

Smart qualification.  
Smart jobs.  
Smart buildings.



SMART DEVELOPMENT OF HVET FOR HIGHLY SKILLED AND MOBILE WORKFORCE

Project Number: 597862-EPP-1-2018-1-HR-EPPKA3-VET-JQ

## WP2 Definition of a detailed qualification profile

### Qualification profile

### Expert in Building Automation

*This project has been funded with support from the European Commission. This publication reflects the views only of the author and the Commission cannot be held responsible for any use which may be made of the information contained therein*



Title of the qualification	An Expert of Building Automation
Qualification level	<b>European Qualifications Framework 5</b>
	Croatian Qualifications Framework 5
	Italian Qualifications Framework 5
	Slovenian Qualifications Framework 6

For the purposes of the Erasmus+ international project "Smart Development of HVET for Highly Skilled and Mobile Workforce" (herein after SHVET) project, we present you an internationally developed qualification profile of an Expert in Building Automation. It is based on the broader range of market needs for the development of highly skilled, qualified and mobile workforce taking into account specifics of current work and future trends identified by employers in three partnering countries: Croatia, Italy and Slovenia. The qualification profile is outlined by Units of competences and learning outcomes while each unit of learning outcomes (ULO) is part of the complete qualification that can be independently evaluated or validated.

The qualification profile fits the following criteria:

- ULO are addressing skills mismatch and are in line with employer's current and future needs;
- The qualification meets the need for advanced technical skills in combination with managerial skills in order to help workers improve job prospects and change or progress in their careers;
- The process of qualification development increases awareness of importance of involvement in educational development (relevant stakeholders were involved in multiple smaller interrelated activities);
- ULOs are understandable to experts from national institutions, employers, professionals of training institutions, teachers, trainers, and learners;
- ULOs are set up in a way that allows for the organization of vocational education and training as well as evaluation and validation of each of them;
- ULOs are acquirable in different educational and training settings (VET schools, adult learning programs, work-based learning, apprenticeship programs and mobility);
- After acquiring all of the ULOs, the learner is be able to perform the work activities indicated in the profile.

The Qualification Profile is the basis for developing joint curricula with mobility of the students and teachers / trainers, and other documents to support the implementation of the project results in the



national context. The following units have been agreed upon by the partnership and relevant stakeholders, participating in the development:

1. Commercial work,
2. Project management and communication,
3. Safe environment and health protection,
4. Hardware and installation,
5. Software - design of installation procedures.

## Unit 1: Commercial work

COMPETENCES / WORK TASKS	LEARNING OUTCOMES	
	Knowledge (A student is familiar with)	Skills (A student is able to)
<b>USING DIGITAL TOOLS FOR MARKETING AND COMMUNICATION</b>		
Using the existing digital tools for implementing and maintaining digital marketing channels	Understands the concept of marketing and its role in business opportunities  Describes the role of marketing in a company  Differentiates marketing communication of products and services  Knows and understands the activities of marketing mix (4P and 7P)	Uses professional terminology  Uses situation appropriate digital marketing tools  Takes into account particularities of services in the market of smart building automation  Designs the marketing mix according to the company's marketing goals, target groups and positioning
Using the existing digital tools for communication and coordination of activities	Determines essential types of collaboration technology and its key benefits  Recognizes benefits of using digital tools for team communication and communication with customers	Suggests, uses and maintains relevant communication tools
<b>CONDUCTING MARKET RESEARCH AND CREATING A BUSINESS OFFER</b>		

<p>Conducting a basic market research</p>	<p>Understands the concept, purpose and process of market research</p> <p>Identifies ways and steps to conduct market analysis</p> <p>Describes methods to assess customer's demand</p> <p>Outlines customer's demand in technical language</p> <p>Lists relevant technical parameters of BA technologies</p> <p>Recognizes benefits of individual technologies</p> <p>Outlines sales strategy</p>	<p>Prepares, conducts and evaluates market research on available technologies</p> <p>Analyses data from technical documents</p> <p>Collects basic pricing information related to different technologies</p> <p>Follows trends, technical and technological developments in BA sector</p>
<p>Creating cost estimation based on the technical documentation</p>	<p>Knows the structure of costs of products and services related to the BA system</p>	<p>Is able to determine preliminary costs of equipment by its purpose</p> <p>Calculates preliminary necessary labour hours for each project phase</p> <p>Categorizes calculated labour hours by EQL system</p> <p>Prepares pro forma invoice for BA project</p> <p>Presents costs estimation to a customer</p>
<p>Creating a product or service query</p>	<p>Knows the importance and approaches in the process of purchasing products or services</p> <p>Knows the principles and methods of sales negotiations</p>	<p>Formulates material and service query</p> <p>Analyses different offers for materials and services</p> <p>Selects favourite offer and confirms purchase according to</p>

	Outlines material and service query procedure	it
Creating an offer according to the client's request	<p>Outlines commercial offer contents</p> <p>Explains different approaches to making offers</p> <p>Understands the concept and purpose of sales marketing and the approaches in the sales processes</p> <p>Knows current market trends and challenges in BA</p> <p>Knows the importance and methods of pre and after-sales customer management</p> <p>Outlines strategies of after-sales processes</p>	<p>Is able to calculate labour costs</p> <p>Is able to calculate material costs</p> <p>Presents possible unforeseen events and estimates related costs</p> <p>Describes assumptions and starting points for the commercial offer to the customer</p> <p>Presents offers for an alternative approach to BA implementation to management and end customer</p>

## Unit 2: Project management and communication

COMPETENCES / WORK TASKS	LEARNING OUTCOMES	
	Knowledge (A student is familiar with)	Skills (A student is able to)
<b>MANAGING TEAMWORK OF PROFESSIONALS</b>		
Performing operational tasks to accomplish goals and schedules	<p>Explains different approaches to organizing work and effective time use</p> <p>Explains types of decision making and decision-making steps</p> <p>Recognizes benefits of individual work and teamwork</p> <p>Knows the principles of team composition and operation</p> <p>Knows roles and functions of team members</p>	<p>Sets timeline and prepares operational plan for project implementation</p> <p>Selects team members and arranges teamwork</p> <p>Assigns tasks to relevant team members</p> <p>Delegates and monitors teamwork</p>
Reporting on the implementation of assigned tasks to company management and customer authorized representative - supervisor	<p>Describes methods for measuring work efficiency</p> <p>Recognizes efficiency of leadership and teamwork</p> <p>Explains importance and relevance of documentation in construction</p> <p>Knows relevant documentation for project planning and</p>	<p>Evaluates work efficiency and suggests improvements in organizing the work</p> <p>Prepares and keeps construction diary</p> <p>Prepares a list of completed activities</p>

	implementation Knows project phases and related project documentation	
Effectively communicating with project team members and designers	Recognizes different communication methods and techniques	Selects the appropriate method of communication in a business setting Uses different techniques of persuasive communication
Reporting on identified problems/difficulties/risks in the implementation of assigned tasks	Explains basic strategies of problem solving Describes common risks in the implementation of BA Explains the role of regulated professions by national law	Suggests coordination procedure to customer and supervisor Resolves problems and conflict situations Uses formal procedure of reporting to certified engineer
Encouraging interaction, open communication and innovation in the team	Understands the need for changes, improvements and progress in a team Describes the importance of an individual's needs in a team Explains the relation between motivation and achievement of the team's goals	Selects effective tools to motivate and satisfy employees Evaluates motivation in the work environment Develops own competencies for effective leadership
Providing technical and moral support to the team	Selects ways to provide necessary support to the team	Organizes knowledge and skills providing activities (workshops, trainings, etc.) Interprets designs to the team Describes materials, components, installation method



		<p>and wiring</p> <p>Demonstrates working procedures</p> <p>Represents a bridge / barrier between company policies and operational work</p>
<p>Communicating in English at B2 level of the Common European Framework of Reference for Languages</p>	<p>Presents advantages of BA in native and English language</p> <p>Describes functionality and structure of BA in native and English language</p> <p>Explains materials, mounting of components and cables, wiring and testing procedures in English at B2 level</p>	<p>Communicates (with supervisor, designer, customer, and installers) in English at B2 level using professional terminology</p>
<p><b>COMMUNICATING WITH CUSTOMERS AND PROVIDING CUSTOMER SUPPORT</b></p>		
<p>Recording current state of the building under BA construction</p>	<p>Explains necessary inputs to designing process</p>	<p>Uses existing floor, electric and machine installations plans to check current state (finds connection points to existing infrastructure)</p> <p>Suggests updates to existing plans where necessary</p>
<p>Collecting and documenting customer needs by direct communication</p>	<p>Understands and explains the importance of customer relations</p> <p>Knows elements of efficient customer relationship and specifics in BA</p> <p>Knows trends and methods of customer relationship</p>	<p>Recognizes customer needs and determines ways on how to meet them</p> <p>Collects/assesses customer requirements and provides a detailed description of functionality</p>

	<p>management</p> <p>Explains methodologies for solution development</p> <p>Identifies relevant risk management methods for successful project implementation</p>	<p>Describes the intended operation of the solution</p> <p>Applies risk management methods to successfully execute a project</p>
Informing users about the status / level of problem	<p>Explains the importance of dealing with complaints promptly and effectively</p> <p>Explains procedures for problems and complaints solving</p>	<p>Suggests/uses procedure for resolving complaints</p> <p>Collects information on the problem</p> <p>Diagnoses the problem, determines its complexity</p> <p>Suggests solutions, engages help, informs user</p>
Educating the end user	<p>Knows legal framework of after sales support</p> <p>Explains relevance of after sales support for commercial success</p>	<p>Creates drafts for user manuals for the system</p> <p>Explains system operation in a user-friendly way</p> <p>Plans training of users and teaches them</p> <p>Diagnoses user problems and proposes solutions</p>
<b>APPLYING PROCEDURES OF QUALITY MANAGEMENT</b>		
Performing security and reliability control of BA devices/system according to the technical documentation	<p>Knows the national regulative on safety of low voltage electrical installations and fire safety</p>	<p>Knows and understands the importance of installation system review procedure and understands measures of relevant safety parameters</p> <p>Reviews fire safety</p>

		Interprets reports on the checks carried out
Monitoring technological development in the field of business and related activities	<p>Understands the importance of lifelong learning</p> <p>Knows official institution responsible for the harmonious development of specific standards in BA, alliances, magazines, databases and forums related to certain BA technology (protocol)</p>	<p>Uses electronic and printed materials for learning</p> <p>Plans training courses for himself and his team members</p>

## Unit 3: Safe environment and health protection

COMPETENCES / WORK TASKS	LEARNING OUTCOMES	
	<b>Knowledge</b> (A student is familiar with)	<b>Skills</b> (A student is able to)
<b>APPLYING PROCEDURES OF ENVIRONMENT PROTECTION</b>		
Applying the environmental protection regulation	Knows EU regulative and national regulative related to environment protection	Organizes work to prevent fire hazards/Prevents the risk of fire  Organizes releases and transfers to reduce the risks to human health and environment
Managing waste	Knows regulative for proper waste management	Plans construction waste management  Plans waste management of electric equipment and electronics
<b>APPLYING PROCEDURES OF HEALTH PROTECTION</b>		
Providing protection measures against dangerous substances	Knows hazardous substances regulative  Explains hazardous substance labelling system	Uses technical files of dangerous substances  Plans safety procedures and personal protection equipment



Implementing procedures for protecting health and health of associates and users

Knows EU and national regulative related to health and safety at work

Knows regulative on occupational safety against electric shock

Knows protection measures at work on electrical installations and appliances

Organizes/demonstrates safe work on low voltage electrical installations

Practices measures to protect and promote health at work

## Unit 4: Hardware and installation

COMPETENCES / WORK TASKS	LEARNING OUTCOMES	
	Knowledge (A student is familiar with)	Skills (A student is able to)
<b>HARDWARE DESIGN PROCEDURES: SELECTING EQUIPMENT AND PROPOSING SOLUTIONS ACCORDING TO THE INPUTS AND DESIGNS</b>		
Classifying technical characteristics of selected equipment	<p>Outlines system integration principles</p> <p>Outlines network topologies (ring, serial, star and tree) of different standard building automation systems and its advantages/disadvantages</p> <p>Outlines net architectures in BA systems (e.g. line, line coupler, main line, area, backbone coupler, backbone for KNX)</p> <p>Outlines electrical characteristics of bus in different BA standards</p> <p>Outlines physical limitations of bus in different BA standards (bandwidth, number of connectable devices)</p> <p>Explains advantages of different building automation system</p> <p>Outlines interconnection of different building automation</p>	<p>Recognizes and explains network topology in given system design</p> <p>Estimates if optimal design/building automation system has been chosen</p> <p>Knows characteristics of appropriate cables for the wiring: number of conductors, cross sections</p> <p>Distributes connectable devices over the network</p> <p>Recognizes interfaces from one building automation system to another</p> <p>Finds relevant technical documents for equipment selection</p> <p>Checks technical parameters of BA (e.g. like powering and consumption of components, driving method and output power of actuators and range, accuracy and dynamics of</p>

	<p>system</p> <p>Explains which technical documents are relevant for equipment selection</p> <p>Understands which technical parameters are relevant for building automation network design.</p> <p>Explains basic components of building automation system</p>	<p>sensors)</p> <p>Knows the characteristics of basic components for building automation system (power supply, programming, input, output, interface, subsystem modules)</p>
<p>Proposing modifications in designs to a certified engineer</p>	<p>Explains formal procedure for introducing modifications in system design</p>	<p>Proposes modifications to certified engineer</p> <p>Documents modification in existing system design</p> <p>Coordinates with designer to enter on-site modifications into existing designs</p>
<p>Identifying main relevant aspects of different technical systems in buildings</p>	<p>Knows hardware commonly used for control in BA</p> <p>Knows basic parameters of lightning and shading in premises</p> <p>Knows basic parameters of living comfort and safety</p> <p>Knows basic settings in terminal units</p>	<p>Understand the characteristics of necessary hardware components for given BA system design</p> <p>Suggests alternative components for a given BA system design</p> <p>Suggests exact location for installation (communicates it with the customer)</p> <p>Connects terminal units and does basic settings</p>
<p>Interpreting the schemes, designs and plans in new and renovated buildings</p>	<p>Reads and understands electrical and mechanical schemes</p>	<p>Uses electrical and mechanical schemes to explain BA system architecture</p>

and proposing equipment replacement	Reads and understands relevant technical building drawings	Uses technical report, building plans and technical drawings to: order materials and set/define exact locations of controllers, sensors and actuators in BA
<b>HARDWARE INSTALLATION PROCEDURES: PROVIDING GUIDELINES AND INSTRUCTIONS ON EQUIPMENT INSTALLATION AND WIRING;</b>		
Performing service testing of BA circuits and / or systems	Describes the procedure for the first connection of smart home installations to power supply	Plans systematic testing of building installations and documents the results
Confirming the functionality of the in-built BA equipment	Explains logic commonly used to regulate parameters of living environment	<p>Plans testing of sensors and actuators before installing them</p> <p>Plans systematic testing of BA functionality and documents the results</p>
Giving precise instructions for installation and wiring of the BA system	Provides technical support to the installation team	<p>Uses electrical and mechanical schemes to explain piping connections and wiring</p> <p>Uses technical report and electrical schemes to instruct team members how to install and wire the equipment</p>
Supporting and supervising the procedures of installation processes for BA	Understands technical aspects to plan and organize installation procedure and wiring	<p>Arranges and verifies preconditions to start the installations</p> <p>Organizes the work and demonstrates how installation and wiring should be done</p>



### HARDWARE POST-INSTALLATION PROCEDURES: PROVIDING SUPPORT AND FEEDBACK CONCERNING IDENTIFICATION OF TECHNICAL SOLUTIONS

<p>Planning and supervising maintenance</p>	<p>Explains maintenance relevance for BA system reliability in warranted lifetime</p> <p>Explains different approaches to maintenance planning (periodic, preventive/predictive, curative)</p> <p>Explains regulations related to periodic checking Knows the importance of building documentation in terms of maintenance planning</p>	<p>Plans periodic inspections of BA systems</p> <p>Performs period tests of BA units/components</p> <p>Plans, writes, collects and stores maintenance documentation</p> <p>Proposes modifications on the system</p>
<p>Upgrading services for system of business automation</p>	<p>Explains the options/possibilities for BA system upgrades</p> <p>Knows different approaches to BA system upgrades</p>	<p>Collects user suggestions and requirements and evaluates them</p> <p>Describes which changes can be done on existing system and what upgrades are necessary</p> <p>Proposes functionality upgrade to designers and programmers (HW and SW engineers)</p> <p>Proposes updates and improvements on the BA system</p>

## Unit 5: Software – design of installation procedures

COMPETENCES / WORK TASKS	LEARNING OUTCOMES	
	Knowledge (A student is familiar with)	Skills (A student is able to)
<b>SOFTWARE DESIGN PROCEDURES: INSTALLING AND TESTING BUILDING AUTOMATION SOFTWARE</b>		
Using software/technologies and programming modules suitable for setting up selected BA systems	<p>Knows different software solutions for programming BA systems</p> <p>Understands programming logics; decision and loop sentences, programs and functions</p>	<p>Configures BA system: addressing, grouping</p> <p>Creates and interprets meaning of scenarios</p> <p>Conducts and interprets testing procedures</p> <p>Uses Engineering Tool Software (ETS) for configuring of a simple BA system: building, building parts, devices, catalogues, main and middle groups, group addresses, devices parameters, logical functions, programming</p> <p>Uses alternative open source tool(s) for configuration of a simple BA system</p>
Designing logic and functionality of supervisory control and data acquisition (central monitoring system) for	<p>Understands functionality of central monitoring system</p> <p>Knows the hierarchy of communication protocol (from PLCs, sensors and above)</p> <p>Explains integration level of central monitoring system:</p>	<p>Is able to solve a simple problem of BA using pseudocode</p> <p>Is able to make simple SQL query, knows the logic behind database structure</p>

<p>basic building automation system.</p>	<p>protocol interfaces, data logging, alarming, displaying, exporting</p> <p>Knows the basics of database management system</p>	
<p>Explaining basic communication model for several most frequently used (1 or 2) Standards in building automation</p>	<p>Knows general concept of net</p> <p>Knows ISO OSI communication model</p> <p>Knows communication protocol and its typical data fields (KNX and at least one other)</p> <p>Knows communication protocol frequency and bit rate</p>	<p>Interprets network topology of wired nets: KNX/LON, Dali</p> <p>Configures basic KNX system with at least 5 BA components</p> <p>Interprets network topology of radio nets: Zigbee, Z-Wave, WiFi, WiFi direct</p> <p>Interprets communication bandwidth in a given design</p>

### PERFORMING DIAGNOSTICS AND TROUBLESHOOTING

<p>Planning and supervising periodic checking, diagnostics and troubleshooting</p>	<p>Explains (to the customer) the importance of performing periodic checking routines for warranted lifetime</p> <p>Explains different approaches to maintenance planning and running troubleshooting routines (periodic, preventive/predictive, curative)</p> <p>Explains regulations related to periodic checking</p> <p>Knows the importance of building documentation in terms of maintenance planning</p>	<p>Performs period tests of software functionality</p> <p>Plans, writes, collects and stores maintenance documentation.</p> <p>Proposes modifications/upgrades on the system</p>
--	--	--



## SOFTWARE SYSTEM TESTING

Planning and supervising  
final software testing for  
building automation

Understands and knows how to perform standard testing  
routines for software modules

Applying problem solving strategies in testing and  
commissioning phases

Is able to do connectivity test (devices are present)

Is able to do functional test (devices do the work)

Is able to do logical test – test of programmed scenes