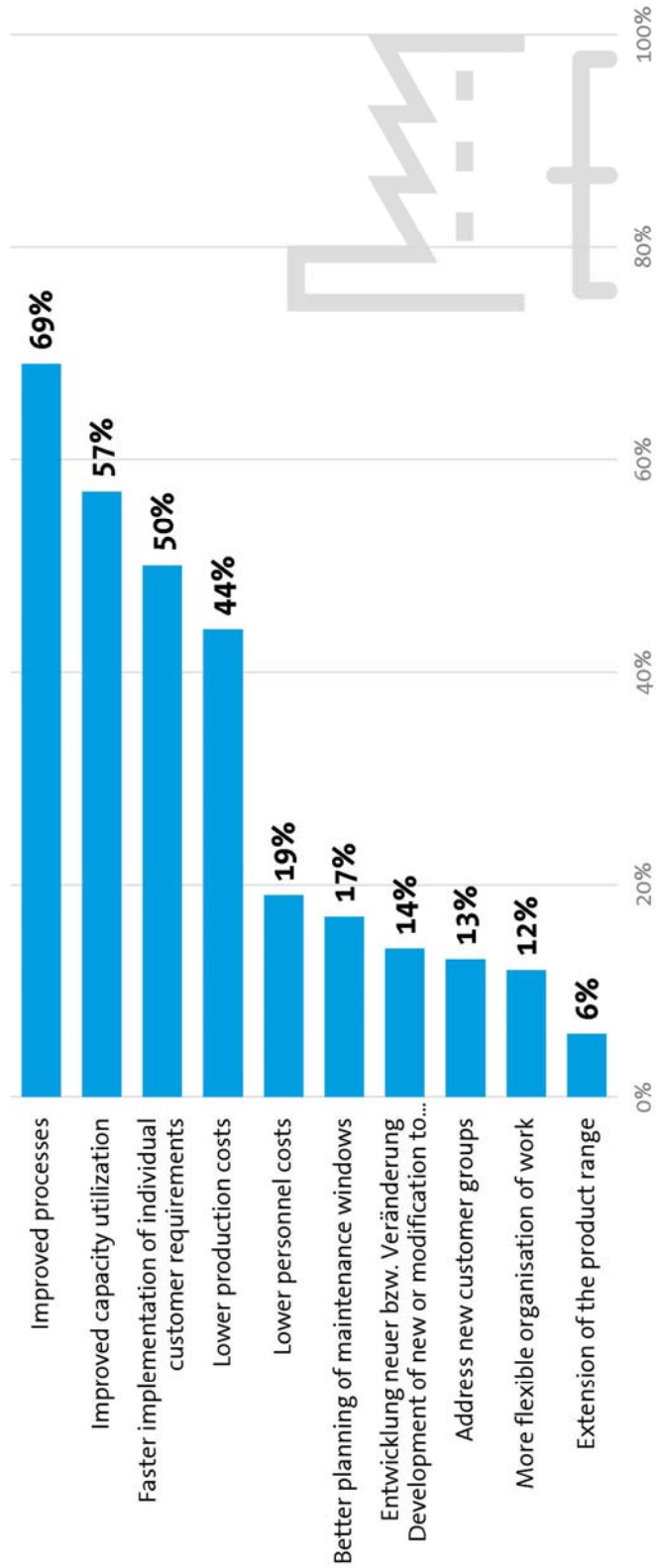
The potential of digitalization in the economy



Source: Bitkom

Top goals: Better processes and capacity utilization

What goals are you pursuing with the use of industry 4.0 applications in your company?*



21. Base: users and planners of industry 4.0-applications | * a Maximum of three answers possible | Source: Bitkom Research

Types of innovative digital business models

**Platform-Based
Business Models**



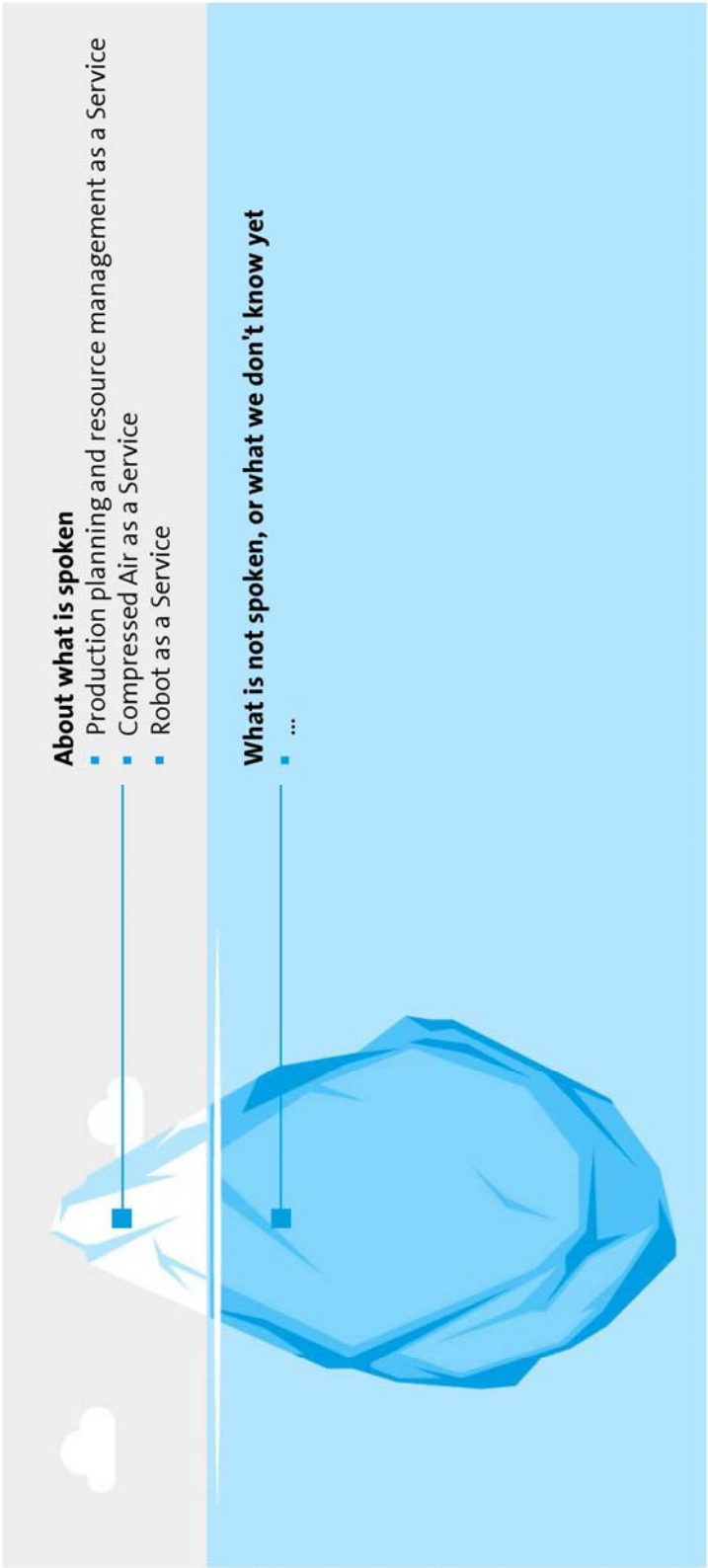
**Business models with
usage-dependent
remuneration**



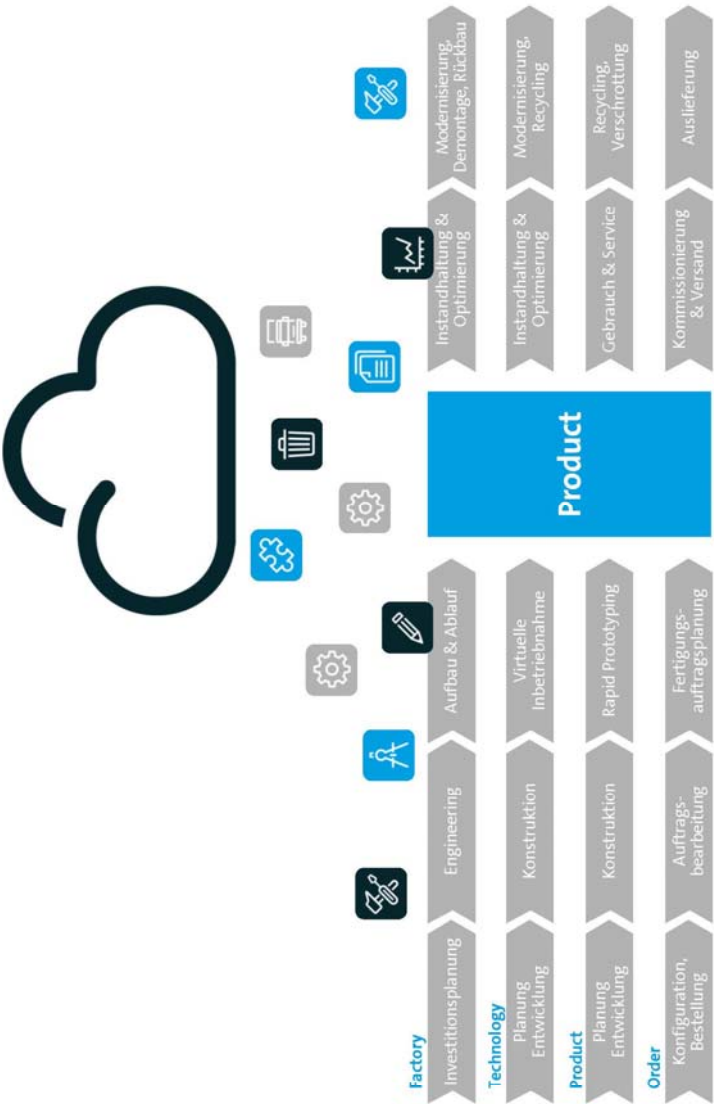
**Data-Based
Business Models**



Iceberg of business models



Industry apps replace classic software in businesses



24 Source: Bitkom, Fraunhofer IPA

Future projects of the High-Tech Strategy in 2011

Content Instrument of the Research-Alliance

For the areas of need...

- Climate/Energy
- Health/Nutrition
- Mobility
- Communication
- Safety



...promoter groups were

- developing future projects,
- Drivers of innovations and obstacles identified,
- Research tasks named,
- Roadmaps compiled
- Need of actions posed.



25 Source: Forschungunion Wirtschaft – Wissenschaft

The future projects in the area of need Communication in 2012

The selection was oriented towards the following guidelines:

- Orientation towards the societal obstacles and the key trends within the ITC-Technology.
- Focus on the consistent implementation in to market successes and the important sectors of Germany.

Future Project „Industrie 4.0“



Germany as manufacturing location shall be pushed, through the merging of technical processes with the business processes via ITC, in to a new digital era.

Future Project „Internet based services for the economy (Smart Service World)“



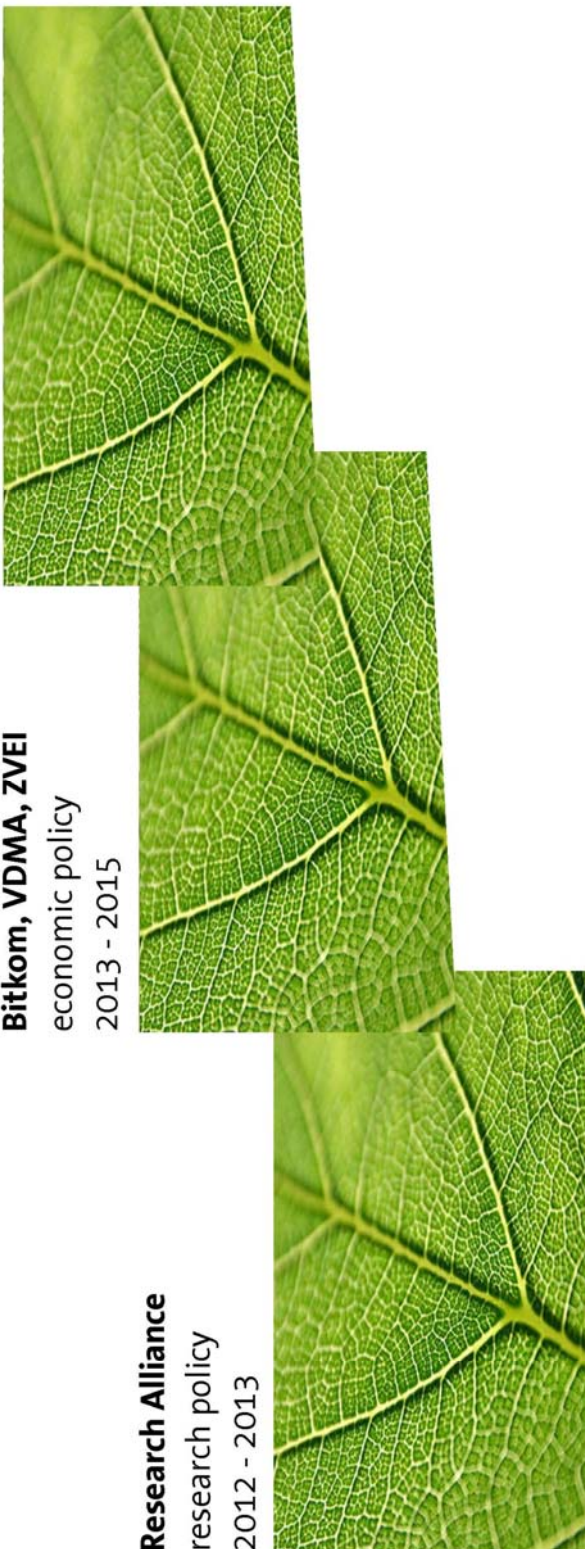
Through the use of secure cloud infrastructures and the delivery of new service-platforms, the framework for the online economy shall be set.

Evolution of the Initiative Industrie 4.0

IT Summit of the Federal Government
socio-politically
2015 -

Bitkom, VDMA, ZVEI
economic policy
2013 - 2015

Research Alliance
research policy
2012 - 2013



bitkom

VDMA

ZVEI:
Zentralverband
der Elektroindustrie

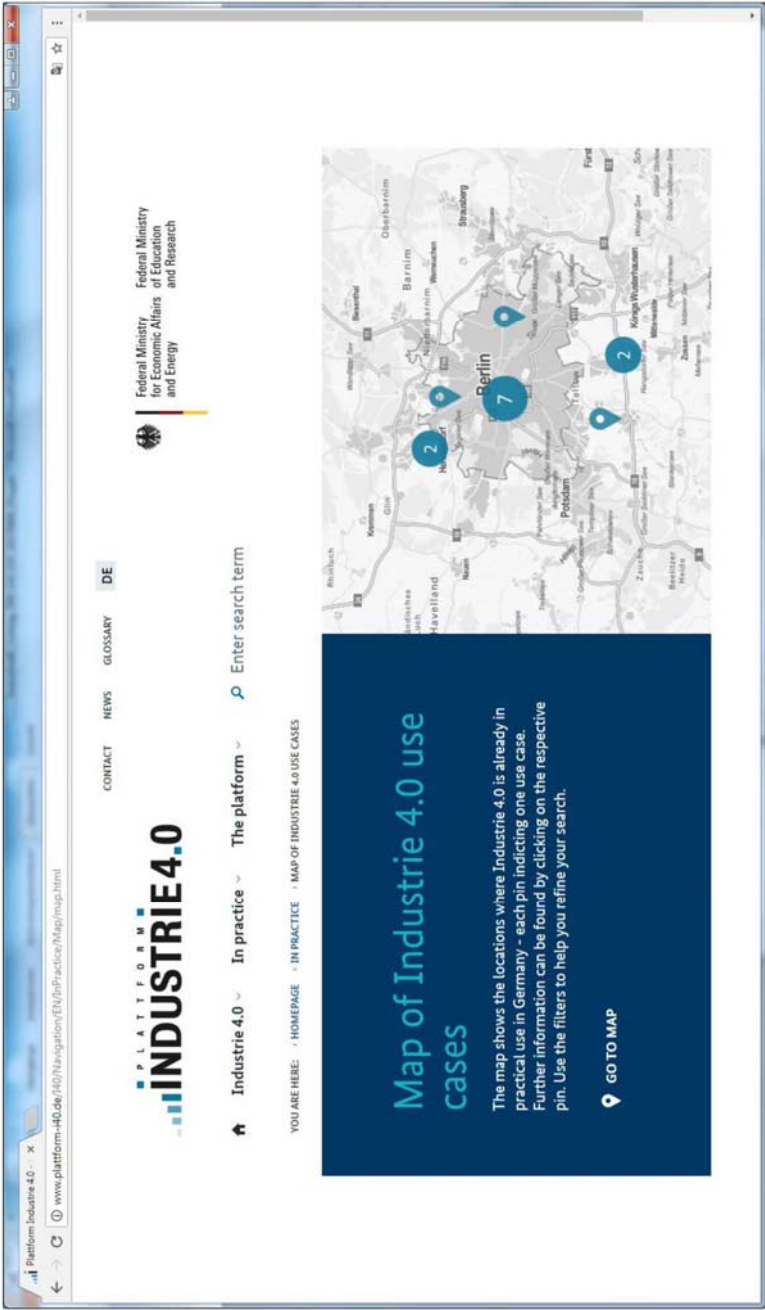
인더스트리 4.0 실현 전략

「플랫폼 인더스트리 4.0」의 결과보고서

2017년 9월

Implementation
Strategy
Industrie 4.0

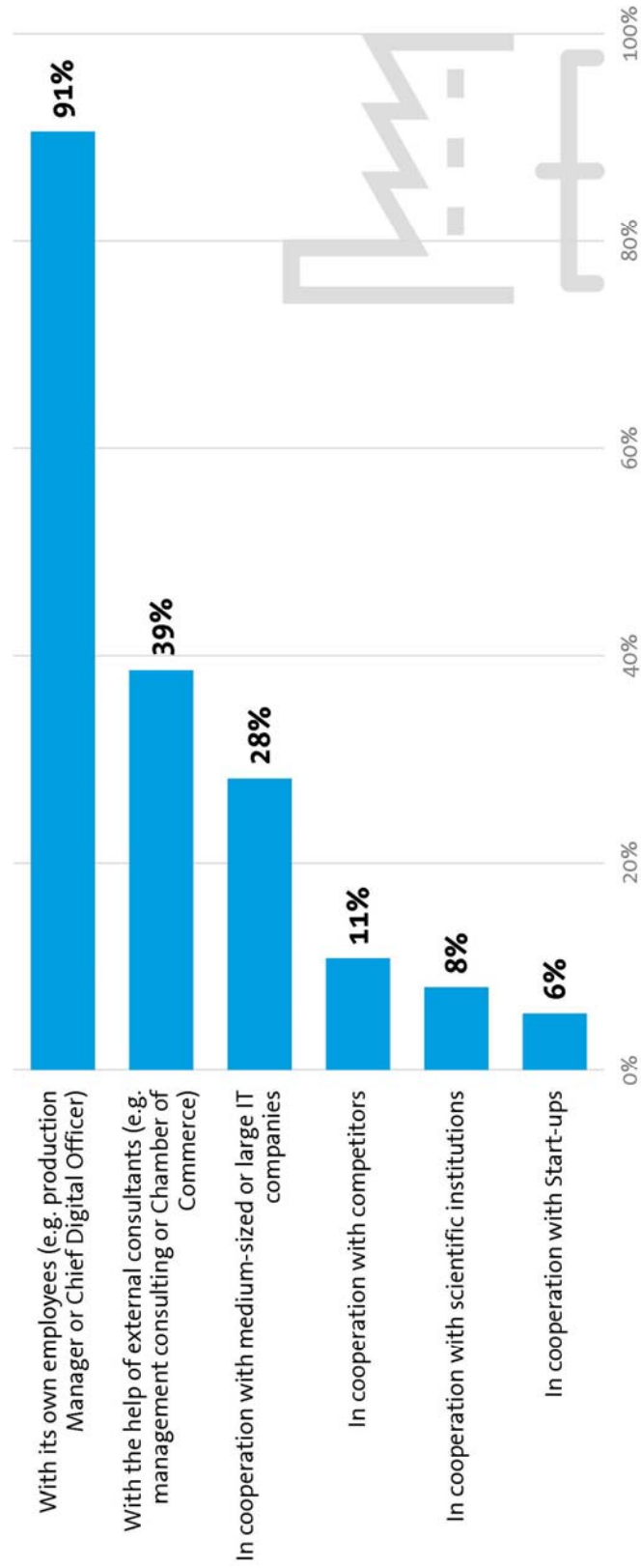
Description of > 150 Use Cases



Source: Screenshot www.plattform-i40.de, 08.08.2017

Strategy is primarily developed internally

How did your company develop the strategy for Industrie 4.0?



30 Base: users and planners of Industry4.0 applications with more than 100 employees (n=364) source: Bitkom Research

Innovation by start-ups



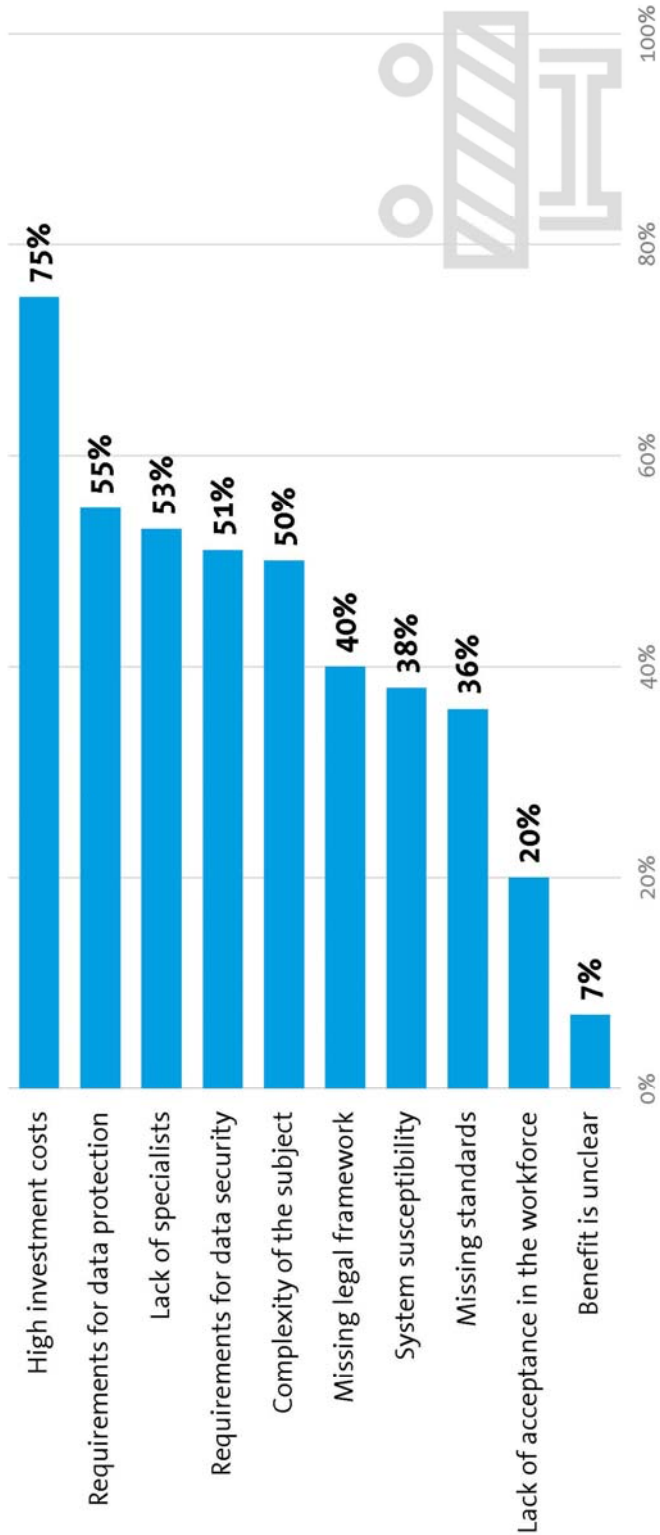
Source: Andrew Rich- iStock

Standing on the shoulders of giants



Investment costs inhibit use of Industrie 4.0

What barriers do you see when using Industrie 4.0 applications in your company?



33 Basis: All surveyed industrial companies Source: Bitkom Research

BMBF Testumgebungen, BMWi Kompetenzzentren, LNI40 Testzentren

BMBF Test Environments at German Research Institutes

- Addresses manufacturers of components, machines and plants
- Industry 4.0 test environments for SMEs - I4KMU
- www.i4kmu.de

BMWi Centers of Excellence

- Addresses manufacturing industry as users of machines and plants
- www.mittelstand-digital.de/DE/Foerderinitiativen/Mittelstand-4-0/kompetenzzentren.html

LNI40 Testlabs

- Aimed at cooperation between small and large companies
- Not limited to SMEs
- International cooperation possible
- Offer of evaluation by private business
- www.lni40.de

Labs Network Industrie 4.0

Cooperation with Plattform & Standardization Council Industrie 4.0



- Recommended actions
- SME mobilization
- International cooperation



- Initiation of cross-sector standards
- Coordination of national and international standards
- Strengthen the German international collaborations



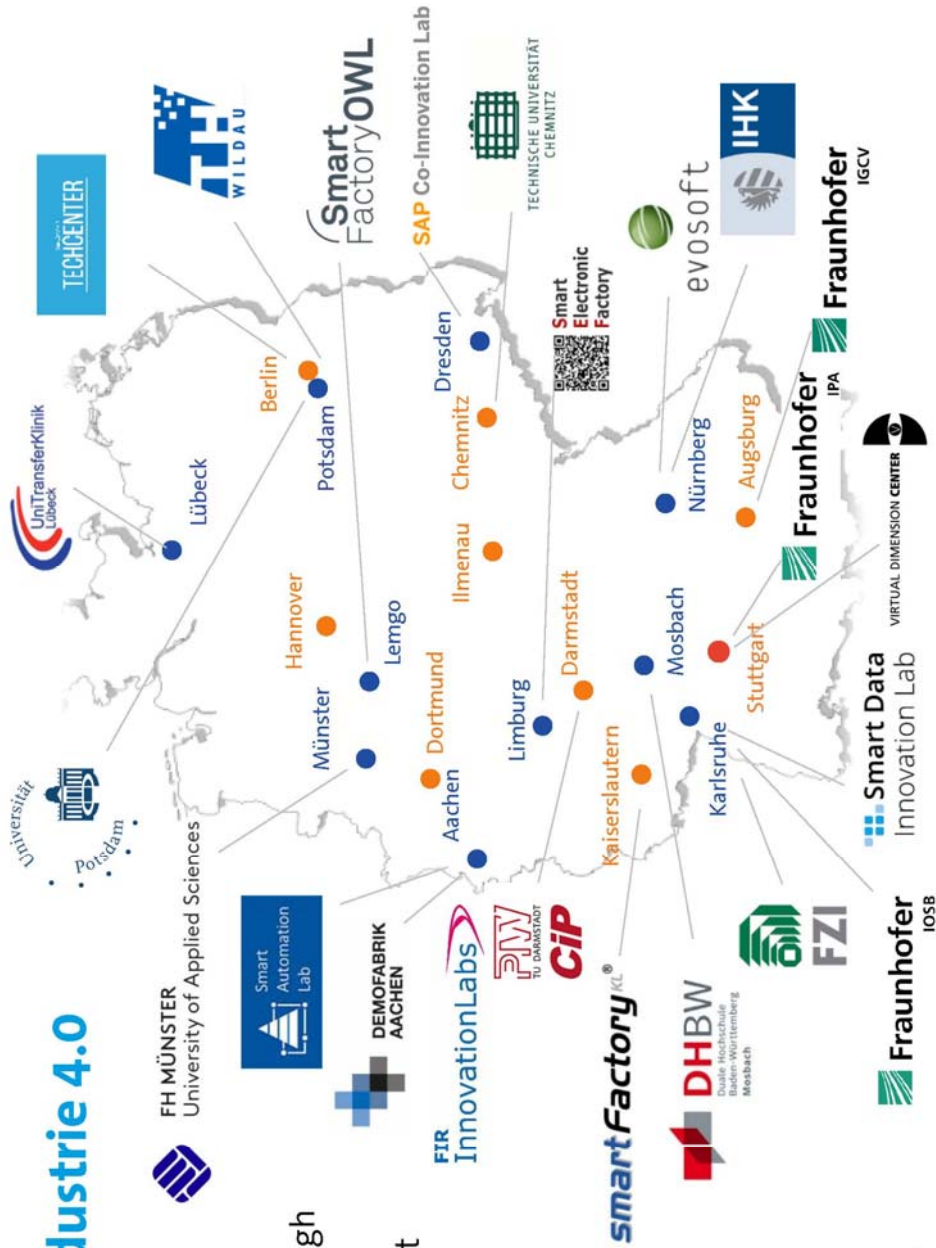
- Network of test centers
- Practical testing
- Validated input for standardization

35 Source: Labs Network Industrie 4.0, 2017

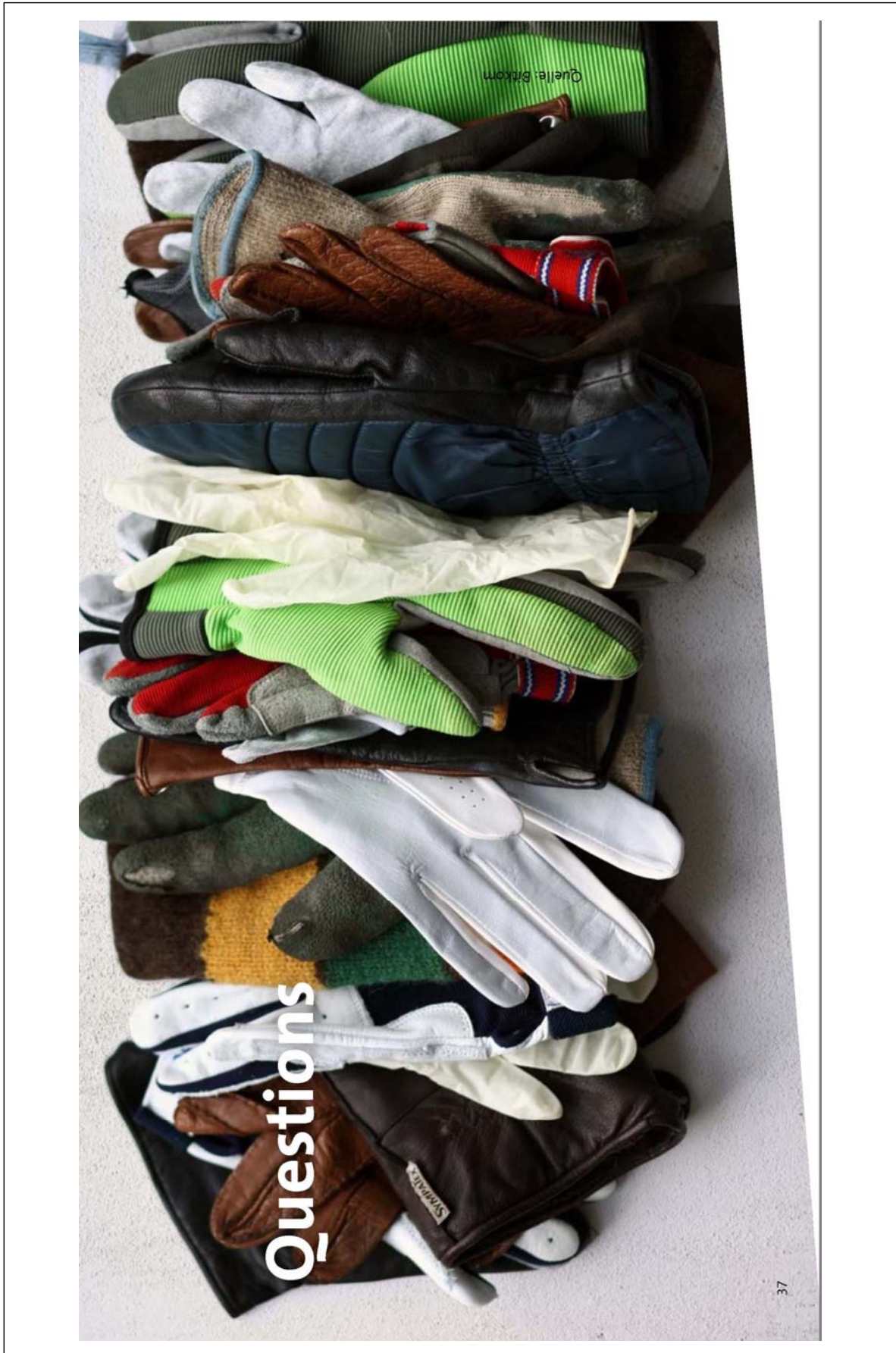
Labs Network Industrie 4.0

Where to find Testlabs?

- > 30 Testlabs
- High availability through increasing numbers
- Distributed throughout Germany
- Local contacts
- Technical verity



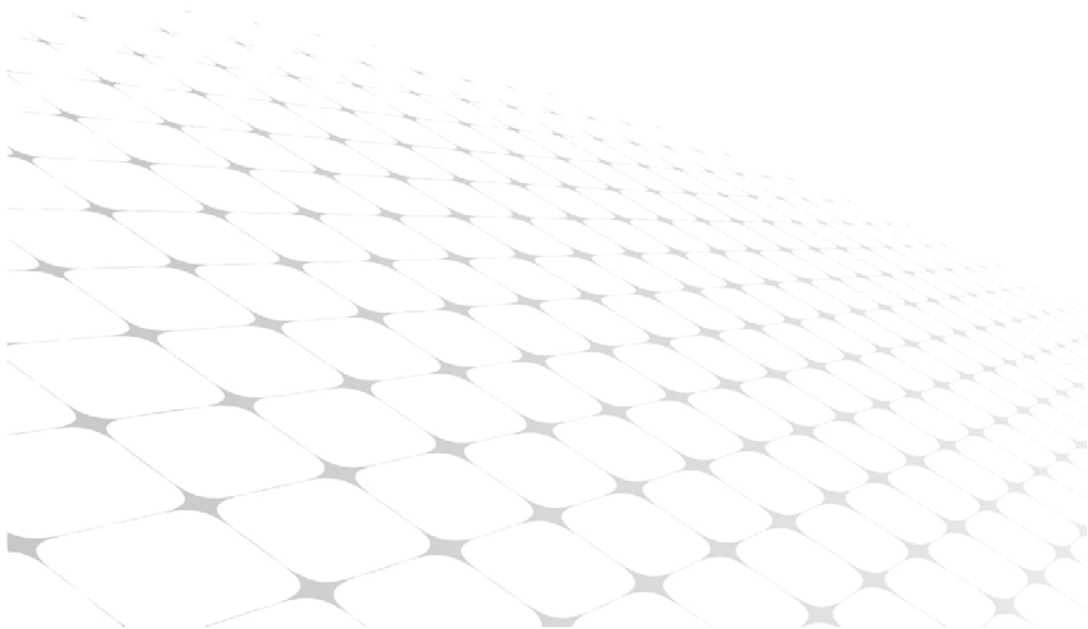
36 Source: Labs Network Industrie 4.0, 2017



토 론 문

Scientific Dialogue in INDUSTRY 4.0

김인숙 KDI 초빙연구위원



Scientific Dialogue in INDUSTRY 4.0

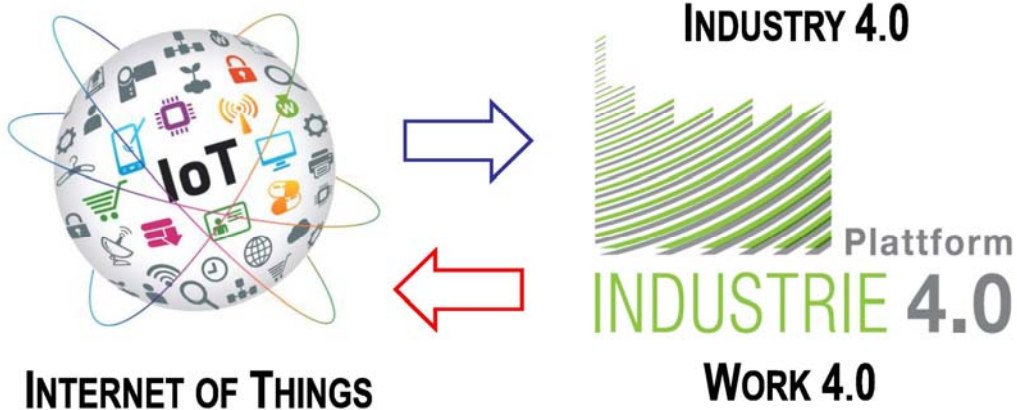
02. NOV. 2017

Korea Development Institute

DR. INSUK KIM

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Internet & Industry 4.0







Industry 4.0 in Germany
Germany Trade & Invest (GTAI)
<https://www.youtube.com/watch?v=d6p9dTHDOKM>

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The Stages of Industrial Revolutions

| Industry | Technology | Business | Leading Country (year) |
|-----------------|---|--------------------------------------|---|
| 1 st | Steam Engine | Filature(1784) | England (late 18 th century)  |
| 2 nd | Electricity, Conveyor Belt | Meat Processing Cincinnati(1870) | USA (Early 20 th century)  Ford Car |
| 3 rd | Computer, Automation (Robot) Lean thinking | Modicon084 (1969) | Japan, USA, and Germany (1970s)  |
| 4 th | CPS(Cyber Physical System), Internet of Things (IoT), Cloud, Big Data | SmartFactory ^{KL} (2005) | Beginning Stage:  Germany (2011-present) |

DFKI 2011, Plattform Industrie 4.0 (2015), VDI(2015).

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Definition: Industry 4.0

Digital Transformation: Time to Market

Real-Time Optimization: Customization

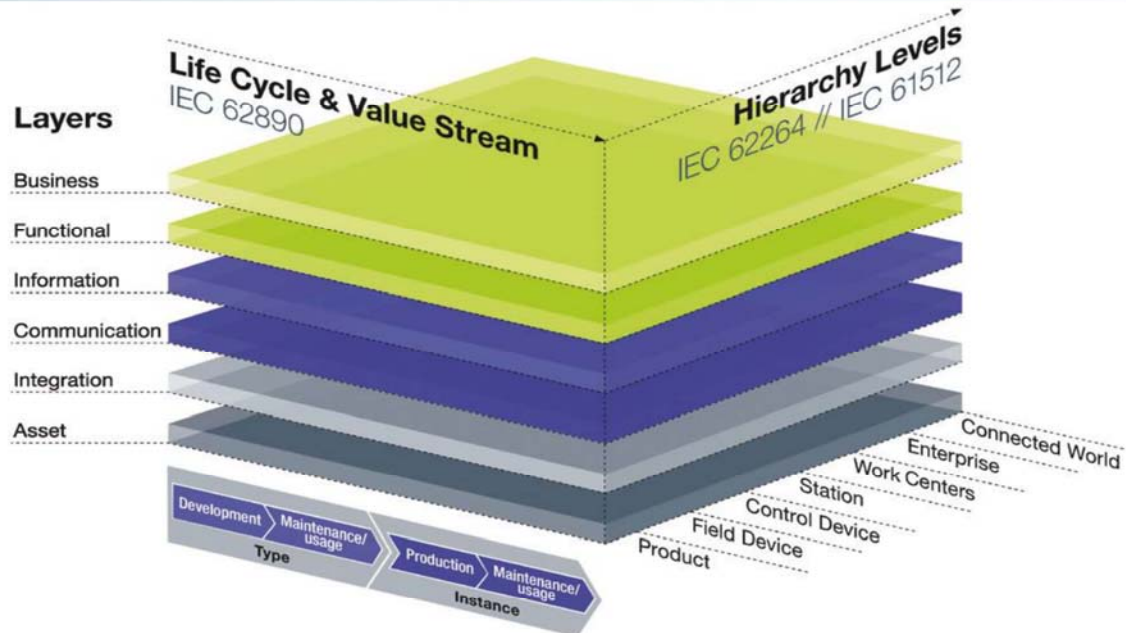
KPI(Key Performance Indicator): Business Model

www.platform-i4.0.de

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Definition: RAMI Model

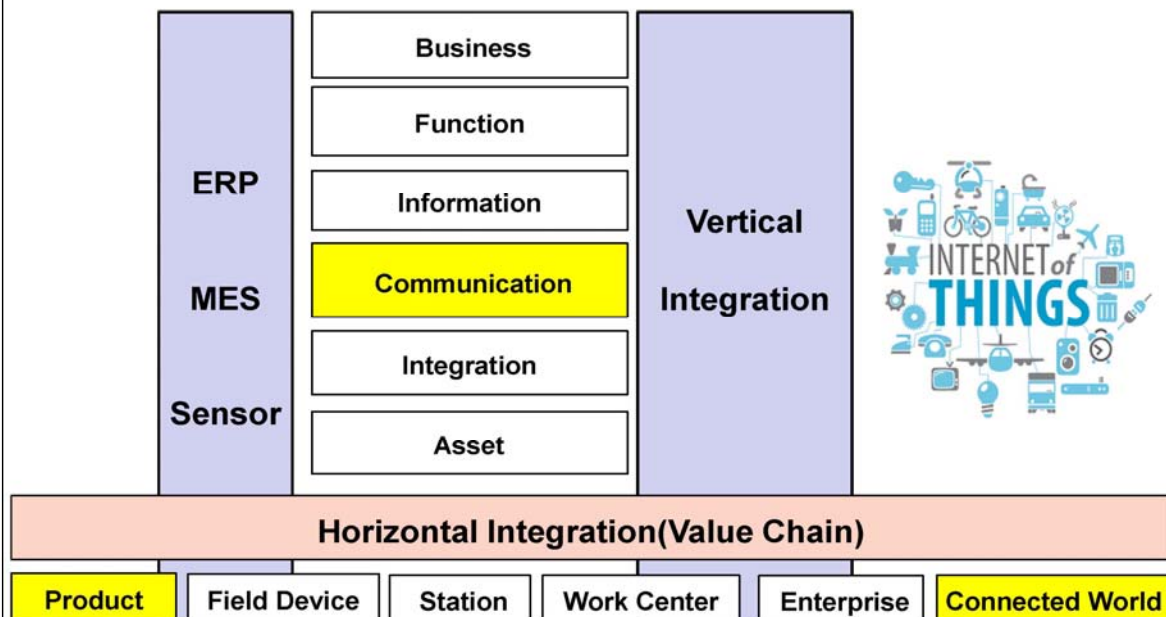


RAMI(Das ReferenzArchitekturModell Industrie 4.0), 기업의 현장과 경영을 잇는 수직통합과 가치사슬을 통합

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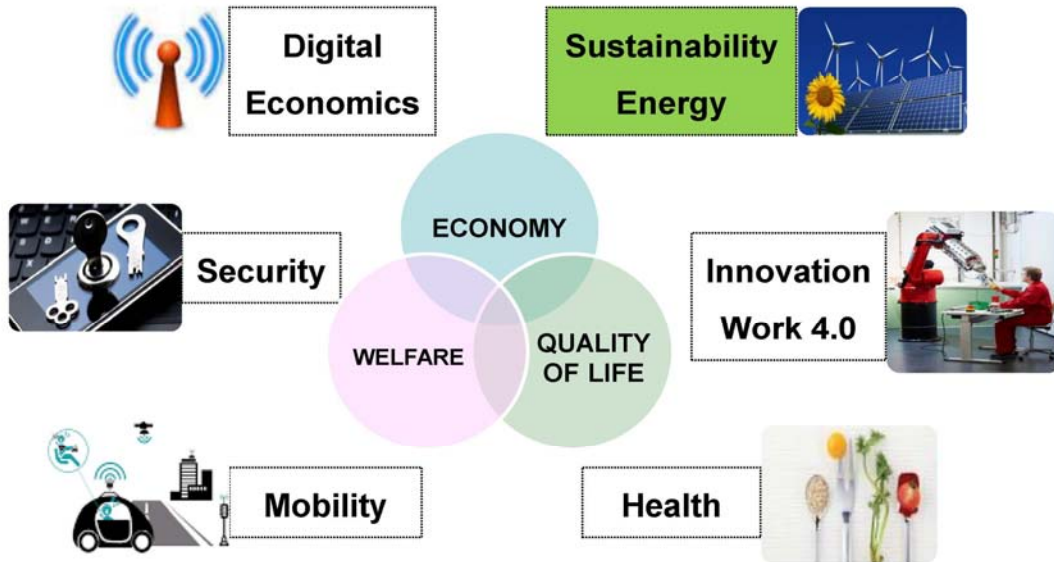
Integration: Vertical & Horizontal



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New Business Model

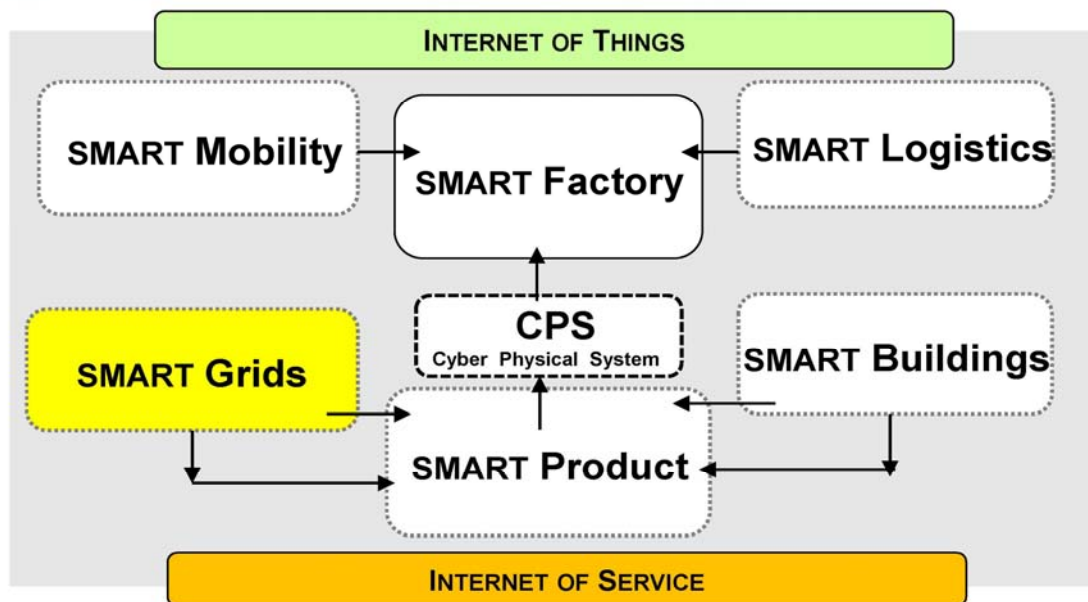


BMBF(2015), Technik zum Menschen bringen, Forschungsprogramm zur Mensch-Technik-Interaktion, Die Neue Hightech Strategie, Innovationen fuer Deutschland.

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Internet of Service

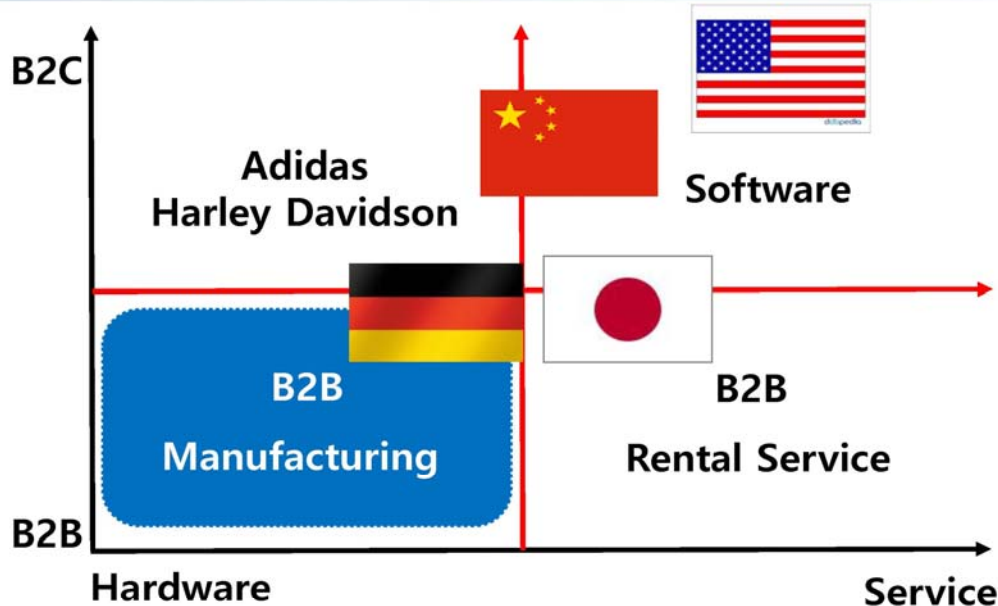


Promotorengruppe Kommunikation der Forschungsunion Wirtschaft-Wissenschaft(2013), Umsetzungsempfehlungen fuer das Zukunftsprojekt Industrie 4.0, p.23.

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Digital Platform Category



Baums, Ansgar; Martin Schoessler; Ben Schott(2015), Industrie 4.0, Wie digitale Plattformen die Wirtschaft veraendern und wie die Politik gestalten kann, Kompendium Digitale Standpolitik, Band 2, p. 8.

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Platform Concept Definition

A platform is fundamentally an **infrastructure** designed to facilitate **interactions** among producers and consumers of **values**.

Parker/Van Alstyne/Choundary

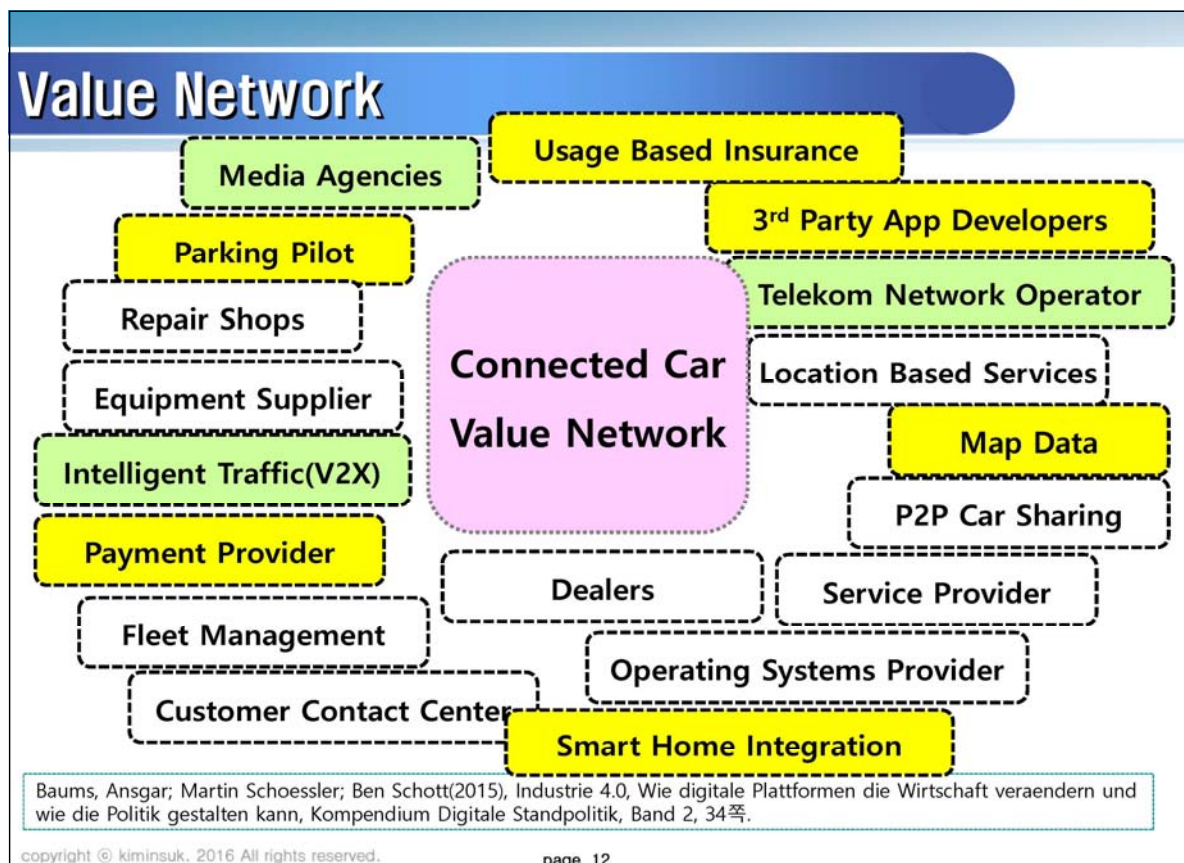
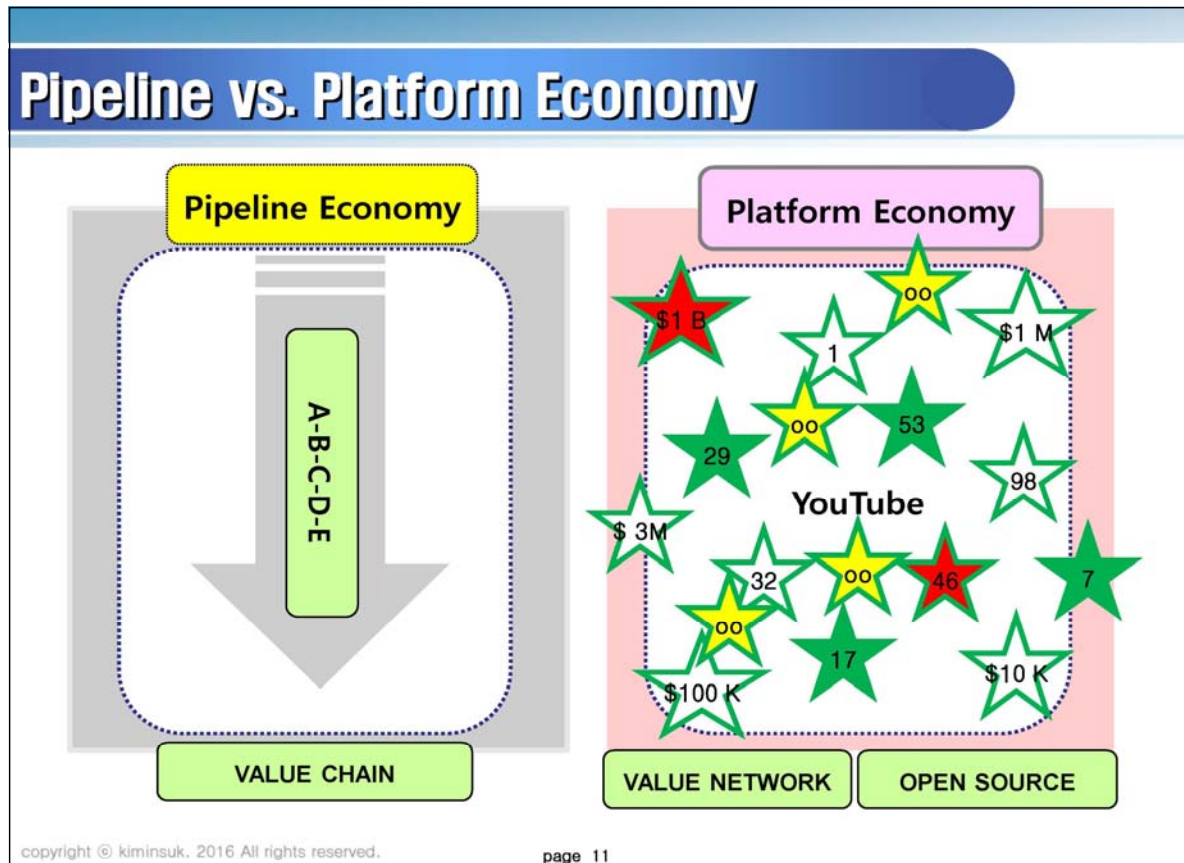
Example of platform companies

U.S : Google, Apple, Microsoft, Amazon, Facebook

China: Tencent(Wechat), Alibaba, Baidu

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Cooperation & Collaboration

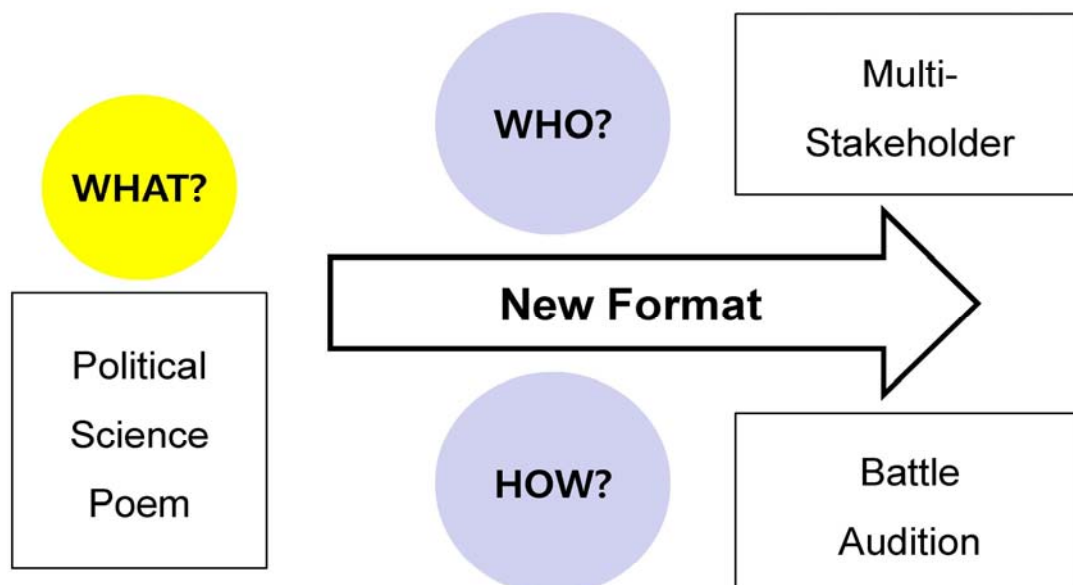


Human & Machine

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Open Innovation: New Format



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Prof. Dr. Elinor Ostrom



Robust Institution

WHO?

HOW?

Stakeholder

Novel Prize in Economics, 2009

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Science Communication

Science Communication (Science Public Relations)

Management of public communication about science
Technology transfer, Innovation communication

Wissenschaftskommunikation(Science Communication)

New forms of communication
Open innovation and Interactive value

Social Network: Academia.edu; Mendeley; ResearchGate

Science-Blogs : ScienceBlogs; SciLogs; hypotheses.org; Thesius(Platform)

New Format : WiD, Science Slam, Basecamp, Ignite

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History of Development

| | | |
|--------------------------|--------|--|
| Science Communication | 1950s | "Enlightenment" of the population |
| | 1980s | PUSH Public Understanding of Science (Humanities) |
| | 1990s | Demand for transparency and economic value of scientific knowledge |
| | | For supposedly confidence-building dialogue between science and society |
| | Todays | Format: "shape, efficiency and effectiveness of public science communication" |

<https://de.wikipedia.org/wiki/Wissenschaftskommunikation>

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Spread Knowledge & New format

TED



Expert
15 minutes
Presentation

Poetry Slam



Destruction
15 minutes
Audience Evaluation

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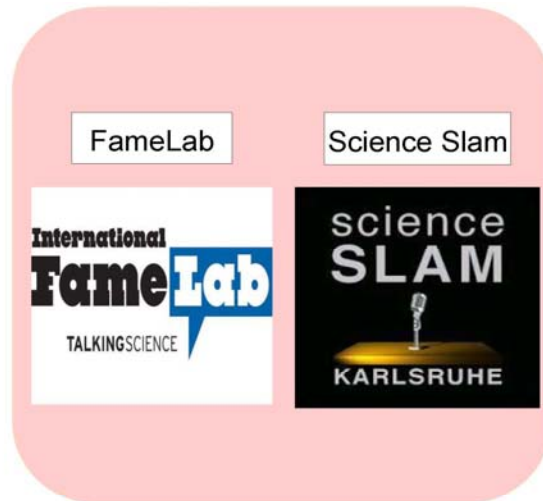
page 18

From Lectures to Competitions

LECTURES FORMAT



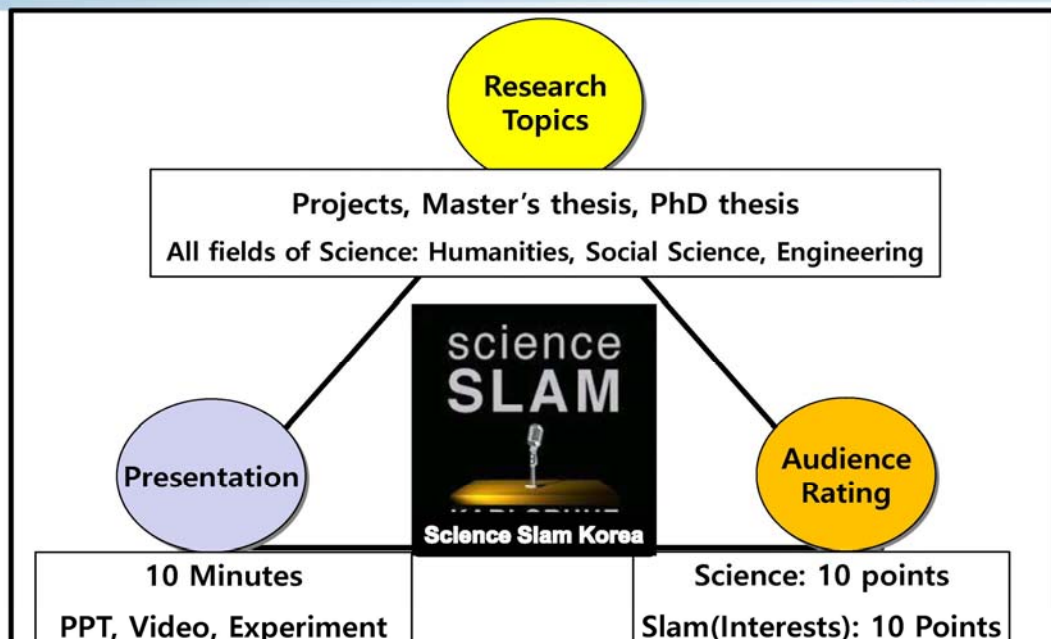
COMPETITIONS FORMAT



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Key Factors of Science Slam



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Audience Evaluation Criteria

Content (10 points)

Interest (10 points)

What did you learn?

Interesting?

Science

Slam

Total points agreed by group

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Research 3.0

Research 1.0

Science journalism
communication channels classic mass media

Research 2.0

Scientific social media platforms & science blogs
had broadened the scientific authorship
on the horizontal scale

Research 3.0

the Vertical Integration of
the entire scientific dialogue of students

<https://de.wikipedia.org/wiki/Wissenschaftskommunikation>

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Knowledge Contest

Innovations create value.
It comes from people's **communication**.

Art, Culture, Media, Social, Science

Media
Offline

Led by
private

Community Centre, Schools, Agencies

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Hannover Messe: 1,000 Presentations

HANNOVER MESSE 2017 - CREATING VALUE IN INDUSTRIE 4.0

| | |
|-------------|--|
| 2015 | Integrated Industry, Join the Network |
| 2016 | Integrated Industry, Discover Solutions |
| 2017 | Integrated Industry, Creating Value |

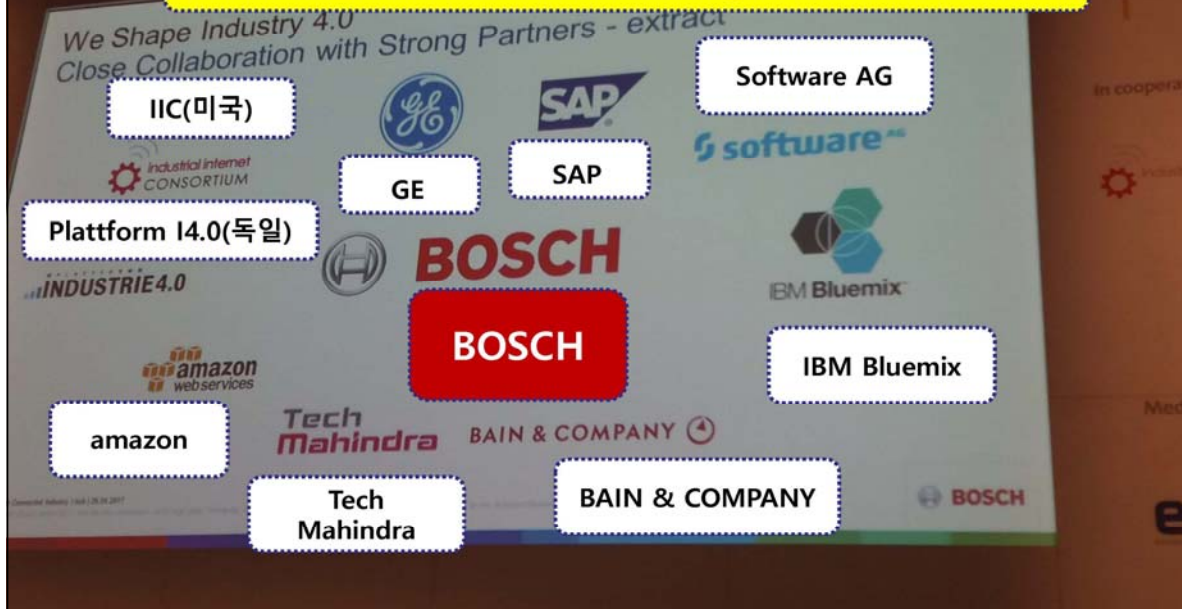
 "Integrated Industry - Creating Value"

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We Shape Industry 4.0: BOSCH

Close Collaboration with Strong Partners-extract



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Siemens MindSphere: IOT 플랫폼



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FUTURE, ... by Design

Industry 4.0 by Design

Security by Design

Standard by Design

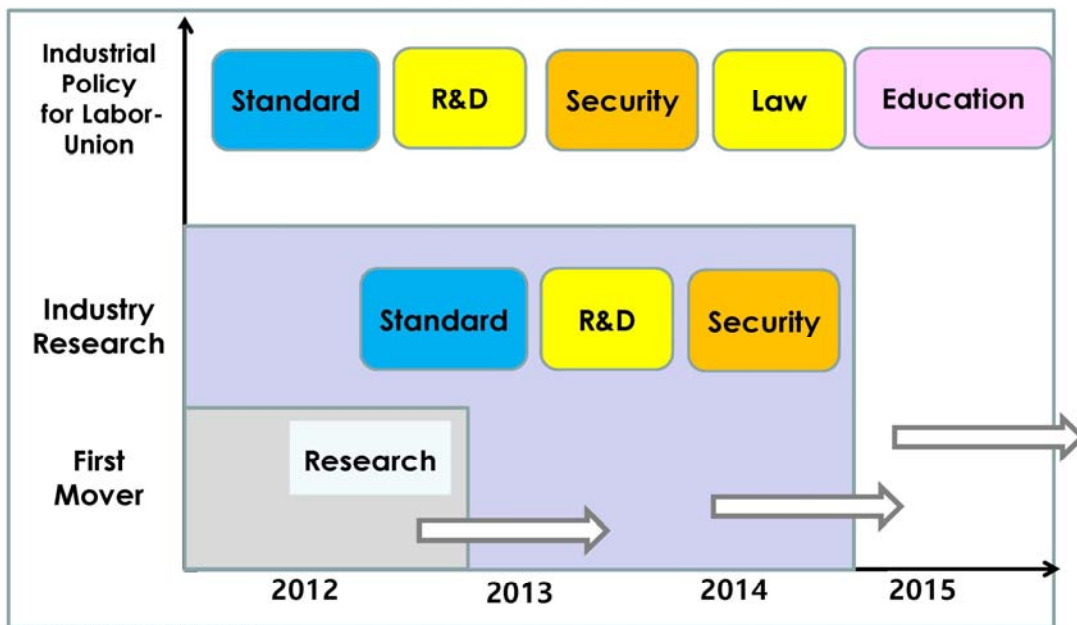
Work 4.0 by Design

Education 4.0 by Design

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Plattform Industrie 4.0 in Germany

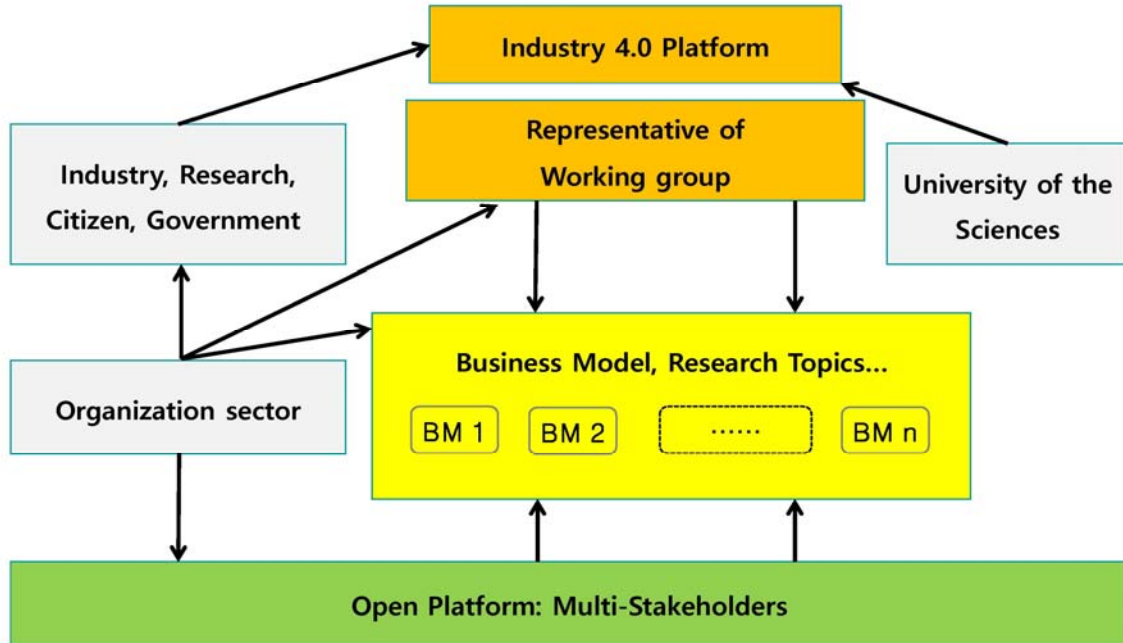


www.plattform-i4.0.de

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Communication Platform: Who?



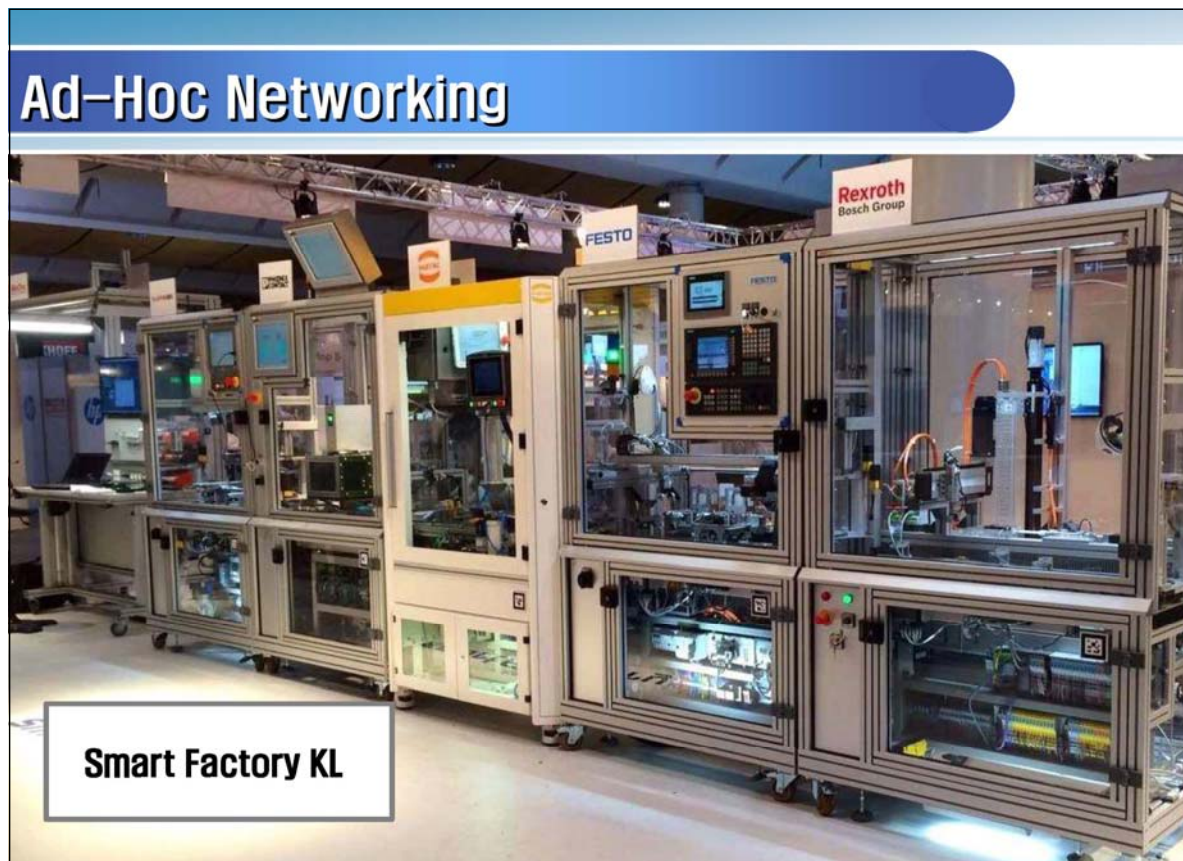
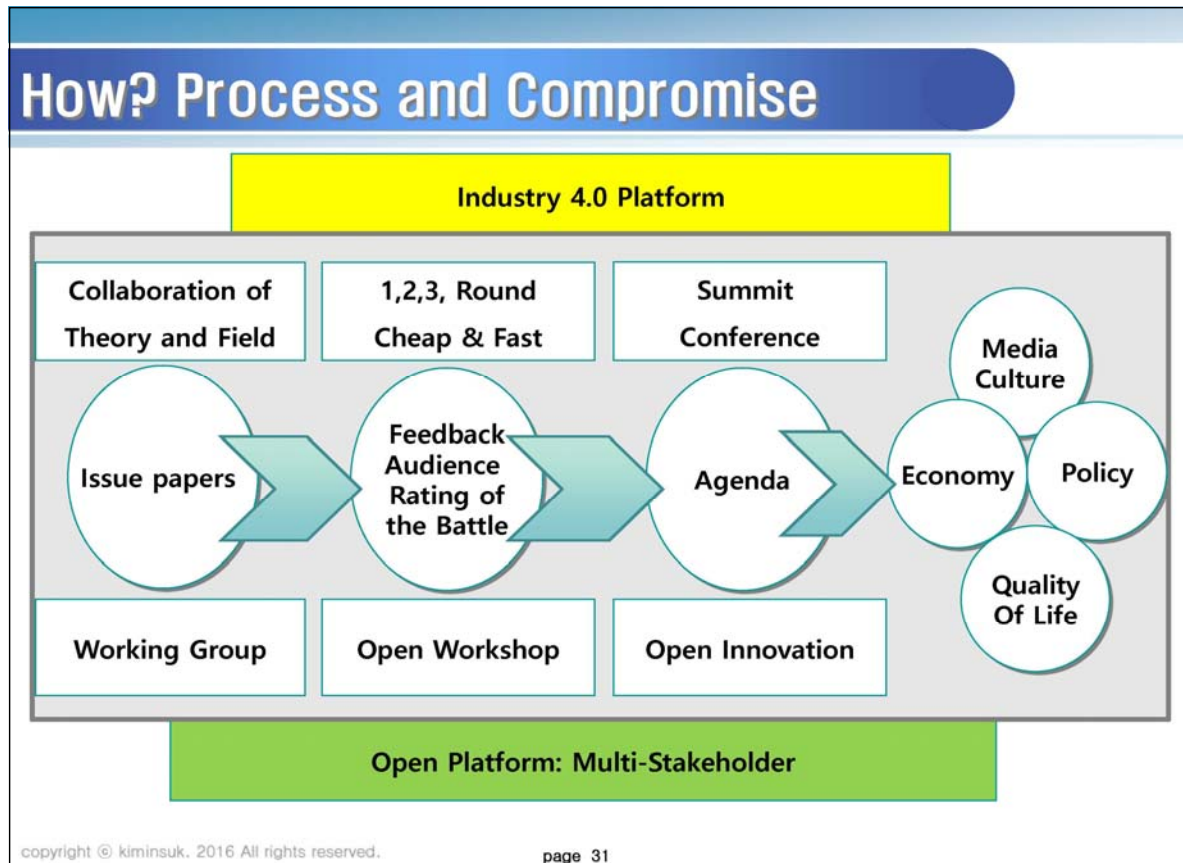
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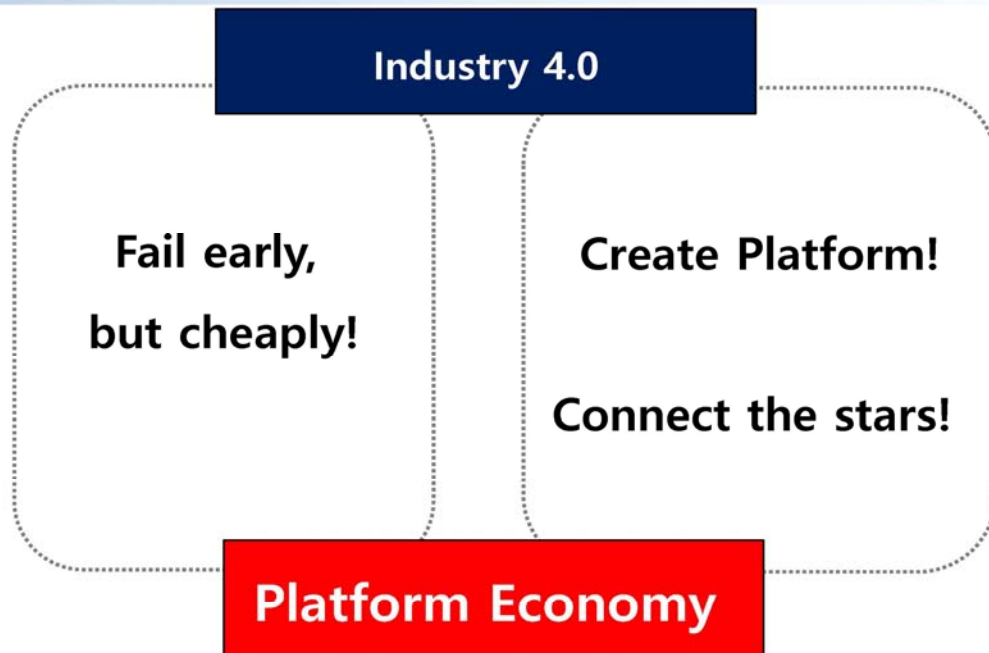
Platform Industrie 4.0(2015)



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How to start?



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