# IN4WOOD

# Industry 4.0 for Wood and Furniture Manufacturers

# Deliverable 2.1.: Training Path and Learning Content Version 1

Lead Beneficiary: CETEM Approved by: All Consortium Dissemination Level: Public

# Partners

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## Table of Track Changes

Version	Date	Changes
1	31 <sup>st</sup> January 2018	First version of the document



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# 1. Executive summary

#### Background

Many observers believe that Europe is at the beginning of a new industrial revolution, considered to be the fourth such leap forward and hence labelled Industry 4.0. The ubiquitous use of sensors, the expansion of wireless communication and networks, the deployment of increasingly intelligent robots and machines (as well as increased computing power at lower cost and the development of 'big data' analytics) has the potential to transform the way goods are manufactured in Europe.

This new, digital industrial revolution holds the promise of increased flexibility in manufacturing, mass customization, increased speed, better quality and improved productivity. However, to capture these benefits, enterprises will need to invest in equipment, information and communication technologies (ICTs) and data analysis as well as the integration of data flows throughout the global value chain.

The EU supports industrial change through its industrial policy and through research and infrastructure funding. Member States are also sponsoring national initiatives such as *Industrie 4.0* in Germany, "*Industria conectada 4.0*" in Spain, the *Factory of the Future* in France and Italy, and Catapult centres in the UK. However, **challenges like training** workers and future professionals **remain**.

One quarter of the world's furniture is produced in the EU. In 2012, more than 900.000 EU workers were employed in approximately 126.000 firms, and production amounted to more than &84 Billion<sup>1</sup>. However, these figures are 13% lower than in 2007, while the Asian market has increased its production a 230% during the same period<sup>2</sup>. In this context, the implementation and transference of the state of the art technologies in the production chain is a crucial point for the European Furniture and Woodworking industries to remain competitive, coupled with the fact that Staff qualifications, along with the ageing workforce and the inability to attract young workers<sup>3</sup> remain one of the crucial points in these industries. To boost the recruitment of highly prepared staff requires initiatives addressing training to make the sector attractive and to transform both the academic knowledge and high-level basic and transversal competences to be useful and applicable.

The furniture and wood sector has identified that it has a shortage of professionals with high qualification in ICTs and other emerging technologies. Some of the specific skills and competencies that stand out as critical for managers in the furniture sector are ICTs skills that are crucial to operate in a modern business environment.<sup>4</sup>



<sup>&</sup>lt;sup>1</sup> (Eurostat SBS Eurostat, (sbs\_na\_ind\_r2).

<sup>&</sup>lt;sup>2</sup> CSIL processing data from official sources: Eurostat, UN, National Statistical Offices, National Furniture manufacturers associations.

<sup>&</sup>lt;sup>3</sup> EFIC (2012) Enhancing the competitiveness of the European Furniture Industry.

<sup>&</sup>lt;sup>4</sup> Investing in the Future of Jobs and Skills. Scenarios, implications and options in anticipation of future skills and knowledge needs. Sector Report. Furniture. European Commission, DG Employment, Social Affairs and Equal Opportunities.

This deliverable detail the learning content proposed by the VET providers of the IN4WOOD Skills Alliance for addressing the skills and competences mismatches of the identified target groups.

With the elements that comprise the learning content, a training path for each one of the target groups identified has been designed in terms of the necessary areas of knowledge and optimized to fit the variety of job profiles and their needs. With this, the second milestone of the In4Wood project, *Training path Designed*, has been achieved.

This will define the content of the Joint Curriculum and will set the main guidelines for development in WP3.

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# 2. Methodology

For the definition of training units and learning outcomes, it was followed the *Learning Outcomes approach*, considering the four main modules of the In4Wood content as Units of Learning Outcomes (here after Units).



Figure 1: Description of qualifications in terms of units of learning outcomes. Source: http://www.ecvet-toolkit.eu

An Unit is a part of a qualification comprising a set of Knowledge, Skill and Competence that are logically structured and can be evaluated and validated. While preparing the proposal, partners designed the four different In4Wood units, being independent from each other and avoiding redundancies among them.



Figure 2: In4Wood Units.

It is in Task 2.1 *Definition of Training Units and Learning Outcomes* when these units are broken down into learning outcomes. These learning outcomes are statements of what a learner knows, understands and is able to do on completion of a learning process. The definition of learning outcomes has been carried out in such a way that:





- All skills and competences needs identified in WP1 have been reflected. •
- No unnecessary training is included. •

Each partner has focused on the definition of the units that are closely related to their expertise and have provided feedback to others, creating a collaborative environment. Breaking down the main units into smaller and more manageable training sub-units and sections.

Digital and Physic World Hybridising	Telecommunications and Data	Management Systems	Standard Certifications and Legal Issues
•KIT •UPCT •CSM •SSSA	•INDRA •UPCT	•CETEM •ION	•UPCT •CETEM

Figure 3: Leaders and contributors of In4Wood units.

Each unit was fully described following ECVET recommendations, such descriptions are fully detailed in D2.2 Common Curriculum Proposal.

The training path procedure defines and analyses the necessary areas of knowledge and pedagogical approaches to address the specific needs of the different target groups of the In4Wood didactic content. Considered as the chosen route taken by a learner through a range of (commonly) elearning activities, it allows users to build their knowledge progressively. For their development, the most suitable sub-units sections have been interconnected for each target group, ensuring that all target groups needs are satisfied and that that no unnecessary training is received.



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# 3. Definition of Training Units.

The results from the definition of skills needs<sup>5</sup> evidenced the consistency of the learning branches and helped to break down such units into smaller and more manageable sub-units. Such sub-units, were also broken down into different sections. This approach allows a better tailored training path and avoids unnecessary training for each one of the target groups.



Figure 4: In4Wood's learning Units.

Coordinated by CETEM, the most suitable sub-units and their related sections were defined. Figure 3 shows the leaders and collaborators of each one of the In4Wood's units. Annex 1 shows the defined sub-units and sections for each one of the units, while Annex 2 shows an inter relation of the key findings from the previous skills needs analysis and the selected units.

# 4. Definition of the didactic materials

In4Wood consortium commonly agreed that the best and most promising way of applying Training curriculum to the Target Users is through an Online basis, which means that all of the forthcoming presented Module are going to be in this way.

The main part of the In4wood didactic content will be released through the video pills, however, further additional content will be delivered that will support the different sub-units and that will be available through the learning platform, they will be mainly text, slides and tests. The common curriculum proposal released in D2.2 details the selected training format and specifies the minimum knowledge requirements for each unit:

- Practice works, to be developed at the different units, where students will have to do some research, analysis, practices etc., in a specific subject.
- Multiple choice questionnaires.
- The development of a Student Project where learners will have the chance of proposing solutions for transforming traditional Furniture and Woodworking industries into smart. Such student will be monitored and evaluated by the developers of the didactic content.

# 5. Assessment of the learning outcomes.

The assessment methodology will comprise three different tools with which the learner will be able to assess their knowledge, skills and competences acquired all along the learning process:

<sup>&</sup>lt;sup>5</sup> See Deliverable D1.2 "Report of the need of the furniture industry regarding I4.0 KETs".



# 6. Design and organization of training paths.

During the proposal preparation stage, the In4Wood alliance defined six well differentiated target users of the In4Wood didactic programme.



Figure 5: In4Wood's target users.

This point details the profile of each different user.

#### CEOs from Furniture and Woodworking companies.

Persons engaged in the managerial part of these industries, mainly SMEs, in charge of overseeing and supervising the activities and employees. Small businesses rely on the CEO to keep workers aligned with the goals of the company. In Larger Enterprises, CEOs report to top executives, but in case of SMEs, the CEO might either own the company or report directly to the owner.

In furniture and Woodworking SMEs, CEOs oversee whether the day-to-day operations of the whole company or an individual department, such as marketing, sales or production.

No specific occupations for CEOs for furniture and woodworking industries have been identified when preparing this document, however it was identified a general occupation: *Chief Executive Officer*<sup>6</sup>.

#### Production Managers from Furniture and Woodworking industries.

The responsibilities of the production managers from the targeted industries depend on the size of such industries. For the case of medium and large enterprises, the production managers monitor and supervise the entire production process to ensure that appropriate working practices are followed and the production needs of the company and customers are met, controlling all production steps and being responsible for compliance, regulations and targets.

<sup>&</sup>lt;sup>6</sup> http://data.europa.eu/esco/occupation/6c3fd65e-2d24-47d8-bc22-9e93512bdcc2





However, for the case of small and family businesses, the production managers are in charge of further activities related to planning, warehousing, maintenance and/or customer support.

The ESCO occupation *Wood Factory Manager*<sup>7</sup> was the only specific occupation identified during the preparation of the present document that covers the profile of the production manager of the targeted industries. The ESCO occupation *Manufacturing Manager*<sup>8</sup> was also identified as general occupation for this target group.

#### **VET students**

A VET student is someone who is enrolled in a degree-granting program (either undergraduate or graduate) at an institution of higher learning and registered full-time or partly (VET) leading to skills and competences to be further developed in a specific workplace. VET students identified as target users of the In4Wood content are those involved in educational programmes linked with whether the furniture and woodworking sectors, or with ICT.

#### **HE students**

Students enrolled in EQF6-7 degrees programmes addressing subjects such as production, engineering, industrial planning or ICT.

After the definition of the sub units and sections from each learning branch, Unit leaders and participant partners selected the most suitable sections for each target users.

Partners worked closely at the implementation of the Training paths, having a fluent communication through email, slack, conference meeting and during the 2<sup>nd</sup> and 3<sup>rd</sup> consortium meeting held in April and November 2017 respectively. As result, 6 different training paths has been defined. Annexes, 3, 4, 5, 6, 7 and 8 details the training paths for the target users define

<sup>&</sup>lt;sup>8</sup> http://data.europa.eu/esco/occupation/6426ada1-4d8c-4612-99e3-91bc569805ee



<sup>&</sup>lt;sup>7</sup> http://data.europa.eu/esco/occupation/b633af32-c8c0-4481-9971-7932ea4b16b5

Annex 1: In4Wood Training Content.

Title of the Unit:	Digital and Physic World Hybridising		
Sub Units	Sections		
3d Printing and Additive Manufacturing for Furniture Manufacturing.	Introduction to 3D printing and Additive Manufacturing Application of 3D printing in the Furniture sector Commercial Aspects	What is 3D printing?A brief description of 3D printing.Main materials for 3D printingWorkflow: How 3d printing works?Production process in 3D printingA brief description of the main software used in 3D printingDesign and PrototypingMolds for Prototyping and final productsFinal products. Batches if size 1 up to X	
Augmented Reality and Intelligent Tools that may be Used During the Design and Fabrication of the Product.	Introduction to Augmented Reality Application of the Augmented Reality during the design and fabrication stage of the product. Augmented Reality in	What is Augmented Reality?         Differences between AR and Virtual Reality         Workflow: How AR works?         A Brief Description of some software used in AR         Design and prototyping         Production process         Picking         Maintenance         Training for Workers	
Examples of Performance Activities Developed in BLM department or Dissemination.	the Commercial Market Example 1 Example 2 Example 3  Example n		
	Introduction	Definition Context in the Industry/Companies	



Title of the Unit:	Digital and Physic World Hybridising		
Sub Units	Sections		
	Main Characteristics		
		Smart Sensors	
		SCADA	
	Types	Wireless Sensors & Networks	
	Types	MEMS/Nano sensors	
Sensors and		Energy Harvesting	
Wearables		Summary of types of sensors and wearables	
	Use Cases		
	Business Success		
	stories		
	Future of Sensors and		
	Wearables in Industry		
	Introduction	Design principles for I4.0	
		Introduction to Cyber Physical Systems	
		From Industrial robotics to collaborative robotics	
Debatter endtedete	Definitions and	Robotics and Artificial Intelligence	
Robotics applied to	Conconto	Embedded systems	
furniture production at		Internet of Intelligent Robotics Things	
the different		Cloud Robotics	
production stages		Examples and case studies	
	Use cases	Applications in furniture manufactures	
		Business models	
	Practical exercises	Robotic Operating System (ROS)	
		Cloud platforms (Azure, Amazon,??)	
Simulation, modelling	Introduction	Main objectives and focus of virtualization in the furniture/interiors sector	
		Why? Enhancement of market competitiveness thanks to the correct use of tools	
and virtualization in	Main Concepts	Approach to simulation, modelling, render and virtualization	
the design, virtual		Panorama of existing tools, technologies and software	
_		How to select the most appropriate tool for specific purposes	



Title of the Unit:	Digital and Physic World Hybridising			
Sub Units	Sections			
catalogues, 3D scanning.	Examples and good practices	Case studies: focus on furniture/interiors SMEs		
Scanning.		Preview and introduction (general notions about display windows, views, use of standard navigation methods, selection methods, grouping, setting up unit of measurement)		
	Practical exercises:	Transformation commands		
	3DS MAX	Creation of primitive and composite objects		
		Edit Commands and modifiers		
		Importing files with other extensions		
		Main Features of the Corona Renderer module (introduction to the Photography and light behavior in reality and within the render engine, set up of Corona as default rendering engine of 3ds Max)		
		Materials, "Material Editor". Set a standard material (Corona Mtl), how to apply the texture on the material (UV and Tiling)		
		Settings, "Render Setup" windows. Workflow optimization		
	Practical exercises: CORONA RENDERER	Set reflections and refractions, adjust the distribution of light on the surface through Glossiness, Bump effect and its uses		
		Concepts of lighting technology (creation and alteration of lights (Corona light), uses and Color temperature properties, creation of photographic setups for "Still Life" of objects of design (with Limbo Fotografico), import of files containing lighting information IES		
		Camera placement (creation and editing of Standard Camera or Corona Camera, add camera's effects such as field blur (DOF) in post- production		



Title of the Unit:	Telecommunications and data		
Sub Units	Jnits Sections		
		What is IoT?	
		Related Concepts	
	Introduction to I.o.T	How does IoT work?	
		Application of IoT	
		Commercial Aspects	
		Concerns (privacy, security, health, etc.)	
		Architecture	
	Features of IoT	Intelligence	
	Features of 101	Automation	
		Design	
		The Cloud	
	Tachnologies of lot	Wired and wireless networks	
	Technologies of IoT	Cyber-physical systems	
had a mark of This an		Technological Standards	
Internet of Things	Technologies related to IoT	Computational Semantics	
		Rule Engines	
		Big data and Analytics	
	IoT framework: SOFIA2 Can you build your own IoT environment?	The SOFIA2 environment	
		Defining your architecture	
		The SOFIA2 Console	
		Connecting to the SIB	
		Creating your own KP	
		The information producer	
		Rule definition	
		Test 1: Set up the server	
		Test 2: Build the clients	
		Test 3: Connectivity	
		Test 4: Intelligence	
		Conclusions	
		Complexity theory	
	Theoretical aspects	Networks in complex systems	
Integrated Systems		Legacy and path dependency	
-		Convergence and divergence	
		Synergy, adaptation and evolution	



Title of the Unit:	Telecommunications and data		
Sub Units	Sections		
		The service economy	
		Service-oriented architecture	
	Architecture	Event-oriented architecture	
		Modularity and self-organization	
		System ecology	
		Middleware for distributed applications	
	Implementation	Integration topologies	
		Integration challenges	
		Big data fundaments	
	Big data theory	Big data platform	
	big data theory	Big data methodology	
		Use cases and added value	
	Big data technologies	Big data technologies I	
		Big data technologies II	
Big Data & Analytics		Data access	
	Using big data	Administration and data structures	
		Advanced programming	
	Analytics	Analytics fundaments	
		Patterns, relationships and predictive modeling	
		Data manipulation and machine learning	
		Analytics technologies	
	Introduction	Definition	
		Context in the Industry/Companies	
		Main Characteristics	
		Infrastrucure as a Service (IaaS)	
	Models of Cloud	Platform as a Service (PaaS)	
	Computing	Software as a Service (SaaS)	
Cloud Computing		Emerging models	
		Summary of CC models	
	Deployment models	Public	
		Private	
		Hybrid	
		Community	
		Summary of deployment models	



Title of the Unit:	Telecommunications and data		
Sub Units	Sections		
		Advantages and disadvantages of Cloud Computing	
		Business success stories	
		Future of Cloud Computing in Industry	
	Introduction	Definition	
	Introduction	Context in the Industry/Companies	
	La desetada l	Body Area Networks (BAN): NFC, Bluetooth Low Energy, Bluetooth 4.0	
	Industrial Communication	Personal Area Networks (PAN): Bluetooth, Zigbee.	
	networks (description	Local Area Networks (LAN): Ethernet, Industrial Ethernet, Rofbus, Profinet, M-Bus	
	and examples)	Wide Area Networks (WAN): GPRS, UMTS, LTE.	
	and examples)	Summary of Industrial communication networks	
		OPC UA	
Communication Networks	Industrial	Power Link	
	Communication	Open Safety	
	Standards	TCP/IP	
		Summary of Industrial communication standards	
	Use Cases		
	Business Success Stories		
	Future of		
	Communication		
	Networks in Industry.		
	Introduction	Definition	
	Introduction	Context in the Industry/Companies	
		User & Password	
		Fingerprint	
	Turper	Face Recognition	
Cubor Socurity	Types	Cryptography	
Cyber-Security		Federation	
		Summary of cyber-security strategies	
	Evaluation	Pentesting (Penetration testing	
	Use Cases		
	Business Success Stories		
	Future of Cyber-Security		



Title of the Unit:	Management Systems		
Sub Units	Sections	Sections	
		Introduction	
		Warehouse Activities	
		Factors that influence the effective use of warehouses	
	Warehouse	Types of Warehouse	
	management systems	Design and Distribution in Plant	
		Definition and Characteristics SGA	
		Relationship of the SGA with the Value Chain	
		Recommendations SGA Implementation	
		Introduction	
		Types of Inventories	
		Types of Demands	
		Inventory Cost	
	Inventory management	FIFO and LIFO	
Applications of Logistics	and DRP (Distribution Resource Planning)	ABC Classification	
		DRP Definition	
		DRP Relationship with the Value Chain	
		DRP Techniques	
		DRP Safety Inventory	
	Table of Board of KPIs (Key Performance Indicators)	Introduction	
		KPI Types	
		Characteristics, how they must be	
		KPI Incidence in Continuous Improvement	
		Implementation and Follow-up Industry Furniture	
	Data capture systems for plant processes control	Definitions	
		Types of RFID	
	(RFID: Radio Frequency	How does it work?	
	Identification,)	Uses and Implementation Industry Furniture	
		Strategic Planning	
	APP (Aggregate Production Planning) and Capacity control and Capacity Requirement Planning		
Workflow Management		Production Planning	
Systems		PAP Production Aggregate Plan: Definition, Characteristics and Application Example Industry Furniture	
		Capacity Requirement Planning: Definition, Characteristics and Application Example Industry Furniture	
		Tactical Planning	
<u> </u>			



# Title of the Unit: Management Systems

Sub Units	Sections	
	MPS (Master Production Schedule) and MRP II (Manufacturing	Master Production Plan: Definition, Characteristics and Example of Application
	Resource Planning)	Material Requirement Plan: Definition, Characteristics and Example of Application
	ERP (Enterprise Resource	Definition and Characteristics Types of ERP
	Planning)	Uses and Implementation Industry Furniture
	Lean Manufacturing	Introduction
	(workflow and improvement of manufacturing	Basic Lean Tools Advanced Lean Tools
	operations)	Examples Application Industry Furniture
	B2B (Business to Business) B2C (Business to	Identification of partners current mechanisms for B2B, B2C and to enable C2C communication.
	Consumer)	Research into best practice and most successful cost-effective options for B2B, B2C and C2C communication.
	C2C (Consumer to Consumer)	Recommendation of possible Platforms along with aggregation recommendations to include data from current partners' approaches
		Identification of partners current mechanisms for U2B communication.
Collaborative platforms	U2B (University to Business)	Research into best practice and most successful cost-effective options for U2B communication. Recommendation of possible Platforms along with aggregation recommendations to include data from current partners' approaches
	U2S (University to Student)	Identification of partners current mechanisms for U2S and to enable S2S communication.
	S2S (Student to Student)	Research into best practice and most successful cost-effective options for U2S and S2S communication. Recommendation of possible Platforms along with aggregation recommendations to include data from current partners' approaches

# Title of the Unit:Standards, certifications and legal issues

Sub Units	Sections				
Introduction to	Definition				
standardization	Context in the industry/companies				
	Why is standardization is an important issue?				
State of art/challenges in standa	ardization in I4.0				
Consortiums and	IEC/ISO				
organisations	IETF/W3C				
	DKE/DIN				
	ETSI/CENELEC/CEN				
	Summary of consortiums and organisations				
Working Group Committees	CyberSecurity, industrial networks				
	Automation Systems and Integration				
	Robots and Robotic devices				
	Sensor Networks				
	Internet of Things				
	Big Data				
	Cloud Computing and Distributed Platforms				
Summary of working group committees					
Standards focused on Wood and	d Furniture Sector				
How to apply standards to facto	ries interested in Industry 4.0				
Legal issues in Industry 4.0					



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Annex 2: Interrelation of the Key Findings from the Skill Needs Analysis and the Selected Units.

		blen	ning p ded le uld be	arnin	g form	nula					
Unit	Sub-Unit	Additive Manufacturing	Augmented Reality	Systems Integration	Internet of Things	Robotics	companies in Germany are much more focused on the application of KETs in the production process with attention to automation and robotics	SMEs in UK and Spain have a higher focus on the entire manufacturing process including logistics and delivery	SMEs in Italy are concentrated on the application of KETs to other processes (marketing, sales and after sales) than the production one.	Results evidence a lack of digital business strategy among furniture industries, specially SMEs, showing also a poor involvement in the IoT and in the use of cloud solutions.	The biggest barrier for the implementation of 14.0 in all these contexts is the lack of knowledge and skills among staff, along with an insufficient training and the high costs of said technologies.
sing	3d Printing and Additive Manufacturing for Furniture Manufacturing.										
Digital and Physic World Hybridising	Augmented Reality and Intelligent Tools that may be Used During the Design and Fabrication of the Product										
ic World	Examples of Performance Activities Developed in BLM department or Dissemination.										
hys	Sensors and wearables										
al and P	Robotics applied to furniture production at the different productions stages						/				
Digit	Simulation, modelling and virtualization in the design, virtual catalogues, 3D scanning.										
.0	Internet of Things										
cat	Integrated Systems										
Telecommunications and data	Big Data & Analytics										
s an	Cloud Computing										
ni	Communication Networks										
F	Cyber-Security										

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Annex 2: Interrelation of the Key Findings from the Skill Needs Analysis and the Selected Units.

		Training programs with a blended learning formula should be focused on									
Unit	Sub-Unit	Additive Manufacturing	Augmented Reality	Systems Integration	Internet of Things	Robotics	companies in Germany are much more focused on the application of KETs in the production process with attention to automation and robotics	SMEs in UK and Spain have a higher focus on the entire manufacturing process including logistics and delivery	SMEs in Italy are concentrated on the application of KETs to other processes (marketing, sales and after sales) than the production one.	Results evidence a lack of digital business strategy among furniture industries, specially SMEs, showing also a poor involvement in the IoT and in the use of cloud solutions.	The biggest barrier for the implementation of 14.0 in all these contexts is the lack of knowledge and skills among staff, along with an insufficient training and the high costs of said technologies.
ut	Application of Logistics										
<b>Management</b> Systems	Workflow Management Systems										
Man Sy	Collaborative platforms										
and	Introduction, state of the Art and challenges in Standardizations										
tions	Consortiums and organisations										
fica	Working Group Committees						/				
s, certi egal is	Standards focused on Wood and Furniture Sector										
Standards, certifications legal issues	How to apply standards to factories interested in Industry 4.0										
St	Legal issues in Industry 4.0										

Deliverable 2.1.: Training Path and Learning Content.

Annex 3: In4Wood Training Path for VET Students of Furniture and Woodworking related programmes.

#### **Title of the Unit: Digital and Physic World Hybridising Sub Units** Sections What is 3D printing? A brief description of 3D printing. Introduction 3d Printing and Additive Main materials for 3D printing to 3D printing Manufacturing for and Additive Workflow: How 3d printing works? Furniture Manufacturing. Manufacturing Production process in 3D printing A brief description of the main software used in 3D printing Augmented Reality and What is Augmented Reality? Intelligent Tools that may Introduction Differences between AR and Virtual Reality be Used During the Design to Augmented Workflow: How AR works? and Fabrication of the Reality A Brief Description of some software used in AR Product. Example 1 **Examples of Performance** Example 2 Activities Developed in Example 3 BLM department or Dissemination. Example n Definition Introduction Context in the Industry/Companies Sensors and Wearables **Business Success stories** Future of Sensors and Wearables in Industry Design principles for I4.0 Robotics applied to Introduction Introduction to Cyber Physical Systems furniture production at the different production Examples and case studies Use cases stages Applications in furniture manufactures Main objectives and focus of virtualization in the furniture/interiors sector Introduction Why? Enhancement of market competitiveness thanks to the correct use of tools Approach to simulation, modelling, render and virtualization Main Panorama of existing tools, technologies and software Concepts How to select the most appropriate tool for specific purposes Examples and Case studies: focus on furniture/interiors SMEs good practices Preview and introduction (general notions about display windows, views, use of standard navigation methods, selection methods, grouping, setting up unit of measurement...) Practical Transformation commands exercises: 3DS Creation of primitive and composite objects MAX Edit Commands and modifiers Simulation, modelling and Importing files with other extensions virtualization in the design, virtual catalogues, Main Features of the Corona Renderer module (introduction to the Photography and light behavior in reality and within the render engine, set up of Corona as default rendering engine 3D scanning. of 3ds Max) Materials, "Material Editor". Set a standard material (Corona Mtl), how to apply the texture on the material (UV and Tiling) Practical Settings, "Render Setup" windows. Workflow optimization exercises: Set reflections and refractions, adjust the distribution of light on the surface through CORONA Glossiness, Bump effect and its uses RENDERER Concepts of lighting technology (creation and alteration of lights (Corona light), uses and Color temperature properties, creation of photographic setups for "Still Life" of objects of design (with Limbo Fotografico), import of files containing lighting information IES Camera placement (creation and editing of Standard Camera or Corona Camera, add camera's effects such as field blur (DOF) in post- production



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Deliverable 2.1.: Training Path and Learning Content.

Annex 3: In4Wood Training Path for VET Students of Furniture and Woodworking related programmes.

#### **Title of the Unit: Telecommunications and data Sub Units Sections** What is IoT? **Related Concepts** How does IoT work? Introduction to I.o.T Application of IoT Commercial Aspects Concerns (privacy, security, health, etc.) Architecture Intelligence Features of IoT Automation Design The Cloud Wired and wireless networks Technologies of IoT Cyber-physical systems **Technological Standards** Internet of Things **Computational Semantics** Technologies related **Rule Engines** to IoT Big data and Analytics The SOFIA2 environment Defining your architecture The SOFIA2 Console IoT framework: Connecting to the SIB SOFIA2 Creating your own KP The information producer Rule definition Test 1: Set up the server Test 2: Build the clients Can you build your Test 3: Connectivity own loT environment? Test 4: Intelligence Conclusions Complexity theory Networks in complex systems Theoretical aspects Legacy and path dependency Convergence and divergence Synergy, adaptation and evolution The service economy Service-oriented architecture **Integrated Systems** Architecture **Event-oriented architecture** Modularity and self-organization System ecology Middleware for distributed applications Implementation Integration topologies Integration challenges Big data fundaments Big data platform Big data theory Big data methodology Use cases and added value Big data technologies I Big data technologies Big data technologies II **Big Data & Analytics** Data access Administration and data structures Using big data Advanced programming Analytics fundaments Patterns, relationships and predictive modeling Analytics Data manipulation and machine learning Analytics technologies

lics technologies





Deliverable 2.1.: Training Path and Learning Content.

Annex 3: In4Wood Training Path for VET Students of Furniture and Woodworking related programmes.

# Title of the Unit: Telecommunications and data

Sub Units	Sections				
	Introduction	Definition			
	Introduction	Context in the Industry/Companies			
Cloud Computing		Advantages and disadvantages of Cloud Computing			
	Business success stories				
		Future of Cloud Computing in Industry			
	Introduction	Definition			
Communication Networks	Introduction	Context in the Industry/Companies			
communication networks		Business Success Stories			
		Future of Communication Networks in Industry.			
Cyber-Security	Internation	Definition			
	Introduction	Context in the Industry/Companies			
		Business Success Stories			
		Future of Cyber-Security			

Title of the Unit:	Management Systems				
Sub Units	Sections				
	Warehouse management systems	Introduction         Warehouse Activities         Factors that influence the effective use of warehouses         Types of Warehouse         Design and Distribution in Plant         Definition and Characteristics SGA         Relationship of the SGA with the Value Chain         Recommendations SGA Implementation			
Applications of Logistics	Inventory management and DRP (Distribution Resource Planning)	Introduction         Types of Inventories         Types of Demands         Inventory Cost         FIFO and LIFO         ABC Classification         DRP Definition         DRP Relationship with the Value Chain         DRP Techniques         DRP Safety Inventory			
	Table of Board of KPIs (Key Performance Indicators) Data capture systems	Introduction KPI Types Characteristics, how they must be KPI Incidence in Continuous Improvement Implementation and Follow-up Industry Furniture Definitions			
	for plant processes control (RFID: Radio Frequency Identification)	Types of RFID How does it work? Uses and Implementation Industry Furniture			
Workflow Management Systems	APP (Aggregate Production Planning) and Capacity control and Capacity Requirement Planning MPS (Master Production Schedule) and MRP II	Strategic Planning Production Planning PAP Production Aggregate Plan: Definition, Characteristics and Application Example Industry Furniture Capacity Requirement Planning: Definition, Characteristics and Application Example Industry Furniture Tactical Planning			

Deliverable 2.1.: Training Path and Learning Content.

Annex 3: In4Wood Training Path for VET Students of Furniture and Woodworking related programmes.

Title of the Unit:	Management Systems				
Sub Units	Sections				
	(Manufacturing	Master Production Plan: Definition, Characteristics and Example of Application			
	Resource Planning)	Material Requirement Plan: Definition, Characteristics and Example of Application			
	ERP (Enterprise	Definition and Characteristics			
	Resource Planning)	Types of ERP			
	Resource Flamming)	Uses and Implementation Industry Furniture			
	Lean Manufacturing	Introduction			
	(workflow and	Basic Lean Tools			
	improvement of manufacturing	Advanced Lean Tools			
	operations)	Examples Application Industry Furniture			
	U2B (University to	Recommendation of possible Platforms along with aggregation recommendations to			
	Business)	include data from current partners' approaches			
	U2S (University to	Identification of partners current mechanisms for U2S and to enable S2S			
Collaborative Platforms	Student)	communication.			
	S2S (Student to	Research into best practice and most successful cost-effective options for U2S and S2S			
	Student)	communication.			
	ctadenty	Recommendation of possible Platforms along with aggregation recommendations to			
		include data from current partners' approaches			

# Title of the Unit: Standards, certifications and legal issues

Sub Units	Sections					
Introduction to	Definition					
standardization	Context in the industry/companies					
	Why is standardization is an important issue?					
State of art/challenges in	State of art/challenges in standardization in I4.0					
Consortiums and organisations	Summary of consortiums and organisations					
Working Group Committees	Automation Systems and Integration					
Robots and Robotic devices						
Standards focused on Wood and Furniture Sector						
How to apply standards to factories interested in Industry 4.0						





Deliverable 2.1.: Training Path and Learning Content.

Annex 4: In4Wood Training Path for HE Students of Furniture and Woodworking related programmes.

# Title of the Unit: Digital and Physic World Hybridising

Sub Units	Sections					
		What is 3D printing?				
		A brief description of 3D printing.				
	Introduction to 3D	Main materials for 3D printing				
3d Printing and Additive	printing and Additive	Workflow: How 3d printing works?				
Manufacturing for	Manufacturing	Production process in 3D printing				
Furniture Manufacturing.		A brief description of the main software used in 3D printing				
C C	Application of 3D	Design and Prototyping				
	printing in the	Molds for Prototyping and final products				
	Furniture sector	Final products. Batches if size 1 up to X				
		What is Augmented Reality?				
	Introduction to	Differences between AR and Virtual Reality				
Augmented Reality and	Augmented Reality	Workflow: How AR works?				
Intelligent Tools that may		A Brief Description of some software used in AR				
be Used During the Design	Application of the	Design and prototyping				
and Fabrication of the	Augmented Reality	Production process				
Product.	during the design and	Picking				
	fabrication stage of	Maintenance				
	the product.	Training for Workers				
	Example 1					
Examples of Performance	Example 2					
Activities Developed in	Example 3					
BLM department or						
Dissemination.	 Example n					
		Definition				
	Introduction	Context in the Industry/Companies				
Sensors and Wearables	Business Success stories					
	Future of Sensors and Wearables in Industry					
	Future of Sensors and W	Design principles for I4.0				
	Introduction	Introduction to Cyber Physical Systems				
		From Industrial robotics to collaborative robotics				
		Robotics and Artificial Intelligence				
	Definitions and					
Robotics applied to	Concepts	Embedded systems				
furniture production at the		Internet of Intelligent Robotics Things				
different production stages		Cloud Robotics				
		Examples and case studies				
	Use cases	Applications in furniture manufactures				
		Business models				
	Practical exercises	Robotic Operating System (ROS)				
		Cloud platforms (Azure, Amazon,??)				
	Introduction	Main objectives and focus of virtualization in the furniture/interiors sector				
		Why? Enhancement of market competitiveness thanks to the correct use of tools				
		Approach to simulation, modelling, render and virtualization				
	Main Concepts	Panorama of existing tools, technologies and software				
Simulation, modelling and virtualization in the design, virtual catalogues, 3D scanning.		How to select the most appropriate tool for specific purposes				
	Examples and good practices	Case studies: focus on furniture/interiors SMEs				
		Preview and introduction (general notions about display windows, views, use of				
		standard navigation methods, selection methods, grouping, setting up unit of				
	Due attend averaging an	measurement)				
	Practical exercises:	Transformation commands				
		Transformation commanus				
	3DS MAX	Creation of primitive and composite objects				



Deliverable 2.1.: Training Path and Learning Content.

Annex 4: In4Wood Training Path for HE Students of Furniture and Woodworking related programmes.

Title of the Unit:	Digital and Physic World Hybridising				
Sub Units	Sections				
		Main Features of the Corona Renderer module (introduction to the Photography and light behavior in reality and within the render engine, set up of Corona as default rendering engine of 3ds Max)			
		Materials, "Material Editor". Set a standard material (Corona Mtl), how to apply the texture on the material (UV and Tiling)			
		Settings, "Render Setup" windows. Workflow optimization			
	Practical exercises: CORONA RENDERER	Set reflections and refractions, adjust the distribution of light on the surface through Glossiness, Bump effect and its uses			
		Concepts of lighting technology (creation and alteration of lights (Corona light), uses and Color temperature properties, creation of photographic setups for "Still Life" of objects of design (with Limbo Fotografico), import of files containing lighting information IES			
		Camera placement (creation and editing of Standard Camera or Corona Camera, add camera's effects such as field blur (DOF) in post- production			

Title of the Unit:	Telecommunications and data				
Sub Units	Sections				
		What is IoT?			
		Related Concepts			
	Introduction to I.o. T	How does IoT work?			
		Application of IoT			
		Commercial Aspects			
		Concerns (privacy, security, health, etc.)			
		Architecture			
	Features of IoT	Intelligence			
	reatures of for	Automation			
		Design			
		The Cloud			
	Technologies of let	Wired and wireless networks			
	Technologies of IoT	Cyber-physical systems			
laters at of This se		Technological Standards			
Internet of Things	Technologies related to IoT	Computational Semantics			
		Rule Engines			
		Big data and Analytics			
		The SOFIA2 environment			
		Defining your architecture			
	Let for an ender	The SOFIA2 Console			
	IoT framework:	Connecting to the SIB			
	SOFIA2	Creating your own KP			
		The information producer			
		Rule definition			
		Test 1: Set up the server			
	Can you build your	Test 2: Build the clients			
	own loT	Test 3: Connectivity			
	environment?	Test 4: Intelligence			
		Conclusions			
		Complexity theory			
		Networks in complex systems			
	Theoretical aspects	Legacy and path dependency			
Integrated Systems		Convergence and divergence			
		Synergy, adaptation and evolution			
		The service economy			
	Architecture	Service-oriented architecture			

Deliverable 2.1.: Training Path and Learning Content. Annex 4: In4Wood Training Path for HE Students of Furniture and Woodworking related programmes

#### **Title of the Unit: Telecommunications and data Sub Units Sections** Event-oriented architecture Modularity and self-organization System ecology Middleware for distributed applications Implementation Integration topologies Integration challenges Big data fundaments Big data platform Big data theory Big data methodology Use cases and added value Big data technologies I Big data technologies Big data technologies II Data access **Big Data & Analytics** Administration and data structures Using big data Advanced programming Analytics fundaments Patterns, relationships and predictive modeling Analytics Data manipulation and machine learning Analytics technologies Definition Introduction Context in the Industry/Companies **Cloud Computing** Advantages and disadvantages of Cloud Computing Business success stories Future of Cloud Computing in Industry Definition Introduction Context in the Industry/Companies **Communication Networks Business Success Stories** Future of Communication Networks in Industry. Definition Introduction Context in the Industry/Companies Cyber-Security **Business Success Stories** Future of Cyber-Security

Title of the Unit:	Management Systems			
Sub Units	Sections			
		Introduction		
		Warehouse Activities		
		Factors that influence the effective use of warehouses		
	Warehouse	Types of Warehouse		
	management systems	Design and Distribution in Plant		
		Definition and Characteristics SGA		
		Relationship of the SGA with the Value Chain		
		Recommendations SGA Implementation		
Applications of Logistics		Introduction		
		Types of Inventories		
	Inventory	Types of Demands		
	Inventory	Inventory Cost		
	management and DRP (Distribution Resource	FIFO and LIFO		
	•	ABC Classification		
	Planning)	DRP Definition		
		DRP Relationship with the Value Chain		
		DRP Techniques		



Deliverable 2.1.: Training Path and Learning Content.

Annex 4: In4Wood Training Path for HE Students of Furniture and Woodworking related programmes.

Title of the Unit:	Management Systems	
Sub Units	Sections	
		DRP Safety Inventory Introduction
	Table of Board of KPIs (Key Performance Indicators)	KPI Types         Characteristics, how must be         KPI Incidence in Continuous Improvement
	Data capture systems for plant processes control (RFID: Radio Frequency	Implementation and Follow-up Industry Furniture Definitions Types of RFID How does it work?
	Identification) APP (Aggregate Production Planning)	Uses and Implementation Industry Furniture Strategic Planning
Workflow Management Systems	and Capacity control and Capacity Requirement Planning MPS (Master Production Schedule) and MRP II (Manufacturing Resource Planning)	Production Planning PAP Production Aggregate Plan: Definition, Characteristics and Application Example Industry Furniture Capacity Requirement Planning: Definition, Characteristics and Application Example
		Industry Furniture Tactical Planning Master Production Plan: Definition, Characteristics and Example of Application Material Requirement Plan: Definition, Characteristics and Example of Application
	ERP (Enterprise Resource Planning)	Definition and Characteristics Types of ERP Uses and Implementation Industry Furniture
	Lean Manufacturing (workflow and improvement of	Introduction Basic Lean Tools Advanced Lean Tools
	manufacturing operations)	Advanced Lean Tools Examples Application Industry Furniture Descent into host most and most successful cost offective estimation for U2D
Collaborative Platforms	U2B (University to Business)	Research into best practice and most successful cost-effective options for U2B communication. Recommendation of possible Platforms along with aggregation recommendations to include data from current partners' approaches
	U2S (University to Student) S2S (Student to Student)	Identification of partners current mechanisms for U2S and to enable S2S communication. Research into best practice and most successful cost-effective options for U2S and S2S communication.
		Recommendation of possible Platforms along with aggregation recommendations to include data from current partners' approaches

Title of the Unit:	Standards, certifications and legal issues		
Sub Units	Sections		
Introduction to	Definition		
standardization	Context in the industry/companies		
	Why is standardization is an important issue?		
State of art/challenges in sta	andardization in I4.0		
Consortiums and	Summary of consortiums and organisations		
organisations			
Working Group	Automation Systems and Integration		
Committees			
	Robots and Robotic devices		
Standards focused on Wood and Furniture Sector			



Deliverable 2.1.: Training Path and Learning Content. Annex 4: In4Wood Training Path for HE Students of Furniture and Woodworking related programmes.

#### Title of the Unit: Standards, certifications and legal issues

Sections **Sub Units** 

How to apply standards to factories interested in Industry 4.0



Deliverable 2.1.: Training Path and Learning Content. Annex 5: In4Wood Training Path for CEOs from furniture and woodworking industries.

# Title of the Unit: Digital and Physic World Hybridising

Sub Units	Sections	
	Introduction to 3D printing and Additive Manufacturing	What is 3D printing?
		A brief description of 3D printing.
3d Printing and Additive Manufacturing for		Main materials for 3D printing
Furniture Manufacturing.		Workflow: How 3d printing works?
rama c Manaractaring.		Production process in 3D printing
	Commercial Aspects	
Augmented Reality and	Introduction to	What is Augmented Reality?
Intelligent Tools that may	Augmented Reality	Differences between AR and Virtual Reality
be Used During the Design		Workflow: How AR works?
and Fabrication of the Product.	Augmented Reality in th	ne Commercial Market
	Introduction	Definition
	Introduction	Context in the Industry/Companies
Sensors and	Main Characteristics	
Wearables	Types	Summary of types of sensors and wearables
wearables	Use Cases	
	Business Success stories	
	Future of Sensors and Wearables in Industry	
Robotics applied to	Introduction	Design principles for I4.0
furniture production		Introduction to Cyber Physical Systems
		Examples and case studies
at the different	Use cases	Applications in furniture manufactures
production stages		Business models
Circulation		Main objectives and focus of virtualization in the furniture/interiors sector
Simulation,	Introduction	Why? Enhancement of market competitiveness thanks to the correct use of
modelling and virtualization in the design, virtual catalogues, 3D scanning.		tools
	Main Concepts	Approach to simulation, modelling, render and virtualization
		Panorama of existing tools, technologies and software
		How to select the most appropriate tool for specific purposes
	Examples and good practices	Case studies: focus on furniture/interiors SMEs

# Title of the Unit: Telecommunications and data

Sub Units	Sections	
		What is IoT?
		Related Concepts
	Introduction to I.o.T	How does IoT work?
		Application of IoT
		Commercial Aspects
		Concerns (privacy, security, health, etc.)
	Features of IoT (Opt)	Architecture
Internet of Things		Intelligence
Internet of Things		Automation
		Design
		The Cloud
	Technologies of IoT	Wired and wireless networks
	recimologies of 101	Cyber-physical systems
		Technological Standards
	Technologies related to IoT	Computational Semantics
		Rule Engines
		Big data and Analytics

Deliverable 2.1.: Training Path and Learning Content. Annex 5: In4Wood Training Path for CEOs from furniture and woodworking industries.

# Title of the Unit: Telecommunications and data

Sub Units	Sections	
		Complexity theory
	Theoretical aspects	Networks in complex systems
		Legacy and path dependency
		Convergence and divergence
Integrated Systems		Synergy, adaptation and evolution
integrated Systems		The service economy
		Service-oriented architecture
	Architecture	Event-oriented architecture
		Modularity and self-organization
		System ecology
	Big data theory	Big data fundaments
	big data theory	Use cases and added value
	Big data technologies	Big data technologies I
Big Data & Analytics	Dig data technologies	Big data technologies II
		Patterns, relationships and predictive modeling
	Analytics	Data manipulation and machine learning
		Analytics technologies
	Introduction	Definition
	Introduction	Context in the Industry/Companies
		Main Characteristics
	Models of Cloud	Summary of CC models
Cloud Computing	Computing	
	Deployment Models	Summary of deployment models
		Advantages and disadvantages of Cloud Computing
		Business success stories
		Future of Cloud Computing in Industry
	Introduction	Definition
	Introduction	Context in the Industry/Companies
	Industrial	
	Communication	Summary of Industrial communication networks
	networks (description	Summary of muusinar communication networks
Communication Networks	and examples)	
communication Networks	Industrial	
	Communication	Summary of Industrial communication standards
	standards	
		Use Cases
		Business Success Stories
		Future of Communication Networks in Industry.
Cyber-Security	Introduction	Definition
		Context in the Industry/Companies
	Types	Summary of cyber-security strategies
	Evaluation	Pentesting (Penetration testing
		Use Cases
		Business Success Stories
		Future of Cyber-Security

Title of the Unit:	Management Systems	
Sub Units	Sections	
	Table of Board of KPIs (Key Performance Indicators)	Introduction KPI Types Characteristics, how they must be KPI Incidence in Continuous Improvement Implementation and Follow-up Industry Furniture



Deliverable 2.1.: Training Path and Learning Content. Annex 5: In4Wood Training Path for CEOs from furniture and woodworking industries.

Title of the Unit:	Management Systems	
Sub Units	Sections	
	APP (Aggregate Production Planning) and Capacity control and Capacity Requirement Planning	Strategic Planning
Workflow Management Systems	ERP (Enterprise Resource Planning)	Definition and Characteristics Types of ERP Uses and Implementation Industry Furniture
	Lean Manufacturing (workflow and improvement of manufacturing operations)	Introduction Basic Lean Tools Advanced Lean Tools Examples Application Industry Furniture
Collaborative platforms	B2B (Business to Business) B2C (Business to	Identification of partners current mechanisms for B2B, B2C and to enable C2C communication. Research into best practice and most successful cost-effective options for B2B, B2C and
	Consumer) C2C (Consumer to Consumer)	C2C communication. Recommendation of possible Platforms along with aggregation recommendations to include data from current partners' approaches
	U2B (University to Business)	Identification of partners current mechanisms for U2B communication. Research into best practice and most successful cost-effective options for U2B communication. Recommendation of possible Platforms along with aggregation recommendations to include data from current partners' approaches

# Title of the Unit: Standards, certifications and legal issues

Sub Units	Sections	
Introduction to	Definition	
standardization	Context in the industry/companies	
	Why is standardization is an important issue?	
State of art/challenges in standardization in I4.0		
Consortia and	Summary of consortiums and organisations	
Organisations		
Working Group	Summary of working group committees	
Committees		
Standards focused on Wood and Furniture Sector		
How to apply standards to factories interested in Industry 4.0		
Legal issues in Industry 4.0		







Deliverable 2.1.: Training Path and Learning Content.

Annex 6: In4Wood Training Path for Production Managers from furniture and woodworking industries.

Title of the Unit:	Digital and Physic World Hybridising	
Sub Units	Sections	
3d Printing and	Introduction to 3D printing and Additive	What is 3D printing?         A brief description of 3D printing.         Main materials for 3D printing
Additive Manufacturing for Furniture	Manufacturing Application of 3D	Workflow: How 3d printing works? Production process in 3D printing Design and Prototyping
Manufacturing.	printing in the Furniture sector Commercial Aspects	Molds for Prototyping and final products Final products. Batches if size 1 up to X
Augmented Reality	Introduction to Augmented Reality	What is Augmented Reality?         Differences between AR and Virtual Reality         Workflow: How AR works?
and Intelligent Tools that may be Used	Application of the Augmented Reality during the design	Design and prototyping Production process Picking
During the Design and Fabrication of the Product.	and fabrication stage of the product.	Maintenance Training for Workers
	Augmented Reality in the Commercial Market	
	Introduction	Definition Context in the Industry/Companies
Sensors and Wearables	Main Characteristics Types Use Cases	Summary of types of sensors and wearables
	Business Success stor	
Robotics applied to furniture production	Introduction	Wearables in Industry         Design principles for I4.0         Introduction to Cyber Physical Systems
at the different production stages	Use cases	Examples and case studies Applications in furniture manufactures Business models
	Introduction	Main objectives and focus of virtualization in the furniture/interiors sector Why? Enhancement of market competitiveness thanks to the correct use of tools
Simulation, modelling and virtualization in the design, virtual catalogues, 3D scanning.	Main Concepts	Approach to simulation, modelling, render and virtualizationPanorama of existing tools, technologies and softwareHow to select the most appropriate tool for specific purposes
	Examples and good practices	Case studies: focus on furniture/interiors SMEs
	Practical exercises:	Preview and introduction (general notions about display windows, views, use of standard navigation methods, selection methods, grouping, setting up unit of measurement) Transformation commands
	3DS MAX	Creation of primitive and composite objects Edit Commands and modifiers Importing files with other extensions

Deliverable 2.1.: Training Path and Learning Content.

Annex 6: In4Wood Training Path for Production Managers from furniture and woodworking industries.

Title of the Unit:	Digital and Physic World Hybridising	
Sub Units	Sections	
	Practical exercises: CORONA RENDERER	Main Features of the Corona Renderer module (introduction to the Photography and light behavior in reality and within the render engine, set up of Corona as default rendering engine of 3ds Max) Materials, "Material Editor". Set a standard material (Corona Mtl), how to apply the texture on the material (UV and Tiling) Settings, "Render Setup" windows. Workflow optimization Set reflections and refractions, adjust the distribution of light on the surface through Glossiness, Bump effect and its uses Concepts of lighting technology (creation and alteration of lights (Corona light), uses and Color temperature properties, creation of photographic setups for "Still Life" of objects of design (with Limbo Fotografico), import of files containing lighting information IES Camera placement (creation and editing of Standard Camera or Corona Camera, add camera's effects such as field blur (DOF) in post- production



**LIN4WOOD** Industry 4.0 for Wood and Furniture Manufacturers Deliverable 2.1.: Training Path and Learning Content.

Annex 6: In4Wood Training Path for Production Managers from furniture and woodworking industries.

# Title of the Unit: Telecommunications and data

Sub Units	Sections	
		What is IoT?
		Related Concepts
	later do attende to to T	How does IoT work?
	Introduction to I.o.T	Application of IoT
		Commercial Aspects
		Concerns (privacy, security, health, etc.)
		Architecture
		Intelligence
	Features of IoT	Automation
		Design
		Computational Semantics
	Technologies related	Rule Engines
Internet of Things	to loT	Big data and Analytics
		The SOFIA2 environment
		Defining your architecture
		The SOFIA2 Console
	IoT framework:	Connecting to the SIB
	SOFIA2 (opt.)	Creating your own KP
		The information producer
		Rule definition
		Test 1: Set up the server
	Can you build your	Test 2: Build the clients
	own IoT	Test 3: Connectivity
	environment? (opt.)	Test 4: Intelligence
		Conclusions
		Complexity theory
		Networks in complex systems
	Theoretical aspects	Legacy and path dependency
		Convergence and divergence
		Synergy, adaptation and evolution
		The service economy
Integrated Systems		Service-oriented architecture
	Architecture	Event-oriented architecture
		Modularity and self-organization
		System ecology
	Implementation	Middleware for distributed applications
		Integration topologies
		Integration challenges
		Big data fundaments
		Big data platform
	Big data theory	Big data methodology
		Use cases and added value
		Big data technologies I
	Big data technologies	Big data technologies II
Big Data & Analytics		Data access
	Using big data	Administration and data structures
		Advanced programming
		Analytics fundaments
	Analytics	Patterns, relationships and predictive modeling
		Data manipulation and machine learning
		Analytics technologies
	1	Definition
Cloud Computing	Introduction	Context in the Industry/Companies
		Main Characteristics
	<u> </u>	

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Deliverable 2.1.: Training Path and Learning Content. Annex 6: In4Wood Training Path for Production Managers from furniture and woodworking industries.

Title of the Unit:	Telecommunications and data	
Sub Units	Sections	
	Models of Cloud Computing	Summary of CC models
	Deployment Models	Summary of deployment models
		Advantages and disadvantages of Cloud Computing
		Business success stories
		Future of Cloud Computing in Industry
	Introduction	Definition
	introduction	Context in the Industry/Companies
	Industrial Communication Networks (description and examples).	Summary of Industrial communication networks
Communication Networks		OPC UA
communication Networks	Industrial	Power Link
	Communication Standards	Open Safety
		TCP/IP
		Summary of Industrial communication standards
		Use Cases
		Business Success Stories
		Future of Communication Networks in Industry. Definition
	Introduction	Context in the Industry/Companies
Cyber-Security	Types	Summary of cyber-security strategies
	Evaluation	Pentesting (Penetration testing
		Use Cases
		Business Success Stories
		Future of Cyber-Security

Title of the Unit:	Management Systems	
Sub Units	Sections	
		Introduction
		Warehouse Activities
	Warehouse	Factors that influence the effective use of warehouses
	management	Types of Warehouse
	systems	Design and Distribution in Plant
	,	Definition and Characteristics SGA
		Relationship of the SGA with the Value Chain
		Recommendations SGA Implementation
		Introduction
	Inventory management and DRP (Distribution Resource Planning)	Types of Inventories
Applications of Logistics		Types of Demands
		Inventory Cost
		FIFO and LIFO
		ABC Classification
		DRP Definition
		DRP Relationship with the Value Chain
		DRP Techniques
		DRP Safety Inventory
	Table of Board of	Introduction
	KPIs (Key	KPI Types
	Performance	Characteristics, How must be
	Indicators)	KPI Incidence in Continuous Improvement

Deliverable 2.1.: Training Path and Learning Content.

Annex 6: In4Wood Training Path for Production Managers from furniture and woodworking industries.

Title of the Unit:	Management	Systems
Sub Units	Sections	
		Implementation and Follow-up Industry Furniture
	Data capture	Definitions
	systems for plant	Types of RFID
	processes control	How does it work?
	(RFID: Radio	
	Frequency	
	Identification)	Uses and Implementation Industry Furniture
	APP (Aggregate	Strategic Planning
	Production	
	Planning) and	Production Planning
	Capacity control	PAP Production Aggregate Plan: Definition, Characteristics and Application Example
	and Capacity	Industry Furniture
	Requirement Planning	Capacity Requirement Planning: Definition, Characteristics and Application Example
	MPS (Master	Industry Furniture
	Production	Tactical Planning
Workflow Management	Schedule) and MRP	Master Production Plan: Definition, Characteristics and Example of Application
Systems	II (Manufacturing	
0,0000	Resource Planning)	Material Requirement Plan: Definition, Characteristics and Example of Application
		Definition and Characteristics
	ERP (Enterprise	Types of ERP
	Resource Planning)	Uses and Implementation Industry Furniture
	Lean Manufacturing	Introduction
	(workflow and	Basic Lean Tools
	improvement of	Advanced Lean Tools
	manufacturing	
	operations)	Examples Application Industry Furniture
	B2B (Business to	Identification of partners current mechanisms for B2B, B2C and to enable C2C
Collaborative platforms	Business)	communication.
	B2C (Business to	Research into best practice and most successful cost-effective options for B2B, B2C and
	Consumer)	C2C communication.
	C2C (Consumer	Recommendation of possible Platforms along with aggregation recommendations to
	to Consumer)	include data from current partners' approaches
		Identification of partners current mechanisms for U2B communication.
	U2B (University to Business)	Research into best practice and most successful cost-effective options for U2B
		communication.
		Recommendation of possible Platforms along with aggregation recommendations to
		include data from current partners' approaches

# Title of the Unit: Standards, certifications and legal issues

Sub Units	Sections
Introduction to	Definition
standardization	Context in the industry/companies
	Why is standardization is an important issue?
State of art/challenges in st	andardization in I4.0
Consortia and	Summary of consortiums and organisations
Organisations	
Working Group	Summary of working group committees
Committees	
Standards focused on Wood	d and Furniture Sector
How to apply standards to f	actories interested in Industry 4.0
Legal issues in Industry 4.0	



Deliverable 2.1.: Training Path and Learning Content. Annex 7: In4Wood Training Path for VET students from ICT-related programmes.

# Title of the Unit: Digital and Physic World Hybridising

Sub Units	Sections	
		What is 3D printing?
		A brief description of 3D printing.
3d Printing and Additive	Introduction to 3D	Main materials for 3D printing
Manufacturing for	printing and Additive	Workflow: How 3d printing works?
Furniture Manufacturing.	Manufacturing	Production process in 3D printing
		A brief description of the main software used in 3D printing
Augmented Reality and		What is Augmented Reality?
Intelligent Tools that may		Differences between AR and Virtual Reality
be Used During the	Introduction to	Workflow: How AR works?
Design and Fabrication of the Product.	Augmented Reality	A Brief Description of some software used in AR
	Example 1	
Examples of Performance	Example 2	
Activities Developed in	Example 3	
BLM department or		
Dissemination.	Example n	
		Definition
	Introduction	Context in the Industry/Companies
	Main Characteristics	
		Smart Sensors
		SCADA
Sensors and Wearables	Types	Wireless Sensors & Networks
	Types	MEMS/Nano sensors
		Energy Harvesting
	Use Cases	
	Business Success stories	-
	Future of Sensors and V	
	Future of Sensors and v	Design principles for I4.0
	Introduction	Introduction to Cyber Physical Systems
		From Industrial robotics to collaborative robotics
		Robotics and Artificial Intelligence
Robotics applied to	Definitions and	-
furniture production at	Concepts	Embedded systems
the different production		Internet of Intelligent Robotics Things Cloud Robotics
stages		
Simulation, modelling and virtualization in the design, virtual catalogues, 3D scanning.	Use cases	Examples and case studies
		Applications in furniture manufactures
	Practical exercises Introduction	Robotic Operating System (ROS)
		Cloud platforms (Azure, Amazon,?)
		Main objectives and focus of virtualization in the furniture/interiors sector
		Why? Enhancement of market competitiveness thanks to the correct use of tools
		Approach to simulation, modelling, render and virtualization
	Main Concepts	Panorama of existing tools, technologies and software
		How to select the most appropriate tool for specific purposes
	Examples and good practices	Case studies: focus on furniture/interiors SMEs
	Practical exercises:	Preview and introduction (general notions about display windows, views, use of standard navigation methods, selection methods, grouping, setting up unit of measurement)
		Transformation commands
	3DS MAX	Creation of primitive and composite objects
		Edit Commands and modifiers
		Importing files with other extensions
	Practical exercises: CORONA RENDERER	Main Features of the Corona Renderer module (introduction to the Photography and light behavior in reality and within the render engine, set up of Corona as default
		rendering engine of 3ds Max)



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Deliverable 2.1.: Training Path and Learning Content. Annex 7: In4Wood Training Path for VET students from ICT-related programmes.

# Title of the Unit: Digital and Physic World Hybridising Sub Units Sections Materials, "Material Editor". Set a standard material (Corona Mtl), how to apply the texture on the material (UV and Tiling) Settings, "Render Setup" windows. Workflow optimization Set reflections and refractions, adjust the distribution of light on the surface through Glossiness, Bump effect and its uses Concepts of lighting technology (creation and alteration of lights (Corona light), uses and Color temperature properties, creation of photographic setups for "Still Life" of objects of design (with Limbo Fotografico), import of files containing lighting information IES Camera placement (creation and editing of Standard Camera or Corona Camera, add camera's effects such as field blur (DOF) in post- production

Title of the Unit:	Telecommunic	ations and data
Sub Units	Sections	
		What is IoT?
		Related Concepts
	later de stien te la T	How does IoT work?
	Introduction to I.o.T	Application of IoT
		Commercial Aspects
		Concerns (privacy, security, health, etc.)
		Architecture
	Features of IoT	Intelligence
	reatures of ion	Automation
		Design
		The Cloud
	Technologies of IoT	Wired and wireless networks
	Technologies of IoT	Cyber-physical systems
Internet of Things		Technological Standards
Internet of Things	Tachnologies related	Computational Semantics
	Technologies related to IoT	Rule Engines
	to 101	Big data and Analytics
		The SOFIA2 environment
		Defining your architecture
	IoT framework:	The SOFIA2 Console
	SOFIA2	Connecting to the SIB
	SUFIAZ	Creating your own KP
		The information producer
		Rule definition
		Test 1: Set up the server
	Can you build your	Test 2: Build the clients
	own IoT	Test 3: Connectivity
	environment?	Test 4: Intelligence
		Conclusions
Integrated Systems	Theoretical aspects	Complexity theory
		Networks in complex systems
		Legacy and path dependency
		Convergence and divergence
		Synergy, adaptation and evolution
Integrated Systems		The service economy
		Service-oriented architecture
	Architecture	Event-oriented architecture
		Modularity and self-organization
		System ecology

Deliverable 2.1.: Training Path and Learning Content. Annex 7: In4Wood Training Path for VET students from ICT-related programmes

#### **Title of the Unit: Telecommunications and data** Sub Units **Sections** Middleware for distributed applications Implementation Integration topologies Integration challenges Big data fundaments Big data platform Big data theory Big data methodology Use cases and added value Big data technologies I Big data technologies Big data technologies II **Big Data & Analytics** Data access Using big data Administration and data structures Advanced programming Analytics fundaments Patterns, relationships and predictive modeling Analytics Data manipulation and machine learning Analytics technologies Definition Introduction Context in the Industry/Companies Main Characteristics Infrastrucure as a Service (IaaS) Models of Cloud Platform as a Service (PaaS) Computing Software as a Service (SaaS) Emerging models **Cloud Computing** Public Private Deployment models Hybrid Community Advantages and disadvantages of Cloud Computing Business success stories Future of Cloud Computing in Industry Definition Introduction Context in the Industry/Companies Body Area Networks (BAN): NFC, Bluetooth Low Energy, Bluetooth 4.0 Industrial Communication Personal Area Networks (PAN): Bluetooth, Zigbee. networks (description Local Area Networks (LAN): Ethernet, Industrial Ethernet, Rofbus, Profinet, M-Bus and examples) Wide Area Networks (WAN): GPRS, UMTS, LTE. Communication Networks OPC UA Industrial Power Link Communication **Open Safety** Standards TCP/IP Use Cases **Business Success Stories** Future of Communication Networks in Industry. Definition Introduction Context in the Industry/Companies User & Password Fingerprint Types Face Recognition Cyber-Security Cryptography Federation Evaluation Pentesting (Penetration testing Use Cases **Business Success Stories** Future of Cyber-Security

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Deliverable 2.1.: Training Path and Learning Content. Annex 7: In4Wood Training Path for VET students from ICT-related programmes.

Title of the Unit:	Management S	ystems
Sub Units	Sections	
	Table of Board of KPIs (Key Performance Indicators)	Introduction KPI Types Characteristics, how they must be KPI Incidence in Continuous Improvement Implementation and Follow-up Industry Furniture
Application of Logistics	Data capture systems for plant processes control (RFID: Radio Frequency Identification)	Definitions Types of RFID How does it work? Uses and Implementation Industry Furniture
	ERP (Enterprise Resource Planning)	Definition and Characteristics Types of ERP Uses and Implementation Industry Furniture
Workflow management Systems	Lean Manufacturing (workflow and improvement of manufacturing operations)	Introduction Basic Lean Tools
Collaborative Platforms	U2S (University to Student) S2S (Student to Student)	Identification of partners current mechanisms for U2S and to enable S2S communication. Research into best practice and most successful cost-effective options for U2S and S2S communication. Recommendation of possible Platforms along with aggregation recommendations to include data from current partners' approaches

# Title of the Unit:Standards, certifications and legal issues

Sub Units	Sections
Introduction to	Definition
standardization	Context in the industry/companies
	Why is standardization is an important issue?
State of art/challenges in st	andardization in I4.0
Consortiums and	IEC/ISO
organisations	IETF/W3C
	DKE/DIN
	ETSI/CENELEC/CEN
Working Group	CyberSecurity, industrial networks
Committees	Automation Systems and Integration
	Robots and Robotic devices
	Sensor Networks
	Internet of Things
	Big Data
	Cloud Computing and Distributed Platforms
How to apply standards to f	factories interested in Industry 4.0

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Deliverable 2.1.: Training Path and Learning Content. Annex 8: In4Wood Training Path for HE students from ICT-related programmes.

# Title of the Unit: Digital and Physic World Hybridising

But During         Decision           3d Printing and Additive         Introduction to 3D A brief description of 3p printing.           Manufacturing for Furniture         Main matrials for 3D printing.           Manufacturing, Printing in the Furniture sector         A brief description of the main software used in 3D printing.           Augmented Reality and Intelligent Tools         Application of 3D production process in 3D printing.           Augmented Reality and Fabrication of the Product.         Application of the Furniture sector           Application of the Product.         Application of the Production process.           Application of the Product.         Application of the Product.           Application of the Product.         Design and Prototyping.           Application of the Product.         Design and prototyping.           Application of the Product.         Design and prototyping.           A Brief Description of some software used in AR         A Brief Description of some software used in AR           A Brief Description of some software used in AR         A Brief Description of some software used in AR           A Brief Description of Some software used in AR         A Brief Description of Some software used in AR           A Brief Description of Some software used in AR         A Brief Description of Some software used in AR           A Drief Description of Some software used in AR         A Brief Description of Some software used in AR	Sub Units	Sections		
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3d Printing and Additive     printing and Additive     main materials for 3D printing       Additive     Manufacturing for Furniture     Manufacturing of the Application of 3D printing in the Furniture sector     Monufacturing of the Production of the main software used in 3D printing       Augmented Reality and Intelligent Tools     Application of 3D printing in the Furniture sector     Design and Prototyping Models for Prototyping and final products       Augmented Reality and Intelligent Tools     Introduction to Application of the Augmented Reality     Moral Society (Society	3d Printing and			
Additive         Additive         Workflow: How 3d printing works?           Manufacturing for Furniture         Manufacturing.         Application of 3D printing in the Furniture sector         Production process in 3D printing           Augmented Reality and Intelligent Tools         Application of 3D printing in the Furniture sector         Molds for Prototyping and final products           Augmented Reality and Intelligent Tools         Introduction of the Augmented Reality         Molds for Prototyping and final products           Augmented Reality and Fabrication of the Product.         Application of the Augmented Reality         Uniferences between AR and Virtual Reality           Augmented Reality and Fabrication of the Product.         Application of the product.         Design and prototyping.           Performance         Example 1         Example 1           Examples of performance         Example 1         Example 2           Example 3         Example 3         Example 3           Torue 4         Example 3         Context in the industry/Companies           Main Characteristics         SCADA           Sensors and Wearables         Introduction         Definition Context in the industry/Companies           Mure 4         Design principles for 14.0         Energy Harvesting           Surver of Sensors and Wearables in Industry         Energy Harvesting           Use Cases			· · · · ·	
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and Intelligent Tools       A Brief Description of some software used in AR         that may be Used       Application of the       Design and prototyping         During the Design       Augmented Reality       Production process         and Fabrication of       during the design       Maintenance         and Fabrication of       Example 1       Training for Workers         Examples of       Example 1       Example 1         Performance       Example 1       Example 1         Autivities Developed       Example 1       Example 1         To Dissemination.       Example 1       Example 1         Example 1       Example 3       Example 3          Example 1       Example 3          Example 3       Example 3          Sensors 4       Networks         Mean Characteristics       S			· · · · · ·	
that may be Used During the Design and Fabrication of the Product.     Application of the Augmented Reality Production process     Design and prototyping       and Fabrication the Product.     Augmented Reality Production process     Maintenance       Examples of Performance     Example 1       Example 2     Example 2       Example 3     Example 3       in BLM department or Dissemination.     Definition       Sensors and Wearables     Introduction     Definition       Types     Smart Sensors       ScoDa     ScoDa       Business Success tories     Success tories       Business Success tories     Energy Harvesting       Definitions and furriduction to Coper Physical Systems     Introduction       Design principles for 14.0 Introduction to Coper Physical Systems       Robotics applied to furniture production at the different production stages     Definitions and Concepts       Definitions and furriduction to Coper Physical Systems       Use cases     Applications in furniture manufactures       Practical exercises     Robotics and Artificial Intelligence       Embedded systems     Embedded systems       Internet of Intelligent Robotics Things       Simulation, modelling and     Introduction	and Intelligent Tools		Production process in 3D printing         A brief description of the main software used in 3D printing         Design and Prototyping         Molds for Prototyping and final products         Final products. Batches if size 1 up to X         What is Augmented Reality?         Differences between AR and Virtual Reality         Workflow: How AR works?         A Brief Description of some software used in AR         Design and prototyping         Production process         Picking         Maintenance         Training for Workers         Smart Sensors         SCADA         Wireless Sensors & Networks         MEMS/Nano sensors         Energy Harvesting         ies         Wearables in Industry         Design principles for 14.0         Introduction to Cyber Physical Systems         From Industrial robotics to collaborative robotics         Robotics and Artificial Intelligence         Embedded systems	
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Or Dissemination.       Definition         Introduction       Definition         Sensors and       Main Characteristics         Wearables       Smart Sensors         Types       SCADA         Wireless Sensors & Networks         Musices Success stories         Business Success stories         Future of Sensors and Wearables in Industry         Introduction       Design principles for 14.0         Introduction       Introduction to Cyber Physical Systems         From Industrial robotics to collaborative robotics       Robotics applied to furniture production at the different production stages         Use cases       Examples and case studies         Use cases       Examples and case studies         Simulation, modelling and       Introduction         Min objectives and focus of virtualization in the furniture/interiors sector		Example n		
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	modelling and			



Deliverable 2.1.: Training Path and Learning Content. Annex 8: In4Wood Training Path for HE students from ICT-related programmes.

# Title of the Unit: Digital and Physic World Hybridising

Sub Units	Sections	
virtualization in the	Main Company	Approach to simulation, modelling, render and virtualization
design, virtual	Main Concepts	How to select the most appropriate tool for specific purposes
catalogues, 3D	Examples and good practices	Case studies: focus on furniture/interiors SMEs
scanning.		Preview and introduction (general notions about display windows, views, use
		of standard navigation methods, selection methods, grouping, setting up unit
	Dra atical avanciana	of measurement)
	Practical exercises: 3DS MAX	Transformation commands
	SDS WIAN	Creation of primitive and composite objects
		Edit Commands and modifiers
		Importing files with other extensions
		Main Features of the Corona Renderer module (introduction to the
		Photography and light behavior in reality and within the render engine, set
		up of Corona as default rendering engine of 3ds Max)
		Materials, "Material Editor". Set a standard material (Corona Mtl), how to
		apply the texture on the material (UV and Tiling)
		Settings, "Render Setup" windows. Workflow optimization
	Practical exercises:	Set reflections and refractions, adjust the distribution of light on the surface
	CORONA RENDERER	through Glossiness, Bump effect and its uses
		Concepts of lighting technology (creation and alteration of lights (Corona
		light), uses and Color temperature properties, creation of photographic
		setups for "Still Life" of objects of design (with Limbo Fotografico), import of
		files containing lighting information IES
		Camera placement (creation and editing of Standard Camera or Corona
		Camera, add camera's effects such as field blur (DOF) in post- production

Title of the Unit:	Telecommunic	ations and data
Sub Units	Sections	
		What is IoT?
		Related Concepts
	Introduction to I.o.T	How does IoT work?
		Application of IoT
		Commercial Aspects
		Concerns (privacy, security, health, etc.)
		Architecture
	Features of IoT	Intelligence
	Technologies of IoT Technologies related to IoT	Automation
		Design
Internet of Things		The Cloud
		Wired and wireless networks
		Cyber-physical systems
		Technological Standards
		Computational Semantics
		Rule Engines
		Big data and Analytics
		The SOFIA2 environment
		Defining your architecture
	IoT framework:	The SOFIA2 Console
	SOFIA2	Connecting to the SIB
		Creating your own KP
		The information producer

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Deliverable 2.1.: Training Path and Learning Content. Annex 8: In4Wood Training Path for HE students from ICT-related programmes.

# Title of the Unit: Telecommunications and data

Sub Units	Sections	
		Rule definition
		Test 1: Set up the server
	Can you build your own IoT	Test 2: Build the clients
		Test 3: Connectivity
	environment?	Test 4: Intelligence
		Conclusions
		Complexity theory
		Networks in complex systems
	Theoretical aspects	Legacy and path dependency
		Convergence and divergence
		Synergy, adaptation and evolution
		The service economy
Integrated Systems		Service-oriented architecture
	Architecture	Event-oriented architecture
		Modularity and self-organization
		System ecology
		Middleware for distributed applications
	Implementation	Integration topologies
		Integration challenges
		Big data fundaments
	Big data theory	Big data platform
	Dig data theory	Big data methodology
		Use cases and added value
	Big data technologies	Big data technologies I
		Big data technologies II
Big Data & Analytics		Data access
	Using big data	Administration and data structures
		Advanced programming
		Analytics fundaments
	Analytics	Patterns, relationships and predictive modeling
		Data manipulation and machine learning
		Analytics technologies
	Introduction	Definition
	introduction	Context in the Industry/Companies
		Main Characteristics
		Infrastrucure as a Service (IaaS)
	Models of Cloud Computing	Platform as a Service (PaaS)
		Software as a Service (SaaS)
Cloud Computing		Emerging models
		Public
	Deployment models	Private
		Hybrid
		Community
		Advantages and disadvantages of Cloud Computing
		Business success stories
		Future of Cloud Computing in Industry Definition
	Introduction	
	lu du atuial	Context in the Industry/Companies
	Industrial	Body Area Networks (BAN): NFC, Bluetooth Low Energy, Bluetooth 4.0 Personal Area Networks (PAN): Bluetooth, Zigbee.
Communication Notworks	Communication networks (description	
Communication Networks	and examples)	Local Area Networks (LAN): Ethernet, Industrial Ethernet, Rofbus, Profinet, M-Bus
		Wide Area Networks (WAN): GPRS, UMTS, LTE.
	Industrial	OPC UA Dower Link
	Communication Standards	Power Link
	Standards	Open Safety

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Deliverable 2.1.: Training Path and Learning Content. Annex 8: In4Wood Training Path for HE students from ICT-related programmes.

#### **Title of the Unit: Telecommunications and data Sub Units Sections** TCP/IP Use Cases **Business Success Stories** Future of Communication Networks in Industry. Definition Introduction Context in the Industry/Companies User & Password Fingerprint Types Face Recognition Cyber-Security Cryptography Federation Evaluation Pentesting (Penetration testing Use Cases **Business Success Stories** Future of Cyber-Security

Title of the Unit:Management Systems
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Sub Units	Sections	
Application of Logistics		Introduction
	Table of Board of KPIs (Key Performance Indicators)	KPI Types
		Characteristics, how they must be
		KPI Incidence in Continuous Improvement
	muicators	Implementation and Follow-up Industry Furniture
	Data capture systems	Definitions
	for plant processes	Types of RFID
	control (RFID: Radio	
	Frequency	How does it work?
	Identification)	Uses and Implementation Industry Furniture
Workflow management Systems	ERP (Enterprise Resource Planning)	Definition and Characteristics
		Types of ERP
		Uses and Implementation Industry Furniture
	Lean Manufacturing	Introduction
	(workflow and	
	improvement of	
	manufacturing	
	operations)	Basic Lean Tools
Collaborative Platforms	U2B (University to Business)	Identification of partners current mechanisms for U2B communication.
		Research into best practice and most successful cost-effective options for U2B
		communication.
		Recommendation of possible Platforms along with aggregation recommendations to
		include data from current partners' approaches
	U2S (University to Student) S2S (Student to Student)	Identification of partners current mechanisms for U2S and to enable S2S
		communication.
		Research into best practice and most successful cost-effective options for U2S and S2S
		communication.
		Recommendation of possible Platforms along with aggregation recommendations to
		include data from current partners' approaches



Annex 8: In4Wood Training Path for HE students from ICT-related programmes.

# Title of the Unit: Standards, certifications and legal issues

Sub Units	Sections	
Introduction to	Definition	
standardization	Context in the industry/companies	
	Why is standardization is an important issue?	
State of art/challenges in standardization in I4.0		
Consortiums and	IEC/ISO	
organisations	IETF/W3C	
	DKE/DIN	
	ETSI/CENELEC/CEN	
Working Group	CyberSecurity, industrial networks	
Committees	Automation Systems and Integration	
	Robots and Robotic devices	
	Sensor Networks	
	Internet of Things	
	Big Data	
	Cloud Computing and Distributed Platforms	
How to apply standards	s to factories interested in Industry 4.0	

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