Digital transformation
of production and employment

Fact-finding seminar on skills, innovation and access to and provision of training

Ricardo Rodriguez Contreras, Eurofound

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Content

1. **Eurofound approach to digitalisation**

2. **Digital transformation in production processes and the provision of services**

3. **Some findings on the impact on skills**

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Six Strategic Areas of Intervention

Key Topics
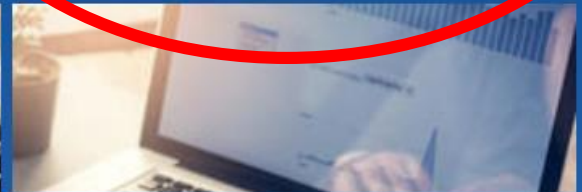
- Industrial relations
- Labour market change
- The digital age: opportunities and challenges for work and
- Quality of life and public services
- Working conditions and sustainable work
- Monitoring convergence in the European Union

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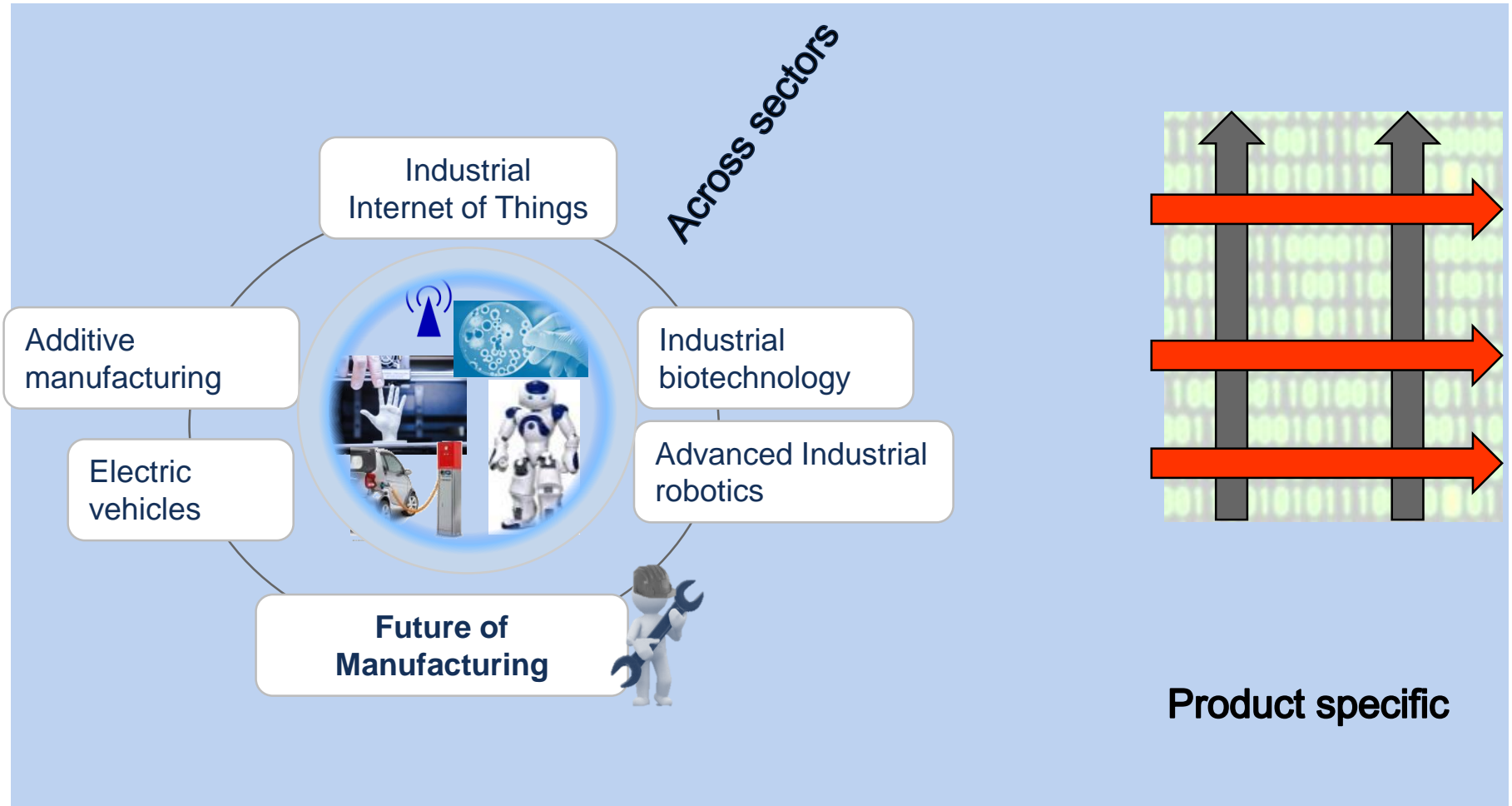# Eurofound approach to technological change

Understanding the technological change

Work processes

Employment, jobs and skills

Impact on working conditions

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Five game-changers in manufacturing

Across sectors

Industrial Internet of Things

Additive manufacturing

Electric vehicles

Industrial biotechnology

Advanced Industrial robotics

Future of Manufacturing

Product specific

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Five game changers in the services sector

Wearable devices
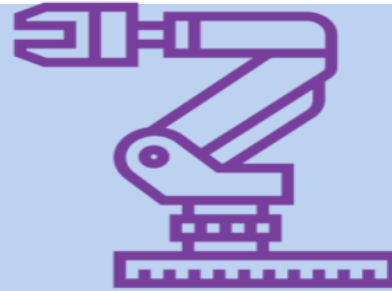
Advanced robotics

Game-changing technologies

Blockchain

Virtual/augmented reality

Autonomous transport devices

La economía de los servicios

Education and Health

Financial activities

Wholesale and retail trade

Other services

Services economy

Transportation and Logistics

Media&Information and Arts

Professional and Businesses services

Leisure and HORECA

Government

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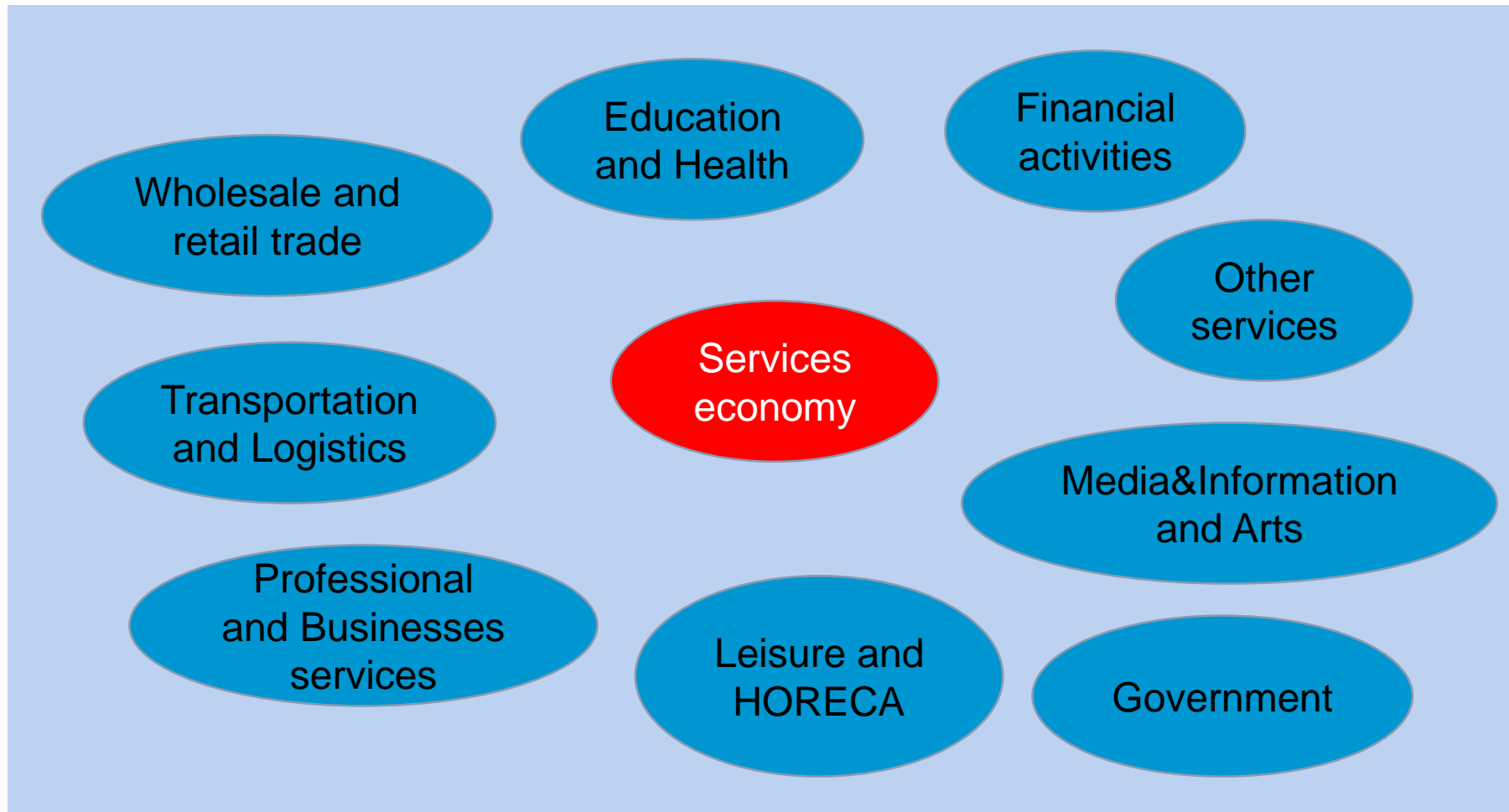
Traditional conceptions of manufacturing and services sector

Manufacturing

- Production of physical goods

- Physical location

- Management of stock

- Market-oriented

- Capital intensive

- More able to automate production processes

Services sector

- Intangible output

- Less dependent of physical sites

- Inventory aligned to forecasts

- Service delivery based on customer-oriented

- Labour intensive

- Social relations

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How is the digital age affecting work and employment?
Three vectors of change

AUTOMATION	DIGITISATION OF PROCESSES	COORDINATION BY PLATFORMS
Artificial Intelligence	Blockchain	
	Internet of things	
Autonomous transport devices	3d printing	Crowd employment/ platform work
	Wearables	
Advanced Robotics	Virtual/augmented reality	
Replacement of labour	Work process reorganisation	Management and work organisation

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Overview of main technology clusters

|	What is it?	Examples	Challenges for work and employment
Automation	Human tasks <u>REPLACED</u> by machines	Robotics, drones, Artificial Intelligence	Job polarisation, work organisation, skill demands
Digitisation	Digital Production <u>PROCESSES</u>	Internet of Things, VR, 3D printing	Fragmentation of jobs, contractual arrangements, privacy
Platforms	<u>COORDINATION</u> Matching of supply and demand	Transport, delivery, online services	Work organisation, fragmentation, employment status

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Game-changing technologies and the production process
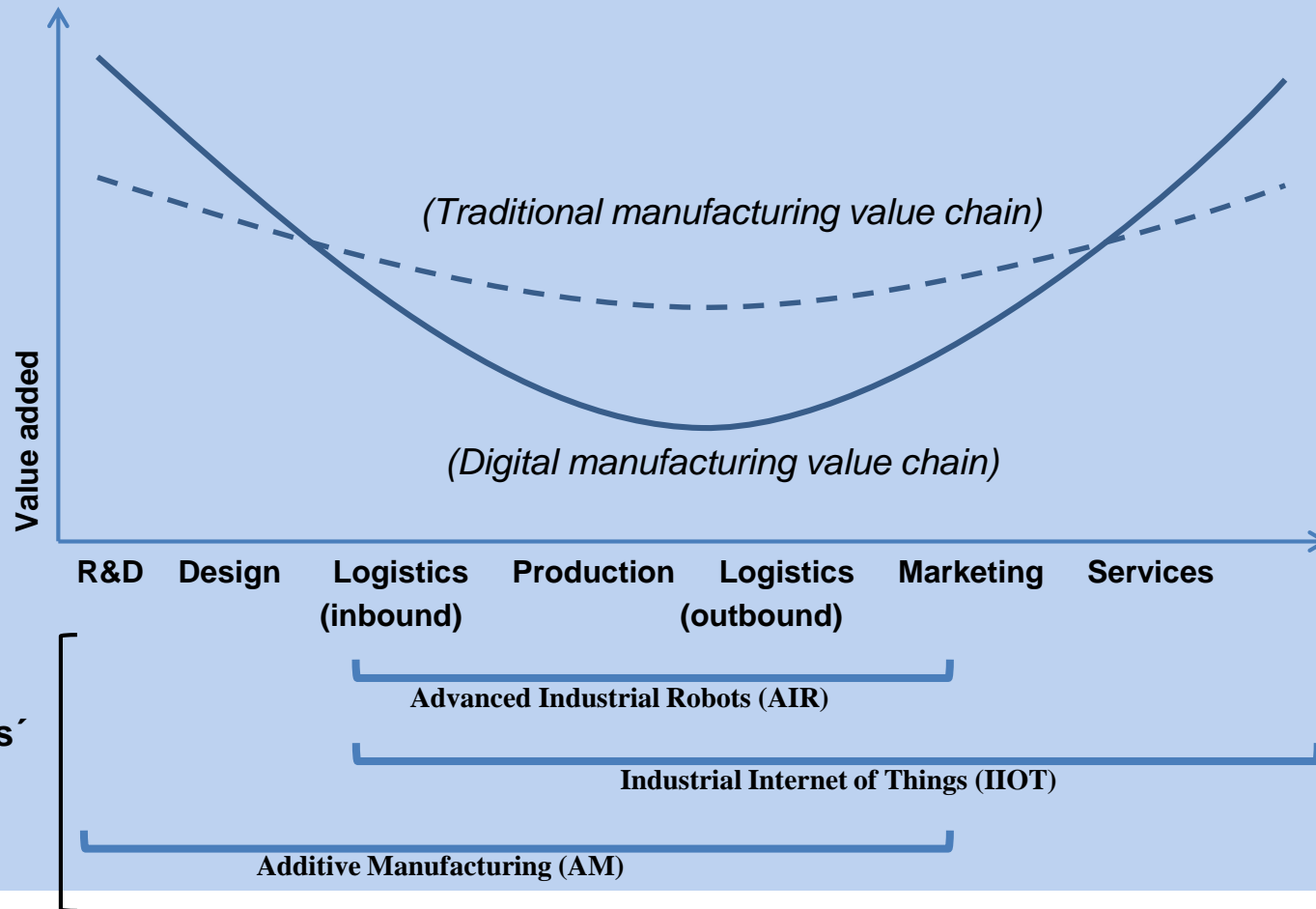
Advanced robotics

Robots with a physical presence that combine improvements in machine dexterity and the ability to interact with the environment with intelligent functions

Trends shaping the landscape

- The market interest and activity in advanced robotics has seen a general upward trend since 2007.
- The service robotics sector is set to experience significant growth in the coming years, particularly in the fields of logistics, public relations, defence, and healthcare.

Drivers

- Increased efficiency in work processes
- Safety benefits offered
- Continued technological advances
- Novelty and PR value

Barriers

- Intensive development and investment costs
- Public acceptance
- Sector-specific challenges depending on the limits of the technology and ethical and practical concerns

Sectors impacted

- Health and healthcare
- Civil service
- Technical safety
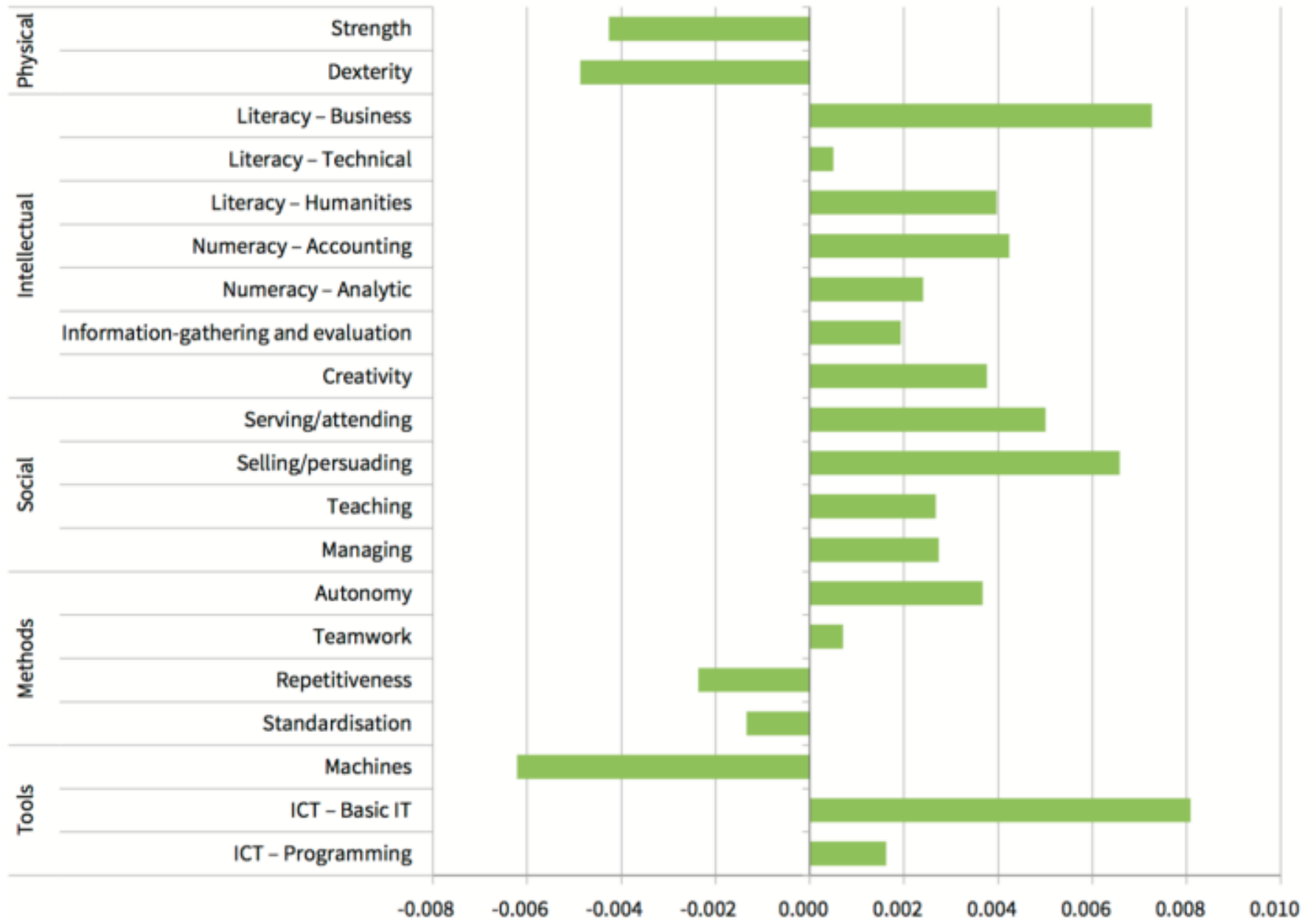- Science and research
- Customer service
- Logistics

Socio-economic implications

- Robot adoption may drive employment demand in specific areas (e.g. jobs that involve engaging with, supervising or developing automating technologies); however, the ultimate impact on job creation/loss is difficult to predict, and may vary significantly across sectors.
- The use of robots is likely to change the nature of tasks performed by humans, automating some repetitive tasks but relying on human collaboration for other tasks.
- Work environments may need to be redesigned to accommodate robots.
- Robots may enhance productivity by augmenting or replacing human labour.
- Robotics, along with wider digital technologies, may change work organisation within the service sector by enabling greater remote and platform working.
- New service sector business models may be created, including system integrators and a new 'robotics as a service' sector may develop.

Key trends

- Workplaces and work environments change

- Increasing servitisation of the industry ….

- Some techs still in the infancy, but <u>interoperability is key</u>, particularly AI and IoT combined with Big data and cloud

- Uneven pace of deployment challenged by a) financial constrains; b) regulatory issues; c) privacy invasion concerns; d) insufficient connectivity and data management; e) cybersecurity issues; f) sectoral features

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Figure 5: Change in the task indices in the EU, 2015 to 2030

Category	Task	
Physical	Strength	
	Dexterity	
Intellectual	Literacy – Business	
	Literacy – Technical	
	Literacy – Humanities	
	Numeracy – Accounting	
	Numeracy – Analytic	
	Information-gathering and evaluation	
	Creativity	
Social	Serving/attending	
	Selling/persuading	
	Teaching	
	Managing	
Methods	Autonomy	
	Teamwork	
	Repetitiveness	
	Standardisation	
Tools	Machines	
	ICT – Basic IT	
	ICT – Programming	

Axis: -0.008   -0.006   -0.004   -0.002   0.000   0.002   0.004   0.006   0.008   0.010

A task-centred analytical approach: understanding what people do at work

Two main patterns of employment growth:

- Upgrading

- Polarisation

Assumptions:

- Tech progress involves greater demand for high-skilled workers

- Less demand for lower-skilled

- Middle of job-wage distribution: the more the tasks are easy to codify, the more to be replaced by machines

- The less routine jobs, the less easy to automate

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Eurofound taxonomy of tasks (2016)

In terms of the content

1. Physical tasks: physical manipulation and transformation of material things:
   a. Strength
   b. Dexterity

2. Intellectual tasks: manipulation and transformation of information and the active resolution of complex problems:
   a. Information processing (literacy and numeracy)
   b. Problem solving (gathering and evaluation of information, creativity and resolution)

3. Social tasks: interaction with other people:
   a. Serving/attending
   b.Teaching/training/coaching
   c. Selling/influencing
   d. Managing/coordinating
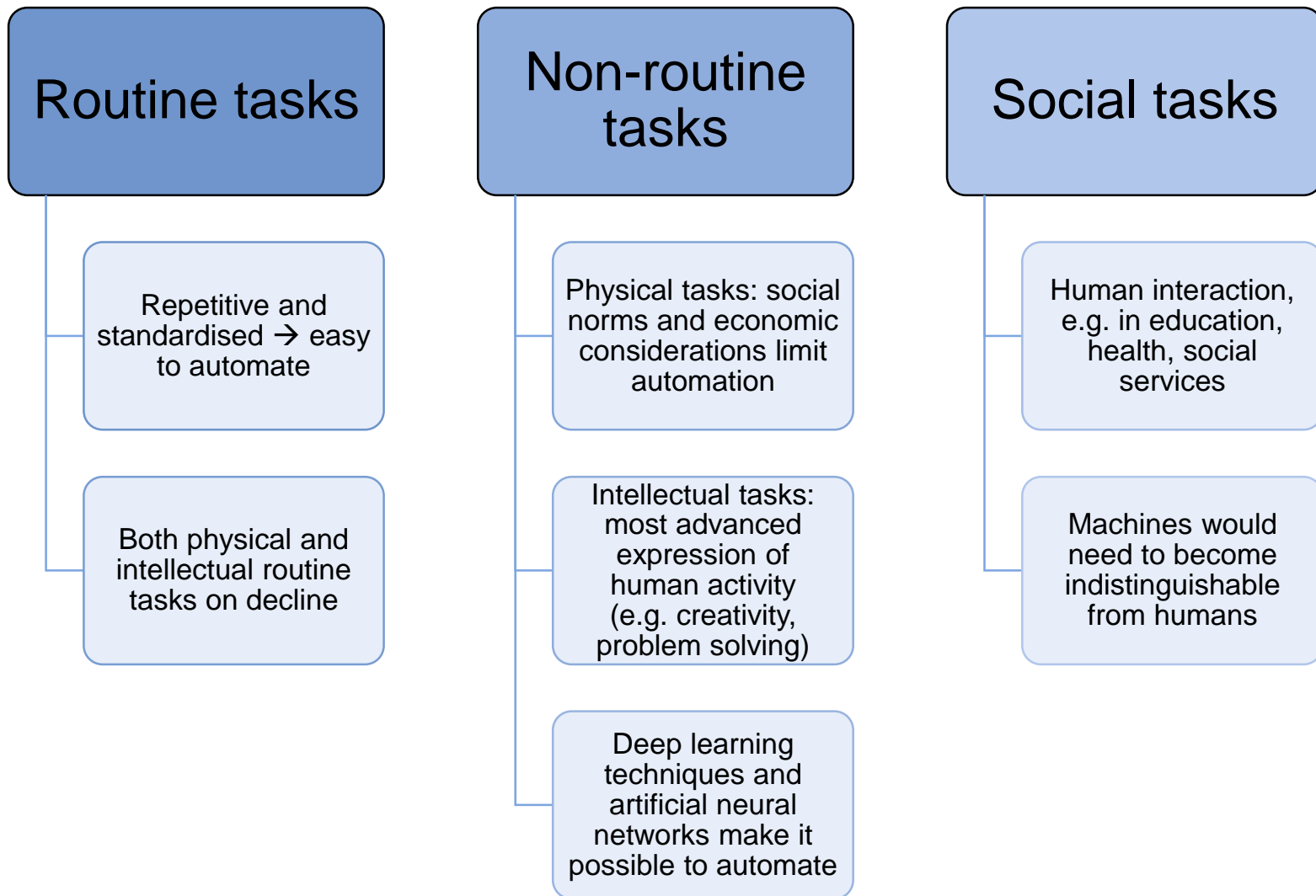
In terms of the methods and tools

1. Methods: forms of work organisation used in performing the tasks:
   a. Autonomy
   b.Teamwork
   *c. Routine (*repetitiveness and standardization)

2. Tools: type of technology used at work:
   a. Machines (excluding ICT)
   b. Information and communication technologies (basic and programming)

Automatable tasks

Routine tasks

- Repetitive and standardised → easy to automate

- Both physical and intellectual routine tasks on decline

Non-routine tasks

- Physical tasks: social norms and economic considerations limit automation

- Intellectual tasks: most advanced expression of human activity (e.g. creativity, problem solving)

- Deep learning techniques and artificial neural networks make it possible to automate

Social tasks

- Human interaction, e.g. in education, health, social services

- Machines would need to become indistinguishable from humans

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Changing nature of jobs in the manufacturing sector: are blue collar jobs turning white?

Use of digitally controlled equipment

- more developed ICT skills
- reading technical documentation
- dealing with numerical information
- troubleshooting production lines and handling errors

Use of quality control and standards

- use of benchmarking documentation
- monitoring performance indicators
- assessing numerical targets
- documenting problems and filling in forms

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Eurofound research on digitalisation 2017-2020

Employment and working conditions

Automation	**Digitisation**	**Platforms**
Game-changing techs. in manufacturing	ICT-based mobile workers	Platform work
Game-changing techs.in services	Nature of work	Platform economy

European Company Survey 2019

Web repository

Digitalisation in health and social services

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Eurofound publications

https://www.eurofound.europa.eu/topic/digital-age

THANK YOU FOR YOUR ATTENTION

Ricardo Rodriguez Contreras

rrc@eurofound.europa.eu

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