DiTwin

Competence Framework

Industry 4.0 profiles for VET education

YEAR:
2026

REALISED BY:
Learnable (IT)
Digital Smart srl (IT)
ETN Training Vision Ireland (IE),
University of Malaga (ES)
Málaga TechPark (ES)
Innovation Frontiers IKE (GR)
University of the National Education Commission, Krakow (PL)

www.ditwin.eu

Co-funded by the European Union

DiTwin – Digital Twin for VET school

DiTwin Competence Framework

The editing of this document was finished on January 2026.

Project website: https://www.ditwin.eu/

DiTwin is a Cooperation Partnership project in vocational education and training sector (KA220-VET) funded under the Erasmus+ Programme.

Project Number: 2023-1-IT01-KA220-VET-000154611

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Agenzia nazionale Erasmus+ INAPP. Neither the European Union nor the granting authority can be held responsible for them.

This document has been created by the collaboration of the whole DiTwin partnership: Learnable Società Coooperativa a r.l. (IT) -project Coordinator, Digital Smart srl (IT), ETN Training Vision Ireland (IR), University of Malaga (ES). Málaga TechPark (ES), Innovation Frontiers IKE (GR), University of the National Education Commission, Krakow (PL).

Contents

Introduction

This Competence Framework is a product of the project DiTwin – Digital Twin for VET schools, an Erasmus+ KA2 Cooperation Partnership project in Vocational Education and Training, co-funded by the European Commission. The main project objective is to improve the effectiveness of VET curricula for achieving the competencies needed by Industry 4.0. The project intends to bridge the gap of facilities and machinery of VET schools by exploiting the potential of Digital Twin technology.

The document provides a reference of 11 profiles required by industry 4.0 in partner countries (Italy, Spain, Ireland, Greece, Poland) related to students that have completed the 4th and 5th EQF level of education. They are described in terms of knowledge, skills and competences using a common language, based on the learning outcomes approach that can be understood across Europe.

The learning outcomes identified are aligned to the standard VET curricula of the partner countries, so to be easily integrated into the VET schools practices.

This document is designed to support VET schools and teachers to continue up-skilling VET students with the competences required by Industry 4.0, connecting the VET sector to the latest developments of the labour market. The main aim is to support school to work transition of VET students , preventing high unemployment rate of young people in partner countries and workforce shortcomings for the Industry 4.0 sector.

Industry 4.0 technologies are considered by the European Union as horizontal technologies "enabling" multiple sectors that are expected to be decisive in tomorrow's economy (EC, 2019 Curriculum Guidelines for Key Enabling Technologies and Advanced Manufacturing Technologies). Despite the great potential of these technologies in supporting youth employment, there is a lack of appropriate and multidisciplinary curricula providing the related digital skills. This is identified as a key barrier also to the development of innovation and digital transformation (EC 2020 Youth Employment Support: a bridge to jobs for the next generation).

In this document, in addition to the detailed description of the profiles, you can also find a description of the methodology implemented by the DiTwin partnership. This will enable other organisations and countries to do the same process and adapt the Competence Framework to their contexts and interests.

Methodology

This document has been produced by the DiTwin partnership based on a process involving different stakeholders.

01

During the first phase, the partnership, through a desk analysis, analysed curricula and training programs at national level in order to select the most relevant topics and competences needed by Industry 4.0.

The partners selected and analysed 42 curricula or programmes in the different partner countries.

The courses, training programmes and curricula have been analysed in terms of topics and learning outcomes highlighting, when possible, knowledge, skills and competences achievable.

The elaboration of these data resulted in a list of 108 items divided in 20 main competence areas:

1. Introduction to Industry 4.0
2. Additive Manufacturing
3. Computer Numerical Control (CNC)
4. Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM)
5. Automation
6. Cloud Computing
7. Cybersecurity in Industry 4.0
8. Data Analysis, Artificial Intelligence (AI) I and Machine Learning
9. AI and machine Learning
10. Drones and AGVs
11. Materials
12. Intellectual Property and New Technologies
13. Internet of Things (IoT)
14. Local, Remote and Predictive Maintenance
15. Networks and Industrial Communication Technology
16. Rapid Prototyping and Reverse Engineering
17. Robotic technologies
18. Virtual Reality (VR) and Augmented Reality (AR)
19. Bioindustry
20. Management

02

During the second phase, the partners, through a comparative analysis, identified the most relevant topic or learning outcome required by Industry 4.0 in partner countries.

This task was carried out through an online questionnaire involving industries and experts in industry 4.0. Respondents were asked to grade the learning outcomes (knowledge, skills and competences) on a scale between 1 (I don't know) to 5 (very important) considering the EQF levels 4 and 5. In total 72 questionnaires were collected in all the partner countries.

At this point, the average value of the responses in each country was calculated and were considered as important for that country only the learning outcomes with a score above 3.8 out of 5.

03

Finally, the learning outcomes (knowledge, skills and competences) selected have been aligned with the VET curricula in partner countries and translated by the DiTwin partnership into profiles needed by Industry 4.0.

Profiles

The following 11 profiles have been selected:

01 Additive Manufacturing technician

Competence

C1. Ensures a smooth and reliable basic operation of 3D printing machines, setting up, maintaining and repairing additive manufacturing and 3-D printing equipment.

Knowledge

K1.1 To describe what additive manufacturing is and how the different systems work
K1.2 To recognise the advantages, opportunities and benefits of the different systems of Additive Manufacturing
K1.3 To describe the sequence of process steps
K1.4 To describe how to prepare and manage the files for printing
K1.5 To describe the quality standards and indicators of the additive manufacturing products
K1.6 To describe maintenance indicators and diagnostic techniques
K1.7 To understand the more appropriate printing material, for the specific 3D printer, with respect to the object to be printed

Skills

S1.1 To prepare and manage the files for printing
S1.2 To properly prepare and set up at least 1 additive manufacturing system
S1.3 To properly operate basic tasks using at least 1 additive manufacturing system
S1.4 To check and ensure the quality of the products

02 Computer Numerical Control (CNC) operations technician

Competence

C2. Operates basic tasks using a Computer numerically controlled (CNC) machine.

Knowledge

K2.1 To describe what a CNC machine is and how it works
K2.2 To describe the work cycle and steps to operate a CNC machine
K2.3 To describe the quality standards and indicators for CNC operations and products

Skills

S2.1 To interpret the technical-mechanical drawing in CAD
S2.2 To properly set up a CNC machine
S2.3 To properly operate basic tasks on a CNC machine
S2.4 To check and ensure the quality of the products
S2.5 To perform basic maintenance operations

03 Computer-Aided Design/Computer-Aided Manufacturing (CAD/CAM) Designer

Competence

C3. Creates basic 2D and 3D Models for CAD/CAM production systems

Knowledge

K3.1 To recognise and understand different files and data types and their use
K3.2 To present the different techniques and tools for creating a basic 3D Model for CAD/CAM systems
K3.3 to describe the main steps for creating a basic 3D Model for CAD/CAM systems

Skills

S3.1 To properly use 3D Modelling software
S3.2 To prepare 3D Models for CNC production

04

Automation technician for Industry 4.0

Competence

C4. Creates, repairs and maintains basic automated systems for industry 4.0

Knowledge

K4.1 To understand how automated machines and plants work in industry 4.0
K4.2 To understand fundamentals of mechatronics
K4.3 To understand fundamentals of automation and robotics
K4.4 To be aware of fundamentals of electrical engineering and electronics
K4.5 To understand the fundamentals of pneumatics and hydraulics
K4.6 To describe maintenance indicators and diagnostic techniques

Skills

S4.1 To be able to operate a Programmable Logic Controller (PLC)
S4.2 To monitor the smooth operation of automated production systems
S4.3 To perform basic repairs on automated production systems
S4.4 To do basic maintenance operations
S4.5 To install basic automated production systems

05

IT Communication technician for Industry 4.0

Competence

C5. Resolves faults and issues in basic communications systems for Industry 4.0

Knowledge

K5.1 To classify the main cloud services and for Industry 4.0 and their characteristics
K5.2 To describe the benefits of cloud computing for Industry 4.0
K5.3 To describe virtualization and resource sharing
K5.4 To understand the risks of adopting a cloud system and how to mitigate them
K5.5 To present fundamentals of cyber security for industry 4.0 (security requirements for devices, risk assessment, Attack surfaces and modes of penetration, Threats and consequences - the possible scenarios, Defence against attacks, The phases (Kill-Chain) of a cyberattack)
K5.6 To describe control system architectures
K5.7 To describe automation system architectures
K5.8 To understand the basics of data security and cyber security (standards, protocols, certifications, protection systems for internet-based-manufacturing)
K5.9 To describe local networks (wired and wireless)
K5.10 To list network diagnostic tools

Skills

S5.1 To identify the needed cloud services for industry 4.0
S5.2 To integrate cloud computing in industries 4.0
S5.3 To properly use cloud services
S5.4 To create and manage a connection to a data cloud
S5.5 To identify network components (switch, router, PLC)
S5.6 To integrate of Security and Safety in the industrial environment
S5.7 To guarantee information security of the company and the other employees in cyberspace

06

Data Analyst for Industry 4.0

Competence

C6. Gathers and scrutinises data and uses them for improving company performances.

Knowledge

K6.1 To present the fundamentals of data analytics and artificial intelligence in Industry 4.0
K6.2 To present the definition of big data how they can be used in industry 4.0
K6.3 To understand how to integrate different data storage
K6.4 To present the types of learning data and differences between learning and testing data;
K6.5 To describe principles, advantages and techniques of predictive maintenance

Skills

S6.1 To apply basic tools and methodologies for data aggregation, analysis and utilisation
S6.2 To apply basic tools and methodologies for predictive data analysis
S6.3 To apply basic tools and methodologies for data analysis for predictive maintenance

07 Artificial Intelligence (AI) and machine learning technician for Industry 4.0

Competence

C7. Integrate basic AI-based resources in Industries 4.0.

Knowledge

K7.1 To define potential uses of AI in industry 4.0
K7.2 To describe Advantages of AI in Industrial contexts
K7.3 To describe how exploit Machine learning in industrial contexts K7.4 To present the role of IoT and AI data analytics for intelligent decision making

Skills

S7.1 To manage AI tools in industrial contexts
S7.2 To support basic activities by using AI tools, machines and services

08 Internet of Things (IoT) technician for Industry 4.0

Competence

C8. Plans and implements basic IoT solutions for Industry 4.0.

Knowledge

K8.1 To define internet of things
K8.2 To describe IoT Technologies and applications in industry 4.0
K8.3 To describe machine-to-machine, machine-to-person, person-to-person connections

Skills

S8.1 To properly use and integrate IoT sensors
S8.2 To plan and prepare a basic IoT solution for industry 4.0
S8.3 To manage the security of IoT solutions

09

Remote and predictive maintenance technician

Competence

C9. Monitors the maintenance of industry 4.0 systems

Knowledge

K9.1 To describe the predictive maintenance principles, advantages and techniques.
K9.2 To present what advanced and collaborative robots are and how they work
K9.3 To list Advantages and disadvantages of collaborative robotics
K9.4 To list types of collaborative robots (collaborative, Anthropomorphic Systems, Cobots, etc....)
K9.5 To present differences between collaborative robots and industrial robots
K9.6 To describe maintenance indicators and diagnostic techniques

Skills

S9.1 To be able to perform data analysis and statistical process control for maintenance purposes
S9.2 To apply principles of maintenance management: maintenance indicators, techniques of analysis of failure and diagnostic techniques

10 Robot machines technician for Industry 4.0

Competence

C10. Makes the setup, operation, and maintenance of a robotic machine for industry 4.0

Knowledge

K10.1 To describe robot components, characteristics and applications.
K10.2 To present what advanced and collaborative robots are and how they wor
K10.3 To list Advantages and disadvantages of collaborative robotics
K10.4 To list types of collaborative robots (collaborative, Anthropomorphic Systems, Cobots, etc....)
K10.5 To present differences between collaborative robots and industrial robots
K10.6 To describe maintenance indicators and diagnostic techniques

Skills

S10.1 To be able to program a robotic arm to do basic tasks.
S10.2 To setup and monitor an industrial robotic arm.
S10.3 To be able to detect risks and safety problems while a robot is running
S10.4 To do basic maintenance operations

11 Virtual Reality (VR) and Augmented Reality (AR) technician for Industry 4.0

Competence

C11. Integrates AR and VR devices in industries 4.0

Knowledge

K11.1 To describe fundamentals of augmented reality
K11.2 To describe fundamentals of virtual reality
K11.3 To list type of devices and their uses

Skills

S11.1 To be able to set up VR and AR devices
S11.2 To perform basic tasks with VR and AR technologies in industry 4.0

Conclusions

The Competence Framework, along with other DiTwin results, has been developed for VET schools, teachers, institutions, and other organizations looking to foster competences that meet the demands of Industry 4.0. While additional project outcomes provide resources for implementing Digital Twin-based activities in VET schools, this document offers a comprehensive overview of the necessary profiles and learning outcomes for achieving competences aligned with Industry 4.0 requirements.

These profiles are applicable across all partner countries but can be adapted to meet the specific needs of individual countries or organizations. The DiTwin Competence Framework enhances VET schools' educational offerings by aligning their curricula with Industry 4.0 transformations. The outlined learning outcomes will enhance VET students' employability and help them keep up with the digital shifts required by the advanced manufacturing industry.

Furthermore, the framework equips VET teachers with tools to design effective educational pathways and assessment methods to boost digital competences among students. The versatile nature of the common competence framework allows for easy adaptation in other sectors or countries. Educational institutions can use it to update and create curricula, and Industry 4.0 companies can leverage it to train their workforce according to the latest industrial technology developments.

www.ditwin.eu

Funded by the European Union. Views and opinions expressed are however those of the author(s) only and do not necessarily reflect those of the European Union or the Agenzia nazionale Erasmus+ INAPP. Neither the European Union nor the granting authority can be held responsible for them

Project Number: 2023-1-IT01-KA220-VET-000154611

Co-funded by
the European Union