



Industrial Engineering and  
Management of European  
Higher Education

# *A European Survey on Higher Education in Industrial Engineering and Management: Preliminary Results*

Erasmus Plus 2018 – KA2 ‘Knowledge Alliance’



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Giovanni Mummolo



## • Academic Partners



Polytechnic  
University of  
Bari



Linköping  
University



Universidad  
Politecnica de  
Madrid



Poznan  
University of  
Technology



## ▶ Company Partners



**BOSCH**

Tecnologie  
Diesel spa



Implema



Arruti  
Catenaria

**ALCOMOT**

Alco-Mot

IE3 - Consortium members

## ▶ Technical Partners

ValueD●

ValueDo srl

**INFOTECH SRL**

Infotech

## ▶ Associated Partners



AIM

**ESTIEM**

ESTIEM



Asociacion  
Madrid Network



Item Oxygen srl

42<sup>nd</sup> AIM Conference, Berlin, 3-6 September 2020



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Goal:

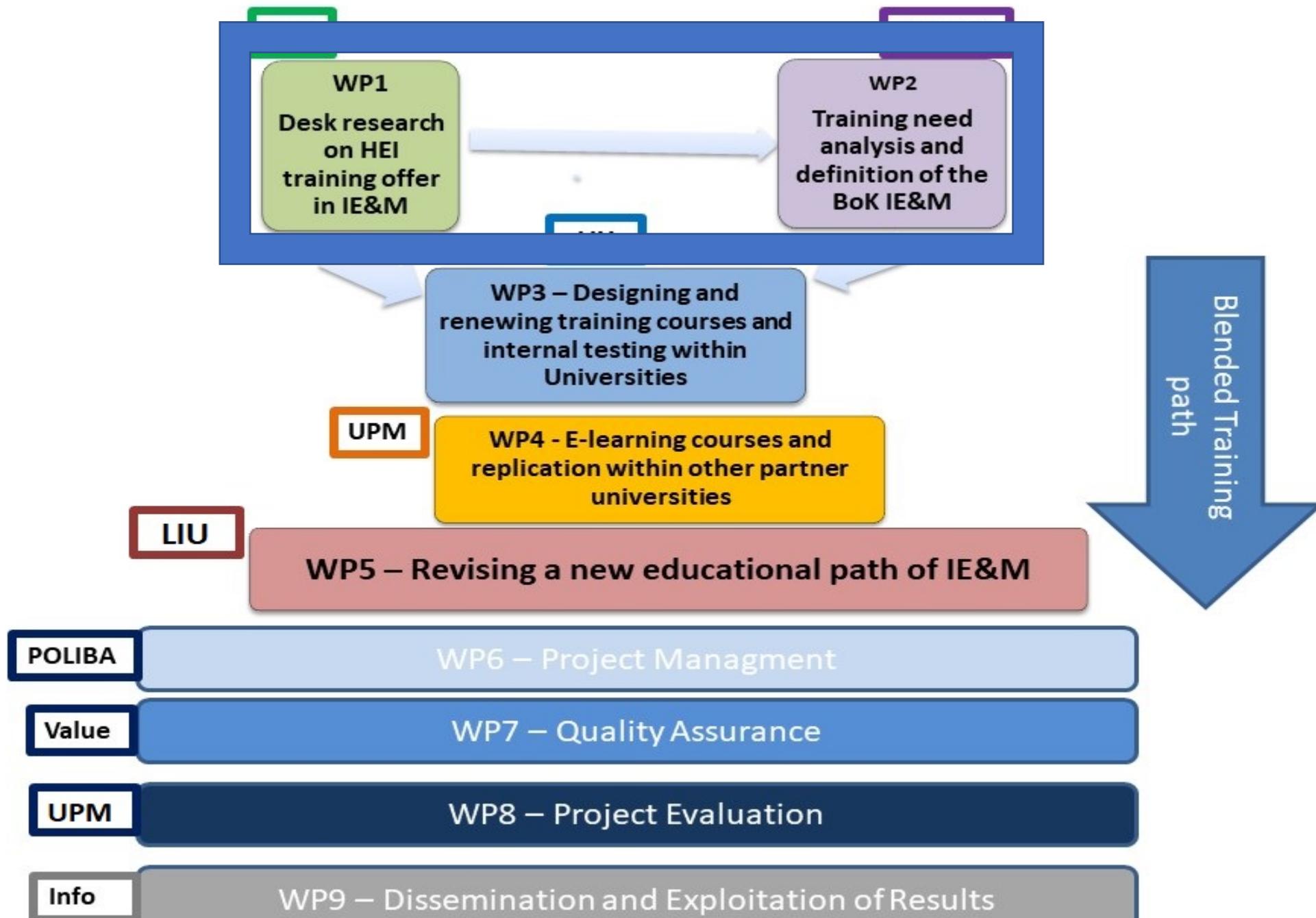
To Design, Test and Disseminate a New Educational Model of Higher Education in IE&M to contribute in increasing the quality of 2nd level academic curricula in Europe (Industry 4.0).



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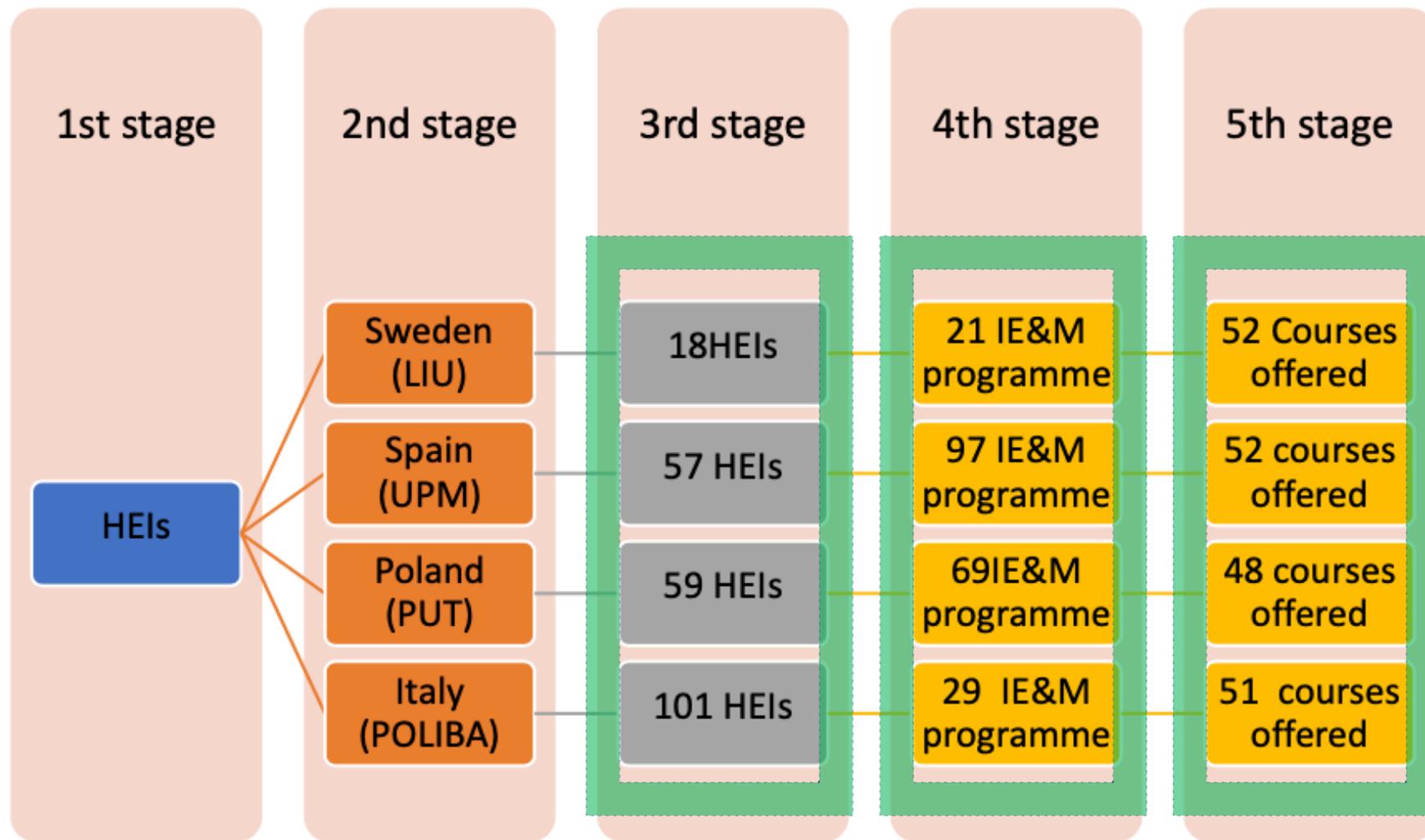


WP1

Sources of publications on Industry 4.0

**WP1**  
**Desk research**  
**on HEI**  
**training offer**  
**in IE&M**

**WP1**  
Desk research  
on HEI  
training offer  
in IE&M



**WP1**

*Quantitative results of the research on IE&M programmes offered by HEIs in selected countries*



# IE3 Erasmus+ Project Questionnaire for Companies

**WP2**  
Training need  
analysis and  
definition of the  
BoK IE&M

## Answers collected

Questionnaire for Companies			
	Answers	Minimum Target	Progress (%)
Italy	11	6	183%
Poland	10	6	167%
Spain	14	6	233%
Sweden	7	6	117%
Other (AIM - ESTIEM - Madrid Network and Company partners)	33	24	138%
<b>TOTAL</b>	<b>75</b>	<b>48</b>	<b>156%</b>

- Preliminary qualitative interviews for tuning Knowledge Subjects for Qs
- 69% of responders agreed to receive results of the survey by e-mail
- 35% of responders agreed to receive information by the Project newsletter

# Company Production site location

Country	City
Austria	Golling
BELGIUM	BRUSSELS
Croatia	Solin
Finland	Helsinki
Finland	Espoo
France	Rodez
Germany	Munich
	Munich
	Munich
	Bremen
	N/A
	Berlin
	Wolfsburg
Hungary	Geneva
Italy	Altamura
	BITONTO (BARI)
	Modugno
	Porto Sant'Elpidio
	Bari
	Bari (Italy)
	Guangzhou
	Milan
	Milan
	Milan
Limena (PD); Modugno (BA)	
Macedonia	Skopje
	Skopje
Netherlands	Amsterdam
	Many
	Amsterdam
	Rotterdam
Norway	Oslo
Portugal	Pinhal Novo
	Carregado
Romania	ALVERCA
Romania	Bucharest
Serbia	Not applicable/Services



Country	City
Poland	Warsaw
	Poznań
	CZARNKÓW, POLAND
	Poznan
	Gadki near Poznan
	Posen
	Wloclawek
	Radom (100km from Warsaw)
	Poznan
Kolo	
Slovenia	Maribor, Slovenia
	Maribor
	N/A
Spain	Maribor
	Bilbao, Spain
	Avilés
	Santurtzi
	AMOREBIETA
	Several cities in Spain (Avilés, ...)
	Madrid
	Gatika. (Basque Country)
	Madrid
	Singapore
	Paris, France
	Barcelone
	N/A
Bonares	
Derio (BIZKAIA)	
Sweden	Linkoping
	Skärblacka but also ...
	Skarblacka but also other locations
	Mjolby
	Stockholm
	Stockholm
Sweden	
Turkey	Izmir, Turkey
United Kingdom	London
	N/A



# Company Sector



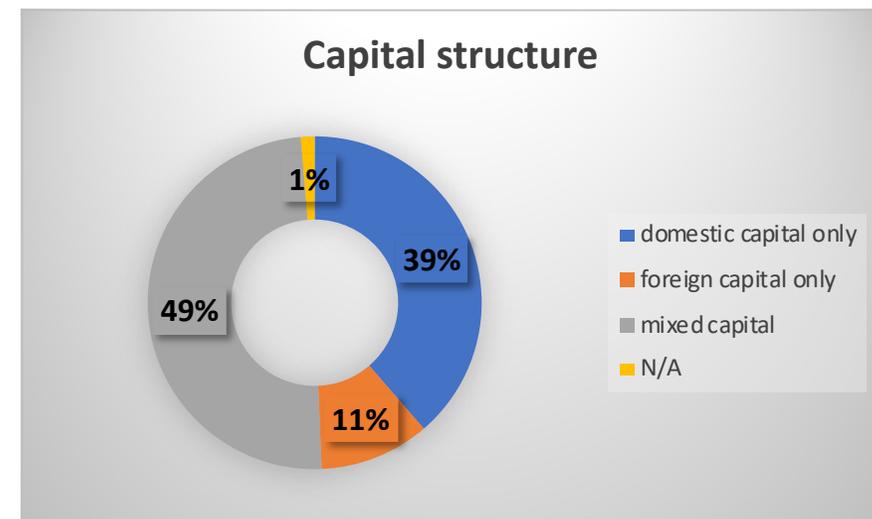
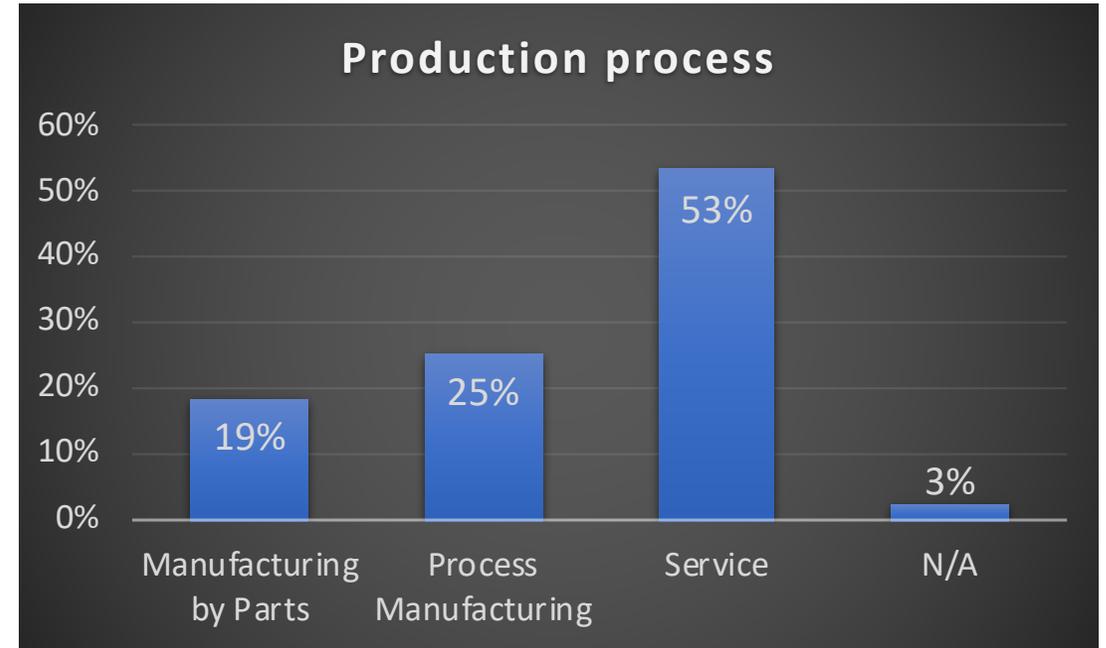
-  Service (36)
-  Process Manufacturing (17)
-  Manufacturing by Parts (14)



# Companies' profile



large (staff 250 or more)	63%
medium (staff 50 or more but less than 250)	13%
small (staff 10 or more but less than 50)	13%
micro (no more than 10 staff)	9%
Not Available	1%





# IE3 Erasmus+ Project Questionnaire for Professors of Higher Education Institutions

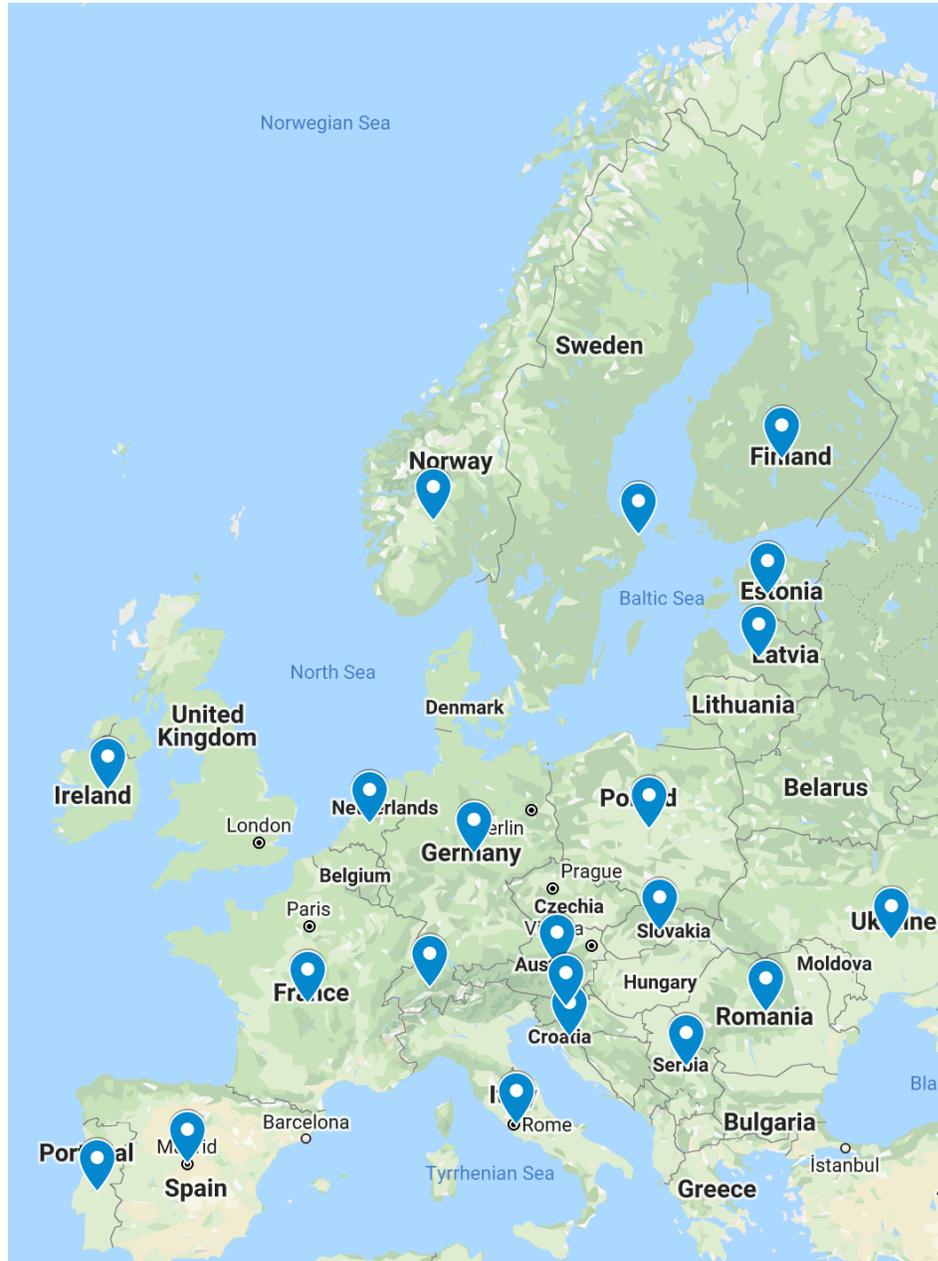
**WP2**  
Training need  
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definition of the  
BoK IE&M

Answers collected

Questionnaire for Professors			
	Answers	Minimum Target	Progress (%)
Italy	28	15	187%
Poland	16	15	107%
Spain	18	15	120%
Sweden	16	15	107%
Other (AIM - ESTIEM)	35	40	88%
<b>TOTAL</b>	<b>113</b>	<b>100</b>	<b>113%</b>

- 81% of responders agreed to receive results of the survey by e-mail
- 53% of responders agreed to receive information by the Project newsletter

# Professors' Country



Country	Answers
Italy	28
Spain	18
Poland	16
Sweden	16
Portugal	8
Croatia	4
Norway	3
Ukraine	3
Austria	2
Germany	2
Serbia	2
Switzerland	2
Estonia	1
Finland	1
France	1
Ireland	1
Netherlands	1
Romania	1
Slovakia	1
Slovenia	1
Latvia	1

# Professors' University

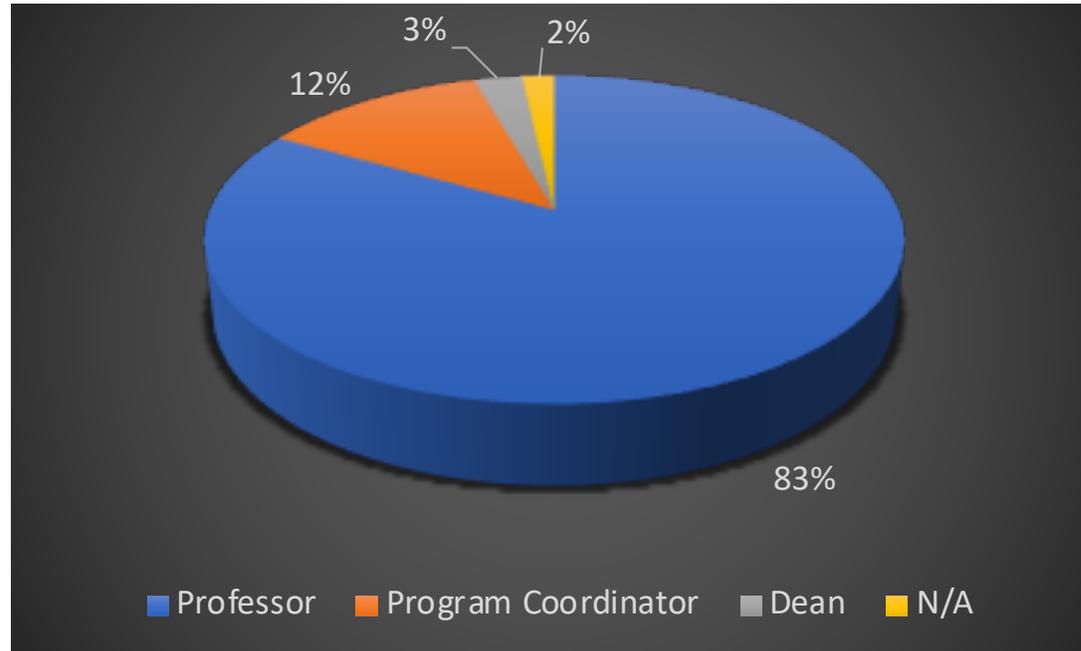
University	#
Linköping University	14
Politecnico di Bari	9
Universidad Politécnica de Madrid	6
Poznan University of Technology	5
University of salento	4
NTNU	3
Politecnico di Torino	3
University of Zagreb	3
Cracow University of Technology	2
Igor Sikorsky Kyiv Polytechnic Institute	2
Minho	2
Polytechnic University of Marche	2
Roma Tre University	2
TU Wien	2
University of Aveiro	2
University of La Rioja	2
University of Novi Sad	2
Warsaw University of Technology	2
Bw Munich	1
Cassino e Lazio meridionale	1
EPFL	1
ETH Zurich	1
Grenoble Alpes University	1
Instituto Politécnico de Setúbal	1
Kazimierz Wielki University	1
KROK University	1
Lodz University of Technology	1
Lublin University of Technology	1
Lund University	1
Malardalen University	1
NUI Galway	1
University of Padova	1



University	#
Politecnico di Milano	1
Polytechnic University of Catalogna	1
Riga Technical University	1
Santiago de Compostela	1
Tallinn University of Technology	1
Technical University of Cluj-Napoca	1
Technical University of Kosice	1
Universidad de León	1
Universidad del País Vasco	1
Universidade Lusíada Norte	1
Universitat Politècnica de València	1
University of Basilicata	1
University of Bergamo	1
University of Bielsko-Biala	1
University of Bologna	1
University of Coimbra	1
University of Groningen	1
University of Huelva	1
University of Malaga	1
University of Maribor	1
University of Napoli Parthenope	1
University of Oulu	1
University of Porto	1
University of Roma Tor Vergata	1
University of Seville	1
University of Siegen	1
University of Split	1
University of the Basque Country	1
University of Valladolid	1
University of Zielona Góra	1
Uniwersytet Rolniczy w Krakowie	1
West Pomeranian University of Technology	1



# Professors' profile



Position	#
<ul style="list-style-type: none"> <li>Program Coordinator</li> <li>Dean</li> </ul>	17
<ul style="list-style-type: none"> <li>Professor</li> </ul>	94
<ul style="list-style-type: none"> <li>N/A</li> </ul>	2

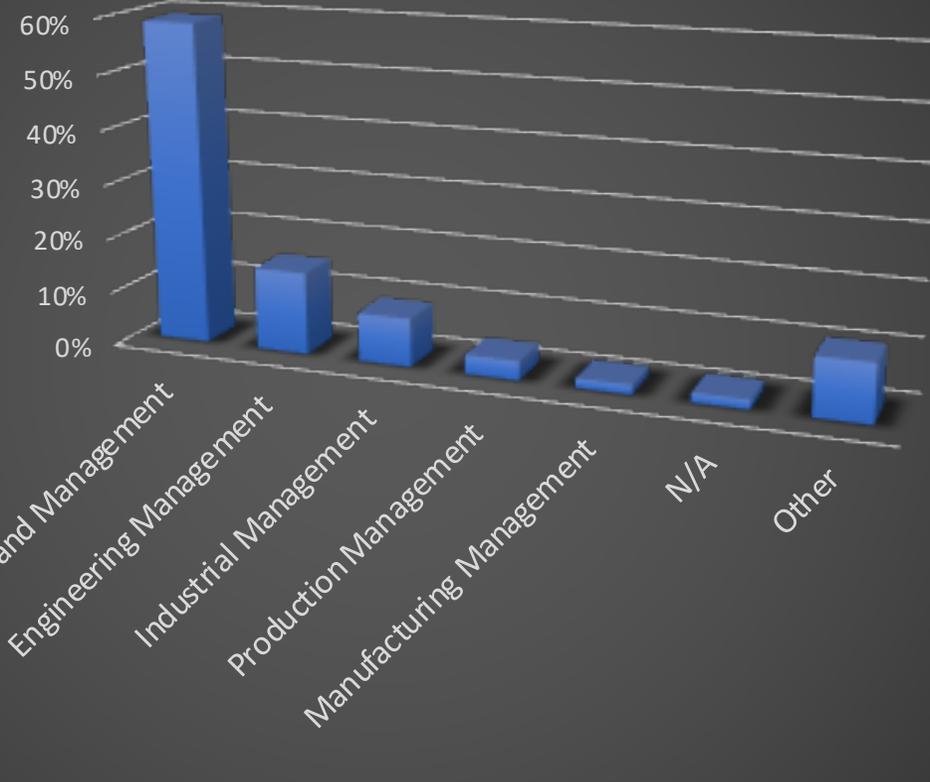


Program	#	Country	#
Industrial Engineering and Management	10	Italy	5
Engineering Management	1	Sweden	5
Industrial Management	1	Poland	2
Other	5	Spain	2
		Portugal	1
		Ukraine	1
		Finland	1



# Professors' profile

Which program(s) within IE&M are offered at Master level or 2nd cycle study



## Other

- Business Engineering
- Computer Science - Business Informatics
- Environmental Technology
- Industrial Engineering
- Logistics
- Logistics and Supply Chain Management
- Mechanical Engineering
- Mechatronics
- Product and Process Development
- Quality Engineering and Management
- Renewable energy sources and waste management
- Technology and Operations Management as well as...



# IE3 Erasmus+ Project Questionnaire for Companies

Methodological notes (1/2)

Questionnaire sections:

I. «Learning skills and competencies»

II. «Knowledge Transfer Methodology».

A numerical value was addressed to each answer:

"not offered (OFFER) or not required (DEMAND)"	0
"low"	1
"medium"	2
"high"	3
"don't know"	<i>null</i>



# IE3 Erasmus+ Project Questionnaire for Companies

Methodological notes (2/2)

For each question, the gap was evaluated as: DEMAND – OFFER.

For each question, the gap has been evaluated only in case the responder gave an answer to both “OFFER” and “DEMAND” side.

Identical Methodological Approach for Questionnaires administered to Professors of HEIs, Alumni, and Students.

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## Results of the Survey (Companies vs. HEIs)



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# IE3 Erasmus+ Project Questionnaire for Companies

WP2  
Training need  
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BoK IE&M

## ● Results of the Survey

Companies were asked to answer questions referring to two main sections organized in an online questionnaire:

A.1 Knowledge, Skills and Competencies (KSCs)

A.2 Operational Tools (OTs)

B Knowledge Transfer Methodologies (KTM)s

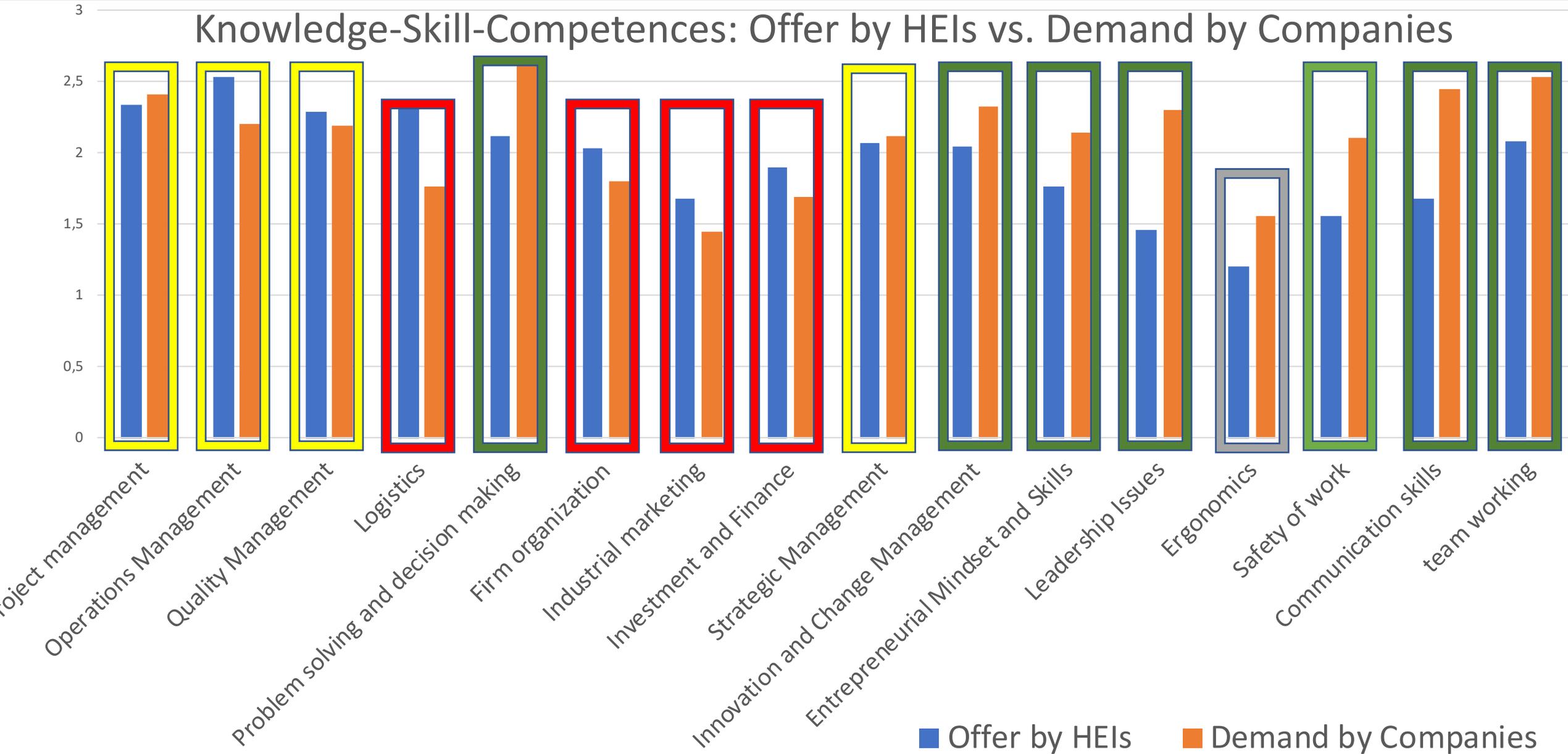


# IE3 Erasmus+ Project Questionnaire for Companies

## B. Other Knowledge Transfer Methodology

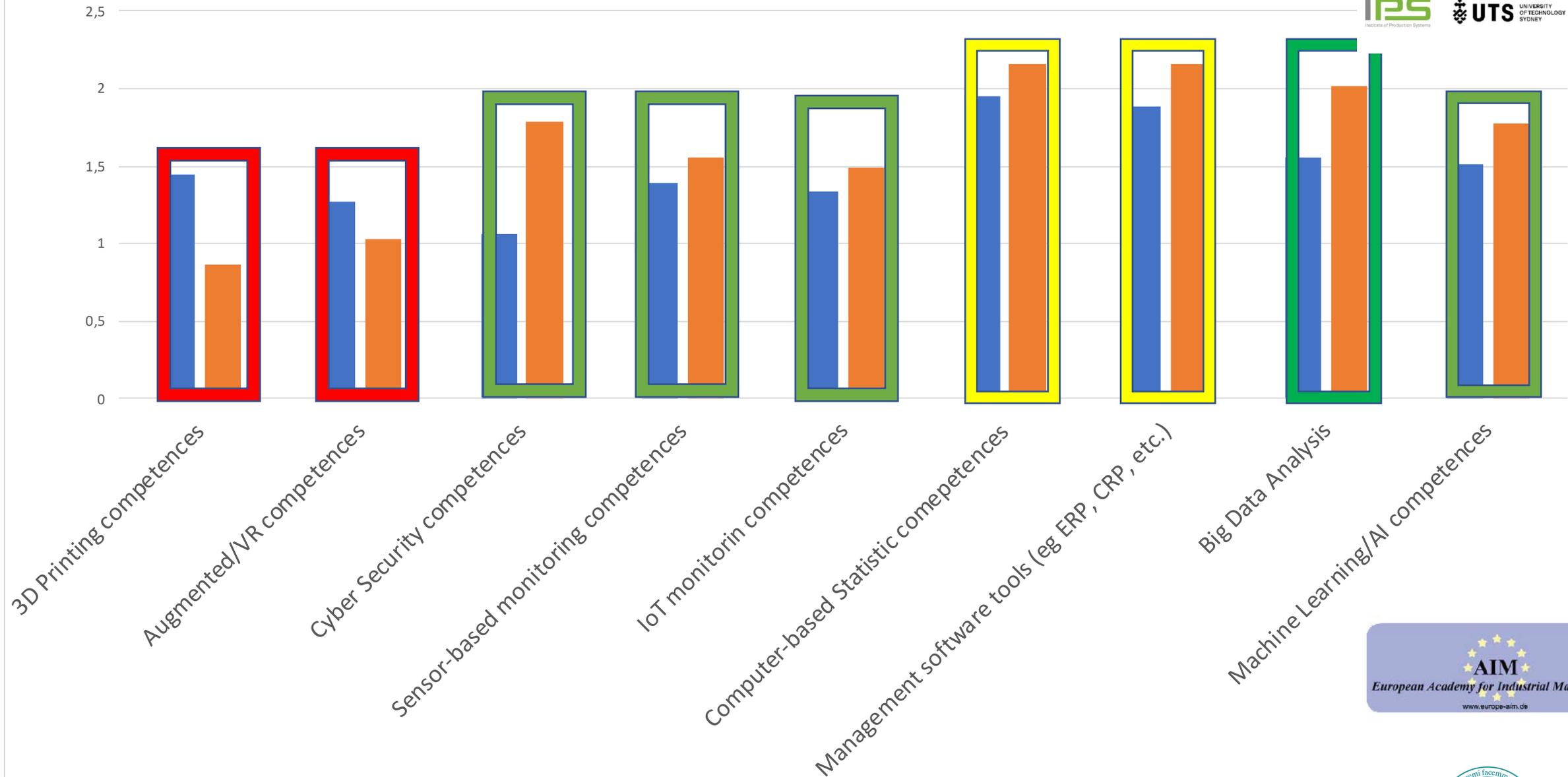
- Face-to-face
- Synchronous Lecturing
- Asynchronous recording
- Hackathon events
- Gemba walkings
- communities of experts
- Learning on the job
- online forums, zoom/skype videocalls
- Flipped classrooms
- ...

# Knowledge-Skill-Competences: Offer by HEIs vs. Demand by Companies



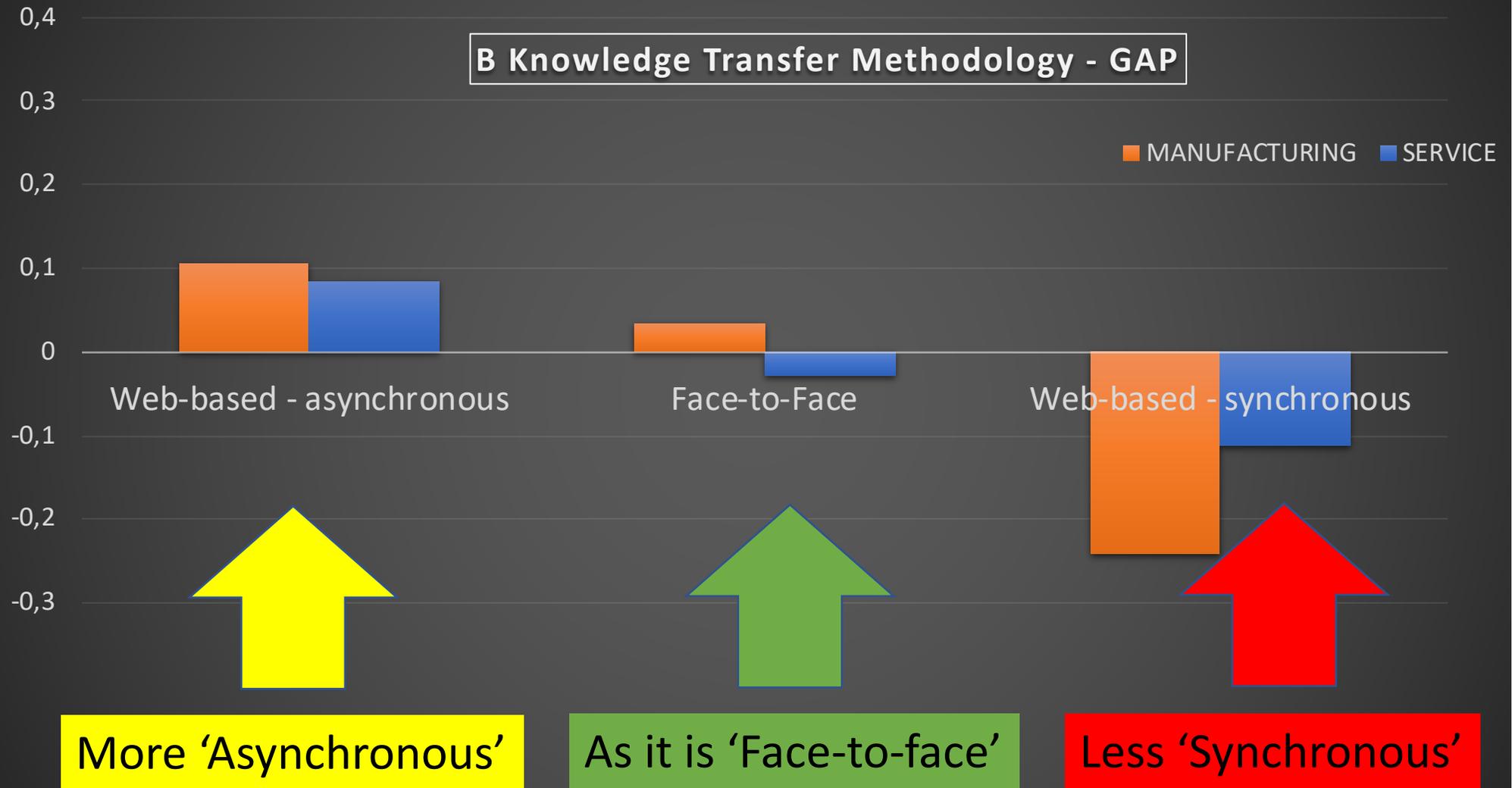
■ Offer by HEIs    ■ Demand by Companies

# Operational Tools: Offer by HEIs vs. Demand by Companies



■ Offer by HEIs ■ Demand by Companies

## B Knowledge Transfer Methodology - GAP



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## Summary and Conclusions:

- *The Erasmus Plus Project (AIM is Associated Partner) is going to assess Knowledge Need and Gap at Master Level Programs in IE&M (I4.0).*
- *First results of Survey by On-line Questionnaires (Companies vs. HEIs).*



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## Conclusion #1:

**HEIs are asked to Increase the Offer of Soft Skills subjects like:**

**‘Problem Solving & DM’, ‘Team working’, ‘Communication Skills, ‘Leadership issues’ & ‘Entrepreneurial mindset and skills’ to meet the Companies’ Demand of Knowledge/Skill/Competencies**



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## Conclusion #2:

*HEIs are asked to keep high the Offer of 'Classical' Operational Tools as well as new Operational Digital Tools like:*

- ***Operations Management Software Tools***
- ***Computer-based Statistics***
- ***Big Data Analysis Tool***



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## Conclusion #3: Methodologies for Knowledge Transfer

*HEIs are asked to Offer Education mainly by:*

- ***Classical Face-to-Face Lecturing***
- ***Asynchronous Digital Platforms***
- ***Lowest preference for Synchronous Digital Platform option***



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## Forthcoming

- *Setting up the BoK in IE&M*
- *Renewal of 4 MS Courses and e-learning modules*



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Are there AIM fellows available to act as 'External Reviewers' of the Body of Knowledge ?



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<http://www.europe-aim.eu/>  
<https://ie3.eu/the-project/>  
<http://ie3.eu/results>

***Thank you for your attention !***



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