

2.3 Identifying skills needs – Digital competencies



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Alliance of Centres of Excellence in
Vocational Training for Sustainable Habitat



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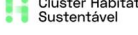
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2.3 Identifying skills needs – Digital competencies

Developed by:

	Clúster de Habitat Eficiente AEICE – Spain
	Consejería de Educación de la Junta de Castilla y León – Spain
	Instituto para el Fomento del Desarrollo y la Formación SL INFODEF – Spain
	Fundación Instituto de la Construcción de Castilla y León ICCL – Spain
	Fundación Centro de Servicios y Promoción Forestal y de su Industria de Castilla y León CESEFOR – Spain
	Fundación Laboral de la Construcción – Spain
	Centro Tecnológico del Mueble y la Madera de la Región de Murcia CETEM – Spain
	Associação Plataforma para a Construção Sustentável CLUSTER HABITAT – Portugal
	Centro Tecnológico da Cerâmica e do Vidro – Portugal
	Universidade de Aveiro – Portugal
	Holzcluster Steiermark Gmbh – Austria
	Fachhochschule Salzburg Gmbh – Austria
	Cluster Viooikonomias Kai Perivallontos Dytikis Makedonias – Greece
	Dimitra Ekpaiditiki Simvilitiki AE – Greece
	Panepistimio Thessalias – Greece
	Public Institution Centre of Excellence in Energy and Electronics – Moldova
	Construction College «Construct2» – Georgia

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Introduction - Digital competencies

Section 2.3 of the Quality Apprenticeship Programme outlines the skills apprentices need to practise their trade. A distinction is made between technical, digital and green skills/competencies. This document focuses on digital competencies.

It is intended to serve as a point of reference to help define the relevant competencies for the specific apprenticeship training programme within the company.

The competencies described below are neither exhaustive nor applicable without adaptation. They are intended merely to provide a rough overview of what falls under the term 'digital competencies' and to serve as a starting point for defining the competencies appropriate to the company's specific situation.

Digital competences are becoming increasingly important in today's world; it is therefore all the more important that these are integrated into apprenticeships so that training can equip people for the future. They are necessary to ensure that existing digital opportunities can be utilised effectively and that apprentices can work well and confidently with digital devices.

Digital competences are further divided into technical knowledge, technical skills and soft skills. For technical knowledge and technical skills, a list of competences is provided that are applicable both generally to the majority of vocational training occupations and specifically to the Habitat sector. This distinction highlights the fact that digital skills are not (exclusively) universal, but that the requirements vary from one profession to another. In contrast, only a general list was drawn up for soft skills, as these are usually more broadly applicable.

When compiling a list of digital competencies within an organisation, it makes sense to distinguish between fundamental competencies and competencies specific to the profession. This provides a clearer overview and can also help to determine later which skills are primarily taught within the company or at the TVET centre. It may also be useful to divide the skills into three categories – technical knowledge, technical skills and soft skills – to maintain a clearer overview. However, when dividing skills into individual groups, it is important to bear in mind that these are still interrelated, and that the overlaps between knowledge and skills must be taken into account when planning training.

The Habitat sector integrates a wide group of professional occupations from the sectors of infrastructure construction, housing and installations, activities related to wood and furniture manufacturing, home textiles, electricity and lighting installations, etc.

Technical knowledge

Technical knowledge is the first component of digital competencies. In this context, technical knowledge encompasses a broad range of expertise in various technologies. This knowledge serves as the foundation upon which digital competencies are built.

As already described, the following topics are divided into general technical knowledge that are universally relevant to all professions, as well as technical knowledge tailored to the Habitat sector.

General technical knowledge

Knowing the fundamentals of IT

- Basics of Internet (Wi-Fi, LAN, MAN etc.)
- Basic programmes (Word processing programmes, spreadsheet programmes, etc.)
- Databases (SQL, NoSQL, etc.)
- Cloud computing (IaaS, PaaS, SaaS)

Cybersecurity

- Virtual Private Network (VPN)
- Data protection
- Privacy regulations
- Forms of cyberattacks

Artificial intelligence (AI)

- AI Fundamentals (symbolic AI vs. machine learning)
- Neural Networks & Deep Learning
- Natural Language Processing (NLP)

Copyright

- Concepts of copyright and licenses
- Rights and obligations

Blockchain

- Blockchain Fundamentals (distributed ledger technology)
- Consensus Mechanisms (Proof of Work, Proof of Stake)
- Cryptographic Principles (hashing, public/private keys)

Programming

- Knowledge of different programming languages (Java, Python, SQL, C#, etc.)
- Robot Programming Basics

Robotics

- Robotics Fundamentals (kinematics, sensors, actuators)
- Human-Robot Interaction
- Safety Standards in Robotics

Data analytics

- Knowledge of different programmes (Microsoft Excel, Tableau, Python, R, etc.)
- Big data analytics
- Statistical analysis techniques

ERP

- ERP Architecture & Core Modules (finance, HR, production, logistics)
- Integration with CRM, SCM, and MES systems
- Customisation & Configuration

Internet of Things (IoT)

- IoT Architecture (edge, gateway, cloud layers)
- Sensors & Actuators (types, communication principles)
- Embedded Systems & Microcontrollers (e.g., Arduino, Raspberry Pi concepts)
- Digital Twins (concept and implementation basics)
- Smart metering technology

Technical knowledge for Habitat sector

The Habitat sector is a combination of many different professions. This means that there are no precisely defined areas of knowledge that everyone in this sector must have. A furniture maker needs different basic knowledge than a plumber, and a woodworker needs different knowledge than an electrician. This should make it clear that the following knowledge areas are not universally relevant for every profession in the Habitat sector and should be adapted to the respective activity. In addition, these areas of knowledge are constantly changing as the industry continues to evolve. That being said, the following knowledge is generally required in the Habitat sector.

Measurement technology

- Laser scanning (LiDAR)
- 3D scanning and point cloud processing

CAD/CAM systems

- 2D and 3D CAD design principles
- Data exchange formats (e.g., DXF, STEP)
- CAM toolpath generation

CNC technology

- CNC machine architecture (3-axis, 5-axis systems)
- G-code programming fundamentals
- Data transfer and machine networking
- CNC simulation and collision detection

Industrial Robotics (robot arms, collaborative robots/cobots)

- Industrial robot types (articulated, SCARA, gantry systems)
- Integration with CNC and CAD/CAM systems
- Safety standards and workspace design
- Robotic cutting, milling, and finishing

Building Information Modelling (BIM)

- BIM principles and lifecycle approach (planning, construction, operation)
- 3D, 4D (time), 5D (cost), and 6D (sustainability/facility management) modelling
- Open BIM vs. Closed BIM

Smart Building technology

- Building automation systems (BAS)
- HVAC automation and energy optimisation
- Smart lighting systems

Technical skills

Technical knowledge forms the basis, while technical skills are the application of this knowledge. It is very important to have knowledge, but if one does not learn how to apply this knowledge, its usefulness remains limited. This is where technical skills come into play. As a rule, skills are best learned through practical application, and they can be improved through frequent repetition. This means that the best way to teach these skills is to give apprentices the opportunity to practice until they have mastered them.

As before, the skills are divided into two categories: general skills that are relevant to a wide range of applications, and skills that are specifically tailored to the Habitat sector.

General technical skills

Gathering information

- Efficient use of search engines to generate information (Google, Ecosia, etc.)
- Efficient use of other digital sources to generate information
- Evaluating information based on credibility and reliability of sources

Cloud Services

- Managing cloud storage solutions
- Implementing backup and disaster recovery in cloud environments

Cybersecurity

- Conducting risk assessments and vulnerability analyses
- Implementing firewalls, IDS/IPS, and endpoint protection
- Managing multi-factor authentication (MFA)
- Implementing Zero Trust architectures

Artificial intelligence (AI)

- Preparing datasets for machine learning
- Training and validating models

Extended Reality (XR)

- Setting up and using Augmented Reality (AR) and Virtual Reality (VR)
- Connecting XR with other technologies

Blockchain

- Setting up private blockchain networks
- Integrating blockchain with enterprise systems

Programming

- Writing structured and modular code
- Debugging and performance optimisation
- Writing automated tests (unit/integration tests)

Robotics

- Programming industrial robots

Data analytics

- Data cleaning and preprocessing
- Data visualisation

Project management tools

- Configuring digital project boards (e.g., Kanban, Scrum)
- Reporting through dashboards

ERP

- Configuring ERP modules (finance, logistics, production)
- Managing master data structures
- Customising workflows within ERP systems
- Creating automated reports and dashboards

Process automation

- Modelling business processes (BPMN)
- Implementing RPA bots

Internet of Things (IoT)

- Connecting and configuring IoT devices
- Collecting and processing real-time sensor data

Technical skills for Habitat sector

Measurement technology

- Operating laser scanners (LiDAR) for building documentation
- Processing and cleaning point cloud data
- Converting scan data into BIM-compatible models

CAD/CAM systems

- Creating detailed 2D technical drawings and 3D models
- Preparing CAM toolpaths for automated machining
- Running machining simulations and collision checks
- Converting design data into CNC-compatible formats

CNC technology

- Programming CNC machines using G-code
- Operating 3-axis and 5-axis machining centres
- Implementing automated nesting strategies

Industrial Robotics (robot arms, collaborative robots/cobots)

- Configuring robotic cutting, milling, and finishing processes
- Setting up collaborative robots (cobots) safely

Building Information Modelling (BIM)

- Creating parametric 3D building models
- Developing 4D (time), 5D (cost) and 6D (sustainability/facility management) simulations
- Performing clash detection and resolving coordination conflicts
- Managing BIM collaboration platforms (Common Data Environment – CDE)

Smart Building technology

- Configuring building automation systems (BAS/BMS)
- Installing and configuring IoT-based sensors
- Setting up energy monitoring dashboards

Soft skills

Unlike technical knowledge and skills, where it is clear what they are needed for, soft skills are not intended for a specific application but can be used universally. On the one hand, this carries the risk that they will be considered less important because their advantages are not immediately apparent. On the other hand, this means that soft skills have great potential because they can be applied in a variety of situations. Soft skills should be seen as the ability to apply technical knowledge and skills in the best possible way.

Due to their broad applicability, soft skills are almost universal and do not need to be classified separately for specific occupational groups. As might be expected, some soft skills are sometimes more or less relevant to certain professions, but a broad range of soft skills is always an advantage.

Self-management

- Willingness to learn
- Being open-minded
- Being responsible
- Self-learning ability

Adaptability

- Adapting to new situations
- Being flexible
- Being resilient

Communication

- Working in teams
- Facilitating (cross-functional) collaboration
- Communicating effectively
- Proper language in the workplace

Intercultural skills

- Understanding and adapting to people from different cultural backgrounds
- Empathy

Critical thinking

- Analytical thinking

Problem-solving

- Decision-making skills
- Creative and innovative thinking

Leadership

- Leading teams
- Training and coaching teams
- Managing projects

Convincing power

- Influencing stakeholders to adopt digital practices
- Influencing organisational culture towards digital practices
- Building awareness
- Advocating digital solutions
- Participative techniques
- Integrating stakeholder/other's perspectives (into digital strategies)

Strategic thinking

- Systems thinking
- Entrepreneurship

Planning and Organisation

- Scenario thinking
- Organisation of projects