



AuToMa

AUTOMATION, TECHNOLOGY TRANSFER AND
MANAGERIAL PRACTICES FOR THE GROWTH
OF SMES, A BETTER EMPLOYABILITY AND THE
PROMOTION OF THE ENTREPRENEURSHIP

www.automa-project.eu



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IO2: Guidelines for the learning outputs

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Aim

The aim of these guidelines is to share a common methodology and advices for the preparation of the two specific learning paths that will be provided in the AuToMa project (one more technical and another one more managerial).

Quality learning contents planning and design are very important for e-learning courses oriented to target groups of Erasmus+ projects.

The matrix contains information on the training materials and options regarding each part of the previous ARIALE training contents, that will be adopted in the AuToMa learning paths. For these reasons, taking in account some of previous ARIALE project (Automatization, Robotization for a new Reindustrialised Europe) modules, will be created two paths with specific learning curricula/contents to improve specific and transversal skills for target users/beneficiaries proposing. As indicated in the AuToMa project one will be more technical and the other one more managerial. In e-learning the design and development of structured training materials must be self-contained and able to be used multiple times. An instructional design model will be adopted to define the activities that will guide AuToMa learning contents development. A particular attention will be given also to a specific paragraph related to the integrated platform requirements.

The developed learning material therefore should be:

- **Modular:** Each of the modules will be designed independently, with a specific learning path, allowing easy adaptations of the program. The training manual will also include a learning path which will detail an example setup including all AuToMa modules. The advantage of having a modular learning program is that the trainings can be easily adapted to specific needs.
- **Competence based:** The competence-based approach allows participants to advance based on their ability to master a skill or competency at their own pace regardless of environment. This method is tailored to meet different learning abilities and can lead to more efficient participant's outcomes.
- **Activity based:** Compared to traditional teaching activity-based, education is proven to be more successful in terms of understanding and applying the learning content especially with the intercultural background of the training.
- **Target-centred:** Participant-centred teaching methods shift the focus of activity from the teacher to the trainees. These methods include active learning, cooperative learning, and inductive teaching and learning.
- **Output-oriented:** Output-oriented teaching is directed towards the learning achievement of the participants. This could be reached through competence orientation, education standards (mostly in formal learning) etc.

The main tasks that will be developed are the following:

- A needs analysis that will be influenced by key characteristics of the target groups (e.g. their previous knowledge and skills, geographical provenience, learning context and access to technology);
- Specific learning needs and job-related skills identification;



- A set of the best learning objectives required to achieve the general and high-level courses objectives;
 - A set of instructional, media, evaluation and delivery strategies useful for AuToMa learning goals;
 - Contents development collecting all the required knowledge and information identified by Partners;
 - Storyboard development: integrating instructional and media elements;
 - Courseware development: developing media and interactive components, producing the course in different paths;
 - Web delivery of content elements by a learning platform that learners will easily access;
 - Evaluation of knowledge and skills acquired by participants;
 - Certification procedure, at the end of the two learning paths that will be available for participants.
- "AuToMa guidelines for the learning outputs" will be an internal document and will be available only in English.

Partners will use European Quality Assurance Reference Framework as work methodology which comprises a quality assurance and improvement cycle (planning, implementation, evaluation, assessment and review/revision) based on a selection of quality criteria, descriptors and indicators applicable to project prototype implementation.

Learning goals and tools

The main aim of this Output is to ensure a successful sectorial and country transmission of cross-cultural approach.

The contents will be developed taking in account of the previous O1 "AuToMa learning methodology" and O2 "AuToMa guidelines for the learning outputs" and will be used to make proper shape of the system functionality, initial content adaptation and participation activities monitoring.

During this Output will be produced also other required products to improve the learning materials as well as to complete the training activities:

- Multimedia tutorial, that will introduce the learners to the training activities;
- Data and report about context analysis and needs;
- Map of the transversal and distinctive competencies (attitudes, comportments, skills, abilities and knowledge) related the fields of Automation, Technology transfer and Managerial practices;
- Skills assessment tools to evaluate the initial know-how of the learners and the knowledge acquired at the end of each module;
- Case studies and best practices con descrizione 10 lines max in each language and 2-3 links to external multimedial links (video, pdf, websites, etc.)
- Skills assessments to evaluate the final know-how or gaps of the learners, at the end of each path.

A preliminary analysis of the first version of the learning materials will be done during the same Focus Groups that will be organized approximately on October or November 2017 (as indicated in the previous Output 3) with invited target groups in each Partners' country.



Target groups

The target groups of the project are: future entrepreneurs and students who want to develop business in manufacturing sector; entrepreneurs and employees of SMEs who want to improve their qualification or re-qualify, as well as unemployed people who want to gain initial competences; Universities, Research centers and VET trainers that want to improve or update their learning curricula. The countries involved in the project are: Italy, Poland, Slovakia, Spain and Bulgaria.

In particular, the project activities will be oriented to:

- increase of flexibility of entrepreneurs and employees who want to improve their qualification or re-qualify with respect to current market demands, as well as unemployed people who want to gain initial competences;
- increase of business opportunities of future entrepreneurs and students who want to develop business in manufacturing sector (by for example the community area that will be available in the website);
- enlarge and improve the learning/training offer of Universities, Research centers and VET trainers by innovative curricula reachable by innovative and easy online tools (e-learning; groupware, social spaces, communities, networks, etc.);
- ensure the successful realization of the target groups on the labour market in the fields of automation, technology transfer and managerial practices of the respective countries;
- increase of motivation of target groups and their commitment for life-long learning and career planning.



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E-Learning / Self-study

Parallel to the presence learning, participants are provided with a training content and are introduced with some self-study tools. Each module has a defined set of preliminary materials, supportive material, and, if available, links to external sources contributing to building basic knowledge and expertise in each module necessary for the development of the relevant skills. All self-study material is available via the online platform. Reading materials and supportive materials are either available for download, ready to print out (if not copyrighted) or as reference.





E–contents structure and goals

The key reason for integrating e-content elements in the programme is a methodological one. In order to optimise the learning process and successfully conclude the programme, self-study supports the learning process.

In addition, the necessity of the e–content elements comes from constraints in terms of time, as the programme is not limitless in its available resources. For these two reasons, one methodological and the other practical, employs a blended learning approach in which the main element is face-to-face training, which can easily be supplemented by additional online material depending on the participants' needs, knowledge and wishes.

Content will be provided on a learning platform and will be taken from the transfer projects, but will also use external training material. External training material will be selected on the criteria of

- usefulness for the target group,
- availability in the project languages
- right to use

and will take into account the European Qualification Framework (EQF).

The two AuToMa curricula have to be based on a clear definition of learning outcomes. These have to be done according to the European Qualification Framework pointing to define Knowledge, Skills and Competence:

- Knowledge is defined as: Knowledge is defined as: Comprehensive, specialised, factual and theoretical knowledge within a field of work or study and an awareness of the boundaries of that knowledge.
- Skills are defined as: Skills are defined as: a comprehensive range of cognitive and practical skills required to develop solutions to manage concrete problems in workplace.



AuToma Learning Curricula

Taking in account some of previous ARIALE project (Automatization, Robotization for a new Reindustrialised Europe) modules, two specific multimedia learning paths (curricula) will be created to improve specific and transversal skills for target users. One will be more technical and the other one more managerial, such as:

- **Technical path.** This learning path will be composed by the 6 previous modules of ARIALE project, but updated to the last innovations, technological trends and specific needs of the project target groups, and will be adapted to the specificness of new Partners countries. In detail, the learning modules that will be transferred and updated, will be based on the following topics:

- 1) ICT based means for automation and innovation;
- 2) Sensors in industrial automation;
- 3) Actuators in industrial automation;
- 4) Application of PLC in industrial automation;
- 5) Industrial networks and interfaces in industrial automation systems;
- 6) Industrial robots in automation systems.

Besides will be developed for this learning path 4 new modules related to:

- 7) Technological infrastructures and industrial processes' digital transformation for manufacturing sector;
- 8) CNC machineries and installations;
- 9) Modelling and CAD design of mechanical components;
- 10) Collaborative robots in the industry

- **Managerial path.** This path will be composed by 10 new modules, all developed mixing the experience of the Partners and the feedback from the Consultation groups for a participate design with stakeholders. In detail, the learning modules that will be developed and based on the following topics:

- 1) Business models, innovation and competitiveness in manufacturing sector: developing medium-and long-term investments and impact;
- 2) The competitive advantage through the protection of technological innovation: patents and brands;
- 3) Forms of cooperation in the public-private industrial research sector.
- 4) Technology transfer models and implementation tools;
- 5) Business organization and management of the innovation: strategies and change management;
- 6) Organization of the supply in industrial sector: systems and production support processes and reorganization of logistic processes;



- 7) Financial instruments and incentives for research, technological innovation, funding and incentives (regional, national, European);
- 8) Creation of new businesses "knowledge based" and entrepreneurship: implementation modalities and instruments;
- 9) Marketing and communication of innovation;
- 10) Cooperation, networking and interaction between SMEs, public sector and financial institutions.

Partners will use European Quality Assurance Reference Framework as work methodology, which comprises a quality assurance, and improvement cycle (planning, implementation, evaluation, assessment and review/revision) based on a selection of quality criteria, descriptors and indicators applicable to project prototype implementation.

Structuring the two learning paths

Each module will provide a total of 3 (different) teaching units as online resources. Each Partner will be involved on the contents development.

In particular:

- PIAP will adapt and reduce the previous 6 modules developed before in ARIALE project;
- PIAP will develop two new modules;
- ECQ will develop 5 modules.
- LUISS, TUKE and CARSA will be involved on the development of three modules for each.

Virtual classroom tool

A virtual classroom tool will be provided to permit Partners to test and refine the learning materials involving participants of Focus Groups and students.

A virtual classroom is an online classroom that allows participants to communicate with one another, view presentations or videos, interact with other participants, and engage with resources in work groups. It allows students and teachers to participate in live classes to collaborate and interact. It can be used to deliver lectures, or even tutorials online, they are also great options for meetings and group projects where members need to check-in on progress and bounce ideas of one-another.

For the AuToMa purposes an open source solution BigBlueButton web conferencing system designed for online learning will be used (<https://bigbluebutton.org/>). BigBlueButton provides real-time sharing of audio, video, slides, chat, and screen as well as provides functionality of recording the lectures which means that they will be available for later review. Students are engaged through sharing of emoji icons, polling, and breakout rooms. When using the whiteboard tool in BigBlueButton, annotations are automatically displayed back to the students in real-time. Presenters also have the ability to zoom, highlight, draw and write on presentations making your points clearer to remote students. There is no limit on the number of webcams which can be share in a session (only limited by bandwidth).



AuToMa technical learning path:

Module 1	
ICT based means for automation and innovation	
Description	The application of the information and communication technologies (ICT) is a decisive factor for the raising of productivity and the economic growth, observed in many industrialized countries. Higher competitiveness, lower costs and access to new markets are expected with the deployment of ICT on a company level. In this module, an analysis of the deployment of automation and innovations is made and their effect to the small and medium enterprises (SME) is examined. In addition, in this module the main obstacles to SMEs in respect to the realization of their innovation potential and their ability to create work places are analysed. The module can be used in programs for enhancing the qualification and re-qualification of the workers in SMEs.
Knowledge	Participants will gain knowledge about the added value of ICT adoption and the needed processes adaptation. Obstacles and limits of ICT usage will be also described and an analysis of the needed key indicators of innovation and technology transfer will be identified.
Skills	Participants will be able to identify mainly efficiency criteria, factors reinforcing the positive effect of ICT and factors contributing to innovation.
Module 2	
Sensors in industrial automation	
Description	The main aim of this module is to acquaint the students with the concept of sensors, their place in the structure of the automation systems, classification of sensors by different classification principles, types and applicability of sensors.
Knowledge	Student will gain knowledge about the functional purpose and role of the sensors in the automation systems and will know the basic requirements for the sensors parameters.
Skills	Student will be able to refer a given sensor to respective groups of sensors according to different classification principles and to explain for measurement and control of which quantities a given type of sensor can be used.
Module 3	
Actuators in industrial automation	
Description	The main aim of the module is to introduce to the students the concept of actuators and what is their place in an automated system. Different types of actuators will be described with potential possibility of applicability.
Knowledge	Student will gain knowledge what are the main actuators and control devices used in industrial automation and what are the key indicators used for selection of actuator mechanisms and how they are selected.
Skills	Student will be able to select proper type of an actuator according to defined production problem and conditions.
Module 4	
Application of PLC in industrial automation	
Description	The main aim of the module is to show why the automation is so important for nowadays industry. In the module there will be presented explanation about the role of PLCs in automation systems. Student will get a knowledge about the structure of programmable logic controllers, about different types of PLCs depending on their structure and way of operation and how the PLCs communicate with real world and how they execute their tasks. Also a basic introduction to programming languages and typical instructions will be presented.
Knowledge	Student will gain knowledge about PLC structure, possible use in automation systems and programming languages.



Skills	Student will be able to select the proper PLC solution according to defined problem and conditions.
Module 5	Industrial networks and interfaces in industrial automation systems
Description	This module will introduce students into Industrial Communication Networks dwells upon basic features of contemporary manufacturing and communication systems, automation and control systems with network communication and their functional distribution. The main aim of this module will be to acquaint the trainees with the features of the modern production and communication systems and their functional allocation.
Knowledge	Student will gain knowledge how to interpret the features of the communication systems, describe the characteristics of the communication systems' separate levels and distinguish the separate types of distributed control systems
Skills	Student will be able to identify and select the proper industrial network solution according to defined problem and conditions.
Module 6	Industrial robots in automation systems
Description	This module will introduce students to industrial robotics particularly in relation to their use in automation systems. General knowledge about robots, some historical background, explanation what are the robots and what is the place of them in the industry will be presented. Student will gain knowledge about build and structure of industrial robots, how they can be applied or where application is not advised.
Knowledge	Student will gain knowledge about brief history of robots and robotics, what the industrial robots are, why robotisation is important, what benefits come from robotisation and what are the constraints. how industrial robots are build. Also student will be aware of what robots can do and what are their mechanical limits.
Skills	Student will be able to identify and select the proper industrial robot solution according to defined problem and conditions.
Module 7	Technological infrastructures and industrial processes' digital transformation for manufacturing sector
Description	The module will introduce concept of technological infrastructures and digital transformation of industrial processes especially in relation to the manufacturing sector.
Knowledge	Students will gain knowledge about types of technological infrastructures in manufacturing
Skills	Student will be able to identify and select the proper solution according to defined problem and conditions.
Module 8	CNC machineries and installations
Description	The use of CNC machines in industry is an important part of the production of many SME companies. Knowledge needed to install, revitalizing and operating at CNC machines enables increasing of the companies competitiveness and adapt to ever-changing market conditions. The module deals with the basic division of CNC machines their installation and actual operation.
Knowledges	Students will acquire the necessary knowledge for setting of basic machine parameters and creating of CNC programs. The acquired knowledge will be used for manually controlling of the CNC machines as well as for creating of program on machine control panel. With help of using CAM environment, student will be able to optimize the programs created to achieve an efficient production process.



Skills	The student will be able for solving problems related to the installation and programming of CNC machines. It will gain competencies for successful recovery and subsequent operation of the CNC machines, on which they will work in future practice.
Module 9	Modelling and CAD design of mechanical components and devices
Description	The module will introduce students to the concept of CAD/CAM processing, modeling and rapid prototyping of mechanical components used in automation systems. CAD/CAM (computer-aided design and computer-aided manufacturing) refers to computer software that is used to both design and manufacture products while Rapid prototyping is a group of techniques used to quickly fabricate a scale model of a physical part or assembly using three-dimensional computer aided design (CAD) data. Construction of the part or assembly is usually done using 3D printing or "additive layer manufacturing" technology.
Knowledges	Students will gain knowledge about CAD/CAM processing of mechanical components and modern methods of rapid prototyping.
Skills	Student will be able to identify and select the proper CAD/CAM and modeling solution according to defined problem and conditions.
Module 10	Collaborative robots in the industry
Description	Collaborative robots are a new technology that requires new approaches, new methodologies and solutions. It can be said that deploying an industrial robot is now a "simple" task. For collaborative robots, we need to explore many new aspects such as knowing the possibilities of cobots, what they can do, how they behave in working with humans, what they have properties and parameters, how they are programmed, and which areas or operations are appropriate.
Knowledges	The student gets knowledge from collaborative robots that are designed for work in the environment where operator is located. They also learn about reasons that lead to collaborative robots design as well as their currently deploying trends.
Skills	The student will be able to recognize, define and control of basic functions of collaborative robot as well as its possibilities and ways for their putting into operation.



AuToMa managerial learning path:

Module 1	Business models, innovation and competitiveness in manufacturing sector; developing medium-and long-term investments and impact
Description	<p>In this module, the student will learn the business models and the models of innovation and improvement of competitiveness in the manufacturing sector. In this way, he will acquire the tools to develop a medium- and long-term investment and impact strategy.</p> <p>The module is distributed in three lessons: (1) Advance manufacturing context, (2) Innovation and competitiveness in the manufacturing sector and (3) Business models definition and validation</p> <p>Lesson 1 will provide the student with a large sight of the advance manufacturing context. In addition to the manufacturing products of the future, the lesson will deal with the Economic, Social and Environmental sustainability of manufacturing. In lesson 2, the student will discover how to innovate in the manufacturing sector and the current trends in advanced manufacturing processes, adaptive and smart manufacturing systems and digital, virtual and resource efficient factories. Finally, other topics covered will cope with the human factor as part of the factory and as a customer. The module will include a lesson explaining the new business models and strategies for the disruptive manufacturing processes.</p>
Knowledge	<p>Understanding the role of KETs in the manufacturing sector and their impact in the European market.</p> <p>Students will learn aspects needed to improve the innovation and the competitiveness in the manufacturing of actual and future products from different domains: advanced materials and products, innovative manufacturing equipment, factory design, data collection and management, operation and planning, networked factories and mobile enterprises, and worker and customer centred manufacturing.</p> <p>Explain the aspects taken into account to define a business model from different outlook; define a business model with a template.</p>
Skills	<p>Identifying the importance of manufacturing sustainability in the European market.</p> <p>Understand the innovation in the manufacturing sector as an ensemble of items, not only the application of advanced materials and digital transformation, also new collaborative networks and the value of the knowledge worker, who will be in direct contact with new challenges. To get started in practical business model and to apply the canvas knowledge in its validation.</p>
Module 2	The competitive advantage through the protection of technological innovation: patents and brands
Description	<p>Unit 1: Understanding competitive advantage</p> <ul style="list-style-type: none"> • Definition of competitive advantage (CA) & sustainable competitive advantage (SCA) • Sources of SCA: superior skills & superior resources • SCA: customer perspective & competitor perspective • Gaining SCA through technological innovation <p>Unit 2: Branding technological innovations</p> <ul style="list-style-type: none"> • Relationship of SCA to the concept of branding



	<ul style="list-style-type: none"> • Technological innovation as a source of differentiation • Brand equity as a source of CA • Extending an existing brand or building a new brand around a technological innovation <p>Unit 3: Protecting technological innovations</p> <ul style="list-style-type: none"> • Patents as a source of SCA • Patents in the information age • Intellectual property infringement • Production of technological innovations: In-house vs Outsourcing <p>Unit 4: Sustaining competitive advantage</p> <ul style="list-style-type: none"> • Sustaining CA through differentiation strategy • Sustaining CA through cost containment strategy • Sharpening your competitive edge
Knowledge	Define the concept of sustainable competitive advantage and its sources; comprehend the ways of gaining competitive advantage through technological innovation. Understand competitive advantage in an industry. Understand the relationship between branding technological innovation and gaining CA. Integrate differentiation features of technological innovation into branding strategy. Understand the value of patents and the inherent risks of sharing know-how. Recognize and evaluate patent worthiness of technological innovations. Understand the relationship between “willingness-to-pay” and “cost-to-serve” and how this relationship should form your strategy to sustain a CA in the marketplace. Define a SCA strategy
Skills	Recognize sources of competitive advantage through case study analysis. Identify key differentiation features pertaining to technological innovation. Identify ways of protecting technological innovations. Analyze and compare “willingness-to-pay” and “cost-to-serve”.
Module 3	Forms of cooperation in the public-private industrial research sector
Description	The module will introduce the main models and tools oriented to support the SMEs for the acquisition of new technologies and implement a scientific cooperation network between enterprises, universities and research centers. The main cooperation aspects on the Collaboration aspects and the core impacts will be also introduced.
Knowledge	Participants will gain knowledge about the main phases of an effective knowledge transfer, contextualized at different levels in public-private cooperation and including the main techniques to involve partners in manufacturing projects and to be involved in a constituting partnership.
Skills	Participants will be able to acquire specific models and techniques to obtain an added value from the cooperation between partners to achieve the best results in terms of innovation and manufacturing results.
Module 4	Technology transfer models and implementation tools
Description	Technology transfer is increasingly becoming an object of interest from politicians, regions, research organizations, universities and entrepreneurs. The main reason for this module is to show a concept, tools and supporting at national and international level.
Knowledge	Student will gain knowledge of available models for technology transfer as well as learning outcomes, support tools and conditions for intellectual property rights.



Skills	Student will be able to define a processes needed for successfully technology transfer, its requirements and possibilities.
Module 5	Business organization and management of the innovation. Strategies and change management
Description	<p>This module will deal with how manufacturing businesses confront the management of the innovation and its organization. The module is comprised by three lessons: (1) Introduction to innovation in manufacturing; (2) Innovation-centred organizational aspects; (3) Managing innovation in the manufacturing enterprise.</p> <p>Lesson 1 describes the basics of innovation, particularly in the manufacturing sector. Main topics are the importance and benefits of R&D+i within the business and early steps to be undertaken, among others. Lesson 2 focuses on organizational aspects of the innovation in the company. The student will acquire the necessary tools to make the innovation transition in a company such as the identification of the key players and resources and how to involve all the staff in this process. Lesson 3 will cope with the management of the innovation within the specificities of the manufacturing companies and how to protect and exploit it results.</p> <p>With this module, managers and workers will be able to implement an innovation management system in their companies. They will also be able to provide outputs to improve the way their companies innovate. Finally, they will acquire precious information on how to protect and exploit the innovation results.</p>
Knowledge	<ul style="list-style-type: none"> -R&D+i management -Innovation management -Identification and analysis of innovation mechanisms -Implementation of innovation strategies in the company -Intellectual Property Protection
Skills	<ul style="list-style-type: none"> -Innovation thinking -Goal orientation -Determination -Adaptability to environment changes -Personal growth -Team work
Module 6	Organization of the supply in industrial sector. Systems and production support processes and reorganization of logistics processes
Description	<p>The supply chain today is a series of largely discrete, siloed steps taken through marketing, product development, manufacturing, and distribution, and finally into the hands of the customer. Digitization brings down those walls, and the chain becomes a completely integrated ecosystem that is fully transparent to all the players involved.</p> <p>The key for a successful digital transformation of the existing supply chain, and therewith reaping the full benefits of DSC, lies in developing an orderly process for implementing and integrating the many technologies and capabilities required.</p> <p>This module will develop the capabilities of the students to prepare them for the leap frog from traditional supply to fully integrated digitization system in the supply chain.</p>
Knowledge	<ul style="list-style-type: none"> -Agile manufacturing -Digital transformation



	-Logistics apps and platforms -Cloud, IoT and CPPS -Servitization
Skills	-Global orientation -Systems thinking -Inspiring and influential leadership -Technical savvy -Platforms and apps use
Module 7	Financial instruments and incentives for research, technological innovation, funding and incentives (regional, national, European)
Description	EU funding programmes cover the major European issues: education, research, environment, transport, culture.... These grants are available to all public, private or non-profit organizations. This module has the purpose to present to the learners the various sources of funding for research and technological innovation. The module contains general introductory part on how to participate in EU programmes and European grants and specific sections for each of the partner countries.
Knowledge	Information on how to develop and run a successful EU project; Assessment criteria for EU projects;
Skills	Assessing the financial needs of the company; Identifying potential funding sources; Basics of funding application forms preparation; Observing EU directives and regulations; Preparing a successful proposal.
Module 8	Creation of new businesses "knowledge based" and entrepreneurship: implementation modalities and instruments
Description	<p>According to the "SMEs, Entrepreneurship and Innovation" paper developed by OECD in 2010, new SMEs and innovating ones are seen as agents of change in the economy, introducing new products and services and more efficient ways of working. They can be considered as drivers for the economic development of any country and directly related to the phenomenon of knowledge-based economy.</p> <p>Thus, the module on "Creation of new businesses "knowledge based" and entrepreneurship: implementation modalities and instruments" aims to provide the representatives of the AuToMa target groups with scientific and practical knowledge about innovation and entrepreneurship along with the skills to turn such knowledge into practice. Overall, the document consists of information on the modalities and instruments for implementation of knowledge-based businesses and entrepreneurship including: the main definition of knowledge-based businesses and entrepreneurship (KBE) concepts; knowledge management; strategy of knowledge-based firms and examples of KBE models being implemented in actual firms.</p> <p>KBE is associated with the knowledge economy which characterized by the crucial role of information and communication technologies, the high proportion of knowledge-intensive activities, the greatest variety of intangible resources in relation to the research and development data. When referring to KBE, the role of creating new knowledge should be considered central to value creation. But knowledge does not automatically lead to innovation and economic growth. Focusing on the definition of KBE at the SME level, there are five key features:</p> <ol style="list-style-type: none"> 1. New firms; 2. Innovative firms;



	<p>3. Firms with significant knowledge intensity in their activities; 4. Firms exploiting innovative opportunities in various sectors; 5. Firms achieving competitive advantage.</p>
Knowledges	<p>The learning outcomes of the module are designed to help users acquire perspectives and skills necessary to take on an entrepreneurial role in future positions and activities.</p> <ul style="list-style-type: none"> - The users will gain knowledge and understanding in the field of entrepreneurship, including specialized knowledge in a subfield; - The users will have insight into research in Innovation and Entrepreneurship both in theory and methodology.
Skills	<p>The users shall acquire the following competences and skills:</p> <ol style="list-style-type: none"> 1) demonstrate ability to identify and formulate issues critically and autonomously; 2) demonstrate ability to critically and systematically integrate knowledge and analyze, assess and deal with complex phenomena, issues and situations even if given limited information;
Module 9	Marketing and communication of innovation
Description	<p>Unit 1 Understanding the value proposition of innovation</p> <ul style="list-style-type: none"> ▪ Disruptive vs sustaining innovation and their value proposition ▪ Competitive landscape analysis ▪ Product differentiation ▪ Proposed value to customer <p>Unit 2 Communicating innovation</p> <ul style="list-style-type: none"> ▪ Communication objectives and targeting ▪ Communication instruments ▪ Communication channels mix ▪ Voice of customer analysis <p>Unit 3 Bringing innovation to market</p> <ul style="list-style-type: none"> ▪ Stand-alone & complimentary innovation: commercialization differences ▪ Definition of the market for your innovation ▪ Pricing innovation ▪ Perceived value from customer ▪ Assuring continuous customer satisfaction <p>Unit 4 Marketing and communication strategy</p> <ul style="list-style-type: none"> ▪ Strategy: purpose, elements and structure ▪ Strategy development walkthrough ▪ Strategy development: reflective exercise ▪ Marketing of innovations: golden nuggets
Knowledges	<p>Understand and define value proposition of innovation; recognize difference between value proposition of disruptive and sustaining innovation. Synthesize and formulate the value proposition of innovation.</p> <p>Distinguish between different communication channels and instruments; comprehend their application for communicating innovation. Generate an effective strategy for communicating innovation.</p>



	<p>Comprehend the difference in commercialization of stand-alone and complimentary innovations. Understand market entry strategies for innovations.</p> <p>Understand the constituent elements and structure of marketing and communication strategy. Reflect on and manage your own marketing and communication strategy.</p>
Skills	<p>Apply tools for competitive landscape analysis. Make an intelligent decision regarding the choice of communication channels and instruments. Position innovation in the marketplace competitively. Conceptualize marketing and communication strategy for bringing innovation to the market.</p>
Module 10	Cooperation, networking and interaction between SMEs, public sector and financial institutions
Description	<p>In a knowledge-based economy competitiveness is becoming more dependent upon the ability to apply new knowledge and technology in products and production processes. However, with growing competition and globalisation and the rapid advancement of knowledge, new technologies and innovative concepts have a wider variety of sources, most of them outside the direct control of firms that have become more specialised and focused on their core competencies. For complementary knowledge and know-how, they increasingly rely on collaborative arrangements, in addition to market-mediated relations (e.g. purchase of equipment, licensing of technology). Inter-firm collaboration within networks is now by far the most important channel of knowledge sharing and exchange. Interactions are also intensifying between firms and a number of other institutions involved in the innovation process: universities and other institutions of higher education, private and public research labs, providers of consultancy and technical services, regulatory bodies, etc.</p>
Knowledges	<p>This module provides systematic theory knowledge for effective networking in the automation industry. Understanding the dynamics of communication that are specific to networking. Appreciating the importance of networking, and different forms of networking. Benefits of networking; Networking etiquette;</p>
Skills	<p>Identifying and managing profiles using online social networking sites; preparing networking strategies; Using various networking tools; How to research existing and potential networks.</p>



Template for a course unit

Module:

No. and title of the module this unit belongs to

Unit Title:

Title of the unit

Description:

A short paragraph about what is done in the unit.

Learning Outcomes:

Learning Outcomes structured according to the EQF in Knowledge, Skills and Competences.

Knowledge:

Skills:

Learning Material:

Description of the learning material. Should include at least a presentation which can be used directly for teaching and the required handouts for student.

Preparation:

Resources needed to prepare the unit if the topic is yet unknown to the trainer.

Additional material:

Material which can be used to deepen the topic, if the trainee is interested.



Factors for successful modules

The factors for contents' development have to be considered, taking in account the specificities of participants:

Workers and managers:

- close levels of preliminary preparation of all participants;
- discipline on the side of the participants;
- motivated participants;
- intelligent participants;
- individuals and/or small groups;
- possibility to interact among participants (blu button);
- opportunity for making new contacts.

Learning materials:

- availability of samples;
- good quality of material and technological basis;
- good presentation of the training material;
- ensuring conditions for practical assignments;
- structure of the course;
- maximum practical orientation of the course;
- multimedia, video materials, (clips), practical materials;
- balancing the level of the training material with the moment level of the trainees;
- well-structured presentation materials;
- training accuracy;
- practical examples and very good communication.

Facilities:

- the learning environment has to provide with the simplest technologies for the participants' interaction in the workplace 10 questions for each module);
- all kind of education procedures and tools should be covered – exercises, presentations, handouts, simulations, forum, etc.;
- the learning management system adopted.

Contents and tasks:

- clear guidelines for each learning module;
- clear video clips with a simple language and several examples;
- simple tasks and learning goals;



- up-to-date and practically useful topics for the trainees;
- quick access to materials related the courses;
- easy to use interface and useful functionalities;
- comprehensiveness of the content of the training course;
- self-check test questions for checking the learned material;
- opportunity to provide feedback and communicate with the mentor/trainer if assistance is needed or there are questions;
- good lector;
- focus and concentration, not to deal with any additional or side activities;
- intelligent participants;
- the topic and the depth of the course;
- motivation of the participants;
- structure of the course;
- adequacy of the training materials;
- availability of links to websites demonstrating the material in the course;
- the usefulness of the information, its systematic, understandable and impressive presentation, attracting the attention of the participants;
- clearly formulated topics and tasks and after that availability of the materials 24/7;
- opportunity for constant contact with the trainer;
- the course has to be conducted with a real lecturer but in virtual environment, in real time in order to follow the results of the training, as well as online training with video materials;
- motivation, the programme (curricula) and the ease of training;
- the good compilation of the materials;
- interest from the trainees;
- diversity of topics;
- giving examples after each topic;
- clear vision about the whole course from the very beginning;
- use more images and visualization to make it easier to memorize the content of the course;
- comfort of place and time;
- unrestricted term and time of day of course utilization!
- accessible in any and convenient time;
- flexibility and possibility to learn from home.



AuToMa

AUTOMATION, TECHNOLOGY TRANSFER AND
MANAGERIAL PRACTICES FOR THE GROWTH
OF SMES, A BETTER EMPLOYABILITY AND THE
PROMOTION OF THE ENTREPRENEURSHIP

Suggested self-evaluation forms before, in the middle and after training course

Multiple choice tests and short open questions were the most preferred forms of examination suggested by the respondents in the open-end questions of the survey. Simply tests without open-end questions were seen as an easier way to cheat, while open-end questions would reduce this risk.

An interesting observation was that the questions before the course give the trainer idea about the knowledge level of the participants. While the questions at the end of the course give idea about the level of the trainer, how prepared he was and whether he/she managed to transmit his knowledge to the audience.

Another observation was that short questions are a good idea during the course but it should be carefully used to not discourage participants. Some of the respondents expressed doubts in the self-assessment as a tool and that results from tests could be not very reliable. However, this is the only approach for learners to tests themselves without feedback from the trainer/instructor. One of the respondents recommended that there should be problems and tests after each chapter/module. At the end of the course, one general test is recommended to check the overall understanding of the material.

Based on the above recommendations, it was decided to adopt a solution based on single choice tests. A set of 10 test questions will be prepared for each module with four proposed answers including one good response. The last option will be "none of the above". This way, during each learning path, the student will have to answer 100 questions directly related to the content of the module to receive the certificate of completion. The completion certificate will be awarded if the student satisfies at least 70% of the questions. Within the framework of the AuToMa project two certificates will be awarded for completing both educational pathways.

The following is a sample certificate issued by the system. The system administrator or teacher will have possibility to adjust the certificate layout by adding or changing each layout element.

Figure 1. Example certificate generated by Moodle

