WOODIGITAL

01.3

Curriculum

The “Woodworker 4.0”

Co-funded by the Erasmus+ Programme of the European Union

WOODIGITAL

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PARTNERS

Mouvement des Entreprises de France Auvergne-Rhône-Alpes

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CENFIM Furnishings Cluster

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Introduction

This report finalizes and matches the results of the previous desk research "*O1.1 - Desk Research: The "Woodworker 4.0". Market needs, knowledges, skills, and competences required in the context of the Twin Transition (Green and Digital) of the furniture sector*" with the main findings of the related Validation Groups, carried out in all Project countries and reported in the report "*O1.2 – Focus Groups - The "Woodworker 4.0". Market needs, knowledges, skills and competences required in the context of the Twin Transition (Green and Digital) of the furniture sector".*

The professional Profile of the Woodworker 4.0 combines the traditional complex of Knowledge, Skills and Competences typical for the Woodworker in the furniture industry with the new ones required by the twin transition of the furniture sector towards new Circular Economy business models and their needed Green Skills and towards the digitization of the processes along the whole sectoral value chain.

WOODigital considers the Woodworker 4.0 the evolution of the traditional professional profiles correspondent basically to the ESCO profiles Carpenters and Joiners (7115), Furniture Assembler (8219.4), Wood Treaters (7521) and Cabinet Maker and related workers (7523) - that includes some sub-profile such as Furniture Finisher (7522.5), Furniture Restorer (7522.6).

The Curriculum of the Woodworker 4.0 defined below is based on the following principles:

- The "Woodworker 4.0" is a woodworker digitally competent and able to use the technologies already existent in the working environment.
- The "Woodworker 4.0" is a woodworker digitally competent and able to use the disruptive technologies emerging in the wood and furniture sector.
- The "Woodworker 4.0" is a woodworker able to work in a working environment affected by the transition to Circular Economy business models.
- The "Woodworker 4.0" is a woodworker aware of the sustainability principles.
- The Curriculum should be attractive for young people or unemployed people, in terms of content and career perspective.
- The scope of this Curriculum is to increase the digital competence and the knowledge of the fundamentals of the Circular Economy in the furniture sector

for the new professional profile of the "Woodworker 4.0". The training related to the traditional profiles above mentioned is out of the scope of this project.

This curriculum must be consistent with the EU instruments for mobility and transparency ECVET, EQF and EQAVET and will include:

- Information and descriptions related to learning objectives and learning outcomes (LO's),
- A list of the Learning Units (training path)
- The description of the Learning Units content in relation to knowledge, skills, and competencies (KSC's).
- ECVET points will be assigned for each unit (with the support of the ECVET toolkit).

Then, we can define the EQF level Qualification of the course, that at this stage is expected to be of level 4. This will be decided when the curriculum will be finalized (M23) and based upon the developed learning pills (IO3).

1. Curriculum description

The findings of the desk research and the recommendations coming from the 5 Focus Groups converge towards the same training priorities:

1. General overview about the fundamentals of Industry 4.0 and Circular Economy
2. Technical skills: competencies related to the knowledge of the main softwares for design and technical drawing;
3. Technical skills: competencies related to the knowledge of the automated machines, robots, and CNC tools;
4. Technical skills: competencies related to the knowledge of the evolution of the manufacturing processes/techniques and digitization of the working environment;
5. Green skills: Circular economy; Eco-design.
6. Transversal skills: project management and entrepreneurial skills; attitude to problem solving and self-learning; intercultural and communication skills;
7. Skills related to quality, risk, and safety;
8. Corporate Social Responsibility: respect for the environment, respect for the people, respect for the resources and working environment.

The proposed curriculum is designed and set up considering that VET providers can use it as a basis for building up the expected new qualification.

Furthermore, the proposed curriculum is useful for students, employees, unoccupied people willing to improve their traditional competence in the furniture sector with up-to-date skills and for employees or unoccupied people coming from other sectors – with a solid technical background - willing to reroute their career toward the furniture industries.

A revision of the curriculum of the Woodworker 4.0 will take place after the implementation of the training course and its validation during the mobility phase, taking into consideration the participants' feedbacks and comments.

2. Woodworker 4.0 – Content of the Curriculum

In this document we will present the definition of the Learning Units and their content, based upon the outcomes of the results of the Report 01.1 "*O1.1 - Desk Research: The "Woodworker 4.0". Market needs, knowledges, skills, and competences required in the context of the Twin Transition (Green and Digital) of the furniture sector*" and of the main findings of the Focus Groups, carried out in all Project countries and reported in the report "*O1.2 – Focus Groups - The "Woodworker 4.0". Market needs, knowledges, skills and competences required in the context of the Twin Transition (Green and Digital) of the furniture sector*"

The layout of all the units will shape the specific training path for the Woodworker 4.0 professional profile.

Taking into consideration the official definitions by the European Qualification Framework, we consider that this new joint curriculum will refer to **level 4**, considering that it will require at least:

- Knowledge: **factual and theoretical knowledge** in broad contexts within a field of work or study;
- Skill: a range of **cognitive and practical skills** required to **generate solutions to specific problems** in a field of work or study;
- Competence: **exercise self-management** within the guidelines of work or study contexts that are usually predictable, but are subject to change; **supervise the routine work of others**, taking some responsibility for the evaluation and improvement of work or study activities.

3. Learning Units: main contents

Introduction

Learning outcomes are described in relation to the specific knowledge, skills, and competences, in order to secure that the new curriculum properly matches the evolution of the market and the sectoral twin transition. The training pills that will be developed within O3 will follow and specify these defined learning outcomes.

Each Learning Unit of the curriculum is delivered in a comprehensive manner and in relation to other parts. This means that the curriculum provides a coherent and appropriate Learning Path, that shows the ideal sequence of learning activities, allowing the participants to become proficient in the shortest possible time in the topic and properly complete the foreseen tasks by the related occupation.

To make it a more systematic tool, the identified general, technical, and transversal skills are divided into six learning units, according to a sensible training path starting from a general introduction about the revolution of Industry 4.0, to give to the learners a sound basis of knowledge and a proper jargon, until the last learning Unit devoted to the fundamentals of the CSR and the ethics principles adequate for a working environment.

Description of the Units

UNIT 1 – INTRODUCTION TO INDUSTRY 4.0: history and cases histories

1.1 Main Topics

- Introduction to Industry 4.0
- Application of Industry 4.0 on Wood/Furniture industry
- Examples of Industry 4.0 application for the Wood/Furniture industry

1.2 Detailed Unit's structure

- Introduction to Industry 4.0 and digitized workplaces
- Industry 4.0 for European SMEs: challenges and opportunities
- Industry 4.0 application to manufacturing (with technical examples and case studies)
- Relevance to European SMEs competitive advantage
- Industry 4.0 in practice (with technical examples and case studies)
- Examples and case histories of Industry 4.0 application for the Wood/Furniture industry

GOAL

At the end of the Unit "Introduction to Industry 4.0" the learner should be able to list/name/describe:

- The principles of Industry 4.0 and its impact on the Furniture industry
- The changes and the challenges for the EU SMEs due to the Industry 4.0 transition
- The main technologies related to Industry 4.0 and their impact on the furniture industries.
- The evolution of the working environment under Industry. 4.0

RELATED SKILLS, COMPETENCES, KNOWLEDGE

SKILLS

- Can manage complex information
- Can recognize the practical application of a theoretical principle
- Can recognize the changes in the working environment due to Industry 4.0
- Can recognize different types of 4.0 technologies and their specific application in the furniture sector
- Can recognize the sequence of manufacturing processes

KNOWLEDGE

- Knowledge of the Principles of Industry 4.0
- Knowledge of the principles of automation/digitization in manufacturing processes

COMPETENCES

- Great interest in innovation, digitization, new technologies
- Intellectual curiosity, creativity
- Open-mindedness

UNIT 2 – 4.0 SOFTWARE

2.1 Main Topics

- Introduction to software 4.0
- Software solutions
- Automated Manufacturing
- System information management

2.2 Detailed Unit's structure

- Different types of software and sensorics solutions
- Computer Aided Design
- Computer Aided Manufacturing
- Building Information Modelling
- Augmented Reality / Virtual Reality

GOAL

At the end of the Unit "4.0 Software" the learner should be able to list/name/describe

- The main software available on the market for design and manufacturing
- The features and possibilities of CAD/CAM/BIM
- The main VR and AR solutions available on the market for the furniture sector
- The related opportunities of VR / AR on his/her daily work
- The main solutions related to the sensorics for the furniture sector

RELATED SKILLS, COMPETENCES, KNOWLEDGE

SKILLS

- Can recognize and describe the functions and the applications of the main manufacturing and design software and sensorics solutions
- Can recognize and describe the functions and the applications of the main VR/AR solutions

KNOWLEDGE

- Knowledge of the principles of software design in manufacturing processes
- Knowledge of the principles of VR/AR
- Knowledge of the principles of the sensorics for the furniture sector

- Knowledge of the principles of automated manufacturing
- Knowledge of the fundamentals of the IT systems integration

COMPETENCES

- Responsibility in his/her work
- Autonomous in his/her work, under supervision and proper training
- Great interest in innovation, digitization, new technologies
- Intellectual curiosity, creativity
- Open-mindedness

UNIT 3 – 4.0 MACHINERY

3.1 Main Topics

- CNC Routers
- Robots/Cobots
- Additive technologies

3.2 Detailed Unit's structure

- 3 axis/5 axis machines, nesting, rail and pod
- Finishing systems
- Material movement
- Laser cutter
- 3D printing

GOAL

At the end of the Unit "4.0 machinery" the learner should be able to list/name/describe:

- The main Tools and Machinery available on the market for design and manufacturing in the furniture sector
- The CNC machines (3 axis/5 axis machines, nesting, rail and pod)
- The Laser and other tools for cutting
- The functioning of the main robots and cobots for the furniture sector
- The fundamentals of the additive technologies (3D printing)
- The main finishing systems

RELATED SKILLS, COMPETENCES, KNOWLEDGE

SKILLS

- Can recognize and describe the functions and the applications of the main CNC Machines
- Can recognize and describe the functions and the applications of the main Laser and cutting tools
- Can recognize and describe the functioning of the main robots and cobots for the furniture sector
- Can recognize and describe the fundamentals of the additive technologies (3D

printing)
- Can recognize and describe the main finishing systems

KNOWLEDGE
- Knowledge of the main CNC machines and tools for the furniture sector
- Knowledge of the Laser and cutting technologies for the furniture sector
- Knowledge of the main Robots and Cobots technologies for the furniture sector
- Knowledge of the fundamentals and functioning of the additive technologies (3D Printing)
- Knowledge of the main finishing systems for the furniture sector

COMPETENCES
- Responsibility in his/her work
- Autonomous in his/her work, under supervision and proper training
- Great interest in innovation, digitization, new technologies
- Intellectual curiosity, creativity
- Open-mindedness

UNIT 4 – MANUFACTURING MANAGEMENT

4.1 Main Topics

- Introduction to manufacturing management
- Manufacturing management systems
- Software systems for management

4.2 Detailed Unit's structure

- Project Management tools and methodologies (Canvas, Gantt, Reporting system)
- Fundamentals of quality control and technical regulation
- Technical standards for health, safety, functionality, ergonomics
- Innovation / Innovation management
- Lean Manufacturing principles
- Enterprise resource planning and related systems (ERP)
- Product Lifecycle Management
- Cybersecurity
- Cloud Computing
- Internet of Things

GOAL

At the end of the Unit "Manufacturing Management" the learner should be able to list/name/describe:

- The main phases of a project (initiation, planning, realization, monitoring, evaluation, closing)
- The main tools and methodologies used by Project Manager (Canvas, Gantt, Reporting system)
- How to report his/her activities and results through the different hierarchy's levels
- The principles of the Lean manufacturing
- The principles of the Product Lifecycle management
- The fundamentals of the ERP and related systems
- The fundamentals of the cloud technologies and their main solutions
- The principles for the resource planning and its related systems

- The main solutions and applications of IoT systems

RELATED SKILLS, COMPETENCES, KNOWLEDGE

SKILLS

- Can recognize the main phases of a Project
- Can report efficiently on his/her work
- Able to communicate in a proper manner, without missing relevant information
- Able to contribute to the companies' reporting
- Can read and understand a Gantt Chart
- Can read and understand a Canva Chart
- Can recognize and apply the principles of Lean Manufacturing, under supervision and with proper guidelines
- Can recognize and describe the principles of the Product Lifecycle Management
- Can recognize and describe the principles for the resource planning and its related systems
- Can recognize and describe the main solutions and applications of IoT systems

KNOWLEDGE

- Knowledge of the Project management principles
- Knowledge of a project lifecycle
- Knowledge of the lean manufacturing methodologies

COMPETENCES

- Time management
- Responsibility in his/her work
- Autonomous in his/her work, under supervision and proper training
- Open-minded and open to continuous self-learning
- Problem solving
- Flexible and adaptive in complex contexts
- Self-management
- Teamwork

UNIT 5 – CIRCULAR ECONOMY AND

5.1 Main Topics

- Introduction to Circular Economy
- Eco-design (design for re-use, repair, remanufacture, end of life and durability)
- Sustainable materials

5.2 Detailed Unit's structure

- Sustainability and lifecycle thinking
- Circular economy in the wood/furniture industry
- New circular business models
- Environmental Tools (carbon footprint)

GOAL

At the end of the Unit "Circular Economy and Eco-design" the learner should be able to list/name/describe:

- The difference between linear economy business models and circular economy business models.
- The difference between circular economy / greenwashing
- The application of the Circular Economy principles in the wood/furniture sector
- The fundamentals of the Lifecycle thinking
- The main tools to measure the environmental product and organization performance (for instance PEF and OEF)
- The innovative and sustainable raw materials for the wood/furniture sector
- The principles of Eco-design and the main techniques related to repairability / maintenance / reuse

RELATED SKILLS, COMPETENCES, KNOWLEDGE

SKILLS

- Can distinguish good/bad circular practices
- Can distinguish good/bad circular business models
- Can understand/interpret a product organization environmental assessment
- Can recognize and use the innovative materials inspired by the principles of the

Circular Economy
- Can recognize and apply the principles of Eco-design, under supervision and with proper guidelines

KNOWLEDGE
- Knowledge of Circular economy principles and practices
- Knowledge of principles for assessing environmentally materials / products / organizations
- Knowledge of Eco-design principles

COMPETENCE
- Sustainable sensitivity
- Life cycle approach
- Environmental product/organization assessment
- Environmental product/organization improvement
- Creative thinking
- Ethics

4. Teaching methodologies: recommendations

The training methodology must be intuitive and user friendly, designed to accomodate a wide range of learners, with different levels of digital competences. The idea is that innovative and effective training methods will be used, such as online video materials, and each learning pill will be developed using the most suited training method for that specific item and the learning outcomes based of specific learning pill. The methodology can be (in function of the specific content/theme and aims of the training pill):

- Video material with interviews, statements, explanations from experts…
- Animated videos or animated graphics, infographics
- Slides, presentations and learning objects
- Case studies (examples / good practice by companies / VET / HE / Research centers)
- Texts and written explanations
- Additional resources such as recommended reading of articles, books, blogs…
- Quizzes and Exercises

It would be recommended to integrate in the training platform a multilingual Virtual room / Forum to enable the direct exchange between the participants and a direct support to all the learners by the Project Tutors and Teachers.

Furthermore, it would be recommended to integrate at the end of each Learning Unit a glossary with the main topic keywords.

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