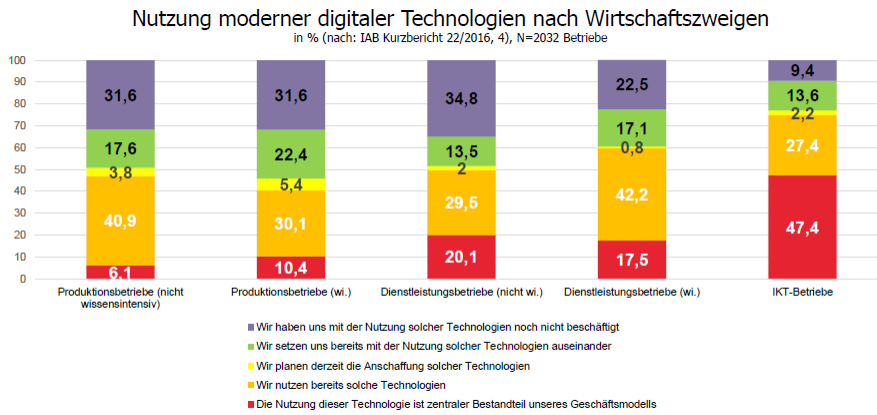


Dissemination rate of digital technologies



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Folie 3



Steps on the path to Industry 4.0

Quelle: Detlef Gerst IG Metall

production work

Human-Robot Interaction

- 3 D - printers
- assistance systems
- Plug & Produce Module
- Mobile multiplemachine operation,
- Remote control of Generation units

Engineering (consistent)

- IT supported Simulation
- eliminate Interfaces
- Use of Cloud und crowd-sourcing

Maintenance

- over spatial distances
- diagnostic assistance
- sensor technology for material- and production conditions

production control

- RFID as a new recording medium
- real-time data
- digital product memory
- intelligent containers
- optimizing based on BIGDATA

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Folie 4



Challenges for Work 4.0

- What activities are lost, which activities are changing, which activities are emerging?
- What changes are there for the workplace organization (scope of action, transparency, performance requirements, activity cuts)?
- What new requirements arise for company data protection, the use of metadata and access to operational and industrywide data ?
- How must education and training be changed? How are access to education and training developed?
- How will working time be designed in the future? (Compatibility or limitation)
- What are the effects of creating working conditions (crowdworking)

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Folie 5



Studies to impact on employment inconsistent

drastic sceneries

- 47% employees in the United States are directly endangered by Robots und machine intelligence (Frey/Osborne 2013)
- 18,3 Mio employment relationships in Germany are directly endangered by computer technology (InG Diba 2015)

moderate sceneries

- Man is completely replaceable in hardly a profession. But: Professions will change (IAB 2015)
- Replaceability potential for manufacturing occupations at more than 70%. (IAB)
- Automation of office work (eliminate interfaces of value creation, automated processing from customer dialog to delivery (Kurz/Rieger)

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Folie 6



Design question Industry 4.0 und Work 4.0

work contents	Extended work tasks with influence on design and objectives	narrow remit, high level of standardization
work organisation	More scope for action and opportunities for participation	strict standards and limited transparency
ergonomics	Discharge in cases of physical and mental stress	dequalification by automation
working time	More temporal sovereignty for the better reconciling of work and private life	Stronger requirements for individual availability (limitation, systems define working time)
dates	Access to information	Control and monitoring
Global work sharing	Internationale Arbeitsteilung unterstützen	Supporting international work sharing
employment	Productivity gains for employees and society	Productivity gains for entrepreneurs - increased social inequality

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Folie 7

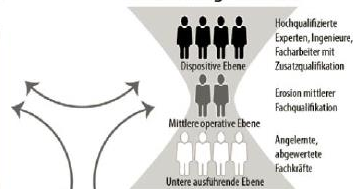


Ersatz – Polarisierung – Aufwertung von Arbeit

Substitution von Arbeit: Automated Factory



Polarisierung von Arbeit



Quelle: Ittermann, u.a. 2016: Social Manufacturing and Logistics. Gestaltung von Arbeit in der digitalen Produktion und Logistik. TU Dortmund.



Upgrading von Arbeit



Diese Szenarien werden von Wissenschaftlern für möglich gehalten. Ihre Wahrscheinlichkeit hängt maßgeblich von **Gestaltungsentscheidungen** ab (Ittermann u.a. 2016).

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Folie 8



Opportunities and risks in hybrid systems

Opportunities

- Less routine
- Adaptation to persons
- Restoring Human Limitations (Ergonomics)
- expanded scopes of action
- better work-life balance
- Easy learning

Risks

- Responsibility without taxation
- Cognitive overload
- Loss of time sovereignty
- Change as a permanent state
- Transparent man
- Control by machine
- New physical and mental stress

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Folie 9



Social organization

Operational design has to be flanked by the shaping of social conditions

- working time configuration
- data protection
- Labor Law (Temporary Work, Works Contracts)
- Qualification
- Labor market policy
- collective bargaining coverage
- welfare state

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Folie 10



Industry 4.0

trend forecasts

- Digitization leads to considerable productivity gains
- Work is accelerated
- Work is more controlled and steered
- Work becomes more flexible
- Reaction to uncertainties

Effects of

- Type and extent of employment
- qualification requirements
- Physical and psychological effects
- Social segmentation
- Employment conditions (homogeneous or fragmented)
- International work sharing

Effects are dependent on company and social organization

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Folie 11



Vielen Dank für Ihre Aufmerksamkeit

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