



# WOODigital

## Handbook



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[www.woodigital.eu](http://www.woodigital.eu)

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# Introduction

The aim of WOODigital is to develop a dual training system to improve the digital skills of young Europeans interested in the wood and furniture sector.

WOODigital (2020-22) aims to develop a **dual training system** to enhance digital skills of young Europeans interested in **entrepreneurial and employment opportunities** in the **woodworking and furniture sector**. The model proposed is thought to be deeply work-based and include **international mobility**, so as to provide young learners with the opportunity to apply knowledge in **real working situations**.

## The present situation

The woodworking and furniture sector is a consolidated industry in Europe, with +300.000 businesses and +2 M people employed (DG Growth). The sector is almost made up of MSMEs (<10 employees) with relatively few large firms, these facts justifying the necessity to run cooperative actions across Europe if MS (micro and small enterprises) want to be effective and successfully keep up with competition (especially from China and US), facing sector-specific challenges.

The labour-intensive nature of the woodworking and furniture industry clashes with an ageing workforce and the difficulties in hiring and recruiting qualified young people not attracted by what they consider a traditional manufacturing sector. The industry is in the top-20 sectors suffering from bottleneck problems due to the lack of applicants with adequate skills and lack of willingness to take jobs (Mapping and Analysing Bottleneck Vacancies in EU Labour Markets, EC Report, 2014). From 2005 to 2014, the number of 25-39 aged employees has been declining by -7% (from 45% to 38%), whereas people +55yrs are increasing by +6% (from 9% to 15%).

Furthermore, in Europe there are recorded +2M unfilled vacancies, including in the woodworking and furniture sector, despite it being estimated that +14% of people aged 15 to 24, and +18% in the age group 25 to 29 (Eurostat, 2019) are unemployed.



## The main objectives

The main objectives of WOODigital are as follows:

- Building a **multi-stakeholder framework** to design a dual system model and training offer that are fit for purpose and relevant for the sector by **building on and enhancing existing knowledge and practices**;
- Optimizing and sharing a well-organized dual system model for fostering digital skills in the woodworking sector by acting upon specific methodological guidelines and promoting innovative training approaches, including **mobility** and **e-learning**;
- Developing a **student-centred training offer** suitable for being exploited and improved in other MS (micro and small enterprises) and initiatives, especially focusing on manufacturing industries.

## The expected results

In details, expected results of WOODigital are:

- Boosting **cooperation and dialogue** between different stakeholders (**SMEs and entrepreneurs/employers' representatives, VET providers, innovation experts and professionals**) aimed at driving innovation across Europe both at training-level and industry-level;
- **Improving woodworkers' digital skills** and making them more capable to cope with and resilient to changes occurring in the sector and led by the Industry 4.0 through VET offers and systems more responsive and innovative;
- Promoting innovation in the woodworking and furniture VET offer/ **supporting school-to-work transition**, inclusion and employability of young people by enhancing learning of digital skills in work-based transnational settings;
- Develop, test and validate a dual model suitable for enhancing **learning mobility**, including a set of innovative teachings, learning and assessment practices; and
- Setting a quality-driven circle by lessons learnt and outcomes from other projects, to further **create synergies among woodworking-based projects at EU level**, and then inspiring other national initiatives (Horizon Europe, COSME, ESF, among others).



## Target groups

The action is targeted to help the **EU youth (ages 18 to 35)** becoming key drivers for properly answering to the challenges posed by the Industry 4.0 and IoT, which have been soundly reshaping the woodworking and furniture industry in recent years.

As well, it contributes to feeding a sector made up almost completely by **SMEs and aged workforce with young skilled workers**, and thus avoiding the loss of European manufacturing and craftsmanship history.

## Dual training

The project thrives within both cooperation and knowledge frameworks of other EU projects (WOODUAL, FUNES, IM-FUTURE, DIGIT-FUR and others), which have been claiming the use of **dual training system** in the wood and furniture sectors to improve digital skills and employability of young people and cooperation between business and VET providers across Europe.

At the core of the project there is a **strategic management of knowledge** by:

- Fostering teaching and learning of digital skills, WOODigital strives to **strengthen employability and key competences of young people**, making woodworking a knowledge-based industry. The more woodworking processes and products are digital and digitalized, the more data and information are available to SMEs and other relevant players to make their offer more attractive and valuable for the market, enhancing the decision-making process;
- Running a feedback loop, the partnership is committed to nurture strategic links to further **enhance synergies among woodworking-based projects at EU level**;
- Being involved in long-lasting cooperation and business relationships, partners have been producing new knowledge that is worth investigating through additional resources, **facilitating a knowledge-transfer process between education and business** for mutual improvements.



# Digital transformation

Digital transformation is the integration of digital technologies into all areas of a company, modifying the way the companies operate and deliver value to customers. It also demands a cultural change that requires organizations to continually challenge the status quo, experiment, and get comfortable with failure.

The adoption of **Industry 4.0 new technologies** is believed to be one of the **key drivers of change** during this and next years for the European industries, together with the Circular Economy, this double transition is known as “Twin Transition”.

By 2025, with a massively connected and globalised economy, the wood furniture manufacturing industry will offer personalised **smart products** and services based on **digital manufacturing**, logistics and sales systems supplied by resource-efficient and sustainable industries with an immense need for enough **digitization talents and skills** securing a competitive transformation of the industry.

Most of the technologies can be used by SMEs as well as large enterprises, making them suitable for a large part of the European wood furniture industry. **The biggest challenge to the wood furniture industry** might well be **the lack of available skills** within engineering, science, technology and ICT.

Digitalization poses new challenges for occupational health and safety. New types of workplaces, new processes, new technologies can increase the safety and health of workers.

The impacts of digital transformation in the wood furniture industry have been studied, analysed, and compiled in the **DIGIT-FUR project**.



# Desk research

The wood-furniture sector is facing a phase of "Green and Digital" Twin Transition<sup>1</sup> at European level, imposed on the one hand by the ongoing environmental and climatic emergency, on the other encouraged by the development of new technologies, tools and methodologies accessible and applicable by SME's, which characterize the sector.

The impact of this transition looks more like a **new revolution** than a normal evolution: the impact on fields like design, product manufacturing, business processes, work organization and market relations will radically transform the sector, with a speed and radicalism never experienced before.

## **New challenges, for new opportunities.**

The business world, the VET and HE sector-related educational institutions, the research world and the institutional stakeholders are all aware that this transition is essential for the wood-furniture sector to remain competitive, while preserving its heritage of creativity and know-how. The tools increasingly adopted by Policy Makers at European and national level to support both innovation (for example funds for the development of Industry 4.0, eco-sustainable materials and processes, Circular Economy) and sustainability of the production system, business direct investments in product and production processes innovation, the contribution of research to develop sustainable and adequate solutions for large-scale production lose effectiveness without the contribution of a training chain dedicated to new workers and employees in the sector.

Can the wood-furniture sector be as attractive to young Europeans as other sectors such as food, fashion, automotive? Digitalization and sustainable development linked to the circular economy can also be a driver to facilitate interest in the sector by young Europeans, digital natives and with a strong environmental sensitivity.

Adequate and innovative training, capable of exploiting the potential of new technologies, therefore responds to a double market demand: to train young people capable of facing innovation and attract talented young people who can bring their talent and passion into the wood-furniture sector.

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<sup>1</sup> SAWYER Project – Social Dialogue EU Programme – Final Report *Impacts of the twin transition on the EU furniture industry*



# Trends and possible scenarios for the wood-furniture sector

In 2019<sup>2</sup>, the EQWOOD project provided a comprehensive overview of the opportunities and threats for the wood-furniture sector at European level by interviewing over 115 stakeholders from the world of business, research, training and institutions from Spain, Belgium, Italy, France, Hungary, and Bulgaria.

Conclusions converge on some key points:

## *Main challenges / Threats*

- *Competition from low cost / low labour market countries*
- *Ageing workforce*
- *Difficulties to attract young "Talents"*
- *Market Barriers*
- *Crisis (including Pandemic crisis)*

## *Opportunities*

- *Export-oriented sector*
- *New customers from emerging countries*
- *New lifestyles trend*
- *High-end products*
- *Circular economy and new materials*
- *Digitization and key enabling technologies*
- *Synergies with tourism / cruising / hospitality / marine industry*

## Post Covid-19 pandemic scenarios

- *New consumer trend: "Home sweet Home"*
- *Digitization of processes management and customer relationship management*
- *Remote working*
- *Increasing costs of raw materials*

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<sup>2</sup> EQWOOD\_ Quality Qualifications for the European Woodworking and Furniture Industry- Project – Erasmus + EU programme - Deliverable WP4 "Sectoral Information Report" – [www.eqwood.org](http://www.eqwood.org)



The crisis due to the Covid-19 Pandemic, if on the one hand implies a reduction in demand for the wood-furniture sector and downward global consumption scenarios (also following the limitation of tourist flows, with a consequent serious impact on the hospitality at a global level), on the other it could represent a “boost” for the “Twin Transition”, whose effects should be taken into account for the development of medium-term training courses.

The first and clearest consequence of the pandemic crisis is **a new attention and sensitivity by consumers towards their home**<sup>3</sup>: forced to live there for a long time, they are willing to invest to improve it, with technological solutions also suitable for remote working, modular furniture to transform the home environment in flexible locations also for work or study, open spaces equipped with multifunctional furniture.

The second consequence is the remotization of non-productive activities, with the consequent development of all the **technologies that allow remote collaborative work** (cloud Technologies, sharing platforms, e-learning tools, collaboration tools).

Another aspect concerns the customer remote management. In addition to the above-mentioned technologies, we are witnessing a progressive spread of advanced CRM tools, as well as the development of new technologies for the remote presentation of products, catalogues and solutions.

Equally noteworthy, although still in an embryonic state, are the **production process remotization**<sup>4</sup> examples coming from some manufacturing sectors. During the lockdown period, many companies had to remotely monitor production to adapt production flows to the needs of the moment, often subject to Covid-19 trend, thus achieving **agile production**. Others have initiated remote testing and management mechanisms of the systems, with the same degree of safety but with a significant decrease in costs compared to on-site procedures, to make it permanent even at the end of the emergency. **Others have experimented with the 'rental' of production plants**, which makes it possible to outsource production and modulate it according to needs, paying for the use of machinery.

Added to this are the opportunities linked to product “Digital Twin” **capable**, on one hand, **of representing the product, allowing navigation within it as well as a certain interaction with its components**; on the other hand, during its life cycle, it must even be able to **change and behave in accordance with what happens to the counterpart in the real world**. Through technologies derived from the gaming world, the product and processes are integrated into multiple scenarios, which simulate complex situations, subject to the variables of time and space.

<sup>3</sup> See the Italian report on the Real Estate - *Scenari immobiliari-Report ISI, 2020*. [www.scenari-immobiliari.it](http://www.scenari-immobiliari.it)

<sup>4</sup> Marco Taisch – Politecnico di Milano – “Chi ha detto che è impossibile il lavoro da remoto?”  
<https://www.paroledimanagement.it/chi-dice-che-non-si-puo-fare-smart-working-in-fabbrica/>



Last but not least, the revision of the entire supply chain. Following the COVID-19 pandemic, **a strong increase in the price of raw materials available on the market** emerges due to the intermittent lockdowns that, in the central months of 2020, significantly reduced their production and the possibility of exporting to European countries by especially Asian countries.

## Green and Digital: the “TWIN Transition”

The evolution of the furniture sector shares two drivers with the entire European manufacturing sector:

- Digitization and the challenges associated with the use of new technologies.
- Sustainability (environmental, but also social and economic according to the SDG criteria established by the UN), with the development of new models of Circular Economy.

Two projects, resulting from the Social Dialogue<sup>5</sup> work for the furniture sector, have taken stock of both dimensions, measuring their impact on the professions that characterize the sector.

### Digital Transition. DIGIT-FUR – The impact of digitization on the wood and furniture sector

The project DIGIT-FUR<sup>6</sup> has provided a better understanding of the possible **scenario of the furniture sector due to digitization impact in 2025** and it forecasted which will be the effects of this transformation on 11 ESCO occupational profiles (ESCO – European classification of Skills/Competences, qualifications and Occupations) in relation to the changes in their tasks, occupational health and safety (OHS) risks and the related new skills, knowledge and competencies (VET) needed.

<sup>5</sup> European social dialogue refers to discussions, consultations, negotiations and joint actions involving organisations representing the two sides of industry (employers and workers). <https://ec.europa.eu/social>

<sup>6</sup> Support for Social Dialogue VP/2016/001. Grant Agreement Reference VS/2017/0027. [www.digit-fur.eu](http://www.digit-fur.eu)



The project has interviewed 56 European experts in the wood-furniture sector from various fields (research and development, companies, training, institutions) that identified a **ranking of 108 factors** that will impact the sector by 2025.

The factors can be grouped into three broad macro-categories:

- A) **New technologies**
- B) **Reorganization of business processes aimed at greater sustainability / effectiveness**
- C) **Re-design of products in line with new market trends**

The first conclusion is clear: **challenge is in the processes!**

However, the evolution of technologies alone is not enough to produce an impact that makes the sector grow. At every level, new technologies need to be integrated into traditional business processes (production, quality control, research and development, marketing, human resources) for a harmonious growth of the company along its entire value chain.

In this respect, the DITRAMA<sup>7</sup> project has always identified, through a survey among sector operator, the **technologies that will have the greatest impact on the wood-furniture sector**, perfecting the results that emerged from DIGIT-FUR and confirming integration among the top technological systems.

## Green Transition. SAWYER – Impacts of the twin transition on the EU furniture industry

The SAWYER Project interviewed 51 experts from 15 European countries, submitting them a list of 49 possible evolutions and impact on the sector of numerous environment-related legislative and voluntary tools. Experts confirmed the following trends for the sector:

- **Growth in the offer of products designed according to the principles of eco-design** (low environmental impact, traceability of the origin of raw materials, sustainable production processes).
- **Development of methodologies for the recovery and reuse of post-consumer materials.**
- **Market increasingly looking for information about the sustainability of products and products with environmental certifications**, also for the construction sector (LEED / BREEAM certifications).

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<sup>7</sup> DITRAMA – Erasmus+ - 601011-EPP-1-2018-1-ES-EPPKA2-SSA -- See output D2.4° "Skills Fine Tune – Final Report" – Page 21. [www.ditrama.eu](http://www.ditrama.eu)



- Development of policies and regulations to **reduce waste production and end-of-life management of products**.
- Development of public and private schemes of **Green Public Procurement**.
- **Cascade use of wood** (use of wood in several stages, as raw material or building material. Wood will be used for energy production only when unsuitable for any type of use).
- Development of **extended producer responsibility**, in which the producer has the financial and organizational responsibility of managing the final phase of a product's life cycle.
- **Development of the REACH regulation**, adopted by the European Community to improve the protection of human health and the environment from the risks that may arise from chemicals. The REACH regulation places the burden of proof on companies.

All these scenarios require the development of Green skills, which can be divided into "Soft Generic Green Skills" and "Technical Green Skills":

According to the **ReSOLVE (ReSOLVE Framework)** developed by McKinsey in co-operation with Ellen McArthur Foundation and adapted to the sector, the wood-furniture sector can complete its transition towards circular economy by focusing in 6 different areas:

- Regenerate
- Share
- Optimise
- Loop
- Virtualise
- Exchange

Digitization and the new technologies available also impact on aspects relating to environmental sustainability through **traceability tools for materials, products and components**, as well as traceability technologies (**QR Code / RFID**). This information can be integrated with booming e-commerce portals to provide the final consumer with detailed information.



# The impact of “Twin Transition” on traditional wood-furniture professions. The professional profile of Woodworker 4.0

The double transition has an impact on traditional wood-furniture professions, in a context of continuous evolution.

The recent BOLSTER-UP II project, financed under the Social Dialogue<sup>8</sup> program, has analysed all the Skills, Competences and Knowledge required for three professions characterizing the sector (**Joiner, Cabinet-Maker, Upholsterer**), indicating their evolution from the previous survey in 2014.

For each of the three profiles, the evolution involves the acquisition of new skills such as:

## Digital Skills:

- using data systems (digital skills)
- working with automated machines (CNC machines and computerised equipment)
- using (C)NC-programming
- knowing digital simulation models, working in an environment with advanced digital process control, cobots and robots
- use the company's ICT system and standard software related to their work field
- understanding of work-flow and sequence of operations

## Green Skills:

- acting responsibly, also complying with security regulations, health and environmental protection
- contributing to maintenance activities and waste management
- using energy efficiently

These general recommendations are analysed in detail by the SAWYER and DIGIT-FUR projects, which redefine 11 professional profiles (identified according to the ESCO classification for the sector) based on the identified scenarios.

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<sup>8</sup> BOLSTER UP II Project – Social Dialogue EU Programme – *Report on European furniture professions*.  
[www.bolster-up2.eu](http://www.bolster-up2.eu)



We analyse in particular the professions consistent with the purposes of WOODDIGITAL, focusing in particular on:

- 1) Cabinet Maker and related workers
- 2) Upholsterer and related workers
- 3) Furniture Assembler

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).
- At the end of the Pilot session - including also the feedback collected during the onsite and online mobilities – the EQF level of this Curriculum is consistent with the complex of skills, knowledge and competences relevant for the EQF 4

Added to this are other **transversal**, non-technical skills, which complete the profile of the "Woodworker 4.0":

- Trendwatching / Knowledge of New Lifestyles
- Risk Management and new hazards, for instance Psychosocial hazards due to lack of social contacts and mental stress due to cognitive interaction with cobots/machines/robots
- Ethics
- Intercultural Skills
- Communication Skills
- Entrepreneurial Skills



# Conclusion: new professional profiles, new skills, new teaching methodologies

In 2015, the FUNES<sup>9</sup> project had already identified 3 out of 7 factors linked to the lack of training among the main weaknesses of the European furniture sector:

- Management training needs
- Low education of workers
- Lack of competences to work with new and different materials (polymers, glasses, stones, composite,...)

Digital challenges were still in evolution but represented a clear development opportunity. In DITRAMA<sup>10</sup>, the lack of adequate staff skills and training, combined with a lack of leadership and resistance to change is indicated among the major barriers to the implementation of technological development in companies.

The lack of skills adequate to the change in progress requires a training effort that reviews not only the contents, but also the **methods of delivery of the training contents**.

It is Bolster UP II that provides some indications to remedy these sectoral weaknesses, through **new training methodologies**, in which learning what is new is combined with new teaching methods.

The following training content and tools are strongly recommended:

- Digital support for using machines (use of Augmented Reality)
- Digital support for mounting (use of Augmented Reality)
- Education on principles of circular economy
- Training in environmental procedures
- Training in waste management
- Training in regulations and procedures in OHS (occupational health and safety)
- Surveillance of new materials (antenna)
- Looking out for and assessing new applications (antenna)

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<sup>9</sup> FUNES Project – Erasmus + EU Programme - Output O3 – A1 – *Analysis of Companies versus Scenario* – Page 5. [www.funeproject.eu](http://www.funeproject.eu)

<sup>10</sup> DITRAMA Project- Erasmus + EU Programme - Output D2.4 "*Skills Fine Tune – Final Report*" – Page 23. [www.ditrama.eu](http://www.ditrama.eu)



# Annexes

## Training material

### 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 **software** 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 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 curriculum is useful for **students, employees, unemployed people** willing to improve their traditional competence in the furniture sector with up-to-date skills and for **employees or unemployed people coming from other sectors** – with a solid technical background and a previous knowledge in the field of Industry 4.0 - willing to reroute their career toward the furniture industries.

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.

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 developed within O3 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.

According to the ECVET framework, each Learning Unit assigns 0.2 ECVET Points and the full training course assigns 1 ECVET Point.



## Learning Unit 1 – Industry 4.0 (0,2 ECVET Points)

In this learning unit students learn about the transition of the wood and furniture industry towards Industry 4.0. Through Learning Pill 1 they will become familiar with some of the disruptive innovations in production and industrial processes that define Industry 4.0 and that are leading to a new culture of work and the emergence of digitized workplaces. Within Learning Pills 2 and 3 they will learn about the correlation between Industry 4.0 and improved competitiveness, innovation, and sustainable practices within European SMEs.

- 1.1 Main Topics
  - Introduction to Industry 4.0
  - Transition of the wood and furniture sector towards the Industry 4.0: technologies and tools
  - 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 in practice
  - Industry 4.0 – Case Studies

### LEARNIG OUTCOMES

At the end of the Unit "Introduction to Industry 4.0" the learner should be able to:

- Understand the definition, development and impact of Industry 4.0
- Have a clear understanding of tools used within Industry 4.0 to optimize the value chain of production
- Describe the opportunities that industry 4.0 brings to SMEs in Europe
- Explain the application of Industry 4.0 in the wood and furniture sectors
- Provide some concrete examples of Industry 4.0 practices in wood and furniture sectors
- Understand the real application of Industry 4.0 in the furniture sector
- Know how this real application allows adapting to new market expectations



## 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

On completion of the learning unit, students must complete a **multiple-choice self-assessment** in order to obtain a completion **certificate and digital badge**. A minimum **result of 75%** is required to pass the Learning Unit.



## Learning Unit 2 – 4.0 Software

### (0,2 ECVET Points)

This learning unit gives an overview about software used in the wood manufacturing industry. Students will learn about the types of software that are commonly used in the design and production of products like Computer Aided Design (CAD) and Computer Aided Manufacturing (CAM). Additionally, students are introduced to more advanced software solutions, such as Augmented Reality (AR) and Virtual Reality (VR).

#### 2.1 Main Topics

- Introduction to software 4.0
- Software solutions: CAD / CAM / BIM / VR / AR
- Automated Manufacturing
- System information management

#### 2.2 Detailed Unit's structure

- Different types of software for the wood and furniture industry
- Elements of Computer Aided Design
- Elements of Computer Aided Manufacturing
- Elements of Building Information Modeling
- Elements of Augmented Reality / Virtual Reality
- 4.0 Software Case-Studies

#### LEARNING OUTCOMES

At the end of the Unit "4.0 Software" the learner should be able to:

- Describe the different categories of software used in the furniture industry
- Identify the benefits of using software in the furniture industry
- Understand the basic principles of Computer Aided Design and Manufacturing (CAD/CAM)
- Describe the benefits of using CAD/CAM and Building Information Modeling (BIM)
- Understand the basic principals of Computer Aided Design and Manufacturing
- Understand the possibilities of AR/VR/BIM software in the furniture industry
- Give examples of the practical benefits of using software in the furniture industry



- Understand the benefits of using software in the design process

#### 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 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

On completion of the learning unit, students must complete a **multiple-choice self-assessment** in order to obtain a completion **certificate and digital badge**. A minimum **result of 75%** is required to pass the Learning Unit.



## Learning Unit 3 – 4.0 Machinery

### (0,2 ECVET Points)

In this learning unit, students will be introduced to the machinery most frequently used for prototyping and manufacturing in the wood and furniture industry. These include different CNC machines and the connected technologies, automated finishing systems and additive technologies, such as 3D printing and laser cutting.

#### 3.1 Main Topics

- 4.0 Machinery
- CNC Routers
- Finishing systems
- Additive technologies

#### 3.2 Detailed Unit's structure

- Description of 3 axis/5 axis machines
- Description of finishing lines for flat panels and complex surfaces
- Description of the main finishing products Description of Laser cutter technology
- Elements of 3D printing
- 4.0 machinery – Case studies

### LEARNING OUTCOMES

At the end of the Unit “4.0 Machinery” the learner should be able to :

- Recognize the importance of machinery in the wood and furniture industry
- Recognize the importance of automation in the wood and furniture industry
- Recognize the importance of automated finishing lines
- Identify the most important finishing products used in furniture manufacturing
- Recognize the benefits of using additional technologies in the wood and furniture industry
- Have an understanding of the practical uses of 3D printing in the furniture industry



## 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 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 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

On completion of the learning unit, students must complete a **multiple-choice self-assessment** in order to obtain a completion **certificate and digital badge**. A minimum **result of 75%** is required to pass the Learning Unit.



## Learning Unit 4 –Manufacturing Management (0,2 ECVET Points)

In this learning unit students will learn about Manufacturing Management approach and about the technologies and methods used in manufacturing the products. The objective is to present the new different organizational, management and production models implemented by using integrated technological tools that are renewing the business models.

### 4.1 Main Topics

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

### 4.2 Detailed Unit's structure

- Project Management principles
- Lean Manufacturing principles
- Operation Management
- Quality and standard of the products
- Enterprise resource planning and related systems (ERP)
- Product Lifecycle Management
- Cybersecurity
- Cloud Computing
- Internet of Things
- Manufacturing management: Case studies



## LEARNING OUTCOMES

At the end of the Unit “Manufacturing Management” the learner should be able to:

- Describe the main typical management practices to support optimization of processes
- Define the main principles of total quality management and the methods and tools used
- Define the technical standards for quality and safety of the product
- Define the main technologies and software used in Manufacturing Management
- Understand the application of ERP system in a real SME
- Recognize the main advantages and obstacles of the implementation of a data management system in a real context

## 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

On completion of the learning unit, students must complete a **multiple-choice self-assessment** in order to obtain a completion **certificate and digital badge**. A minimum **result of 75%** is required to pass the Learning Unit.



## Learning Unit 5 – Circular Economy (0,2 ECVET Points)

In this learning unit, students will learn about the concept of the circular economy as a new and more sustainable model of manufacturing. Students are also introduced to ecodesign and sustainable materials and how they can be used to improve innovation and help companies transition to more circular manufacturing practices.

### 5.1 Main Topics

- Introduction to Circular Economy
- Eco-design (design for re-use, repair, remanufacture, end of life and durability)
- Sustainable and eco-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)
- Life Cycle Analysis
- Ethical procurement
- Ecodesign approaches: Case Studies

### LEARNING OUTCOMES

At the end of the Unit “Circular Economy and Eco-design” the learner should be able to :

- Understand the principles of the circular economy and why there is a need for it
- Describe how circular economy relates to the design and production of modern furniture
- Understand the principles of ecodesign and why it is needed for a circular economy
- Know how ecodesign relates to the reduction of the environmental impact of products in their complete life cycle
- Understand the principles of sustainable materials as an ecodesign approach



- Knowing how the use of sustainable materials can reduce the environmental impact of products in their complete life cycle
- Understand the real application of ecodesign in the furniture sector
- Know how this real application could bring competitive advantage to the companies, by reducing the environmental impact of their products/services

#### 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

##### COMPETENCES

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

On completion of the learning unit, students must complete a **multiple-choice self-assessment** in order to obtain a completion **certificate and digital badge**. A minimum **result of 75%** is required to pass the Learning Unit.



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