



# Global corporate value chains and innovation networks in the fourth industrial era: New models of production and work organisation

**Prof. Dr. Julian Müller**

# A short introduction



Salzburg University  
of Applied Sciences

**Since 2018:**

Professor at Salzburg University  
of Applied Sciences

**Research areas:**

- Industry 4.0
- Sustainability
- Supply Chain Management
- (Business Model) Innovation
- Small and medium-sized enterprises



## **1) Industry 4.0: A short introduction and unsolved issues**

2) Industry 4.0 and Workforce 4.0

3) Industry 4.0, Business Model Innovation, and SMEs

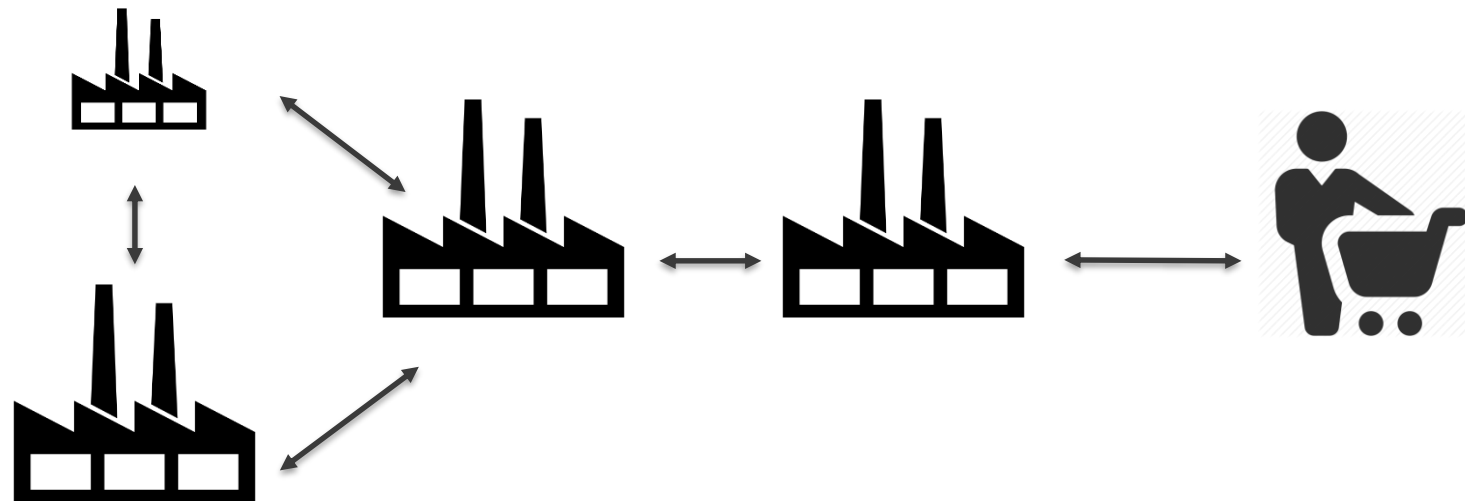
4) Data and information sharing for Industry 4.0 in supply chains

5) Industry 4.0 in comparison to China

6) Conclusion

# *(Some of the) less regarded topics in Industry 4.0 research*

## Industry 4.0 in SMEs



**Horizontal and vertical interconnection across the supply chain**

## **Horizontal (and vertical) interconnection**

- Data exchange across supply chains
- Integration of SMEs

## **Digital transformation of business models**

- Data-driven value generation for traditional industrial sectors
- Competitiveness of traditional industrial sectors

## **Ecological and social impact**

- Changing skills requirement
- Relocation of production and jobs

1) Industry 4.0: A short introduction and unsolved issues

## **2) Industry 4.0 and Workforce 4.0**

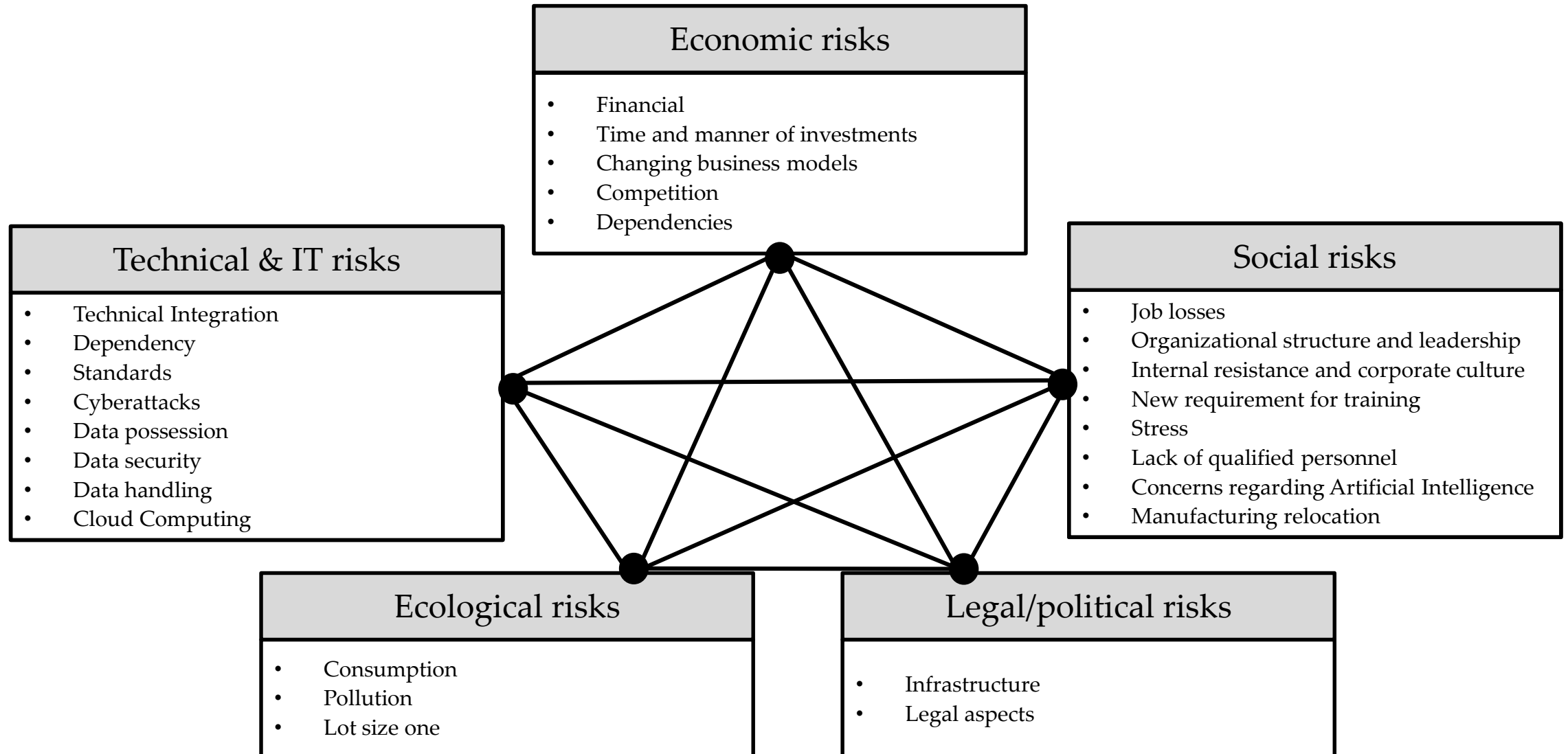
3) Industry 4.0, Business Model Innovation, and SMEs

4) Data and information sharing for Industry 4.0 in supply chains

5) Industry 4.0 in comparison to China

6) Conclusion

# Research insight: Risk dimensions of Industry 4.0



## **Leadership**

- Vertical integration in companies
- New mind-set in traditional industries

## **Training**

- New, data-based competencies
- New skill set

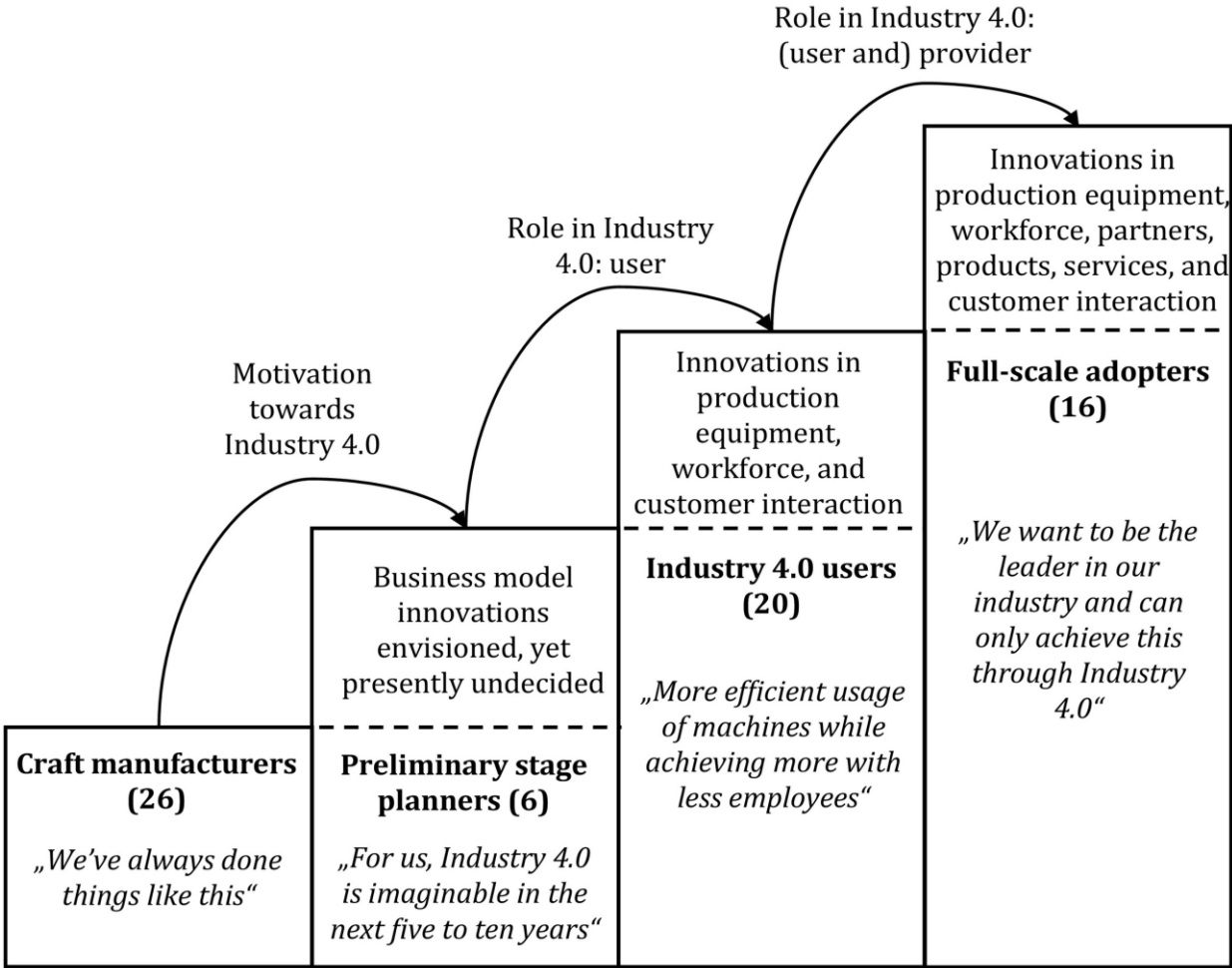
## **Retraining**

- Requalification of existing workforce
- Low-skilled jobs might be lost in the first place, activities of supervision will follow



- 1) Industry 4.0: A short introduction and unsolved issues
- 2) Industry 4.0 and Workforce 4.0
- 3) Industry 4.0, Business Model Innovation, and SMEs**
- 4) Data and information sharing for Industry 4.0 in supply chains
- 5) Industry 4.0 in comparison to China
- 6) Conclusion

# Stage-Gate model of Industry 4.0 in SMEs



# Classification of Industry 4.0-related business model implications through Industry 4.0

Role within Industry 4.0	Both	(1)	<b>4 SMEs</b> Production equipment (3) Workforce (3) Products (4), Services (2) Customer interaction (3)	<b>4 SMEs</b> Production equipment (3) Workforce (3) Partners and suppliers (2) Products (4), Services (3) Customer interaction (3)
	Provider	(1)	(2)	<b>4 SMEs</b> Production equipment (2) Workforce (2), Partners and suppliers (4) Products (2), Services (2), Customers (3) Customer interaction (3)
	User	<b>11 SMEs</b> Production equipment (9) Workforce (8) Customer interaction (7)	<b>8 SMEs</b> Production equipment (4) Customer interaction (4)	(1)
		Internal	External	Both
Motivation towards Industry 4.0				

- 1) Industry 4.0: A short introduction and unsolved issues
- 2) Industry 4.0 and Workforce 4.0
- 3) Industry 4.0, Business Model Innovation, and SMEs
- 4) Data and information sharing for Industry 4.0 in supply chains**
- 5) Industry 4.0 in comparison to China
- 6) Conclusion

# Company characteristics lead to specific targets of Industry 4.0



SMEs tend to be interested in operational targets of in Industry 4.0



Process industries are also rather oriented towards operational targets



Machine and plant engineering enterprises or electrical and ICT industries are further oriented towards strategic benefits of Industry 4.0



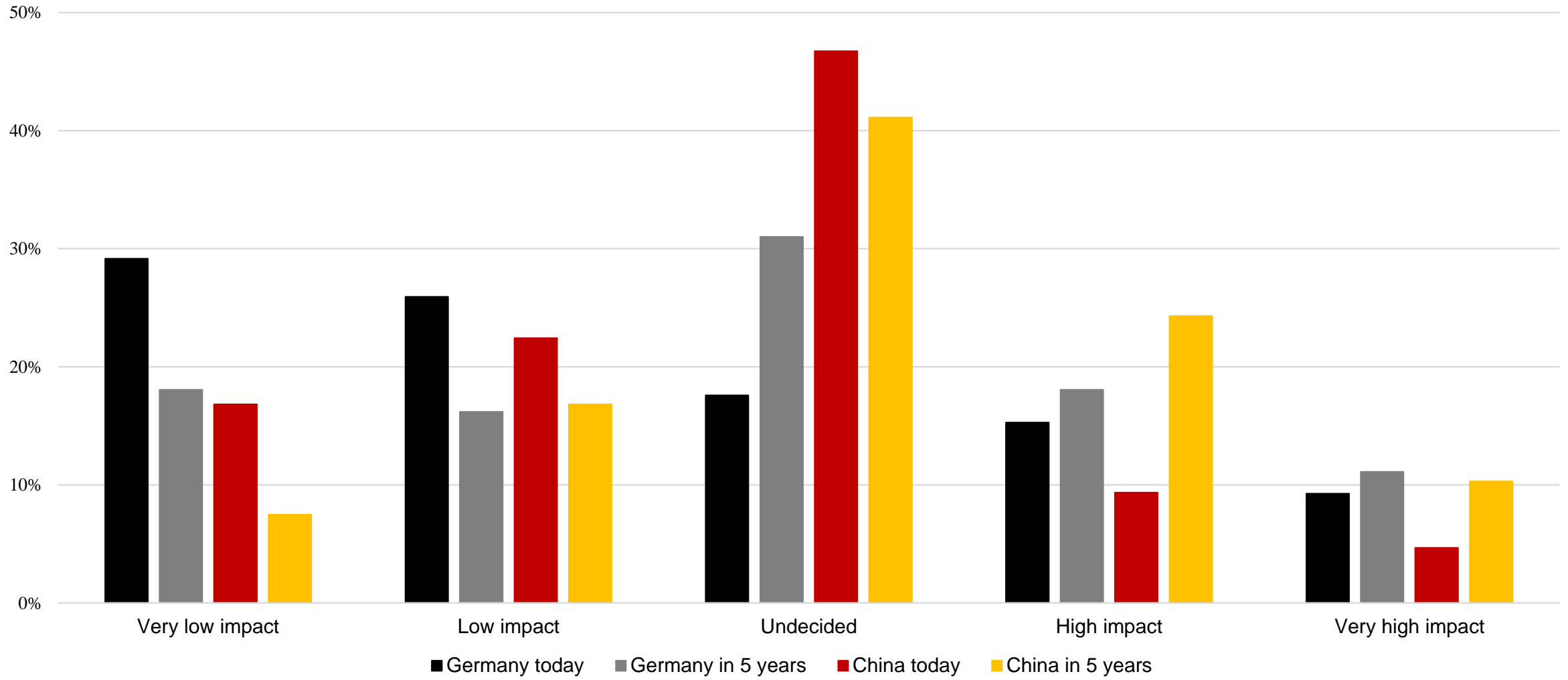
The role as user or provider of Industry 4.0 technologies is decisive



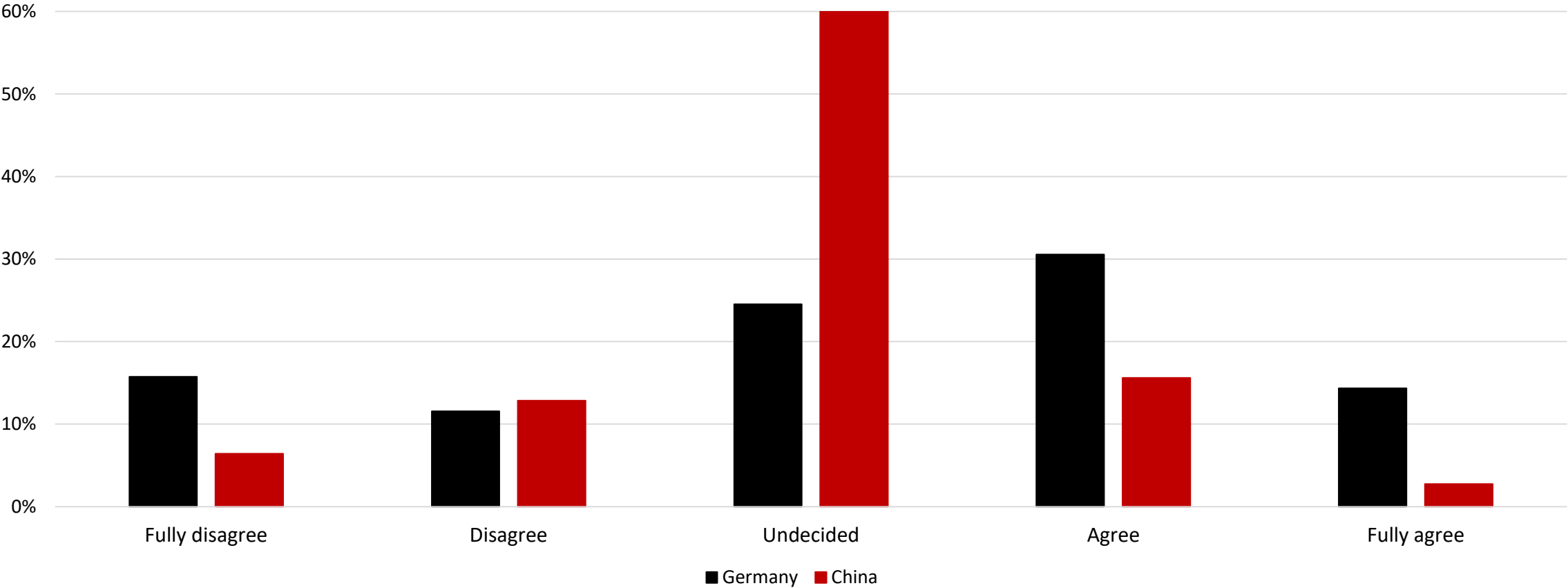
**Industry 4.0-specific solutions  
are required**

- 1) Industry 4.0: A short introduction and unsolved issues
- 2) Industry 4.0 and Workforce 4.0
- 3) Industry 4.0, Business Model Innovation, and SMEs
- 4) Data and information sharing for Industry 4.0 in supply chains
- 5) Industry 4.0 in comparison to China**
- 6) Conclusion

# Perceived impact of Industry 4.0 in Germany and China



# Unsuitability of the current programs for SMEs

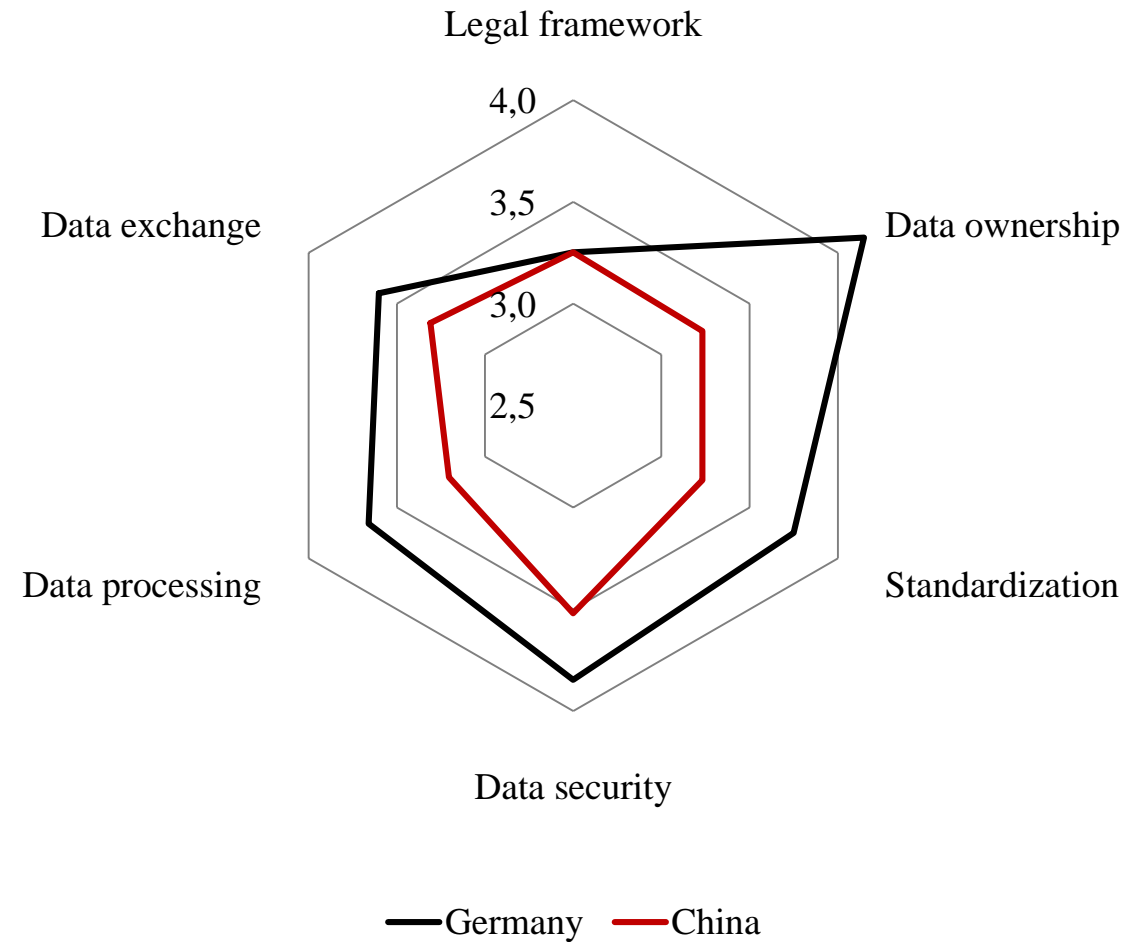




# Challenges of Industry 4.0 in Germany and China



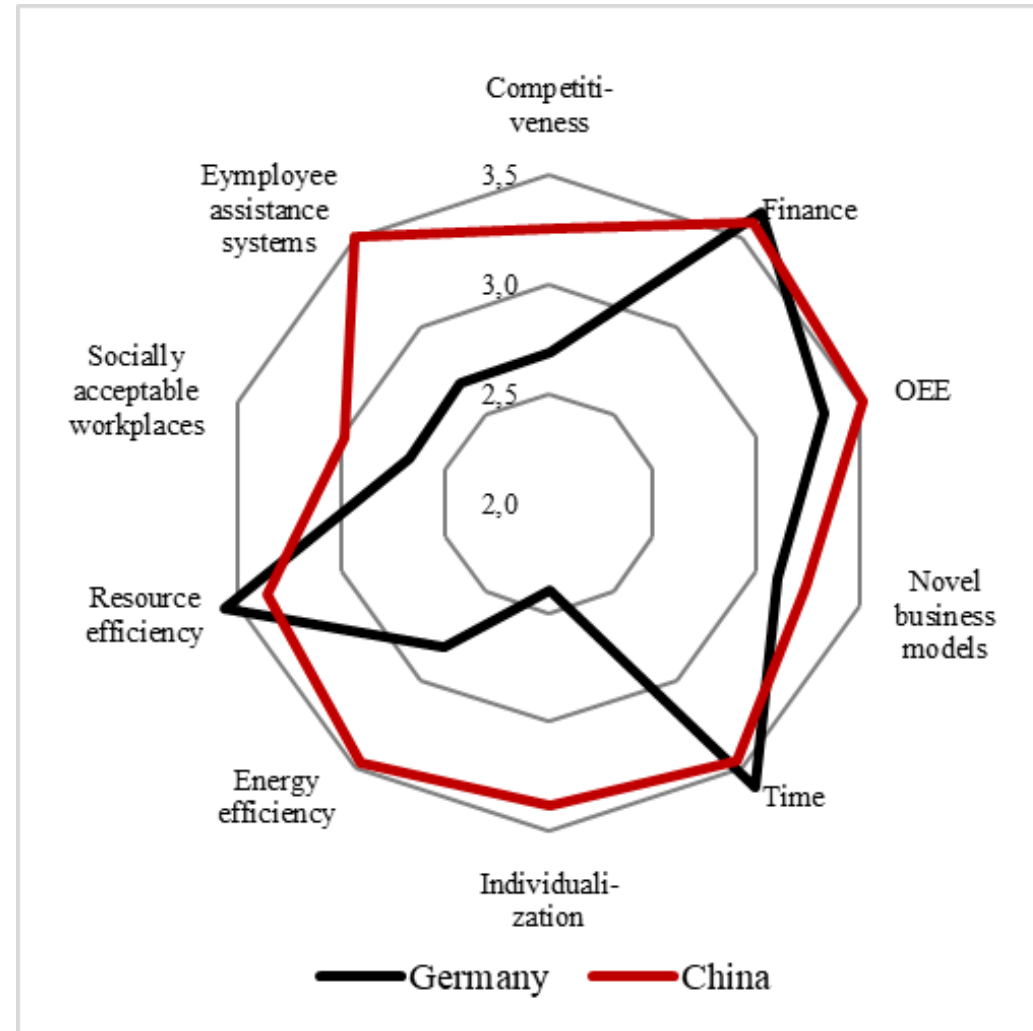
Salzburg University  
of Applied Sciences



# Benefits of Industry 4.0 in Germany and China



Salzburg University  
of Applied Sciences



- 1) Industry 4.0: A short introduction and unsolved issues
- 2) Industry 4.0 and Workforce 4.0
- 3) Industry 4.0, Business Model Innovation, and SMEs
- 4) Data and information sharing for Industry 4.0 in supply chains
- 5) Industry 4.0 in comparison to China

## **6) Conclusion**

# *Conclusion: Implications for policy*

Training and jobs

Manufacturing relocation

Integration of SMEs

Data ownership and security

Industry-Politics-Science  
support

Manufacturing and innovation  
ecosystems

Legal framework



# Global corporate value chains and innovation networks in the fourth industrial era: New models of production and work organisation

**Prof. Dr. Julian Müller**

julian.mueller@fh-salzburg.ac.at

Brussels, 17.05.2019

- Birkel, H. S., Veile, J. W., Müller, J. M., Hartmann, E., & Voigt, K. I. (2019). Development of a risk framework for Industry 4.0 in the context of sustainability for established manufacturers. *Sustainability*, 11(2), 384.
- Kiel, D., Müller, J. M., Arnold, C., & Voigt, K. I. (2017). Sustainable industrial value creation: Benefits and challenges of industry 4.0. *International Journal of Innovation Management*, 21(8), 1740015-1-1740015-34.
- Müller, J. M. (2019). Business model innovation in small-and medium-sized enterprises: Strategies for industry 4.0 providers and users. *Journal of Manufacturing Technology Management*, in press.
- Müller, J. M., & Voigt, K. I. (2018). Sustainable Industrial Value Creation in SMEs: A Comparison between Industry 4.0 and Made in China 2025. *International Journal of Precision Engineering and Manufacturing-Green Technology*, 5(5), 659-670.
- Müller, J. M., Buliga, O., & Voigt, K. I. (2018). Fortune favors the prepared: How SMEs approach business model innovations in Industry 4.0. *Technological Forecasting and Social Change*, 132, 2-17.
- Müller, J. M., Kiel, D., & Voigt, K. I. (2018). What Drives the Implementation of Industry 4.0? The Role of Opportunities and Challenges in the Context of Sustainability. *Sustainability*, 10(1), 247.
- Müller, J. M., & Voigt, K. I. (2018). Sustainable industrial value creation in SMEs: a comparison between industry 4.0 and Made in China 2025. *International Journal of Precision Engineering and Manufacturing-Green Technology*, 5(5), 659-670.
- Müller, J., Dotzauer, V., & Voigt, K. I. (2017). Industry 4.0 and its impact on reshoring decisions of German manufacturing enterprises. In: *Supply Management Research* (pp. 165-179). Springer Gabler, Wiesbaden.