Digitalization YES – but Good Processes FIRST

Results of Quick-check Initiative for
Industry 4.0 Introduction in SME

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Chambre de Commerce, Luxembourg

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Portfolio

IPL - Institute for Production and Logistics Systems

Global orientation

- Worldwide projects
- Located in the Greater Region of FR, LU, DE

Production & logistics

- Greenfield-/Brownfield-concepts
- Development and transformation of production systems

Strategy consulting

- **Industry 4.0 Roadmapping**
- Supply chain organisation
- Design of material flow

Qualification, coaching and training

- Lean Six Sigma
- Company and supplier development

European Research and Development

- Academic research methodology
- Development of innovative methods for practical application

Management and organisation

- Project management
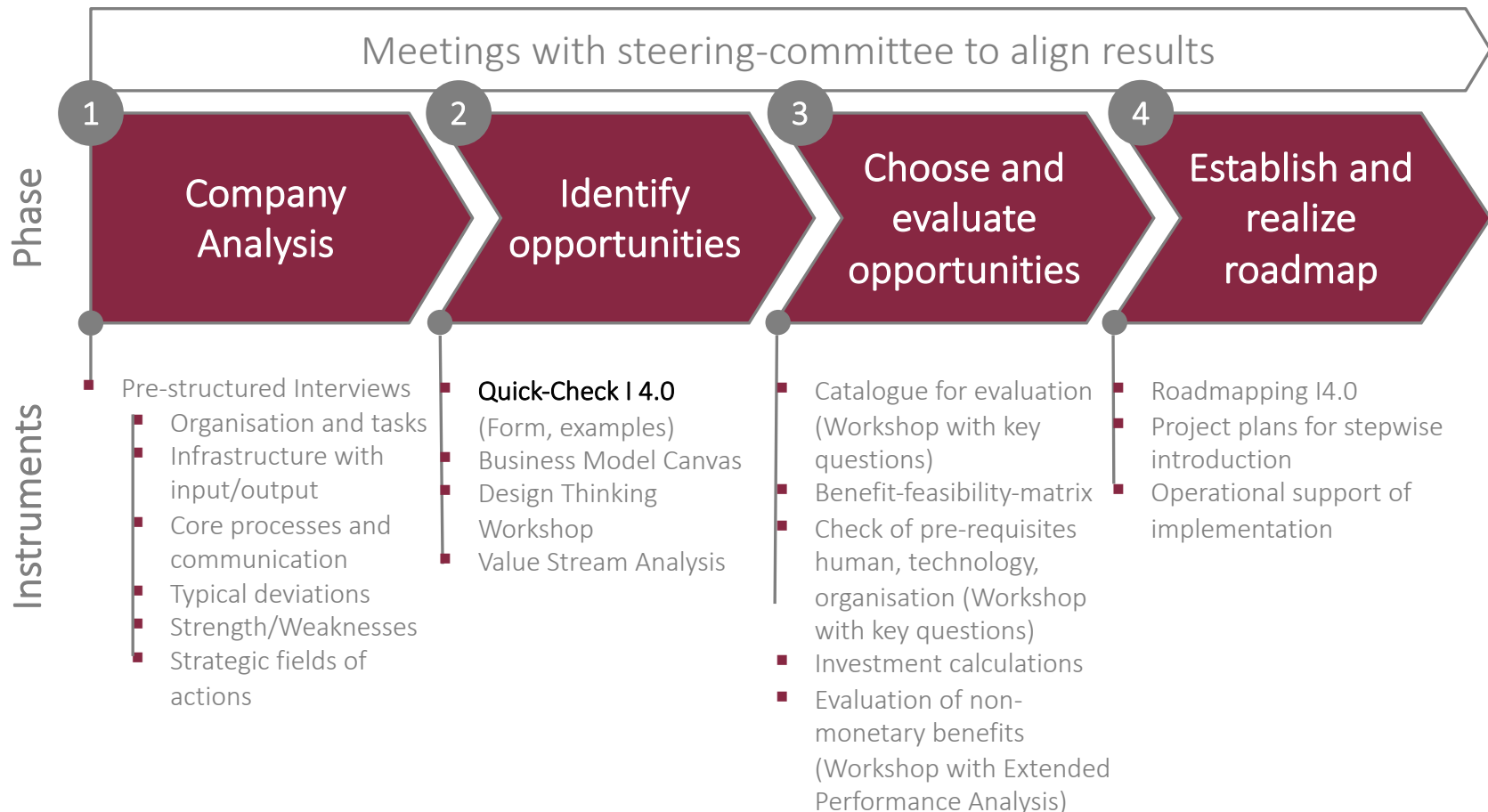- Interims-management & service

Agenda

Content of Presentation

- Quick-Check I4.0 Methodology
- Product Side
    - Current transition level of I4.0
    - Recommendations
- Production Side
    - Current transition level of I4.0
    - Pre-requisites for Industry 4.0
    - Crossroads-model
    - Industry 4.0 from lean process perspective
    - Recommendations
- Summary

# Methodology: Individual Company Roadmap for Industry 4.0

Approach, Phases and Instruments

Meetings with steering-committee to align results

Phase

1 Company Analysis

2 Identify opportunities

3 Choose and evaluate opportunities

4 Establish and realize roadmap

Instruments

- Pre-structured Interviews
  - Organisation and tasks
  - Infrastructure with input/output
  - Core processes and communication
  - Typical deviations
  - Strength/Weaknesses
  - Strategic fields of actions

- Quick-Check I 4.0 (Form, examples)
- Business Model Canvas
- Design Thinking Workshop
- Value Stream Analysis

- Catalogue for evaluation (Workshop with key questions)
- Benefit-feasibility-matrix
- Check of pre-requisites human, technology, organisation (Workshop with key questions)
- Investment calculations
- Evaluation of non-monetary benefits (Workshop with Extended Performance Analysis)

- Roadmapping I4.0
- Project plans for stepwise introduction
- Operational support of implementation

Source: AK4.0 model, Seiter M. et al. (2016), modified

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Methodology: Identify Opportunities

Quick-Check I4.0 for Production

Six application levels with five technological and sequential development stages support brainstorming of ideas
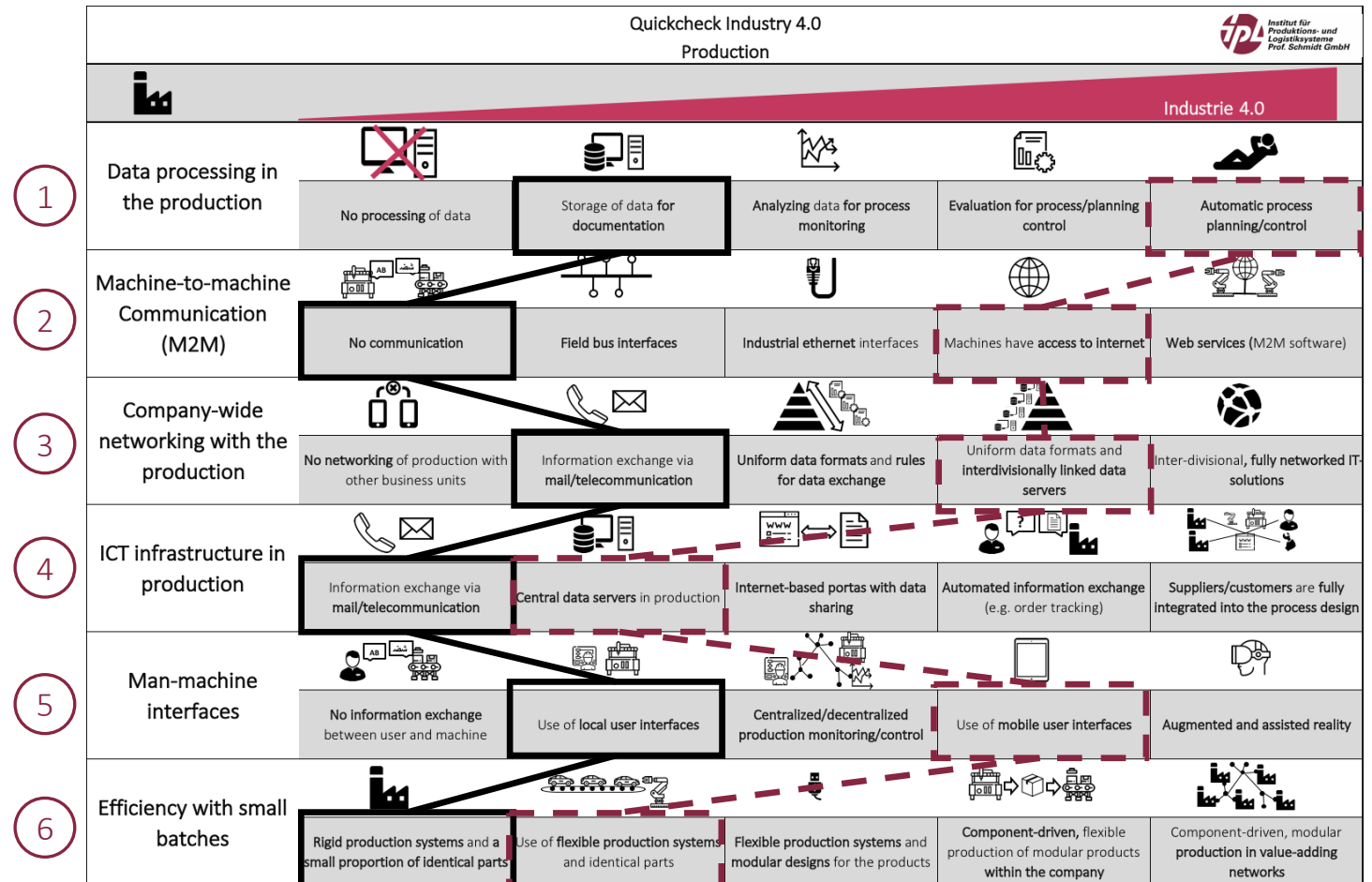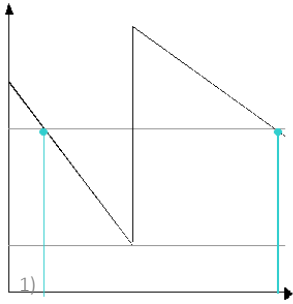

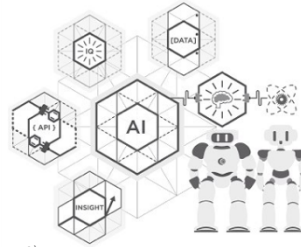Quick-Check-interviews or workshops reveal

Current state ———

Future state – – –

Quickcheck Industry 4.0
Production

1 Data processing in the production	No processing of data	Storage of data **for documentation**	Analyzing data **for process monitoring**	Evaluation for process/planning control	Automatic process planning/control
2 Machine-to-machine Communication (M2M)	No communication	Field bus interfaces	**Industrial ethernet** interfaces	Machines have **access to internet**	Web services (M2M software)
3 Company-wide networking with the production	No networking of production with other business units	Information exchange via **mail/telecommunication**	Uniform data formats and rules for data exchange	Uniform data formats and **interdivisionally linked data servers**	Inter-divisional, **fully networked IT-solutions**
4 ICT infrastructure in production	Information exchange via **mail/telecommunication**	Central data servers in production	Internet-based portas with data sharing	Automated information exchange (e.g. order tracking)	Suppliers/customers are fully integrated into the process design
5 Man-machine interfaces	No information exchange between user and machine	Use of local user interfaces	Centralized/decentralized production monitoring/control	Use of mobile user interfaces	Augmented and assisted reality
6 Efficiency with small batches	Rigid production systems and a small proportion of identical parts	Use of **flexible production systems** and identical parts	Flexible production systems and **modular designs** for the products	**Component-driven,** flexible production of modular products **within the company**	Component-driven, modular **production in value-adding networks**

Industrie 4.0

Methodology: Data processing

Example: Inventory Management

Institut für
Produktions- und
Logistiksysteme
Prof. Schmidt GmbH

1 Company Analysis → 2 Identify opportunities → 3 Choose and evaluate opportunities → 4 Establish and realize roadmap

No processing of data	Storage of data for documentation	Analysing data for process monitoring	Evaluation for process planning / control	Automatic process planning / control
Manual disposition (order point) for C-parts in traditional containers	Documentation of replenishment; manual ordering process	Data Analytics with data based inventory reduction	Know-how auto-mation for inventory planning (Cognitive Computing)	iBin: automized inventory detection and trigger for purchase orders
1)	2)	3)	4)	5)
		SAP Deutschland SE & Co. KG	SAP Deutschland SE & Co. KG	Würth Industrie Service GmbH & Co. KG
Human Manual process	**Human:** Manual process	**Human:** Competency in data	**Human:** Acceptance by worker	**Human:** Only for escalation
Technology: Traditional	**Technology:** traditional	**Technology:** ERP & Software	**Technology:** Data Analytics Tool	**Technology:** RFID, optical camera, ERP
Organisation: Skilled labor required	**Organisation:** Standardized work	**Organisation:** Consistent Master data	**Organisation:** Clarified legal basis	**Organisation:** Skilled labor, consistency

Product Side

Quick-check I4.0 questions and level

Industry 4.0 for Product					
Application	**Maturity level**				
	Level 1	Level 2	Level 3	Level 4	Level 5
Integration of sensors/ actuators	No use of sensors/actuators	Sensors/actuators are integrated	Sensor readings are processed by the product	Data is evaluated for analyses by the product	The product independently responds based on the gained data
Communi- cation/ Connectivity	The product has no interfaces	The product sends or receives I/O signals	The product has field bus interfaces	The product has Industrial Ethernet interfaces	The product has access to the internet
Functionali- ties for data storage and information exchange	No functionalities	Possibility of individual identification	Product has a passive data store	Product with data storage for autonomous information exchange	Data and information exchange as integral part
Monitoring	No monitoring by the product	Detection of failures	Recording of operating condition for diagnostic purposes	Prognosis of its own functional condition	Independently adopted control measures
Product related IT- services	No services	Services via online portals	Service execution directly via the product	Independently performed services	Complete integration into an infrastructure of IT services
Business models around the product	Gaining profits from selling standardized products	Sales and consulting regarding the product	Sales, consulting and adaption of the product to meet customer specifications	Additional sale of product-related services	Sale of product functions

Product Side

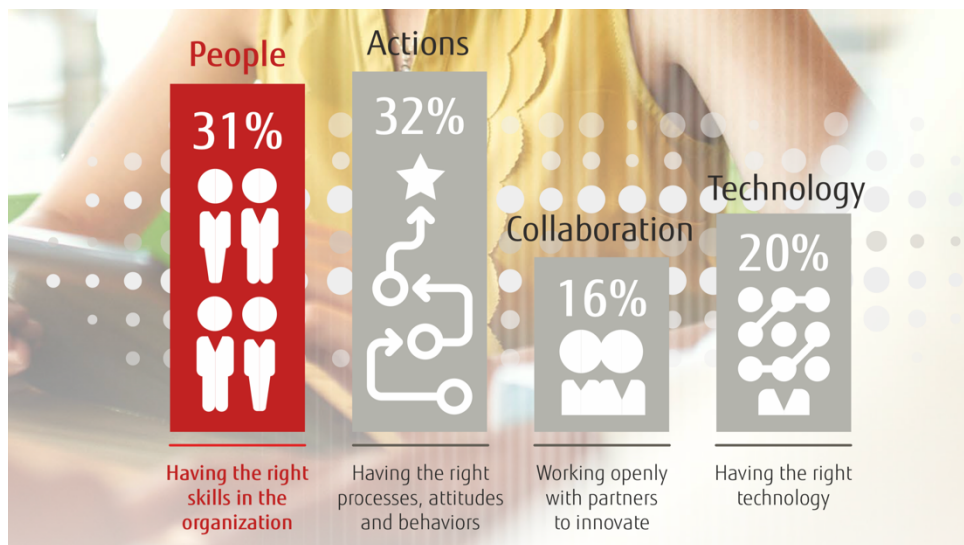Quick-check I4.0 box-plot of results from Luxemburg companies (n=8)
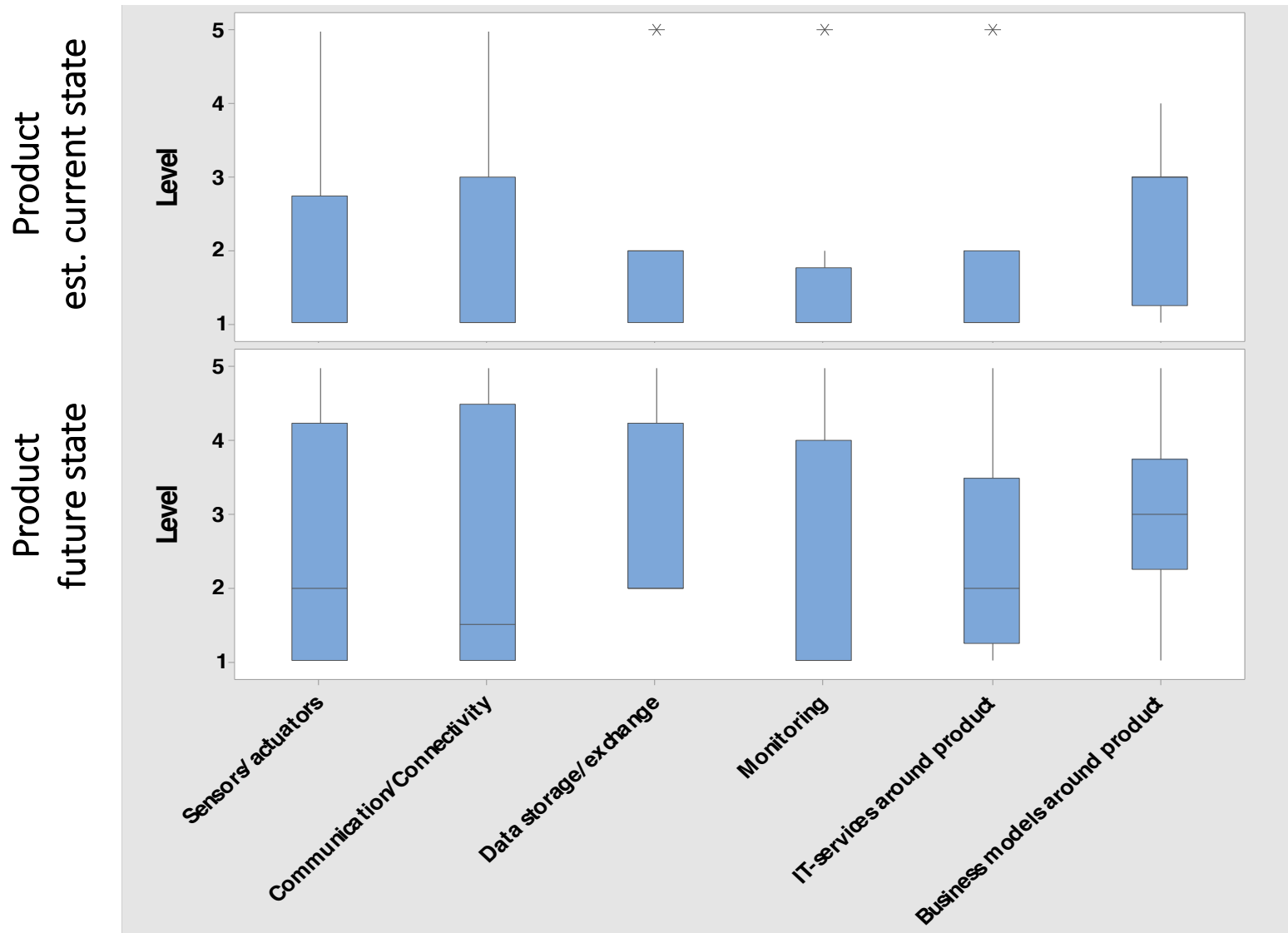
Product Side

Recommendations for company transformation (Fujitsu study 2018)

Quelle: Fujitsu Global (2018), Study with n= 1,625 decision makers from finance, retail, manufacturing and public sector, July-August 2017, company size at least 50 employees

Key findings

- Almost half (46%) of all organizations have already delivered digital transformation projects and seen outcomes delivered from these.
- Customers (58%) are the biggest drivers for digital transformation.
- The 'Actions' taken by a business, i.e. having the right processes, attitudes and behaviors within the organization, is the most important criteria for achieving digital success (32%).
- Digital transformation is expected to deliver both operational and financial results within 18 months on average.
- A third (33%) of organizations have cancelled a digital transformation project in the past two years.
- The average cost of a failed project is more than € 500,000.

Recommendations

→ Digitize your business before others will do so

→ Use numerous agile and cost-effective projects to gain insight

→ Companies must fail quickly, fail forward and work cost-effectively

→ Agile digital strategies and implementation plans that can be easily and quickly adapted when a project is not progressing as expected

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Production Side

Quick-check I4.0 questions and level

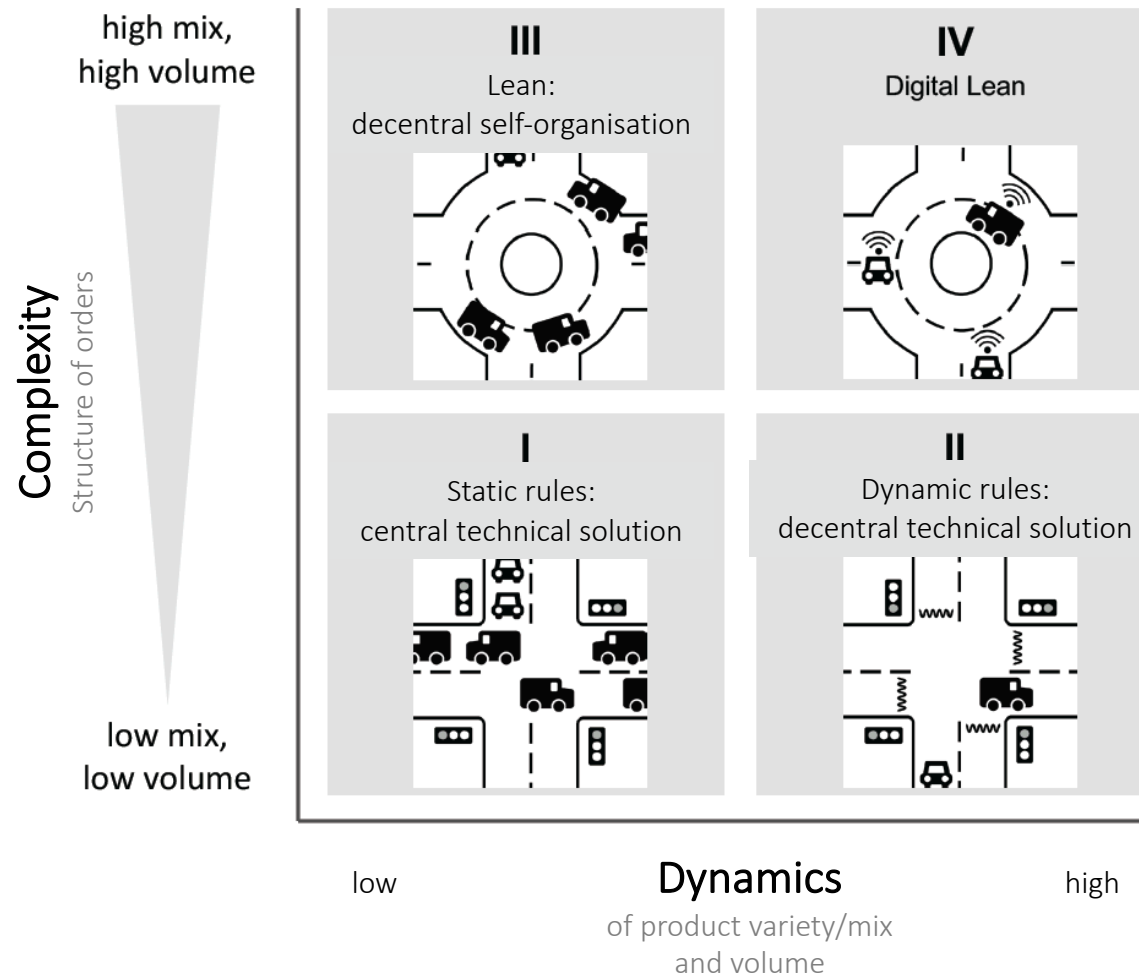| Industry 4.0 for Production					
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Production Side

Quick-check I4.0 box-plot of results from Luxemburg companies (n=8)
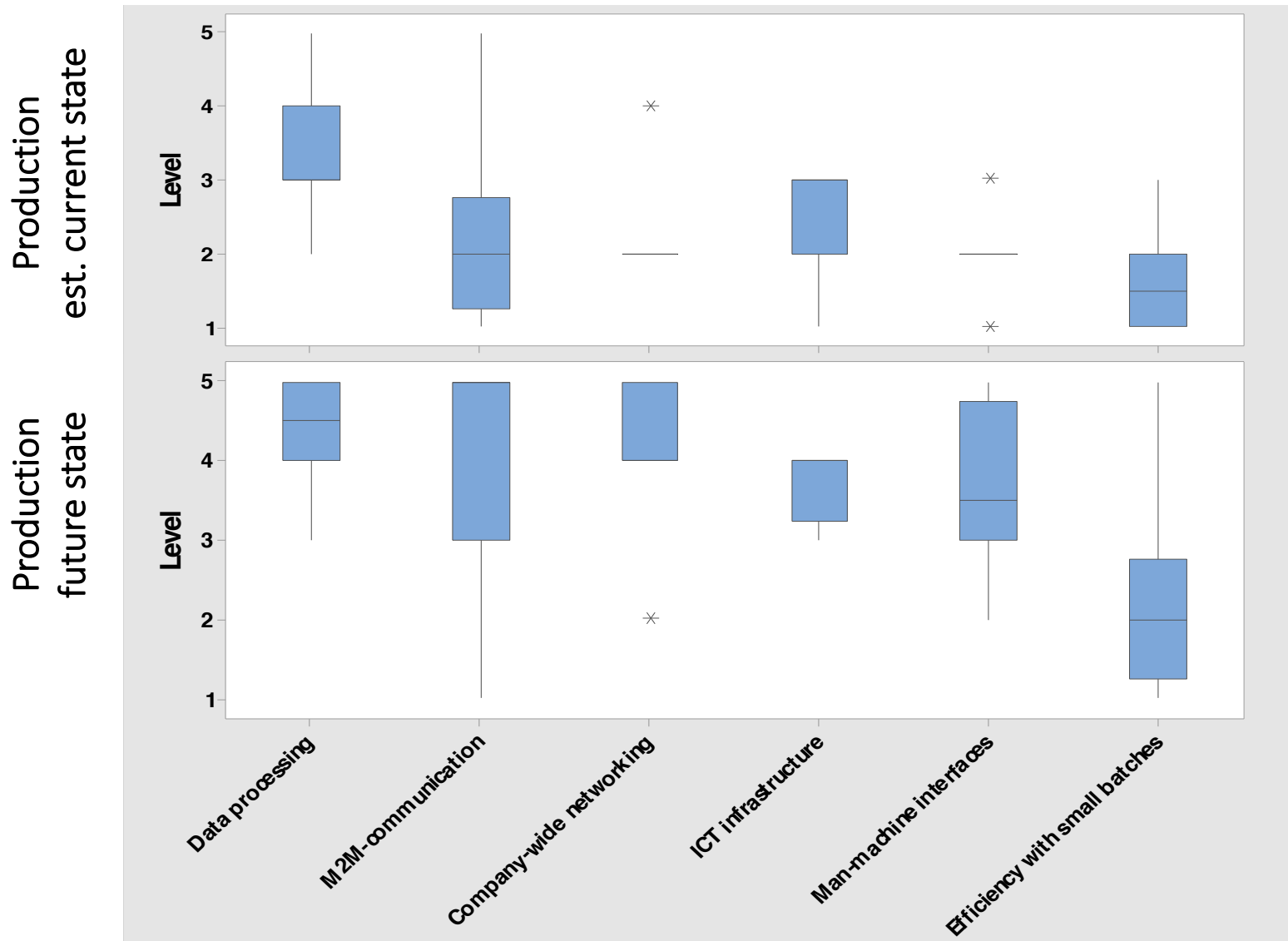
Production Side: Crossroads-Model explains Suitability of Concepts

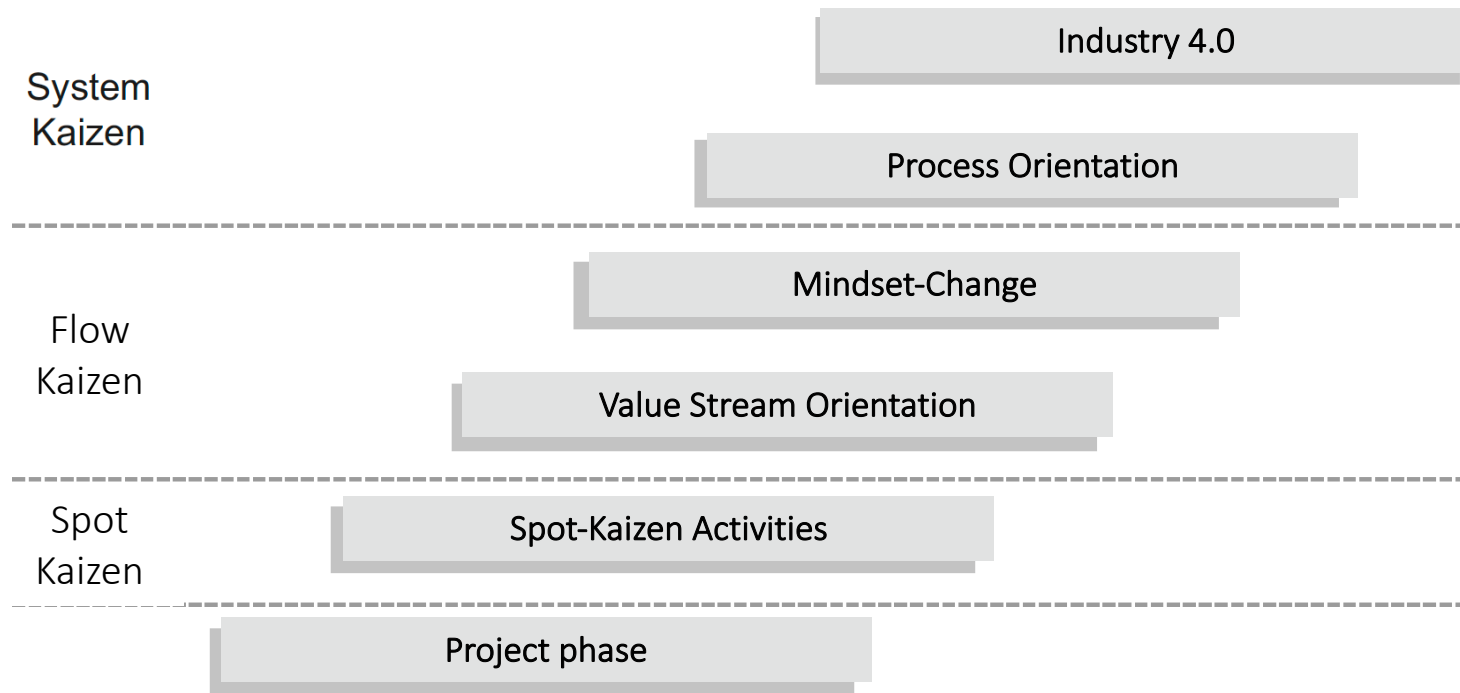Benefit of digitalization depends on complexity and dynamics of orders

Source: Feldmann, C., Ziegenbein, R. (2018), S.38

Production Side

Similarities and differences of concepts

Lean Production	Industry 4.0
Similarities of both concepts	- Increase in productivity - Avoidance of complexity - Stable and self-controlling processes - Standardization of products and processes, modularization - Holistic view of the company
Differences between concepts	**Lean Production** - Many simple solutions - Focus on employee creativity - All employees can contribute regardless of their level of qualification	**Industry 4.0** - Focus on data - Networking and process automation as a means of optimization - Assistance for the employee - Increased complexity is accepted - High level of qualification required

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Production Side: Six steps to Industry 4.0 from Lean Perspective
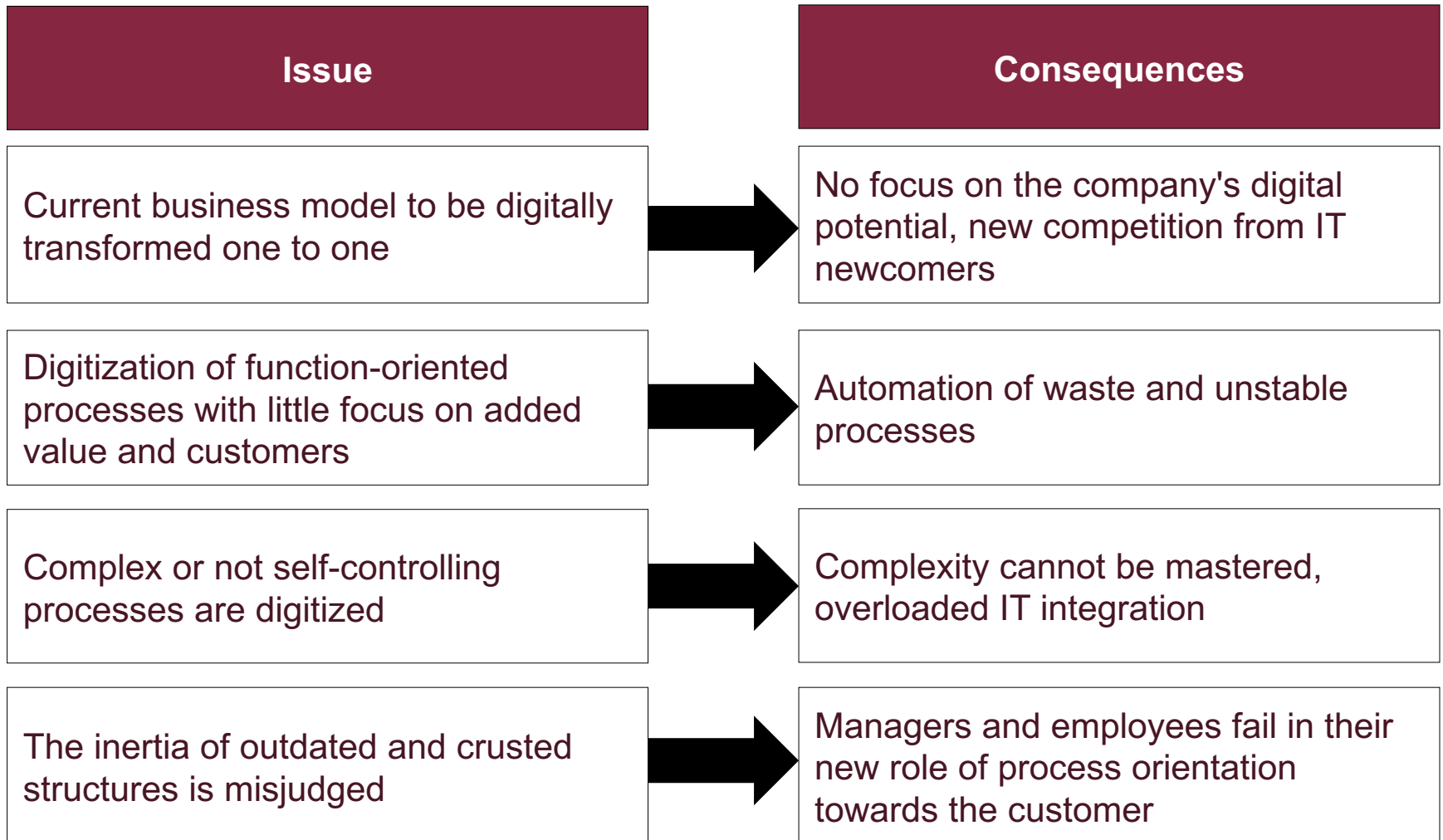
Improve your processes, first!

System Kaizen

Industry 4.0

Process Orientation

Flow Kaizen

Mindset-Change

Value Stream Orientation

Spot Kaizen

Spot-Kaizen Activities

Project phase

Recommendations

→ Lean and Industry 4.0 complement each other

→ Improve processes first or in parallel before starting Industry 4.0 transition

→ Digitize production especially to adjust for complexity and dynamics

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Summary (I)

Manage the risk of transformation

Issue	Consequences
Current business model to be digitally transformed one to one	No focus on the company's digital potential, new competition from IT newcomers
Digitization of function-oriented processes with little focus on added value and customers	Automation of waste and unstable processes
Complex or not self-controlling processes are digitized	Complexity cannot be mastered, overloaded IT integration
The inertia of outdated and crusted structures is misjudged	Managers and employees fail in their new role of process orientation towards the customer

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Summary (II)

Create new value through implementation of Industry 4.0 Roadmap

- Reach out for the potentials on the product side in small but fast steps!

- The prerequisite for industry 4.0 in production is the successful implementation of good processes and process orientation in the company:

  - Waste-free and stable processes,
  - Self-organization and control,
  - Standardized and modularized products and processes,
  - Process-oriented added value tailored to customer requirements,
  - Mindset change in managers and employees

- Success factors:

  - Commitment of leadership
  - Planning success
  - Role model function of leadership
  - Correct mindset, competent and responsible employees
  - Pursuing a holistic approach
  - Measuring success

Thank you for your attention!

Q&A

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4) Creative Market: https://creativemarket.com/sjagiello/574425-Cognitive-Computing-Icons

5) Würth Industrie Service GmbH & Co. KG: https://www.wuerth-industrie.com/web/de/wuerthindustrie/cteile_management/kanban/ibin_intelligenterbehaelter/ibin.php

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