

# **Socio-Digital Transformation: Combining Industry 4.0 with Qualification 4.0**

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**Problem / Challenge:**

Effective and Efficient Digitalisation

**Solution:**

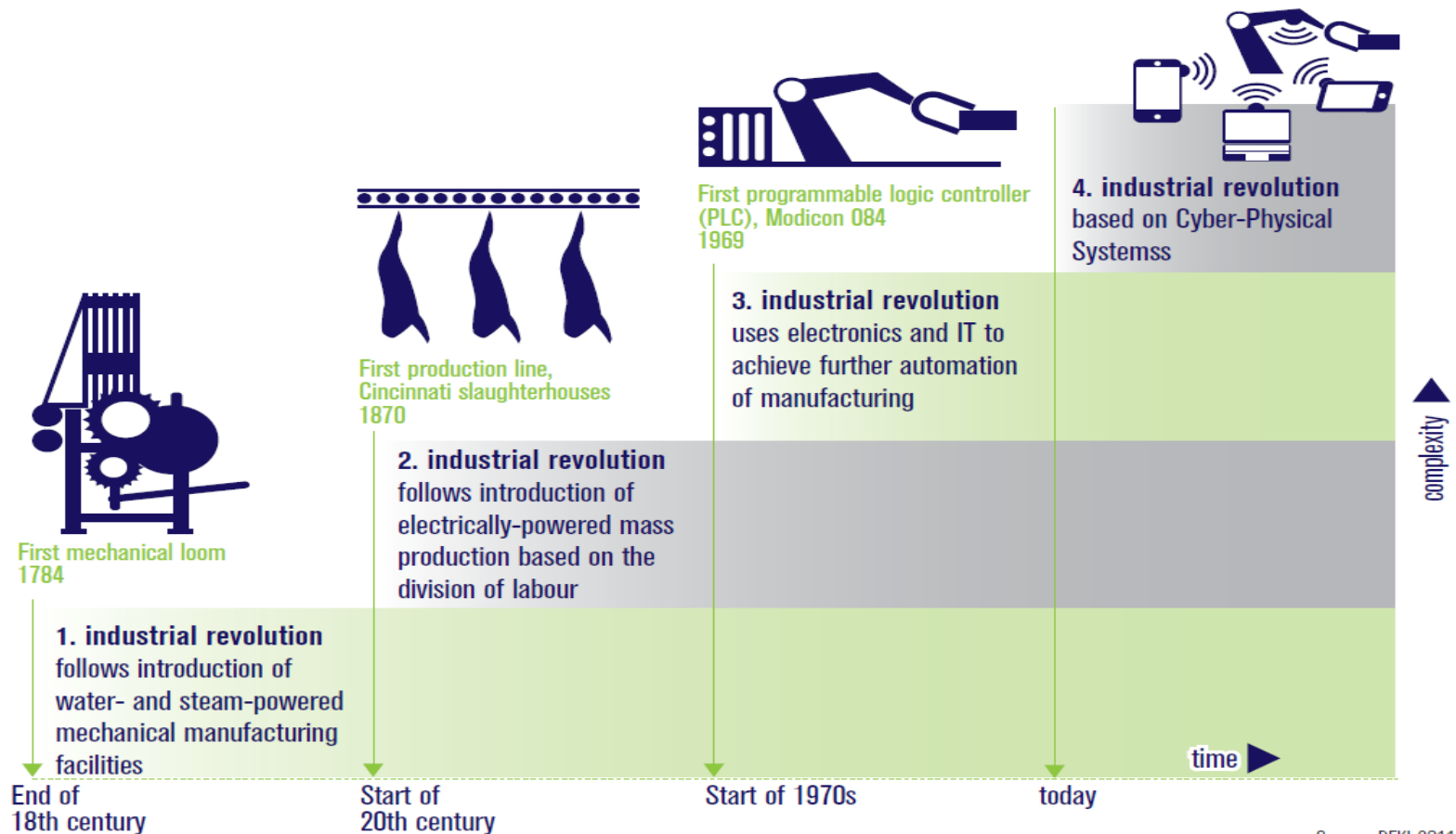
Socio-Digital Transformation Process - Combining technological and social innovation

**Lessons Learned:**

How to do it!

## The Challenge

## From the 1st to the 4th Industrial Revolution



## Objectives of Industry 4.0

- Real-time capable, intelligent, horizontal and vertical **networking of humans, machines, objects and ICT systems** for the **dynamic management of complex systems**
- Make it possible for intelligent products, machines and equipment to **exchange information autonomously, initiate actions and control each other** independently in real time
- Integrating existing industrial control and data systems to **optimize production processes**
- **Individual and small scale production** for costs of mass production

(Source: Bitkom Study, cited by Pfeiffer APuZ 31-32/2015, S. 10)

## Historical Review

### Experiences of the Past:

#### The dream

- Halle 54 (VW): Dream of a factory without people
- Robots will do the dirty, heavy and stupid work
- More intelligent work (control, maintenance) for workers

#### The reality

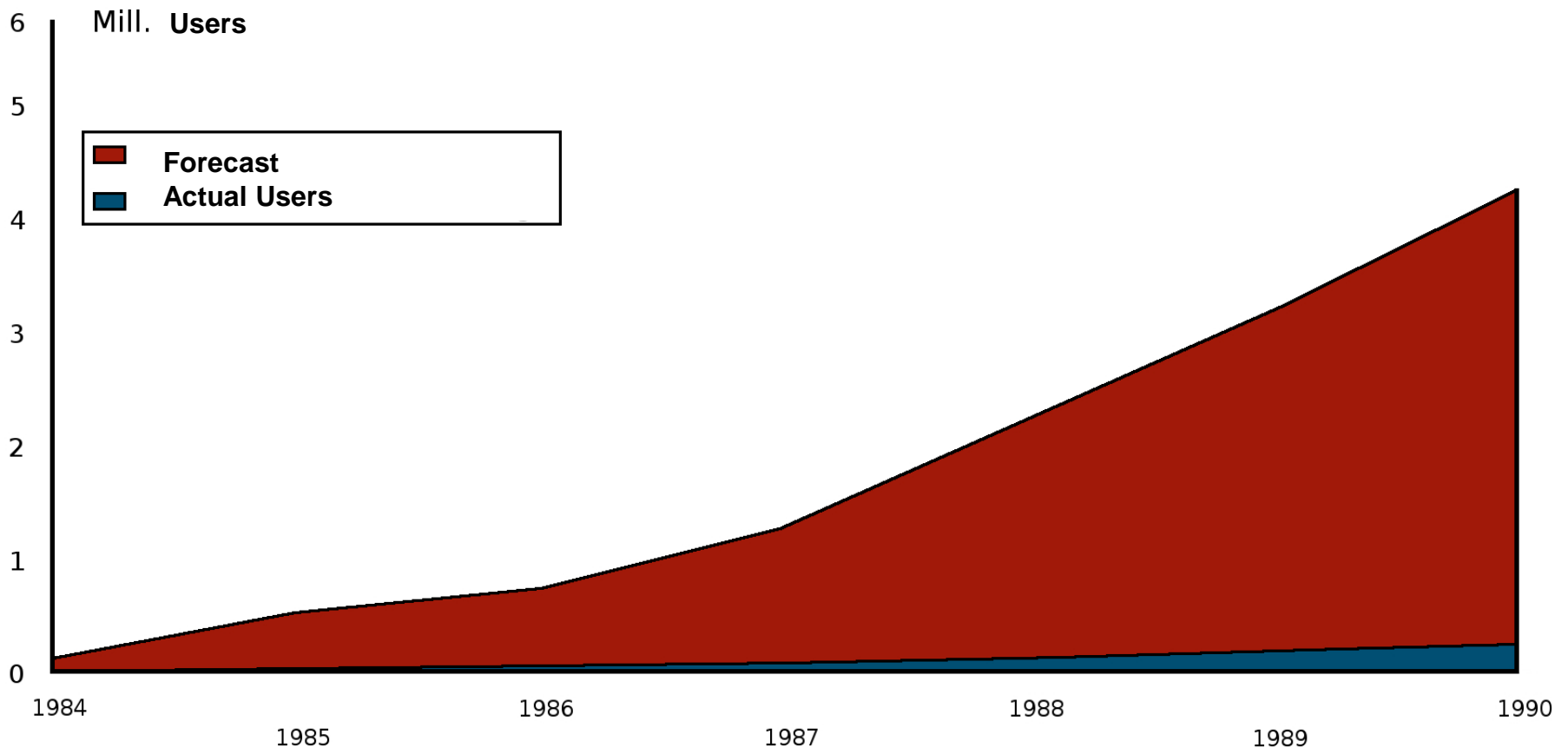
- Over-engineering
- Lack of quality
- high follow-up costs (because of malfunctions)
- Demotivation and absenteeism

#### The consequence

- People are important
- Social and organisational factors are driver of productivity and innovation
- Integration of technological innovation within a social innovation process is needed (co-creation and teamwork)



## Forecast and Actual Demand: Telecommunication 1984 – 1990 in Germany (BTX)



## Basic Assumption

Requirements concerning labour organisation and labour policy are increasing. The question about conditions of preservation and further development of innovation capacity at the level of organisation of human work will become the central future issue of public innovation policy, where **economic, technological and social innovations interact**.



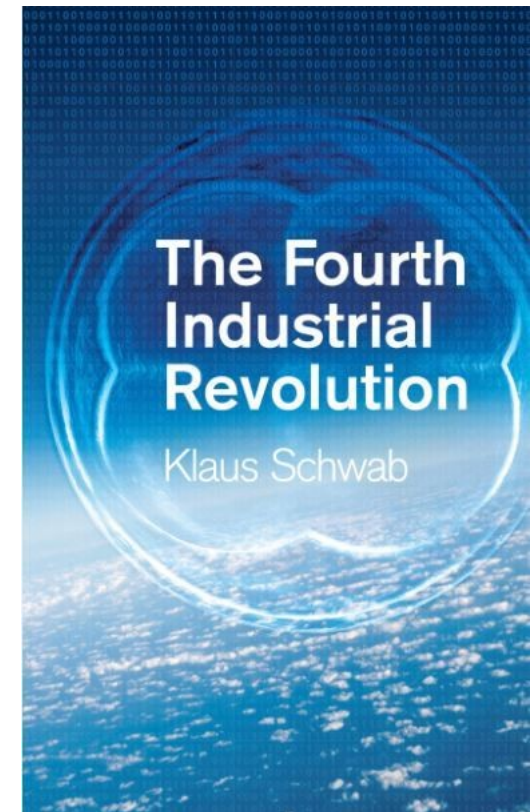


## The Fourth Industrial Revolution and the Consequences for Society

Schwab calls for leaders and citizens to

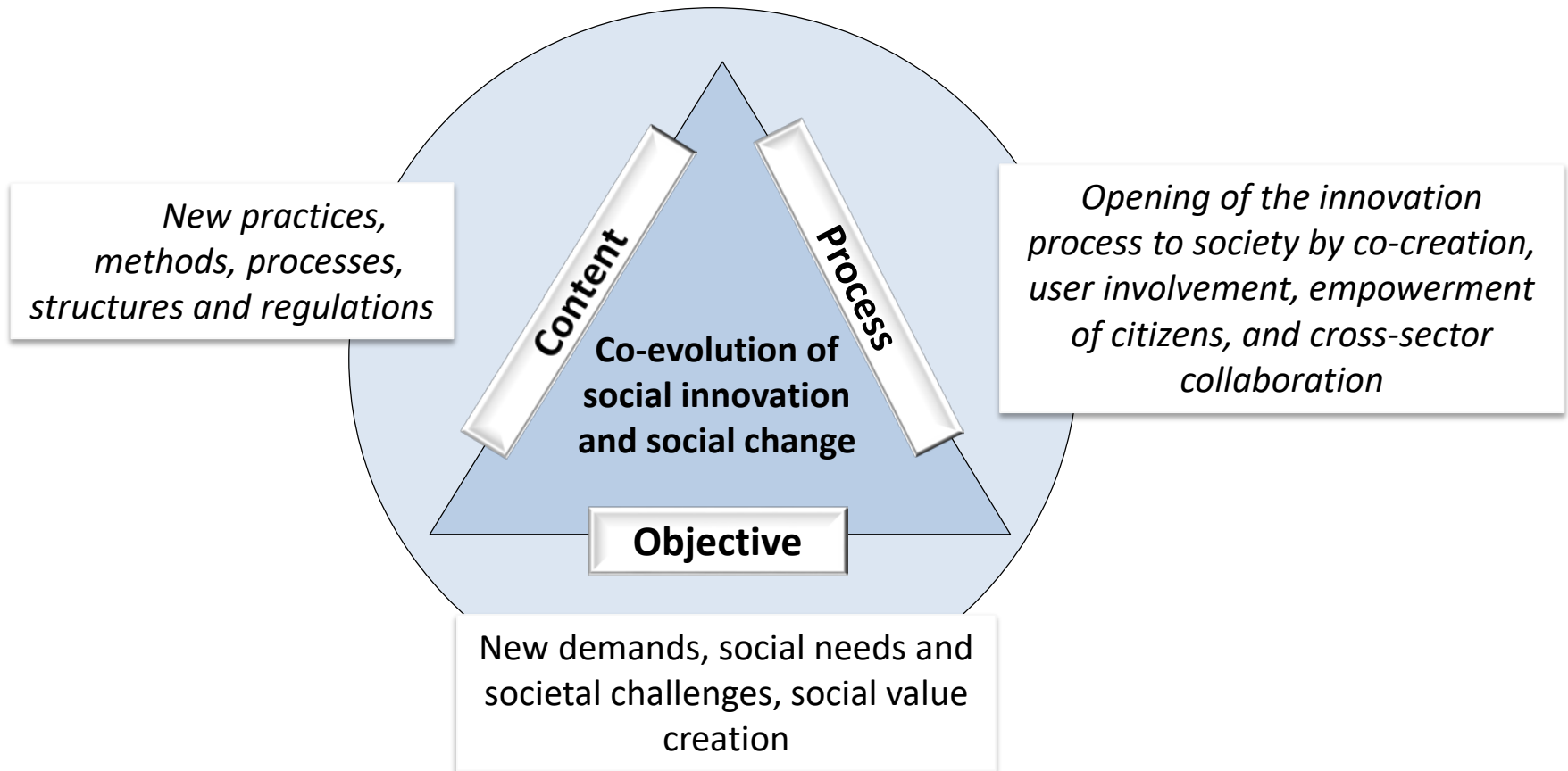
“together shape a future that works for all by **putting people first**, empowering them and constantly reminding ourselves that all of these **new technologies are first and foremost tools made by people for people.**”

Professor Klaus Schwab, Founder and Executive Chairman of the World Economic Forum



## The Solution

## Framework: A New Innovation Paradigm



## Starting Point: A New Innovation Process

### Starting point:

A lot of technological innovation is not being used and implemented

- Every technological or economical innovation is also a social innovation (process), which is decisive for or at least co-determining efficiency and effectiveness, success and failure of an innovation.
- Technology is an **enabler** of innovation.  
“A New Nature of Innovation” (OECD 2010).

**Social innovation in Horizon 2020 – A horizontal task**

*"Particular attention will be paid to ensuring a balanced approach to **research and innovation**, which is not only limited to the development of new products and services on the basis of scientific and technological breakthroughs, but which also incorporates aspects such as the use of existing technologies in novel applications, continuous improvement and **non-technological and social innovation**."*

HORIZON 2020 Specific Programme

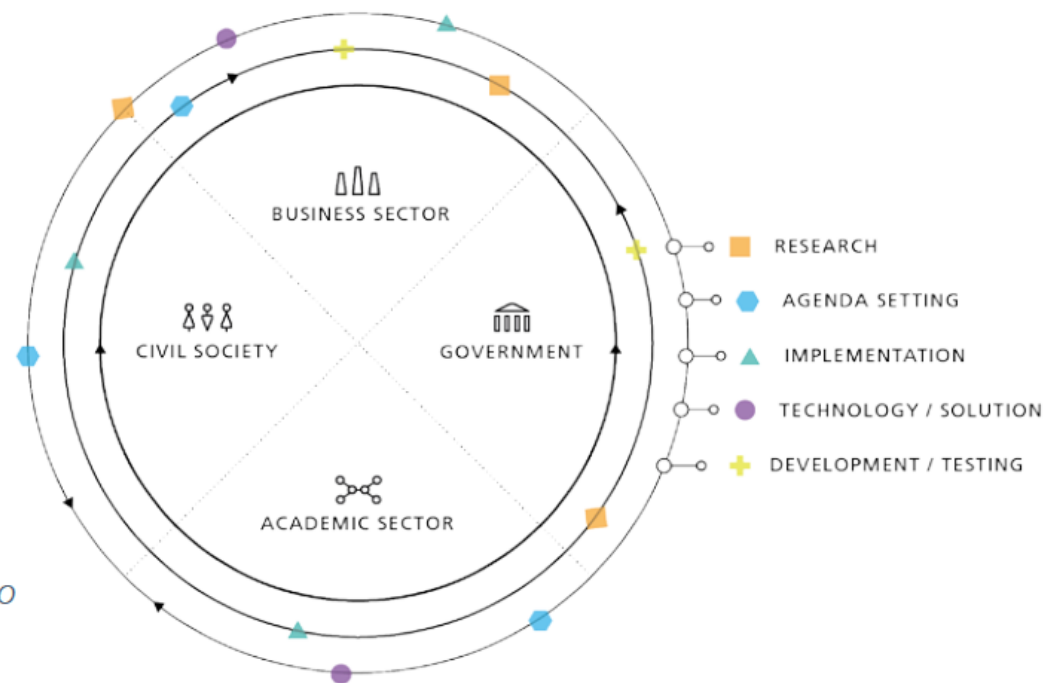
EUROPEAN COMMISSION **HORIZON 2020**

### Solution:

- Setting up of **social innovation concept and process** (innovation process design): stakeholder and user involvement right from the beginning considering co-creation, impact, organisational and personnel development

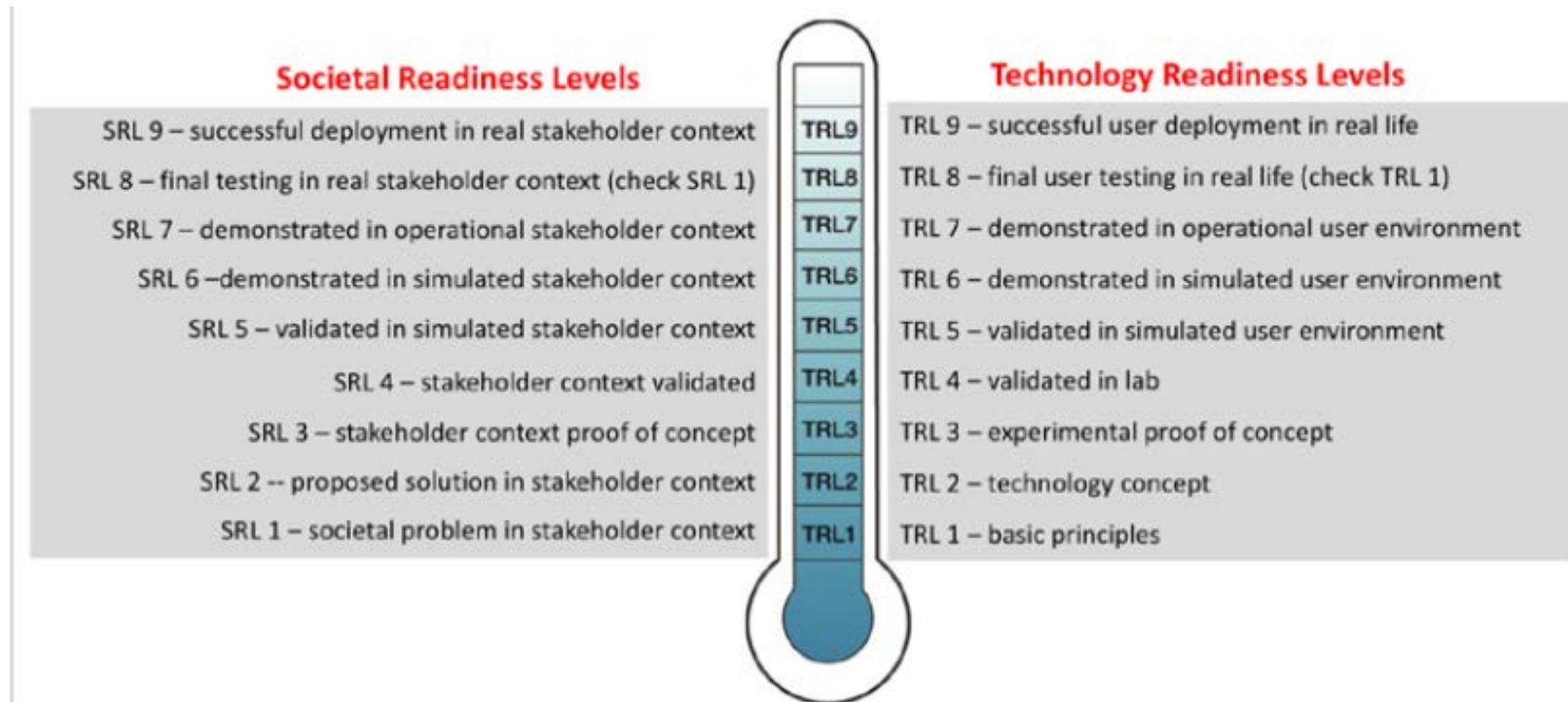
# Combining Technological and Social Innovation within an Innovation Ecosystem

INTERCONNECTED  
PROCESSES  
of social and technological  
innovation



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## Combining Societal and Technology Readiness Levels



© Danish Technological Institute

## Digital Transformation

High Level Expert Group on the Impact of the Digital Transformation on EU Labour Markets (2019):

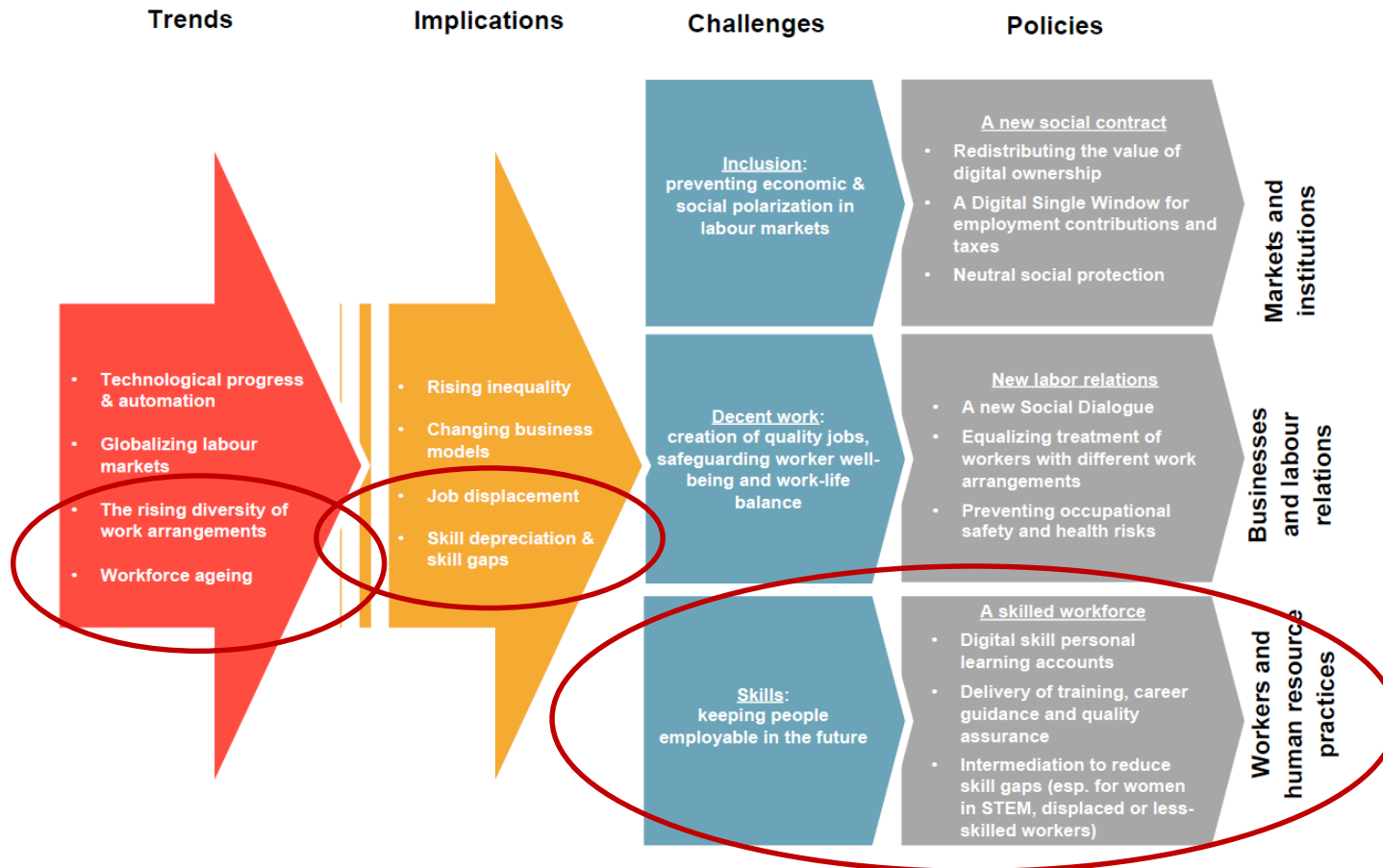
- **Definitions** (page 15)
  - Digitisation: conversion from analogue to binary bits
  - Digital technologies: electronic tools, systems, devices and resources that generate, store, process, exchange or use digital data;
  - Digitalisation: application or increase the use of digital technologies
  - Digital transformation: adoption of digital technologies in production and consumption activities (→ *social practices*)

**Trends, implications, and challenges** (page 11):

- Interconnected trends: digitalisation, globalisation, rising diversity of work arrangements, and aging workforce.
- Implications for the labour market: inequality, new business models, job displacement, skills depreciation, skills mismatch and gaps
- Important challenge: Keep employability of workers for the future, ensure a skilled workforce

# The Relevance of Skills for Digitalisation

A Framework for the impact of the digital transformation on EU labour markets  
(High Level Expert Group on the Impact of the Digital Transformation on EU Labour Markets 2019,p.30)

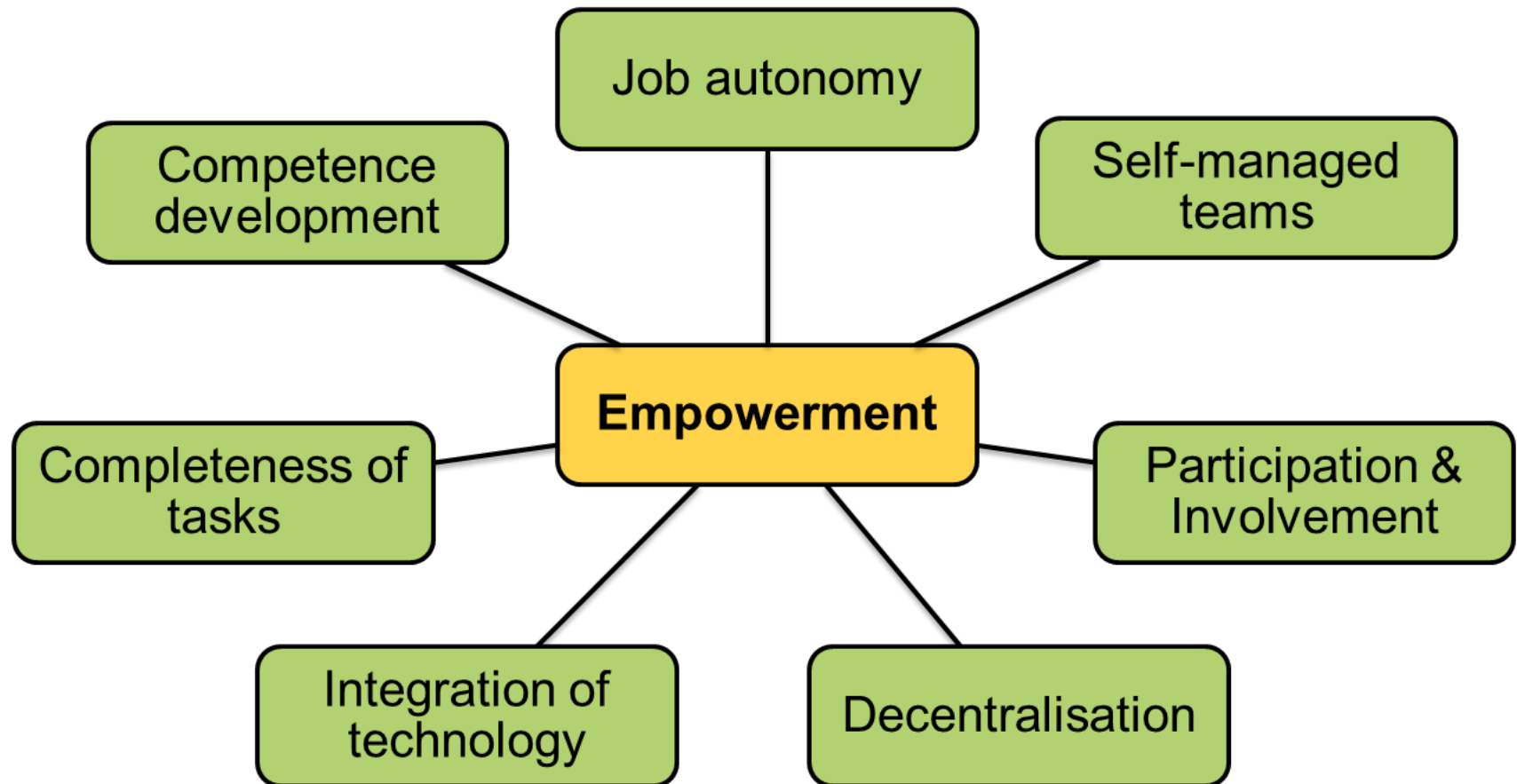




## Barriers to Digitisation



## Impact of Industry 4.0 on Work 4.0



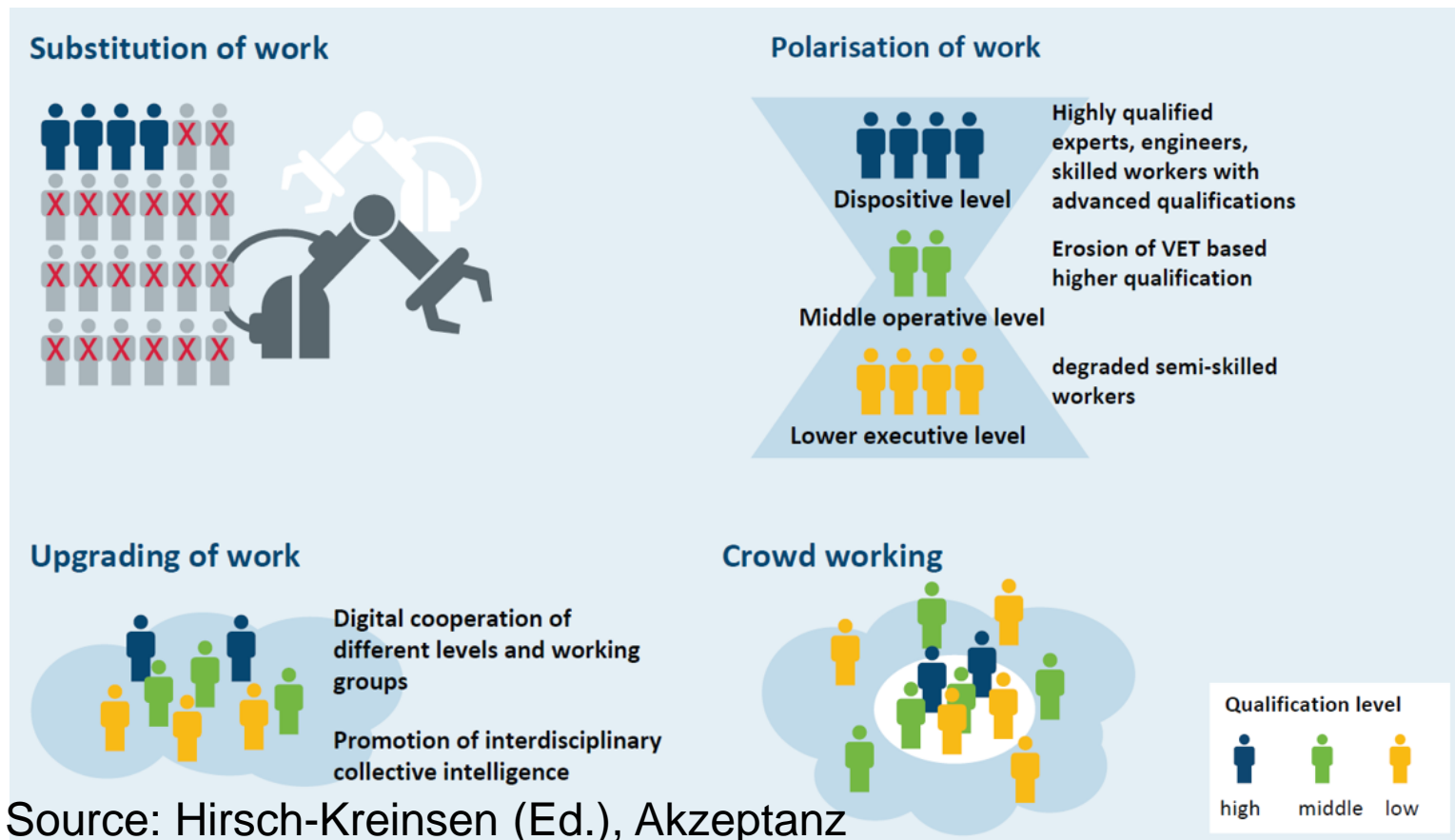
## Digital Transformation

*85% of all jobs in the European Union embrace **digital skills** (European Skills and Job Survey)*

*“The digital transformation is rapidly changing the demand for workers’ skills and task competencies. This way, the digital transformation is contributing to skill mismatch and shortages that require investments in employee training.” (HLEG 2019, p. 31):*

- Qualification and skills adjustments are key for the success of digital transformation
- Integration of practical experience, knowhow and requirements of the users / beneficiaries in the development of digital solutions are key
- New (digital and didactical) learning arrangements are needed (online, on the job, in time, individual, ...), including new didactical concepts (action and workplace oriented learning, self-responsible learning, trainer as learning coach, learning communities, ...)

## Scenarios of changing work and qualification structures because of digitalisation



Source: Hirsch-Kreinsen (Ed.), Akzeptanz von Industrie 4.0, 2019

## Classification of Digital Skills

- **Digital Increased Occupations:** no significant changes in the work and worker requirements of the occupation. The work context may change, but the tasks themselves do not.
- **Digital Enhanced Skills Occupations:** The impact of digital activities and technologies results in a significant change to the work and worker requirements of an existing occupation. This impact may or may not result in an increase in employment demand for the occupation.
- **New and Emerging Digital Occupations:** The impact of digital activities and technologies is sufficient to create the need for unique work and worker requirements, **resulting in the generation of a new occupation profile.** This new occupation could be entirely novel or “born” from an existing occupation.

Based on Green Skills Classification of Dierdorff et al. (2009) p. 11/12

## How to do it

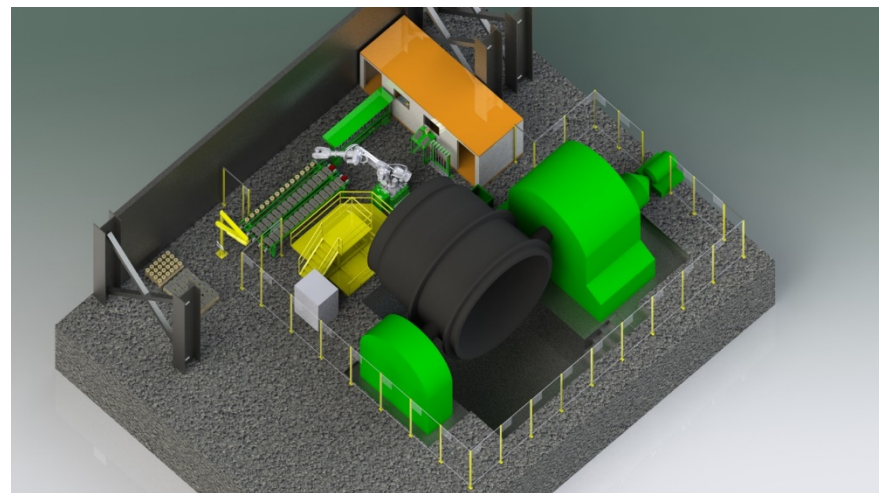
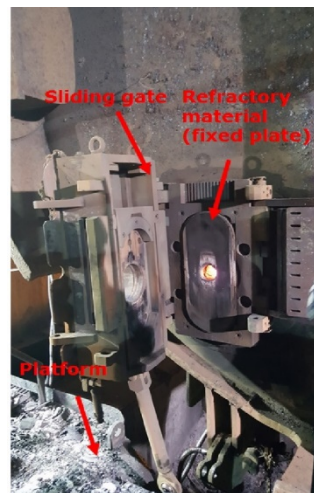
## ROBOHARSH:

### Robotic workstation in harsh environmental conditions to improve safety in the steel industry

**Aim:** robotic cell in the steel shop supporting the technical personnel for control of the tap hole and replacement of the sliding gate and related refractory material at the bottom of the

**Method:** ad-hoc designed industrial robotic cell with a vision system, social approach to innovation

**Results:** the robotic cell was designed, ad-hoc tools to be handled by the robot, including a vision tool, were designed, KPIs to measure the effectiveness and social acceptance of the robotic cell were selected



# How to do it

## Skills and Qualification Development



## Blueprint “New Skills Agenda Steel”: Industry-driven sustainable European Steel Skills Agenda and Strategy (ESSA)

EU Funding: ERASMUS+ “New Skills Agenda”  
January 2019 – December 2022



Co-funded by the  
Erasmus+ Programme  
of the European Union



## Blueprint for an industry driven long-term skills strategy

### Main objectives:

- Proactive **skills adjustments**
- New **training and curricula requirements**  
including new ways of short term implementation within both companies and education and training institutions;
- **Political support** measures by mobilising and integrating stakeholders and policy makers of the EU and national level;
- Successful sectoral **upskilling schemes** and efficient management of knowledge;
- More attractiveness of the Steel Industry and careers for talented people (**recruitment and retention**)
- Key Performance Indicators (KPIs) to **monitor** success and adjustment needs continuously.

## Partnership (24 partners plus about 15 associated partners)

- **Steel companies:**  
ThyssenKruppSteel Europe, TataSteel, ArcelorMittal (Poland, Spain), Salzgitter AG, Sidenor, BARNA (Celsa Group)
- **Education and training providers:**  
Steel Institute VDEh , IMZ, Scuola Superiore Sant'Anna, TKSE Training Centre, AM Spain, Steel University
- **Steel associations and social partners:**  
EUROFER, World Steel Association, UNESID, Polish Steel Platform, German Steel Federation, European Cold Rolled Steel Association CIELFFA, Association of Finish Steel and Metal Producers, OS KOVO
- **Research institutions:**  
TU Dortmund University, Cardiff University, CSM, Visionary Analytics

### Plus 14 associated partners:

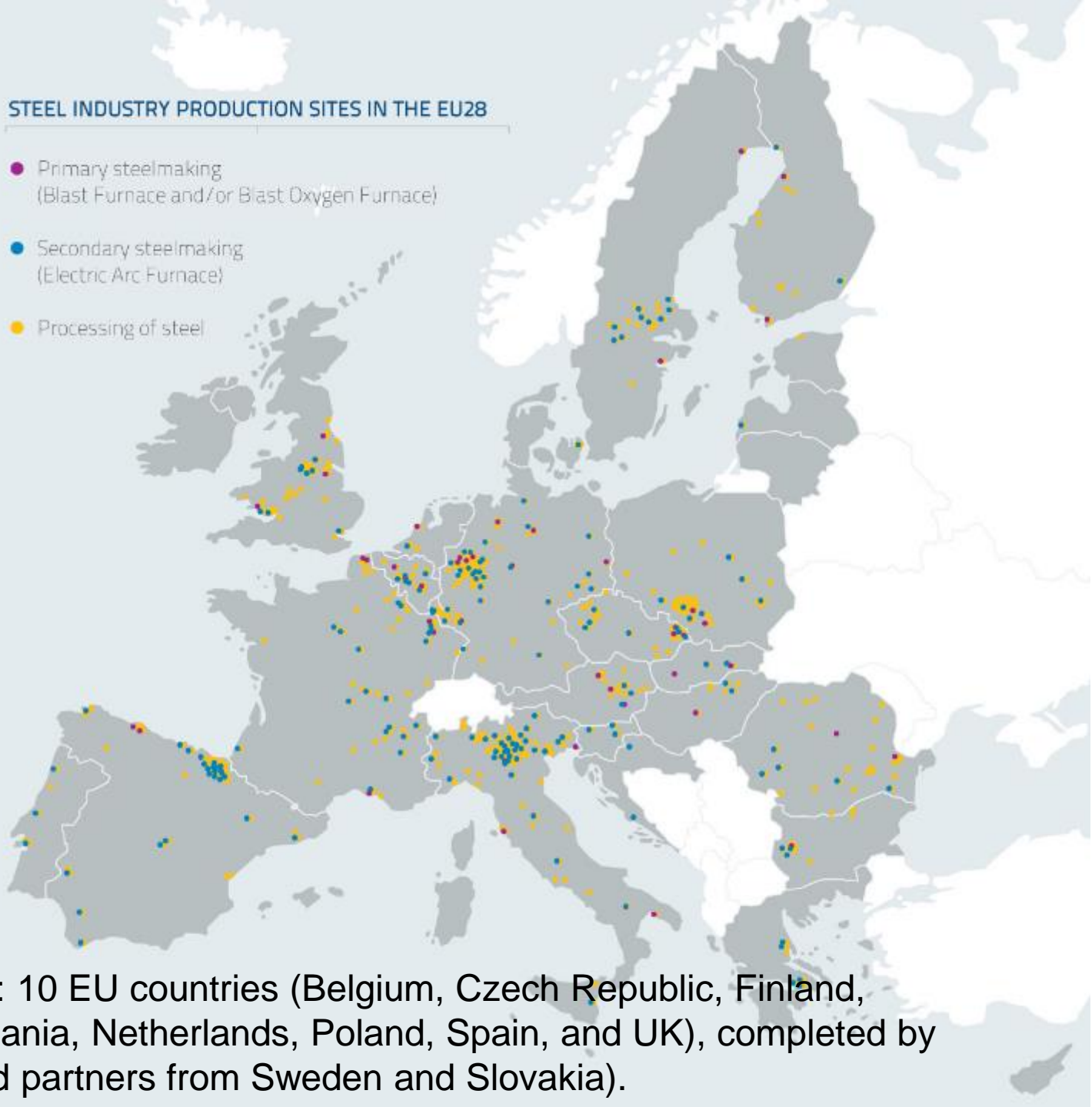
European Steel Technology Platform (ESTEP), IndustriALL (European Industry Union), Polish Steel Technology Platform, EIT Rawmaterials, Council of the European Professional Informatics Societies (CEPIS), Community (union UK), Metalowcow NSZZ - Solidarnosc (union Polen), Federation Metallurgie CFE-CGC (union France), Industriarbetsgivarna (Swedish Industry Federation), UK Steel, Celsa Group (beside partner BARNA representing steel companies from France, Norway, Wales, Poland and Spain), University of the Basque Country (UPV/EHU), Warwick University (UK), Enrico Gibellieri (European Steel expert).

# Covering the all the Steel Relevant Member States

(via EUROFER,  
ESTEP and  
industriALL)

## STEEL INDUSTRY PRODUCTION SITES IN THE EU28

- Primary steelmaking  
(Blast Furnace and/or Blast Oxygen Furnace)
- Secondary steelmaking  
(Electric Arc Furnace)
- Processing of steel



**Direct involvement:** 10 EU countries (Belgium, Czech Republic, Finland, Germany, Italy, Lithuania, Netherlands, Poland, Spain, and UK), completed by additional associated partners from Sweden and Slovakia).

## European Blueprint Development Level

### Steering Committee

European Level of Steel Companies, Social Partners, Research Institutes,  
Steel Associations (EUROFER, ESTEP, World Steel, national Steel Platforms),  
non steel producing sector agencies, VET Institutions (CEDEFOP, ...)  
European Union (Erasmus+, Grow, EAC, ...)  
Educational and Technological Experts



### Member State A Roll out

national / regional  
VET System institutions  
Steel companies  
Social Partners  
Steel Associations  
Unions  
Policy/Funding Agencies  
(ESF/EFRE, ...)

### Member State B Roll out



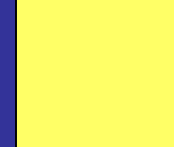
### Member State C Roll out



### Member State D Roll out



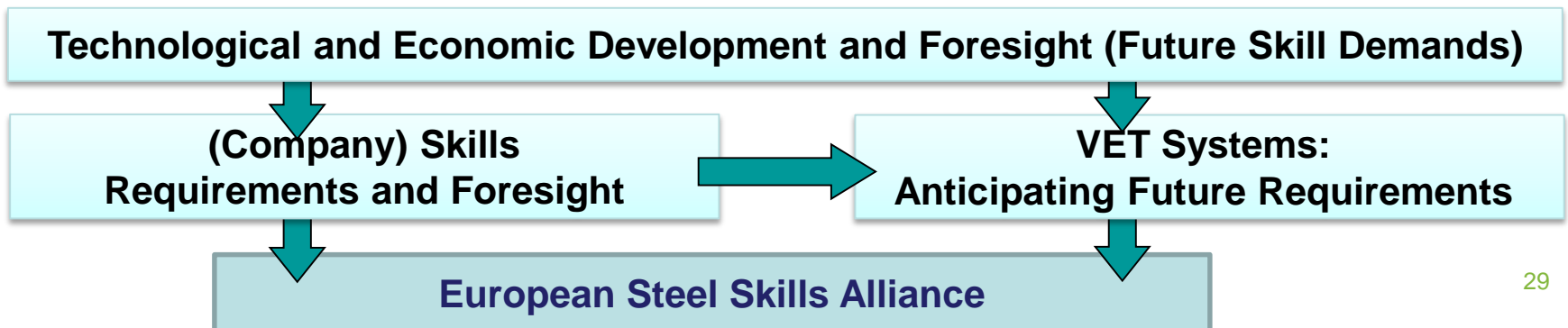
### Member State ... Roll out



All the main steel producing member states

## Approach for the developing the blueprint

- combine a **European, cross-border sectoral approach** with national/regional specifications by including national and regional authorities
- **cooperation of companies and research / educational / training institutes**
- involve the **social partnership** (European, and pilot member states)
- set-up a **foresight scheme** to identify recent future demands and requirements in a pro-active way, driven and run by the steel industry
- develop concrete **tools and activities** together with the people concerned (such as HR managers, technicians and engineers, workers, trainers and teachers)
- foster an interrelated and **joint development of Industry 4.0 and Work 4.0**
- last but not least: ensure a **cross-sectoral development and exchange** of industry representatives, companies, policy, science and education.



## Expected Results

**Blueprint for an industry driven long-term skills strategy for steel companies and VET institutions:**

- **Adjusting the workforce proactive**, to deploy and implement new technologies aiming at an optimisation of the production process
- **Monitoring and shorten the implementation of industry relevant qualifications in national VET systems, continuously.**
- **Developing and exchanging modules, tools and the experiences** with the implementation process of the new skills agenda and strategy
- **Developing a blueprint** to be discussed and compared with the solutions / blueprints of other sectors

## **Conclusions:**

# **Digitalisation as a Socio-Digital Transformation Process**

## Conclusion

***“In the very core of digitalization, there is social innovation!”***

- Every technological development is a **socio-digital transformation process**, especially when it comes to a new functional and operational working division between digital tools, robots and humans
- Often not the general acceptance of the end users is the problem, but the **design of the solution**
- Embedded in a new innovation paradigm technological development is more effective and efficient when **integrating the existing competences and experience of the users/beneficiaries in a co-creation process**
- Socio-digital transformation is **not a self-perpetuating process**: different understandings, cultures and „languages“ of technicians and social, human resources actors, a “translation” of human requirements into technological possibilities and designs have to take place
- **New Skills and qualifications are key** for the digital transformation (acceptance, usage, effectiveness, ...)



## Thanks a lot for your attention!

- BEYOND 4.0 - Inclusive Futures for Europe – **BEYOND 4.0**  
BEYOND the Impacts of Industrie 4.0 and Digital Disruption (2019-2022)  
<http://beyond4-0.eu/>
- ESSA: Blueprint “New Skills Agenda Steel”  
Industry-driven sustainable European Steel Skills Agenda and Strategy  
(2019-2022) <https://www.estep.eu/essa/>
- COCOP: Coordinating Optimisation of Complex Industrial Processes,  
2016-2020 <https://www.cocop-spire.eu/>
- ROBOHARSH: Robotic workstation in harsh environmental conditions to  
improve safety in the steel industry (2016-2019)
- Euwin: European Workplace Innovation Network since 2013  
<http://ec.europa.eu/growth/industry/innovation/policy/workplace-innovation-network/>

