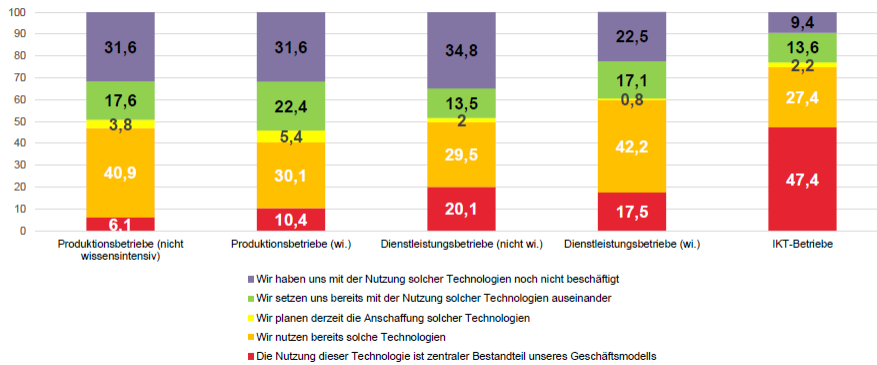




## Dissemination rate of digital technologies

### Nutzung moderner digitaler Technologien nach Wirtschaftszweigen

in % (nach: IAB Kurzbericht 22/2016, 4), N=2032 Betriebe



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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

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

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Folie 7

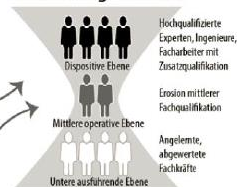


## Ersatz – Polarisierung – Aufwertung von Arbeit

### 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**

**ffw GmbH - Gesellschaft für Personal- und Organisationsentwicklung**

Allersberger Straße 185/F, D-90461 Nürnberg  
[www.ffw-nuernberg.de](http://www.ffw-nuernberg.de), E-Mail: [info@ffw-nuernberg.de](mailto:info@ffw-nuernberg.de)  
 Tel.: 0911/462679-0

