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Smart Development of Competences for Smart Industries

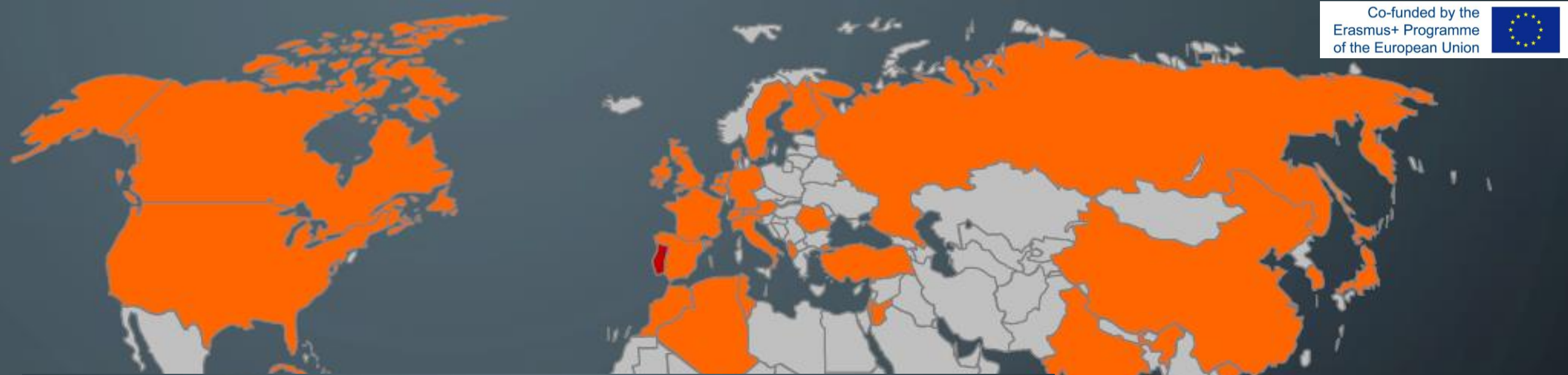
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Curriculum Development
of Master's Degree Program in
Industrial Engineering for Thailand Sustainable Smart Industry



Braga
GUALTAR CAMPUS
LARGO DO PAÇO

Guimarães
AZURÉM CAMPUS
COUROS CAMPUS
AVEPARK

Porto





Braga

the ancient and 3rd Portuguese city

Guimarães

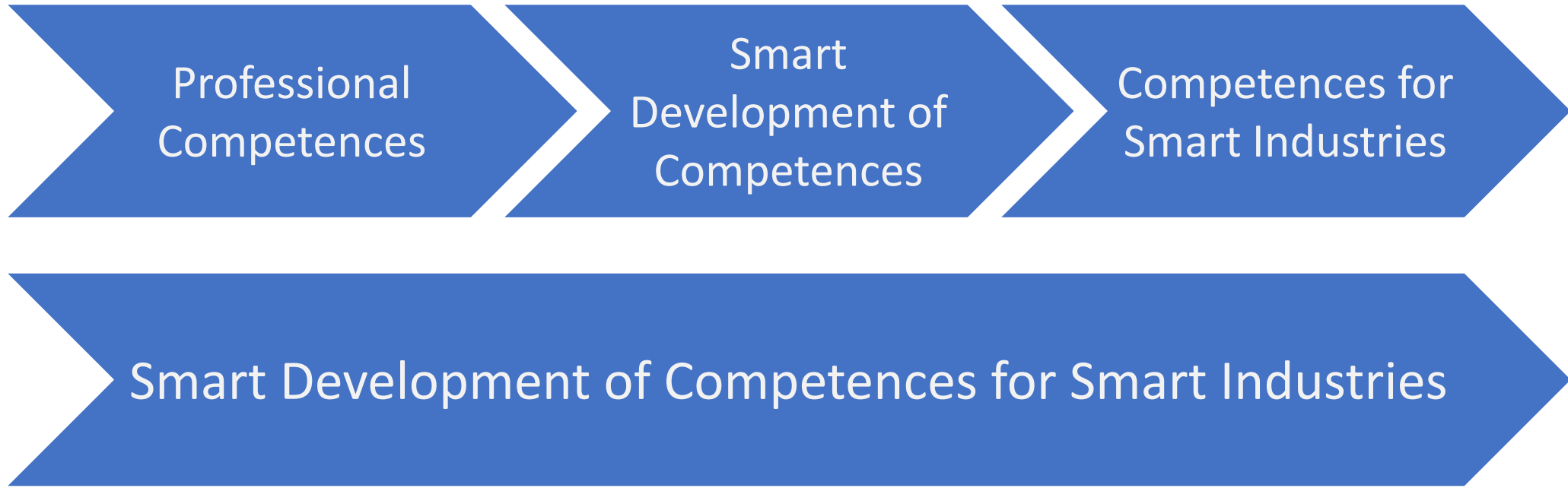
the cradle of the Nation and UNESCO Heritage site

<p>DEB BIOLOGICAL ENGINEERING</p>	<p>DEC CIVIL ENGINEERING</p>	<p>DEI INDUSTRIAL ELECTRONICS</p>
<p>DEM MECHANICAL ENGINEERING</p>	<p>DEP POLYMER ENGINEERING</p>	<p>DET TEXTILE ENGINEERING</p>
<p>DI INFORMATICS</p>	<p>DPS PRODUCTION AND SYSTEMS</p>	<p>DSI INFORMATION SYSTEMS</p>

Biological Engineering
 Biomedical Engineering
 Civil Engineering
 Materials Engineering
 Polymer Engineering
 Telecommunications and Informatics Engineering
 Engineering and Management of Information System
 Industrial Management and Engineering
 Industrial Electronics and Computers Engineering
 Physics Engineering
 Informatics Engineering
 Mechanical Engineering
 Textile Engineering

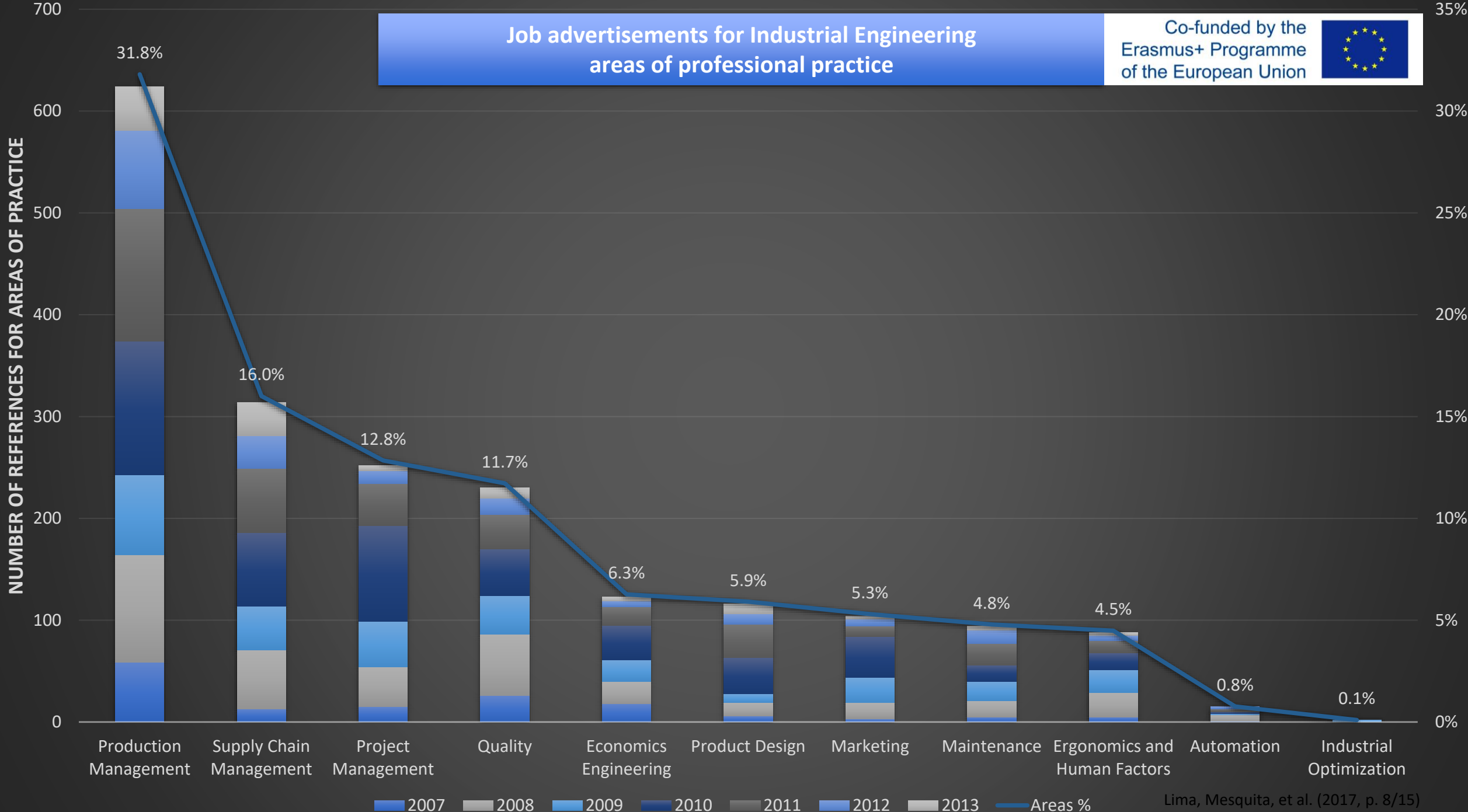
600 eng.
Graduates / year

+26 master programs and
+29 PhD programs



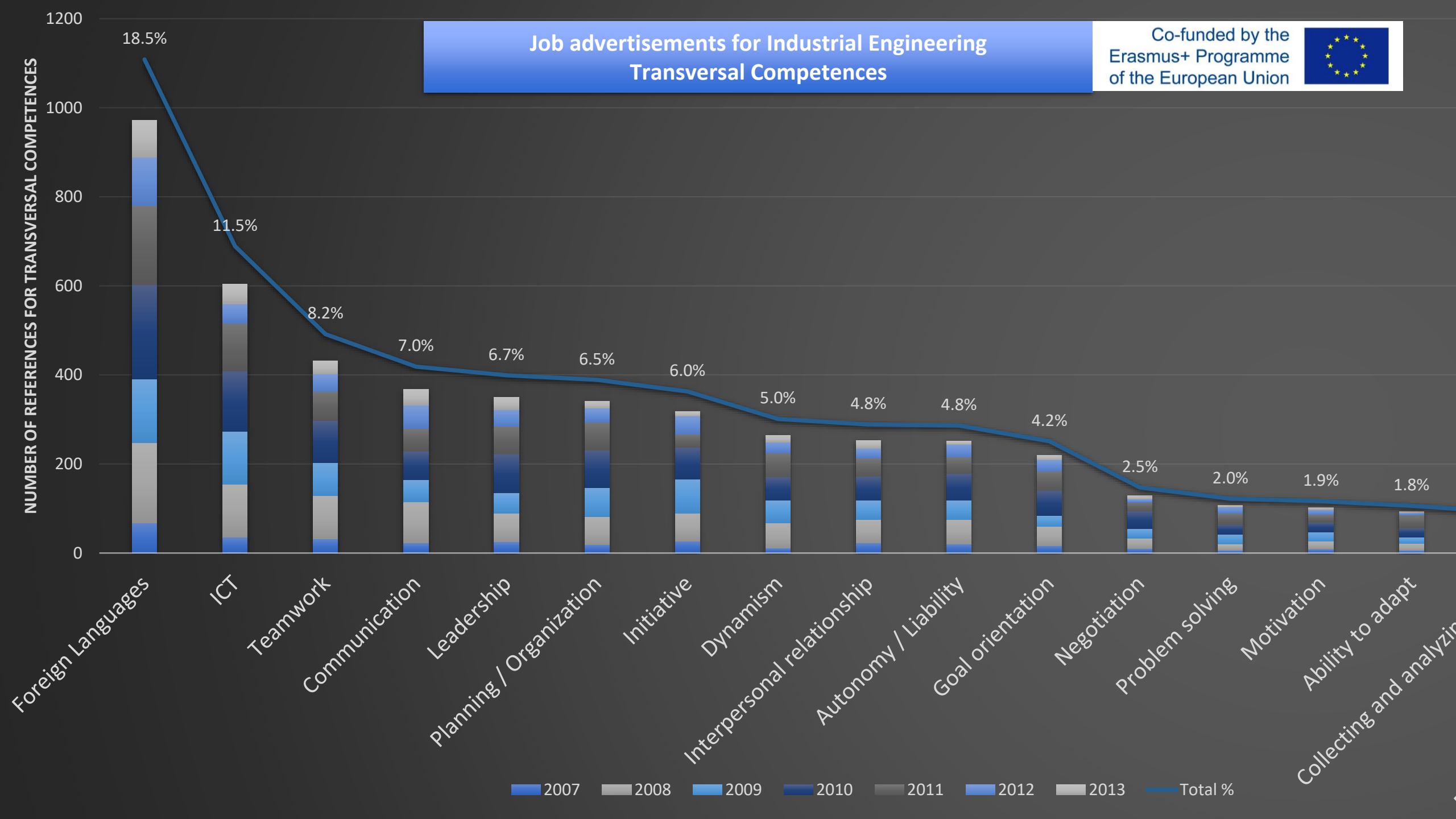
Job advertisements for Industrial Engineering areas of professional practice

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Job advertisements for Industrial Engineering Transversal Competences

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Mobilize

Resources

Values

Experiences

Habilites

Knowledge

Contexts

Problems

Solve

COMPETENCES



Teaching and Learning system based on the idea of **knowledge transfer**

transition

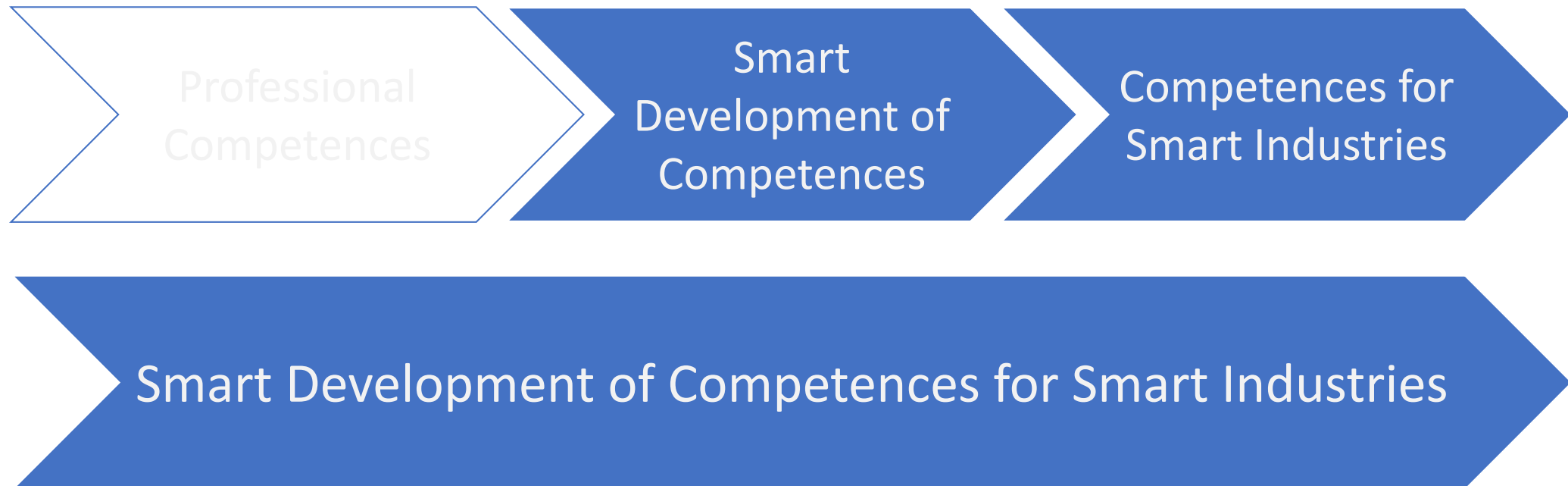
Teaching and Learning system based on the idea of **development of competences**

Capacity to mobilize resources (knowledge, abilities, experiences, values,...) in specific contexts, to formulate and solve problems.

Le Boterf (1997, 2004, 2005); Zarifian (2001)

Learning outcomes are “statements of what a learner is expected to know, understand and/or be able to demonstrate after a completion of a process of learning”.

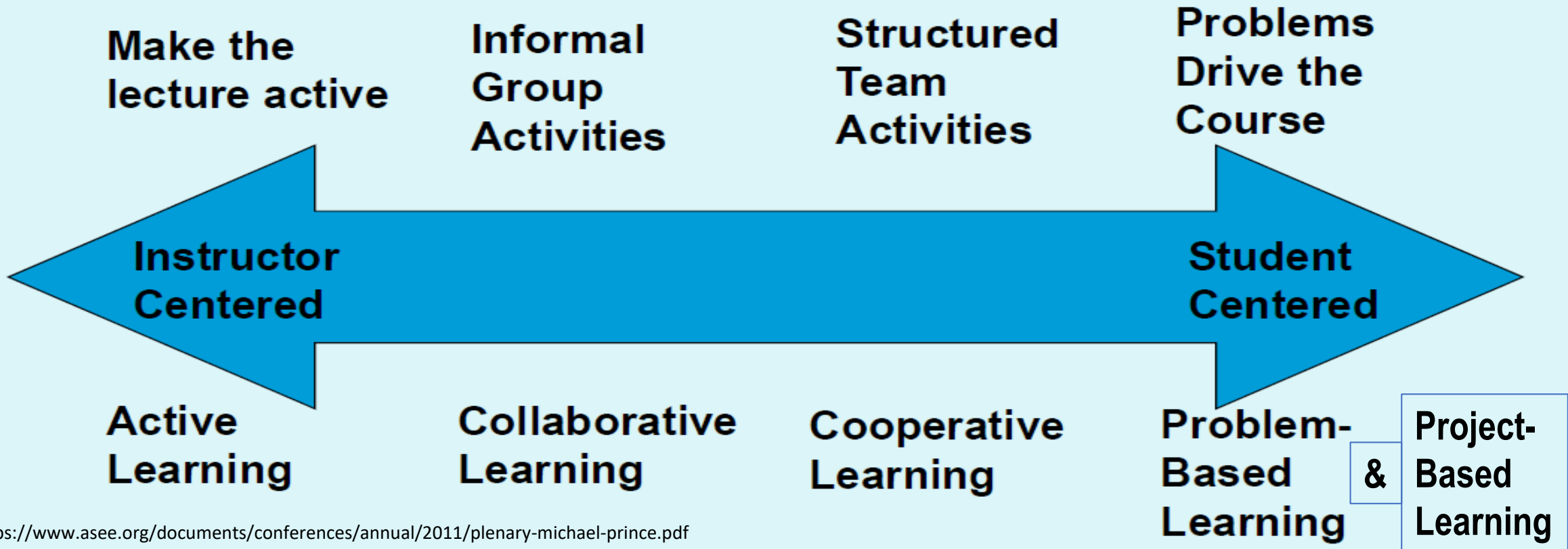
CEDEFOP (2009)



- Active Learning – Meaningful Experiences
 - Context – adequate environments
 - Engagement – energy and motivation
 - Relevance – why learn this?
 - Critical thinking – evaluate their own learning
 - Felder & Brent (2009), Prince (2004), Prince & Felder (2006), Bonwell & Eison (1991)
- One evidence amongst several:
 - Based on a meta-analysis of the data published in 225 studies, Freeman et al. (2014) refer that active learning increases the performance in exams... and lectures increase the failure rate in 55%.



“The Active Learning Continuum” - Prince



<https://www.asee.org/documents/conferences/annual/2011/plenary-michael-prince.pdf>

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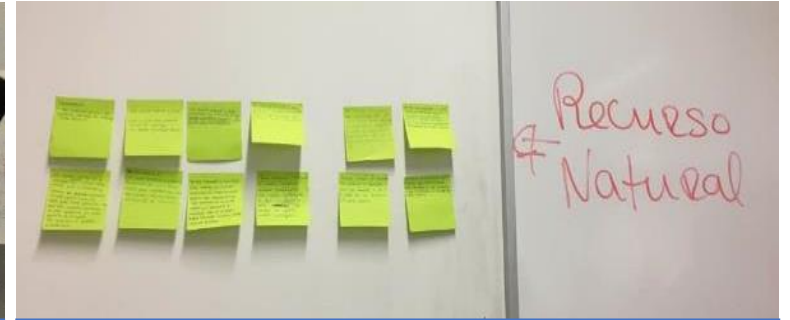
Brainstorming



Team building



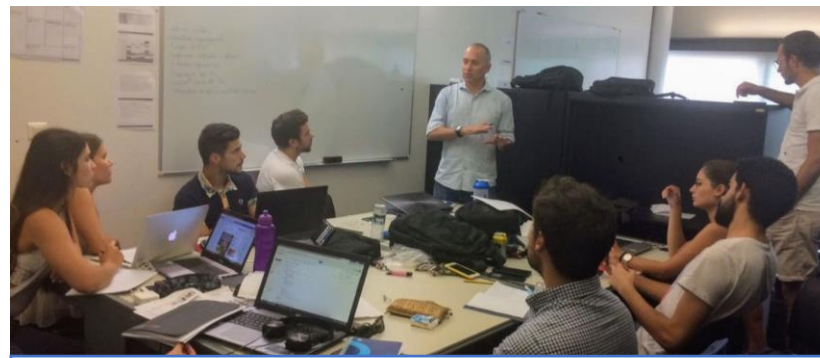
Gallery Walk



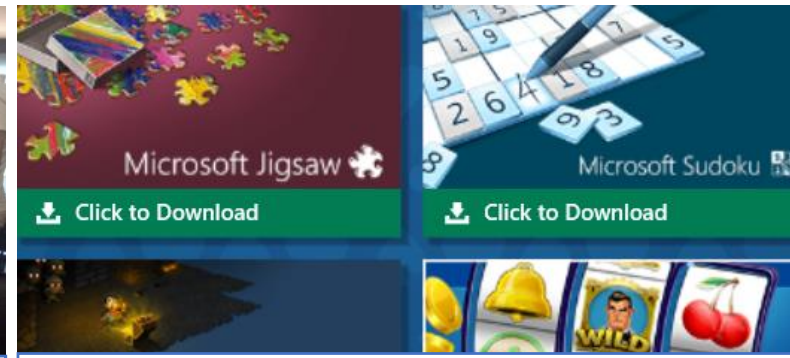
Think Pair Share



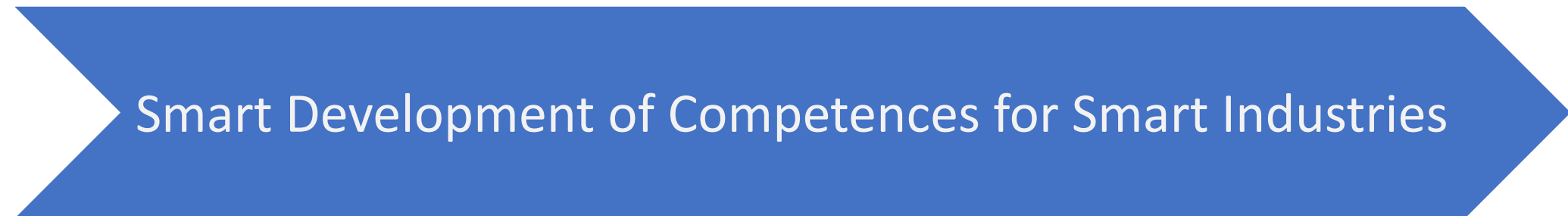
Flipped Classroom



PBL – Problem and Project-Based Learning



Gamification





Industry 4.0 jobs of the future

1

IoT



2

Process
Mapping



3

Cloud
Computing



...

4

Simulation
VR/AR



5

Artificial
Intelligence





Top 10 skills

IE? I4.0

in 2020

1. Complex Problem Solving
2. Critical Thinking
3. Creativity
4. People Management
5. Coordinating with Others
6. Emotional Intelligence
7. Judgment and Decision Making
8. Service Orientation
9. Negotiation
10. Cognitive Flexibility

in 2015

1. Complex Problem Solving
2. Coordinating with Others
3. People Management
4. Critical Thinking
5. Negotiation
6. Quality Control
7. Service Orientation
8. Judgment and Decision Making
9. Active Listening
10. Creativity



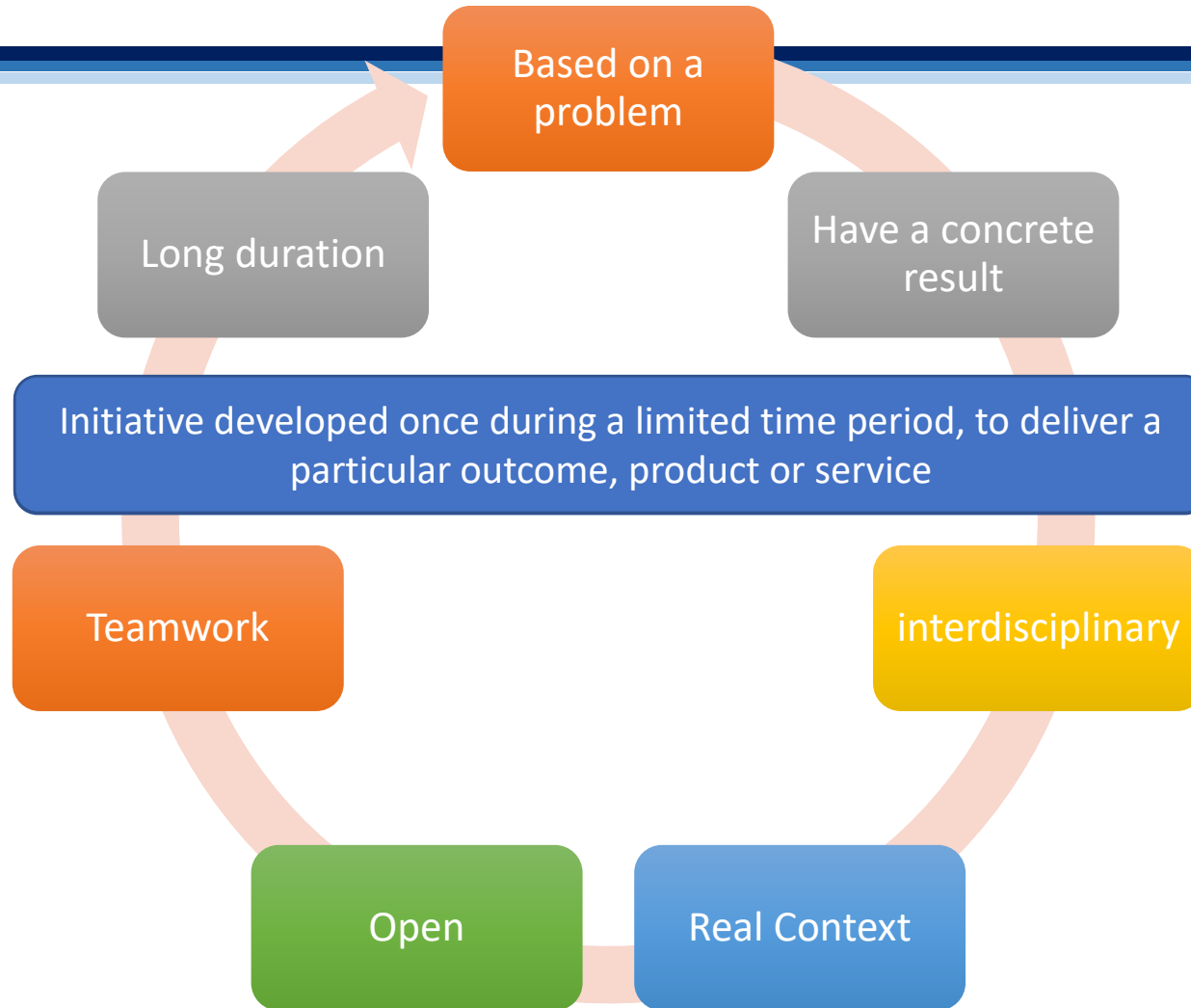
Source: Future of Jobs Report, World Economic Forum



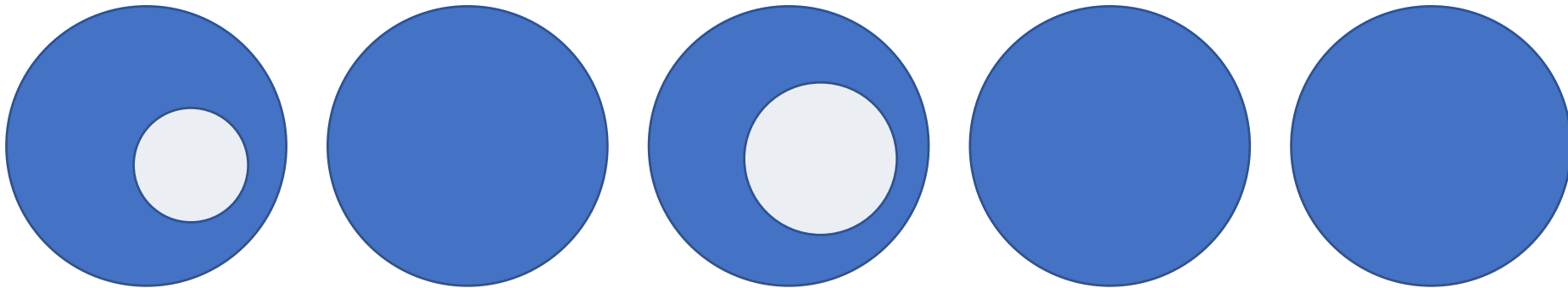


Smart Development of Competences for Smart Industries

PBL - characteristics

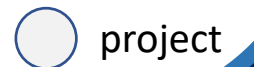
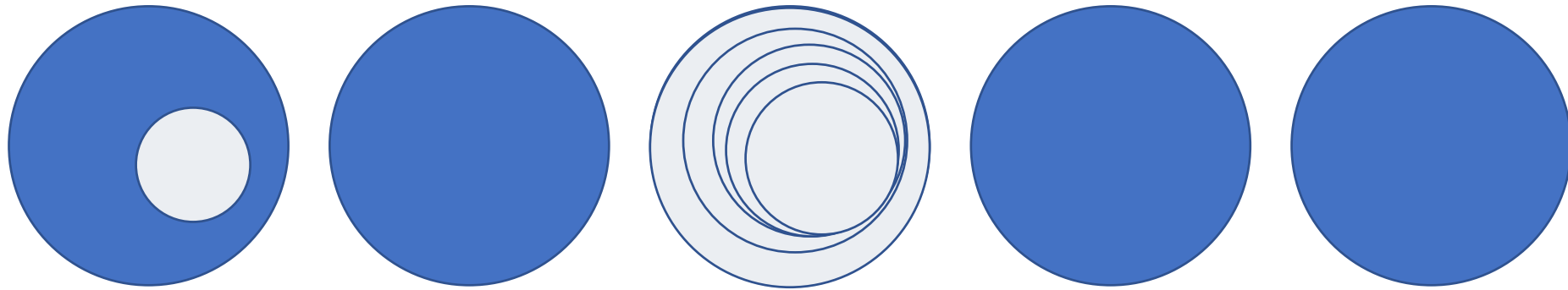


- An **exercise** of project

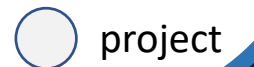
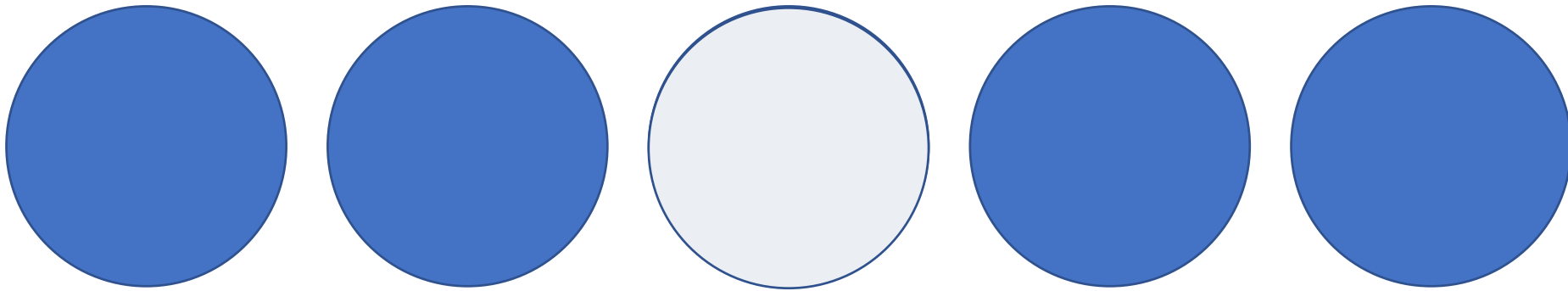


Kolmos, 1996; Helle, Tynjälä, & Olkinuora, 2006.

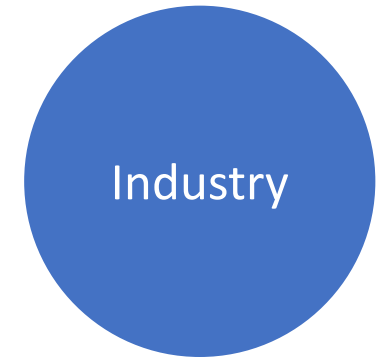
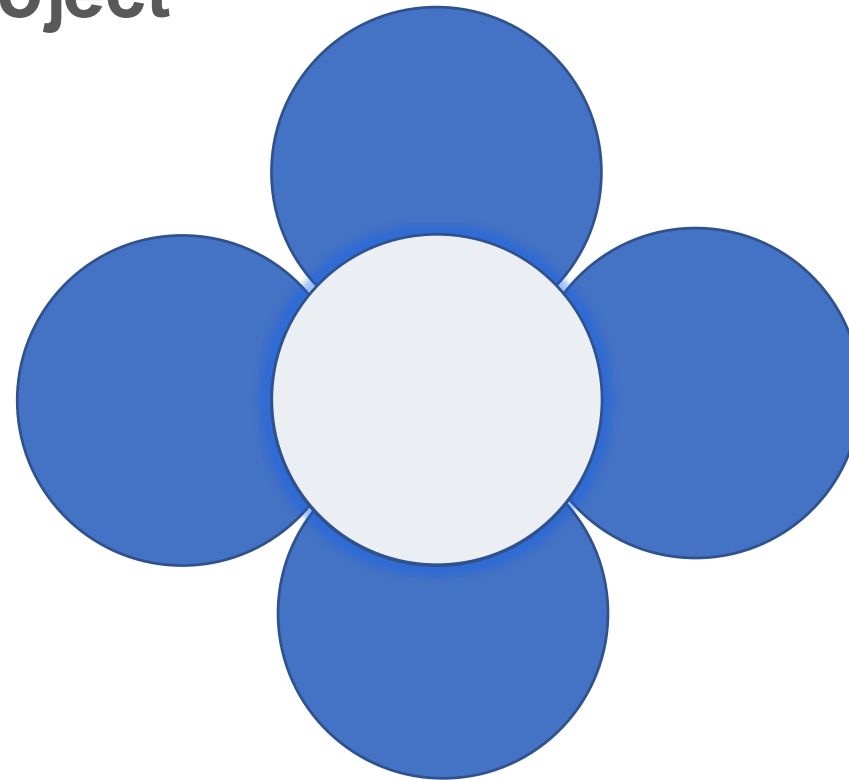
- A **course** as a project

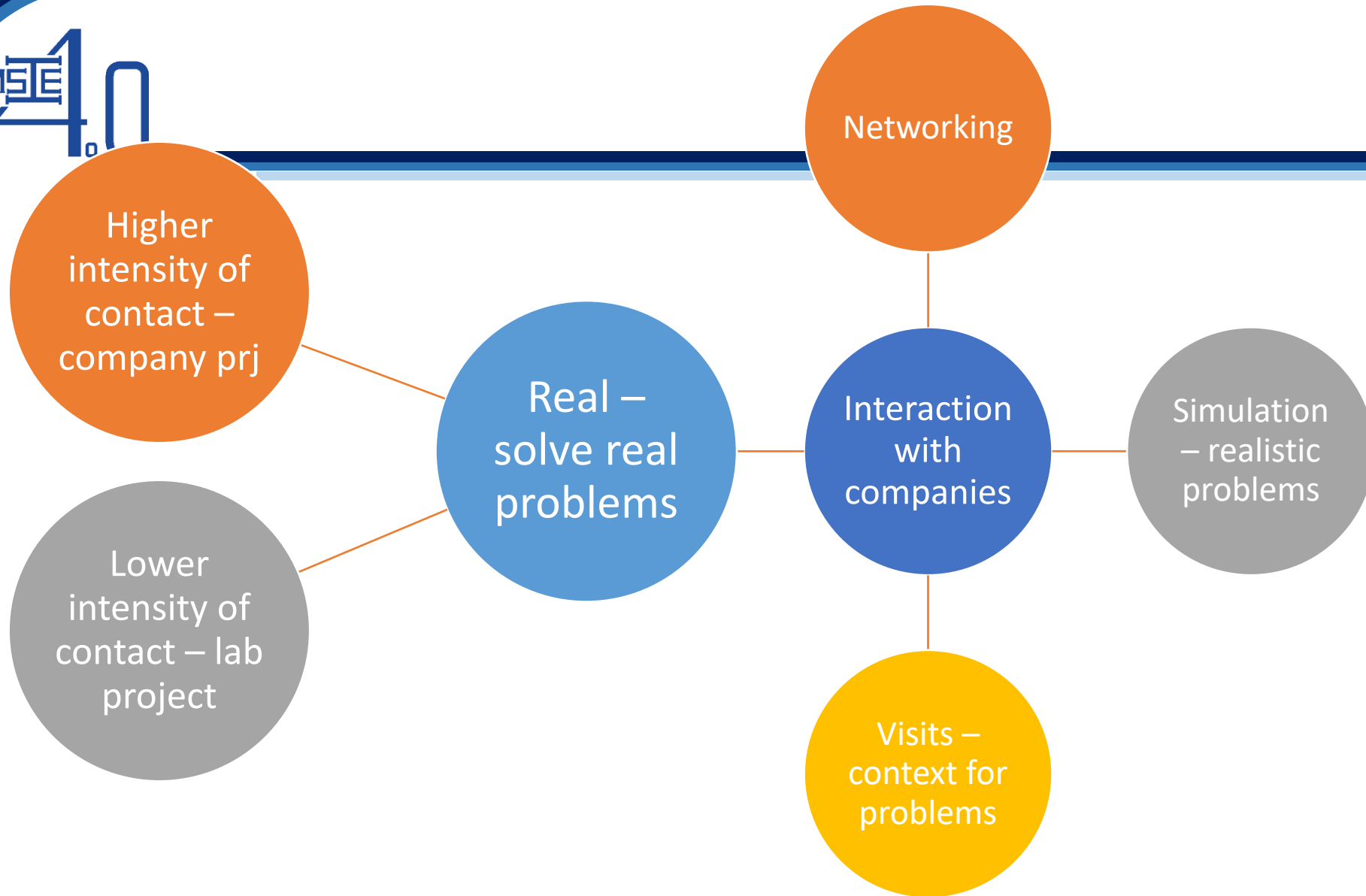


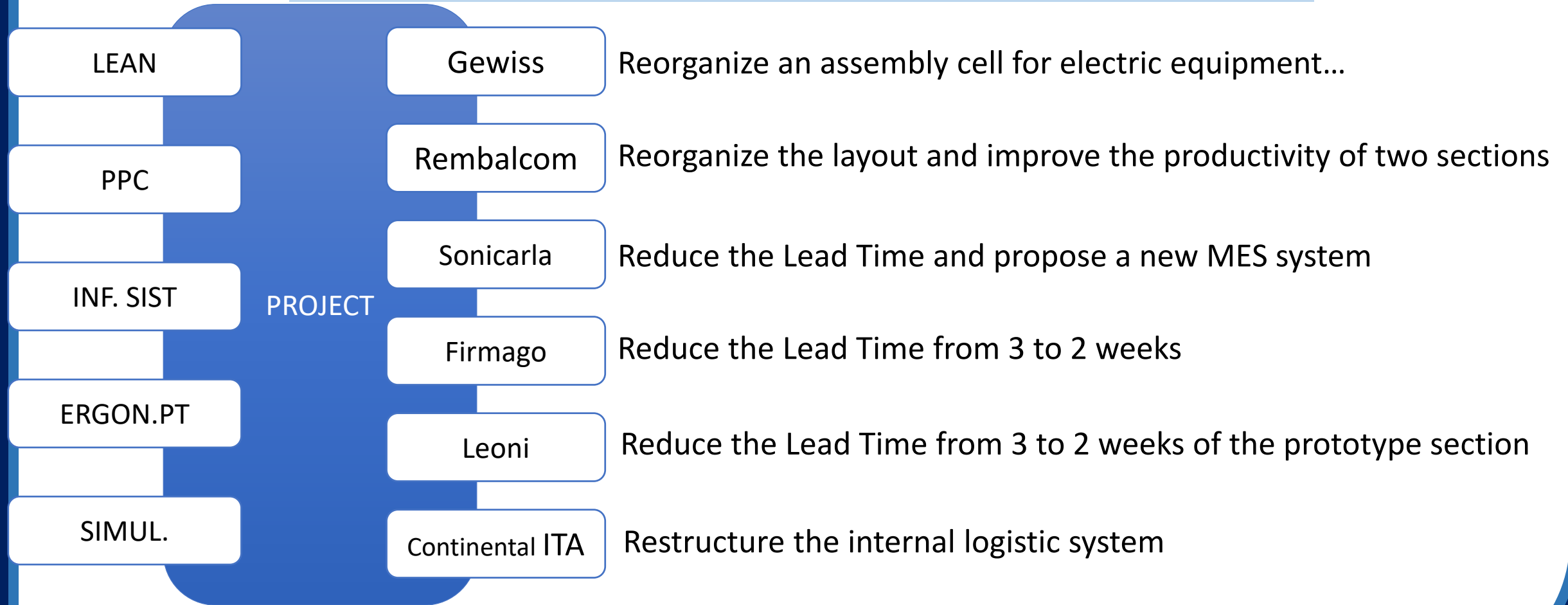
- **Interdisciplinary project approach**

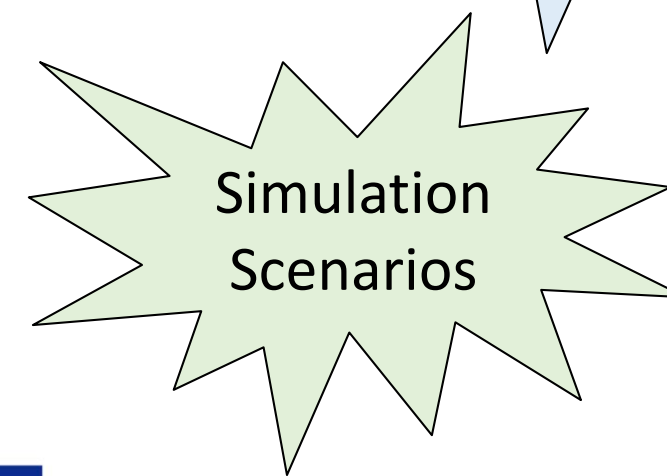
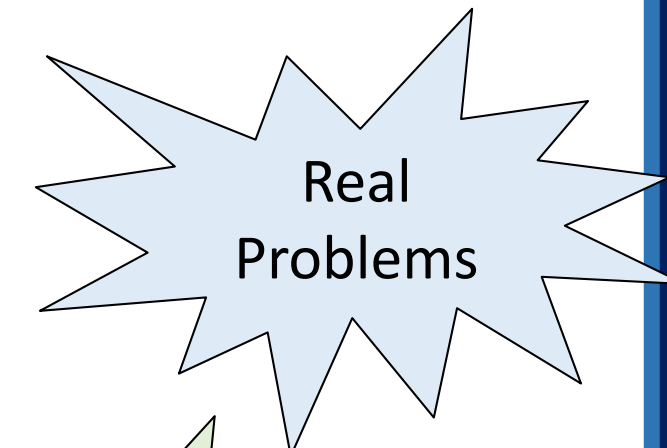
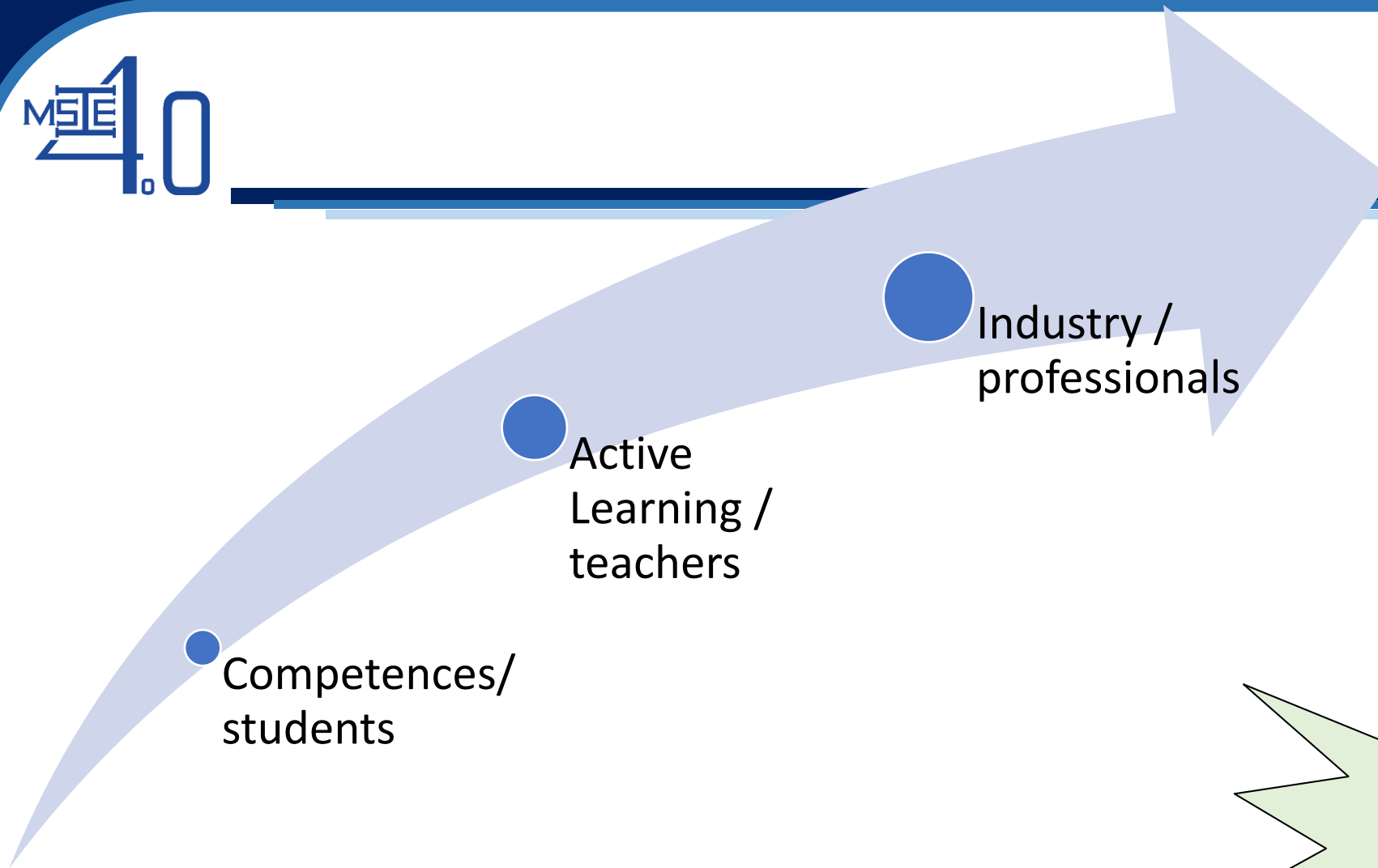


- **Interdisciplinary project approach**











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Thank You



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A Whole New Engineer – 5 pillars for change

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Alegria
(Joy)



Confiança
(Trust)



Coragem
(Courage)



Abertura
(Openness)



Colaboração
(Collaboration)