

# Robots and Labor Markets: Impact on the Future of the Human Workforce

Dr. Uwe L. Haass  
Uwe.Haass@roboconsult.eu

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## Hypothesis A: "Release theory"

- jobs are lost on a massive scale due to technology
- Technological progress increases rationalisation potential, drives the productivity pace stronger than output growth.
- Unemployment to a large scale, impoverishment of masses

### History:

- already in the machinery debate about 1820 ("Luddites", "Maschinenstürmer")
- the rationalisation debate around 1930
- the automation debates in 1958, 60s, 80s were lively discussions.

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## Hypothesis B: "Compensation theory"

- New products, new markets expand the demand, especially with *additive* innovations
- Efficient production technologies lead to cheaper products: "real" income growth and increasing demand overcompensate any problems due to higher unemployment
- *Production* of machinery requires more jobs in OEM and supply chains
- Better Position in international competition
- After a few years, people find new jobs in growth industries

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## History: Situation in Germany 1982



**20.08.1982**

NÜRNBERG (cmd) - Despite the use of microelectronics, employment in the Federal Republic has increased from 1976 to 1980...

In his study "Five years microelectronics discussion", IAB researcher Werner Dostal tries to shed light on the impact of new technologies on the employment structure. Within each industry, **he states a significant increase in employment in the service sector and the manufacturing industry**. An above-average growth rate was recorded here during the investigation period **by 64.5 percent, for manufacturers of office machines and data processing equipment and facilities**.

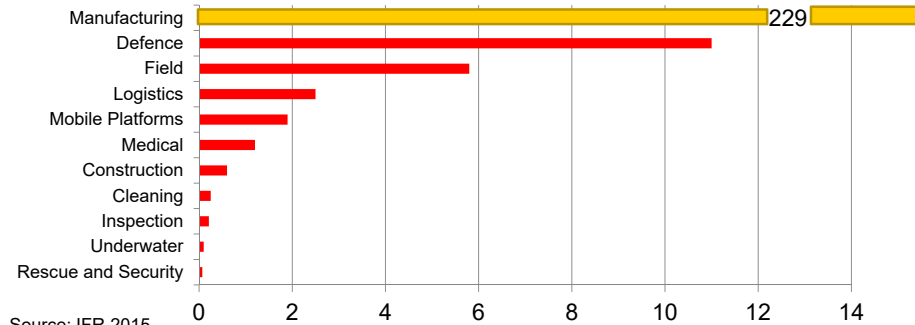
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## Discussion mostly about effects of industrial robots /manufacturing

### Robots sold in 2014 (times 1,000)



Source: IFR 2015

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## Interest in Influence of Robots on Labour

July 2010	Booz & Co, Perspective on Global Robotics, Market Overview
Aug 2012	IFR World Robotics 2012
Jan 2013	IFR study by Metra Martech: Positive Impact of Industrial Robots on Employment
May 2013	Disruptive technologies: Advances that will transform life, business, and the global economy, McKinsey
Sep 2013	Oxford University: The Future of Employment: How Susceptible are Jobs to Computerisation?
Aug 2014	Boston Consulting The Rise of Robots, Alison Sander and Mel Wolfgang
Aug 2014	Pew Research: AI, Robotics, and the Future of Jobs
Sep 2015	European Commission: Analysis of the Impact of Robotic Systems on Employment in the EU
Jan 2016	TECHNOLOGY AT WORK v2.0 The Future Is Not What It Used to Be (Oxford Martin School and Citi Global Perspectives and Solutions)
Jan 2016	Future of Jobs, Employment, Skills, and Workforce Strategy for the 4 <sup>th</sup> Industrial Revolution: World Economic Forum Davos

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## Hopes and Concerns in the **Pew Survey**

### 1. Hopes = Compensation Theory (Minority)

- Advances in technology (industrial revolutions) may displace certain types of work, but historically they have been a net creator of jobs.
- Robots will free us from day-to-day drudgery, unhealthy, dangerous, and tedious jobs.

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## Hopes and Concerns in the Pew Survey (2014)

### 2. Concerns = Release Theory (Majority)

AI and Robotics are different from all previous industrial revolutions: by giving machines *human (physical and cognitive) capabilities*, "they will kill more than 50% of all current jobs within the next 20-30 years" (→ mass unemployment)

### 3. Agreement of both sides:

- The "concept of work" needs to change

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## Oxford Study (Michael Osborne and Carl Benedikt Frey): research on jobs/professions (updated vers. Jan. 2016)

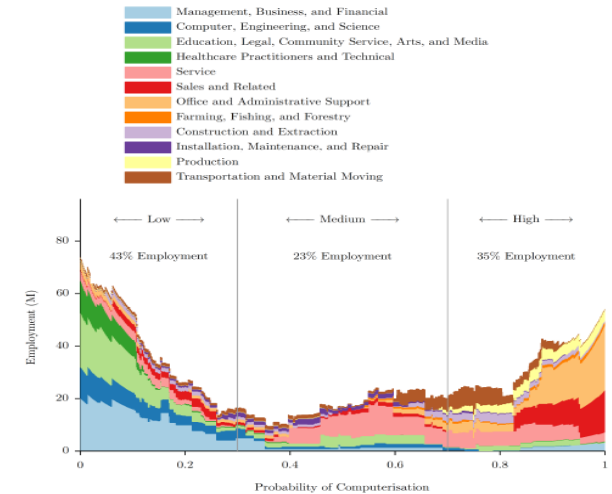
- Quickly as popular as the Pew survey
- Dataset of 702 occupations, categorised for employment, income and skills related to automatability (e.g. finger dexterity, originality and persuasion).
- Figures from US and UK
- 35% of UK jobs will get lost within the next 20 years
- resistant to computerisation: high-skilled and creative jobs, designers, social competencies, engineers,...
- BBC has a website to answer "will a robot take your job?": <http://www.bbc.com/news/technology-34066941>

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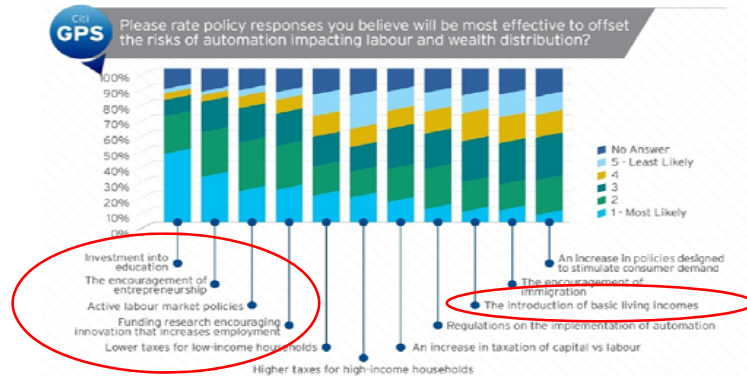
## Oxford Study: jobs in danger (UK data set)



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## Oxford Study: Remedies

Figure 89. Citi's Survey Results on Policy Responses



Source: Citi Research

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## Situation in Germany 2016

- Experience: "If we do not innovate into robotics, we'll lose *all jobs*"
- Work force: high percentage well educated/trained, especially *dual apprenticeship model* → flexible and highly professional / problem solvers
- Unions are modest to supportive
- 2.8 million unemployed, 0.5 million open positions; demographic change
- Germany's economy in good shape: restructuring of work/jobs easier
- High level of manufacturing industries (22% of GNP; F: 11%, UK: 9%) → car industry: high automation, but more employment
- (Industrial/service) robotics industry matured, science excellent
- Weaknesses in IT, but catching up (Industrie 4.0)

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## What needs to be looked at for any forecast?

- What robots can do and what they cannot do
- What type of robots
- Related technologies: computing, AI, etc.
- How many are installed in what industries
- what circumstances, what countries (role of unions)
- What economies, what structure /sectors of industry / services
- What other effects create jobs/ create unemployment? Effects of other sectors of industry, international trade etc.
- Besides “strict” unemployment: any adaptation of job profile?
- What type of jobs? → Example next slide

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## Harvesting Cucumbers, state-of-the art



„Gurkenflieger“ Photo: obs/Hengstenberg

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## Robotics in Logistics

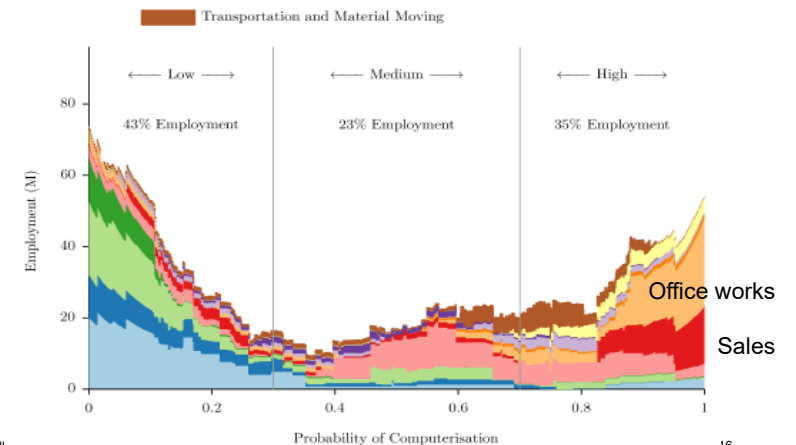
- Analyse jobs and estimate the complexity of the robot: Dexterity? Transportation? Manipulation? Navigation? Flexibility? Climbing? → challenges for robot R&D
- Robots in Distribution and Sorting Centres: tedious jobs for humans, challenges for robots due to complexity but potential for growing percentage of automation
- Jobs of delivery service (“last mile” – but what about the “first mile?”):
  - Mid-term: robotic devices for transportation, humans for supervision (robot companions)
  - Long-term: new infrastructure (smart cities)?
  - Organisation and IT are more influential on business models

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## Oxford Study: jobs in danger (UK data set)



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## Summary about recent studies

- Highly important among politicians and media (made it up to Davos World Economic Forum)
- **much more differentiating than earlier ones:**
  - what type of jobs
  - what type of robots (abilities,...) and prognoses for installations
  - what type of education/training/flexibility
  - country-related etc.
- **A.I. /IT mostly amalgamated with robotics**
- include suggestions how to avoid unemployment
  - education /training
  - innovation/entrepreneurship

but →

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## Studies for society as a whole - not yet done (1/2):

- **Ethical / Legal aspects of robots** (from privacy to “Singularity”)
- **Danger of Polarisation:**
  - society as a whole in danger of losing middle class
  - uneven situation in EU:
    - high-tech economies using and building/selling robots,
    - low-tech economies only using/buying robots
    - strategy needed for EU cohesion policy
- **Labour**
  - Organisation of work, working times etc., Human Resources
  - Taxation principles: balance lost between labour and capital; more wealth reaches the owners of capital
  - Aging population (covered partially), shortage of workers

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## Studies for society as a whole - not yet done (2/2):

- **Studies have not yet looked at societal benefits of robots** (dangerous jobs, health, quality of life, rescue, etc.)
- **Missing: how robots create jobs!**
  - E.g., inspection robots save oil and gas industry millions of investment
  - Increase Industrial Manufacturing!
- **Re-shoring of industries:**
  - making industries with knowledge in Europe profitable again
  - e.g., textile and leather industry in combination with design and custom-tailored

**How to change opinions propagated by media and politicians?**

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Thanks. More? Ask! ...

...and become a member of



Dr. Uwe L. Haass  
Consultant

[Uwe.Haass@roboconsult.eu](mailto:Uwe.Haass@roboconsult.eu)

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