

# icoins

## Industry 4.0 Competences for SMEs- Awareness Raising Tools

### icoins- Competence Map



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## INTRODUCTION

After analyzing the situation regarding Industry 4.0 in the partners' countries, a report was prepared (IO1- final report) in which the main needs were explained. This report has been the main basis for the production, development and integration of the modules in the OER.

All partners recognize the need for new digital training skills and models to provide a wide reaching Digital Training program. Investment in Digital Skills Training is necessary for future growth and competitiveness within most business sectors.

Some of the identified fields of improvement, regarding education, were:

- Software Development
- Increase in ICT and Digital Skills
- Use of Cloud Technology,
- Management Software
- Hybrid Training
- Info-Structure Training
- Virtual Training
- Big Data 3D
- CyberSecurity
- Digital Awareness
- Robotics
- Artificial Intelligence
- Internet of things
- Additive Manufacturing,
- Logistics
- After Sales
- Basic Digital Skills
- Embedded Systems
- Simulation
- Supply Chain Management
- Platform and Digital Transformation
- Communication
- Networking
- Project Management

After this analysis and gathering of information, the partners decided to create the following competence map based on the findings in all partners' countries according to ECVET principles. It defines the modules for the iCOINS educational platform and avoid overlapping of content and materials.

In this chart you will find:

- The partner developing the module
- Name of the module
- Units of the module
- Knowledge
- Skills
- Competences

## iCOINS Competence Map

MODULE		UNITS	Knowledge	Skill	Competence
1	Introduction to Industry 4.0	Unit 1.1 Industry 4.0 for SMEs	Define the meaning of industry 4.0 for organisations Describe the automation of communication between mankind and machines	Plan changes in terms of industry 4.0 Explain how embedded systems and human resources communicate within companies	Manage changes in a SME in terms of industry 4.0 Plan the adoption of automation within own company to enable communication through embedded systems
		Unit 1.2 Industry 4.0 principles	Describe industry 4.0 principles Describe the technological trends of Industry 4.0 (IoT and IoS etc.) within own company	Apply industry 4.0 principles in own company plan Plan to implement technological trends of Industry 4.0 (IoT and IoS etc.) within own company	Manage and monitor the industry 4.0 design principles within the SME Manage the integration of technological trends of Industry 4.0 (IoT and IoS etc.) in own company
		Unit 1.3 Industry 4.0 Advantages and challenges	List the advantages and challenges of industry 4.0 for organisations List sectors that may benefit from the implementation of Industry 4.0 Describe the main challenges that SMEs have to face before/after implementing Industry 4.0	Explain the advantages and challenges of industry 4.0 for own company Explain how Industry 4.0 encourages consumer trust, compliance and traceability, flexibility and better planning of internal resources Explain how Industry 4.0 negatively affect SMEs	Collaborate in solving the challenges of industry 4.0 in the SME Manage the integration of Industry 4.0 to encourage benefits in business operations Manage both advantages and challenges related to Industry 4.0 integration
2	Overview of 4.0 Key Enabling Technologies	Unit 2.1. Introduction to Internet of Things Technologies and Smart Factories	describe the IoT architecture and components identify the applications of IoT to industry 4.0 describe the main features of a smart factory	explain how to use IoT in own company plan changes in own company towards a smart factory	Manage the integration of IoT in own company manage changes in own company towards a smart factory
		Unit 2.2. Introduction to Big Data and Cloud Technology for Industry 4.0	describe what big data is useful for in industry 4.0 describe what cloud technology is useful for in industry 4.0 describe the different typologies of NUI - Natural User Interfaces ( touch, voice, gesture)	explain how to use big data in own company explain how to use cloud technology in own company	manage the integration of big data in own company manage the integration of cloud technology in own company
		Unit 2.3. Introduction to Advanced Human Computer Interfaces	define the potential of NUI in the context of Industry 4.0 describe the AR concept and technologies define the potential of AR in the context of Industry 4.0	explain how to use innovative NUI in own company plan potential applicability of AR principles in own company	manage the exploitation of innovative NUI in own company manage the exploitation of AR in own company
3	Applications of IOT and Cybersecurity	Unit 3.1 Internet of Things (IOT) 3.1.1 IOT Components 3.1.2 Smart Buildings 3.1.3 Smart Factories	Define "things" and "smart", "IP" concepts List the three core elements of smart connected products Define the birth and development progress of IoT Describe the benefits of IoT Describe IoT components and its features Define the smart buildings Define what the smart factory is, its key features, and the components and technologies that comprise the smart factory, and how it fits the digital supply network	Explain the features of "things" and "smart", "IP" concepts Explain the relation between the three core elements of smart connected products Explain the birth and development progress of IoT Discuss the benefits of IoT Use the hardware and software components Analyse the relations between IoT and Buildings Analyze how to smart factory can drive value and its other benefits	Differentiate usage area of smart things and IP concepts Manage the integration of smart connected products in own company Differentiate the different periods of IoT development process Recognize the benefits of IoT Differentiate hardware and software components and their features Capability to identify strategy to improve buildings' performance by utilizing IoT Differentiate the ways of organizations which can begin buildings and enacting a true, holistic smart factory
		Unit 3.2 Communication and Networks 3.2.1. Connectivity and Networks 3.2.2. M2M Communication	Define the computer network Define the components and functionalities of machine to machine communication	Interpret and understand current state of local and global networks. Explain the fundamentals and uses of machine to communication	Cognizant of the opportunities and difficulties that are arising in connected environments Recognize the features of M2M Communication
		Unit 3.3 Cyber Security and Industrial Security	Define the security in general and the critical infrastructure areas Tell the case studies of cyber-physical attacks List the basic components of security Define the kinds of threats in industrial security, types of attackers and the defense methods against industrial security threats	3Explain kinds of threats in industrial and cyber security, and defence methods against them Plan the prevention strategies from cyber-physical attacks Explain the features of the basic components of security Plan the prevention strategies from threats in industrial security	Provide examples of cyber-physical attacks Deal with cyber-physical attacks threats within own company Differentiate all components of security Deal with threats in industrial security within own company
4	Business Strategies: Digital Transformation, Data-Driven	Unit 4.1 Journey to digital transformation	identify the role of Industry 4.0 in different business environments	Identify the basics of strategic planning for digital transformation	prepare strategy to improve organizations' performance by utilizing Industry 4.0 approach
		Unit 4.2 Requirements for the Open Industrial Interoperability Ecosystem	describe how to use Open Data and Application Programming Interface in business management	describe the basics of using open data	identify the importance of open data and interoperability
		Unit 4.3 Industry 4.0 as Business Architecture	define the Industry 4.0 Business architecture framework	demonstrate the basics of planning the Industry 4.0 architecture	identify digital transformation towards Industry 4.0 model
		Unit 4.4 Asset Life Cycle Management in Digital Environment	identify the life-cycle management and eco-systems	describe the basics of planning the digital ecosystem	apply and manage life-cycle of digital eco-systems according Industry 4.0 model
		Unit 4.5 Strategic Business Co-Evolution Management	identify the importance of co-innovation development	describe the basics of strategic Business Co-Evolution Management	deal with Strategic Business Co-Evolution development work
5	Soft-Skills In 4.0: Communication, E-Leadership	Unit 5.1 Communication 5.1.1 Communication: Introduction, verbal and written communication 5.1.2 Communication: non- verbal communication	Identify and define what communication is and it's importance in Industry 4.0	Identify different types of communicative skills and how to improve them	Identify situations where improved communication skills are needed
		Unit 5.2 E-Leadership	Identify and define leadership and how it has evolved including traits of the modern leader Identify proper negotiation techniques	Develop leadership skills and understanding of techniques for working well with team members and peers Improve problem solving skills in response to the needs of various constituents in workplace settings	Recognize and develop idea of self in the workplace including emotional intelligence and intercultural awareness Evaluate issues in order to develop critical thinking skills
		Unit 5.3 Other Relevant Soft Skills 5.3.1 Critical thinking, Problem solving and negotiation 5.3.2 Teamwork and goal setting 5.3.3 Time and resource management 5.3.4 Creativity	Develop understanding of how to engage in successful business interactions, including how to work efficiently and interact as a part of a team and individually Identify and become familiar with effective time management tools Identify useful tools for creating more efficient presentations	Analyze methods for setting and sticking to goals Achieve better results through effective planning and clarifying of objectives Identify tactics for integrating creativity in the workplace	Develop strategies for effective task distribution Manage time and resources more efficiently Demonstrate practical understanding of uses of brainstorming and playing in the workplace
		Unit 6.1: Introduction to Data Science	List the advantages of using data science in Industry 4.0 applications Describe data science project process and its coverage List descriptive statistics concepts	Undertake further research on the use of data science in Industry 4.0 applications Apply data mining techniques for a given data set Calculate descriptive statistics for a given data set	Ensure the importance of data science in Industry 4.0 applications Differentiate between different data mining techniques Differentiate between different descriptive statistics such as mean, median and mode
6	Data Science	Unit 6.2: Descriptive Statistics	Identify descriptive statistics concepts	Analyze data and present descriptive statistics as a basis for decisions Apply supervised and unsupervised machine learning concepts	Apply descriptive statistics methods for a given data set Differentiate between supervised and unsupervised machine learning concepts
		Unit 6.3: Predictive Analytics 6.3.1 Basics of Predictive Analytics 6.3.2 Supervised-Unsupervised Learning	Describe application areas of predictive analysis in businesses Define supervised and unsupervised machine learning concepts Describe how to apply predictive analytics algorithms for a given data set	Analyze data using predictive analytics algorithms	Apply predictive analytics algorithms for a given data set
		Unit 6.4: Data Science and Business Strategy 6.4.1 Data science and business strategy 6.4.2 Reasons for Data Science in business 6.4.3 Tools for Data Science	Describe privacy, ethics and using data about individuals Describe competitive advantages that business can achieve through data science Describe the main functions of the tools used for data analysis List examples of data-driven business success stories Describe examples of data science tools used in business	Undertake further research on privacy, ethics and using data about individuals Provide examples of data-driven business success stories Provide examples of data science tools used in business	Recognize the importance of privacy, ethics and using data about individuals Differentiate problems to be solved with data science Use data analysis tools

## CONCLUSION

This common competence map has served the partners as a guiding document in order to develop the remaining activities of the project:

- IO2: The training modules were based on the competence map. The online training modules have been developed according to the common competence map developed in Output 1
- IO3: HAMKi UAS has define the requirement specification for the open educational resources platform based on the defined learning outcomes and methods and according to the common competence map developed in Output 1
- IO4: This output has pulled together an overview of the iCOINS competence map, the 6 training modules, the OER platform and the iCOINS open badges into a methodological description and practical ideas of implementing the material at various levels: national, regional and local.



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