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THE FOF-DESIGNER:  
DIGITAL DESIGN SKILLS FOR FACTORIES OF THE FUTURE

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DigiFoF



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## 1 Introduction

The work package 4 is dedicated to the vocational training for professional FoF-designers with formal and open badge certificates and trainings. The provision of vocational training must be aligned with the needs of industries dealing with FoF. In doing so, these trainings will be provided based on training needs identified in WP1 (D1.3) and by means of the training content provided in WP2 and WP3. According to the project basic document, the main objectives of this deliverable is to provide the planning for: [Project document]

- “Realizing vocational and initial training programs/curricula using a problem-based learning approach.”
- “Developing and testing a vocational training program for employees in the manufacturing sector dealing with aspects of FoF so as to create value added for the trainees as well as the enterprises.”

## 2 The vocational training method

The vocational training and retraining aims at “supporting industry professionals in gaining competences, skills and certifications for FoF-design” [Project document]. The method is mostly Problem-Based Learning (PBL) which is explained in D3.1.

## 3 The training ecosystem for FoF design

Along with efforts to provide vocational training, the project focuses on creating the training ecosystem. In doing so, besides the main OMiLAB laboratory in Austria, DigiFoF supports five more national laboratories which will be created during the project (Table 1), creating national nodes of the competence network. Each of these educational node provides vocational training to improve different skills related to FoF.

Table 1 OMiLAB4FoF Laboratories

OMiLAB4FoF Laboratories	Educational applications
OMILAB France (EMSE)	<ul style="list-style-type: none"> <li>▪ Imagine services associated with products</li> <li>▪ Clextrol learning: management of service delivery processes</li> <li>▪ Transformation of Business Model through digitalization and servitization</li> <li>▪ Interactive training to initiate a service-oriented strategy</li> </ul>
OMILAB Italy (UNIBG)	<ul style="list-style-type: none"> <li>▪ Vocational training on the identification of innovative Product Service Systems (Adopting Scene2Model).</li> <li>▪ Vocational training on the lifecycle management of products and services.</li> <li>▪ Vocational trainings on Service Operations Management</li> <li>▪ Vocational trainings on Business process analysis and re-engineering.</li> </ul>
OMILAB Romania (ULBS)	<ul style="list-style-type: none"> <li>▪ Vocational training about Scene2model and Emotion Recognition for employees</li> <li>▪ Vocational training about Machine Vision for Manufacturing Industry Application</li> </ul>

OMiLAB4FoF Laboratories	Educational applications
OMILAB Poland (UNIBIAL)	<ul style="list-style-type: none"> <li>▪ Vocational trainings on Business process modelling and monitoring</li> <li>▪ Vocational trainings on Business process analysis and re-engineering</li> <li>▪ Vocational trainings on Industry Process Automation and Lean Manufacturing</li> </ul>
OMILAB Finland (UNIOULU)	<ul style="list-style-type: none"> <li>▪ Vocational training about Bee-up model based on ADOxx platform</li> </ul>

## 4 Educational material development

### 4.1 The training specifications

This template can be used to complete the information on each training.

Table 2 The training specification details

Training specification	Explanation
Organizer	Name of the trainer institute, country
Training Topic	The training topics should deliver one or more competences related to FOF design. DIGIFOF proposes three main categories of topics (proposed in section 2) to cover FOF design (strategy-, processes-, or systems-oriented topics). These topics and sub-topics proposed can be detailed according to the need of the training.
Training objectives	Describes what skills, competences, or knowledge participants will learn at the end of the training.
Date	The estimated planned date for the training.
Location	The location for the training.
Certificate	Does it provide a certificate or not? If yes, which kind of certificate.
Method	Defines phases or steps of the training.
Target groups	Defines the participants (e.g. professionals from the same company)
Recommended composition	Could be homogeneous or heterogeneous (Mix of jobs, abilities, gender, work experience)
Recommended size of groups	Different categories as less than 10 persons, between 10 and 20, or more than 20
Training duration	Based on the training needs and the project target (estimated 3x5 days in WP4),
Mode of tutoring	Can be lecture, case, tutor role, and participants' role.
Mode of provision	Can be physical, virtual, or blended learning.
Tools and resources to be used (technological-support tools)	Either outside or from OMiLAB laboratories.
Recommended preparation	Defines the necessary information (e.g. having some information about the company, its strategy, and activities)
Modes of working in teams	concerns the team animation and collaboration method (e.g. playing role, collaborative problem-solving, individual Q&A)
Communication and cooperation mode	Facebook, social bookmarking, photo or video sharing, wiki documents, word documents, instant messaging or texting, the group workspace, etc.
Necessary abilities to tackle the tasks of open problems	Core skills like research skills, critical analysis, problem solving, report writing, presentation skills, communication skills, organization skills, time management, group working skills, presentation skills

Training specification	Explanation
Knowledge prerequisites	Domain specific knowledge for entry level

## 4.2 The training evaluation

The training evaluation questionnaires are presented in D6.3. These questionnaires will be filled by the attendees, either at the end of each training (Hot evaluation) or as the post-training evaluation (on the job).

## 5 List of trainings provided by DIGIFO Competence Network

During the project, the FoF Competence Network provides various vocational trainings based on problem-based learning. These trainings are listed in Table 3.

Table 3 List of trainings provided by the Project partners

Item	Training topic	Organizer
1	<ul style="list-style-type: none"> <li>Interactive training to initiate a service-oriented strategy</li> <li>Imagine services associated with products</li> <li>Transformation of Business Model through digitalization and servitization</li> </ul>	EMSE-France
2	<ul style="list-style-type: none"> <li>Trainings on Business process analysis and re-engineering</li> </ul>	BOC-Poland
	<ul style="list-style-type: none"> <li>Trainings on Business process modelling and monitoring</li> <li>Trainings on Business process analysis and re-engineering</li> <li>Trainings on Industry Process Automation and Lean Manufacturing</li> </ul>	UNIBIAL-Poland
3	<ul style="list-style-type: none"> <li>Cobots - installing and programming information needed for a rapid implementation of Cobots in industrial environment.</li> <li>AGV for modern Logistics in industrial companies</li> </ul>	CONTI-Romania
4	<ul style="list-style-type: none"> <li>Clextral learning: management of service delivery processes</li> </ul>	Clextral-France
6	<ul style="list-style-type: none"> <li>Identification of innovative Product Service Systems (Adopting Scene2Model).</li> <li>Lifecycle management of products and services.</li> <li>Service Operations Management</li> <li>Business process analysis and re-engineering.</li> </ul>	UNIBG- Italy
7	<ul style="list-style-type: none"> <li>Trainings on Industry Process Automation and Lean Manufacturing</li> </ul>	IDPC-Poland
8	<ul style="list-style-type: none"> <li>Robotics application in Virtual Laboratory</li> <li>Robot-robot collaboration</li> <li>Robot-human collaboration</li> </ul>	UNIOULU-Finland

### 5.1 Vocational trainings provided by EMSE-France

“The future of manufacturing will see more service-driven manufacturing business models as customers increasingly demand more added value” (McKinsey Global Institute, 2012). World Economic group (2016) mentioned servitization besides global value chain, advanced manufacturing, and digitalization as policies and trends shaping the FoF. In this matter, Ecole Nationale Supérieure des Mines de Saint Etienne (EMSE) provides the vocational trainings on PSS at the strategy level (defining and implementing successful strategies for FoF design and effects of Industry 4.0 revolution). In order to define the required trainings, a systematic approach from strategy to system delivery is adopted as follows (Figure 1).

Table 4 EMSE Training subjects from a strategy-level viewpoint

Subject	Related trainings
1 Business strategy	Initiating Service-Oriented Strategy
2 Customer proposition	Imagine services associated with products
3 Execution vision	Transformation of Business Model through digitalization and servitization

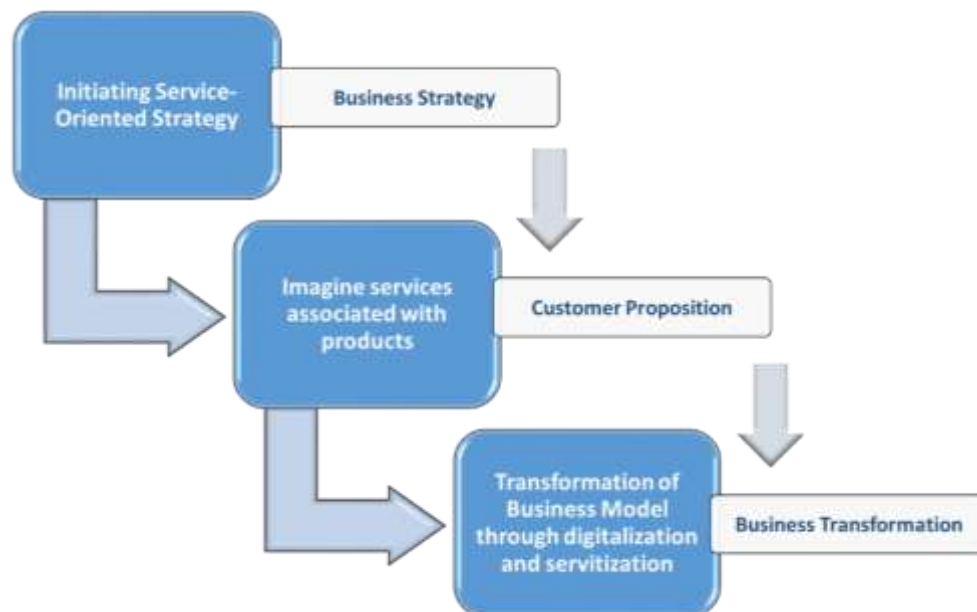


Figure 1 Trainings subjects from a strategy-level viewpoint (from strategy to delivery)

Ecole Nationale Supérieure des Mines de Saint Etienne (EMSE) provides the following trainings.

## 5.1.1 Interactive training to initiate a service-oriented strategy

Training specification	Explanation
Organizer	EMSE France
Training Topic	Interactive training with small and medium size industrial companies, to initiate a service-oriented strategy
Training objectives	The objective is to bring various complementary competencies of the company, to work collaboratively on both strategic diagnosis and perspective development, so as to identify key strategical factors and incentive/resistance for service development, and key opportunities for initiating the transition.
Date	June 2019 (solistic)
Location	TBD
Certificate	NO
Method	A structured framework is proposed, for various diagnosis steps : <ul style="list-style-type: none"> <li>- Service-oriented strategical context analysis;</li> <li>- Service opportunities analysis, through business sectors</li> <li>- Collective competence transformation anticipation</li> <li>- Proposal of service development trajectory</li> </ul>
Target groups	Vocational training: each training is dedicated to only one company. SMI companies with, a first contact with service activities, and an ambition to further develop service-oriented strategies
Recommended composition	Each group should gather actors from the key functions involved in product-service innovation in the companies, like top management board, marketing, sales management, system design and development, production, after sale services, customer relationship management.
Recommended size	15 persons
Training duration	2 days (4 half-day courses during 2 month)
Mode of tutoring	The seminar is full interactive diagnosis process, applied to the internal data of the company. The 2 days of training include three half-days in direct interaction with the actors for interview and information capture + one half-day of final debriefing and interaction. Additionally, the animators have to work 'off-line' additionally to the 2 training days on information analysis, synthesis and diagnosis.
Mode of provision	Interactive academic/industrial diagnosis process
Tools and resources to be used (technological-support tools)	Structured diagnosis methodology, including audit and diagnosis tools at different steps.
Recommended preparation	Top management of the company should be involved and should act as sponsor of the training. A preliminary awareness-raising on product-Service innovation strategies should be delivered to company staff.

Training specification	Explanation
Modes of working in teams	Collective problem analysis and solving. Collective creativity
Communication and cooperation mode	Physical interaction
Necessary abilities to tackle the tasks of open problems	Creativity, Innovation, Context analysis, Design thinking, System thinking.
Knowledge prerequisites	A preliminary awareness-raising on product-Service innovation strategies should be delivered to company staff.

### 5.1.2 Imagine services associated with products

Training specification	Explanation
Organizer	EMSE France
Training Topic	Imagine services associated with products
Training objectives	The training allows the company's employees to create product-related service ideas and test them before implementing a deployment plan.
Date	February 2020
Location	Mines Saint Etienne, France
Certificate	TBD
Method	Stage 1-Empathy: Understanding the human needs involved Stage 2-Definition: Reconstructing and defining problems in a human-centric manner Stage 3-Ideate: Making many creative ideas in the conception session Stage 4-Prototyping: Practicing method in a Prototype Stage 5-Testing (Proposing prototypes/solutions to the problem): this stage could be postponed outside the training)
Target groups	Professionals of the same company
Recommended composition	Mix of jobs, abilities, gender, work experience
Recommended size of groups	Less than 10
Training duration	3 hours to 6 hours on the same day or on 2 separate days
Mode of tutoring	Design thinking
Mode of provision	Workshop



Training specification	Explanation
Tools and resources to be used (technological-support tools)	Tools of Design Thinking
Recommended preparation	Having some information about the company, its strategy, its activity
Modes of working in teams	Playing roles, open mind for creativity
Communication and cooperation mode	Word documents; Empathy Map; Persona; Feasibility Roadmap
Necessary abilities to tackle the tasks of open problems	Group working skills, Presentation skills
Knowledge prerequisites	Product-Service System

### 5.1.3 Transformation of Business Model through digitalization and servitization

Training specification	Explanation
Organizer	EMSE France
Training Topic	Transformation of Business Model through digitalization and servitization
Training objectives	Introduction to business model concept and tools Impacts of digitalization and servitization on business models Case study
Date	TBD
Location	Mines Saint-Etienne
Certificate	TBD
Method	Lecture and case study
Target groups	Students or professionals
Recommended composition	Only students or only professionals, from the same company or from different companies
Recommended size of groups	20 max
Training duration	1,5h (lecture) +6h (case study)

Training specification	Explanation
Mode of tutoring	Lecture and case study
Mode of provision	Lecture and case study
Tools and resources to be used (technological-support tools)	Traditional (PPT )
Recommended preparation	Not necessary
Modes of working in teams	The case study is realized in groups of 2-3 (students or professionals)
Communication and cooperation mode	/
Necessary abilities to tackle the tasks of open problems	/
Knowledge prerequisites	None

## 5.2 Vocational trainings provided by BOC-Poland

BOC Poland provides the following trainings, which are building upon the training offered by UNIBIAL in a Process-oriented topic: Fundamentals of Business Process Management (BPM) und trainings offered by IDPC. Those trainings are intended to be taken sequentially in order to provide a complete learning path. An example of such learning paths, executed by all Polish partners (UNIBIAL, IDPC, BOC-PL) is provided on the picture below:

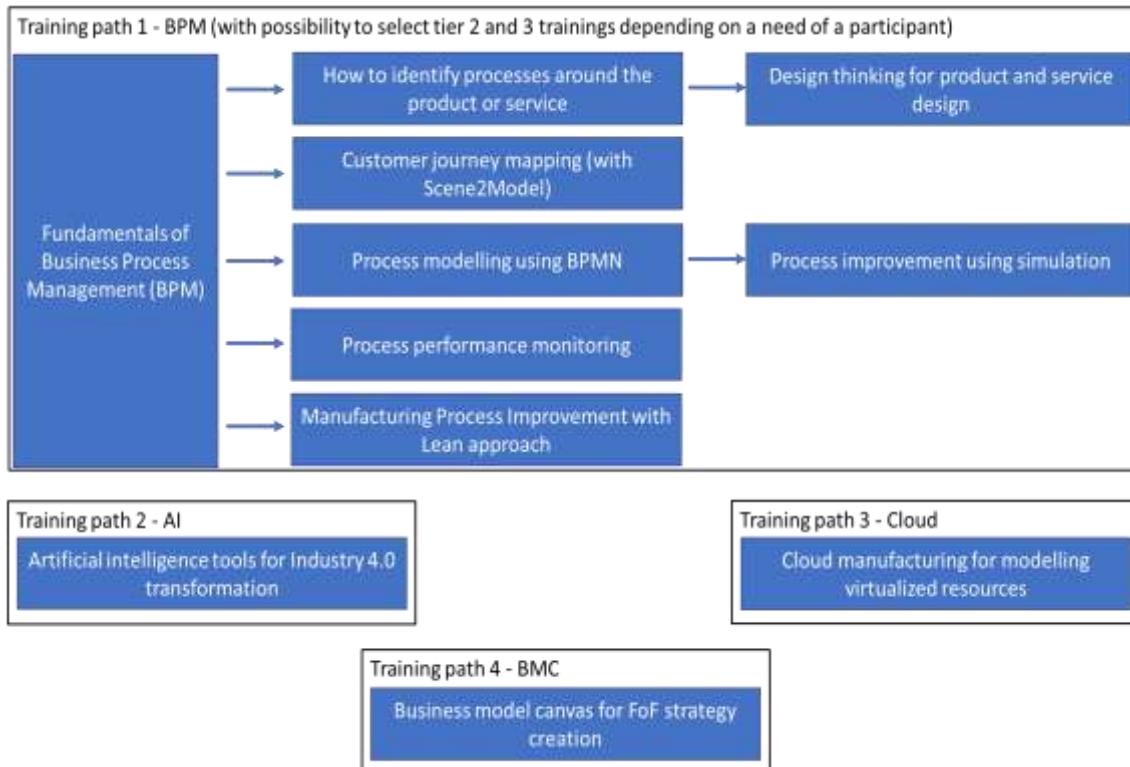


Figure 2 Vocational trainings provided by BOC-Poland

The trainings performed by BOC Poland are described below:

### 5.2.1 How to identify processes around the product or service

Training specification	Explanation
Organizer	BOC Polska, Poland
Training Topic	How to identify processes around the product or service
Training objectives	Knowledge of impact of processes on products and services. Being able to identify processes and their inter-relations.
Date	PM15-PM28
Location	Bialystok, Poland
Certificate	Yes, internally issued certificate
Method	Methods of documenting processes Process architecture Overview of process modelling notations Sources of information about processes
Target groups	Professionals of the same or different companies
Recommended composition	Mix of jobs, abilities, gender, work experience
Recommended size of groups	Less than 10 persons
Training duration	2 hours to 8 hours on the same day or on 2 separately days – depending on a local needs
Mode of tutoring	Lecture, Case method
Mode of provision	Workshop/laboratory-based training
Tools and resources to be used (technological-	ADOxx

Training specification	Explanation
support tools)	
Recommended preparation	Fundamentals of Business Process Management (BPM) training to understand the basic concepts of BPM
Modes of working in teams	Collaborative problem-solving, Team/individual Q&A
Communication and cooperation mode	Process maps and models, Reports, Collaboration tools
Necessary abilities to tackle the tasks of open problems	Critical analysis, Group working skills
Knowledge prerequisites	Fundamentals of organization/business unit management

### 5.2.2 Customer journey mapping (with Scene2Model)

Training specification	Explanation
Organizer	BOC Polska, Poland
Training Topic	Customer journey mapping (with Scene2Model)
Training objectives	Understanding both “inside out” and “outside in” paradigm for documenting processes. Being able to identify touchpoints and moments of truth as well as elements building the customer experience and their links to the “internal” process.
Date	PM15-PM28
Location	Bialystok, Poland
Certificate	Yes, internally issued certificate
Method	Inside out and outside in view on organization Introduction to Customer Experience Customer journey mapping
Target groups	Professionals of the same or different companies
Recommended composition	Mix of jobs, abilities, gender, work experience
Recommended size of groups	Less than 10 persons
Training duration	2 hours to 8 hours on the same day or on 2 separately days – depending on a local needs
Mode of tutoring	Lecture, Case method
Mode of provision	Workshop/laboratory-based training
Tools and resources to be used (technological-support tools)	ADOxx
Recommended preparation	Fundamentals of Business Process Management (BPM) training to understand the basic concepts of BPM
Modes of working in teams	Collaborative problem-solving, Team/individual Q&A
Communication and cooperation mode	Process maps and models, Reports, Collaboration tools
Necessary abilities to tackle the tasks of open problems	Critical analysis, Group working skills
Knowledge prerequisites	Fundamentals of organization/business unit management

### 5.2.3 Process modelling using BPMN

Training specification	Explanation
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Training specification	Explanation
Organizer	BOC Polska, Poland
Training Topic	Process modelling using BPMN
Training objectives	Understanding key concepts of BPMN. Modelling levels: descriptive, analytic, executable. Practical usage of BPMN for documenting product/service-related processes and extending those diagrams for automation purposes.
Date	PM15-PM28
Location	Bialystok, Poland
Certificate	Yes, internally issued certificate
Method	History of BPMN Purposes of BPMN diagrams Descriptive modelling Analytic modelling Advanced BPMN and automation based on BPMN diagrams
Target groups	Professionals of the same or different companies
Recommended composition	Mix of jobs, abilities, gender, work experience
Recommended size of groups	Less than 10 persons
Training duration	2 hours to 8 hours on the same day or on 2 separately days – depending on a local needs
Mode of tutoring	Lecture, Case method
Mode of provision	Workshop/laboratory-based training
Tools and resources to be used (technological-support tools)	ADOxx
Recommended preparation	Fundamentals of Business Process Management (BPM) training to understand the basic concepts of BPM
Modes of working in teams	Collaborative problem-solving, Team/individual Q&A
Communication and cooperation mode	Process maps and models, Reports, Collaboration tools
Necessary abilities to tackle the tasks of open problems	Critical analysis, Group working skills
Knowledge prerequisites	Fundamentals of organization/business unit management

#### 5.2.4 Process improvement using simulation

Training specification	Explanation
Organizer	BOC Polska, Poland
Training Topic	Process improvement using simulation
Training objectives	Understanding difference between AS-IS and TO-BE processes. Being able to apply process improvement techniques such as simulation to a process. Knowledge of information gathering methods for the purpose of a simulation.
Date	PM15-PM28
Location	Bialystok, Poland
Certificate	Yes, internally issued certificate
Method	Extending BPMN diagrams with information about costs and times. Process frequencies, probabilities, variables. Using simulation to compare AS IS and TO BE processes and

Training specification	Explanation
	recommend changes Change management and process improvement Methods of process improvement
Target groups	Professionals of the same or different companies
Recommended composition	Mix of jobs, abilities, gender, work experience
Recommended size of groups	Less than 10 persons
Training duration	2 hours to 8 hours on the same day or on 2 separately days – depending on a local needs
Mode of tutoring	Lecture, Case method
Mode of provision	Workshop/laboratory-based training
Tools and resources to be used (technological-support tools)	ADOxx
Recommended preparation	Fundamentals of Business Process Management (BPM) training to understand the basic concepts of BPM Process modelling using BPMN
Modes of working in teams	Collaborative problem-solving, Team/individual Q&A
Communication and cooperation mode	Process maps and models, Reports, Collaboration tools
Necessary abilities to tackle the tasks of open problems	Critical analysis, Group working skills
Knowledge prerequisites	Fundamentals of organization/business unit management

### 5.2.5 Process performance monitoring

Training specification	Explanation
Organizer	BOC Polska, Poland
Training Topic	Process performance monitoring
Training objectives	Being able to define goals for a process on a basis of a strategy and stakeholder analysis. Defining KPIs on a basis of goals or using the APQC PCF. Designing a process performance monitoring system, defining roles and responsibilities. Planning changes.
Date	PM15-PM28
Location	Bialystok, Poland
Certificate	Yes, internally issued certificate
Method	Process goals and KPIs Benchmarking and KPI libraries Process performance monitoring system along with the processes (gathering data, reviews, planning initiatives), roles and responsibilities.
Target groups	Professionals of the same or different companies
Recommended composition	Mix of jobs, abilities, gender, work experience
Recommended size of groups	Less than 10 persons
Training duration	2 hours to 8 hours on the same day or on 2 separately days – depending on a local needs

Training specification	Explanation
Mode of tutoring	Lecture, Case method
Mode of provision	Workshop/laboratory-based training
Tools and resources to be used (technological-support tools)	ADOxx
Recommended preparation	Fundamentals of Business Process Management (BPM) training to understand the basic concepts of BPM
Modes of working in teams	Collaborative problem-solving, Team/individual Q&A
Communication and cooperation mode	Process maps and models, Reports, Collaboration tools
Necessary abilities to tackle the tasks of open problems	Critical analysis, Group working skills
Knowledge prerequisites	Fundamentals of organization/business unit management

### 5.3 Vocational trainings provided by Clestral-France

With collaboration with EMSE, Clestral will provide training on the definition of needs and requirements for the vocational training program with focus on 'servitization and PSS'.

#### 5.3.1 Clestral learning: management of service delivery processes

Training specification	Explanation
Organizer	Clestral-EMSE France
Training Topic	Clestral learning
Training objectives	Training oriented on management of service delivery processes. (The precise content is still to be defined)
Date	June 2020
Location	France
Certificate	TBD
Method	Interactive sessions, with share of good practices among professionals and input of theoretical insights on service provision by academics
Target groups	Professionals of the same company
Recommended composition	Members of service related departments
Recommended size of groups	15

Training specification	Explanation
Training duration	4 hours
Mode of tutoring	Interactive case studies
Mode of provision	workshop
Tools and resources to be used (technological-support tools)	/
Recommended preparation	/
Modes of working in teams	Process diagnosis, and process improvement in small brainstorming groups
Communication and cooperation mode	Face to face interactions
Necessary abilities to tackle the tasks of open problems	Team working, share of practice
Knowledge prerequisites	Service process experience and diagnosis

#### 5.4 Vocational trainings provided by CONTI-Romania

CONTI-Romania provides the following trainings.

##### 5.4.1 Cobots - installing and programming information needed for a rapid implementation of Cobots in industrial environment

Training specification	Explanation
Organizer	Continental Automotive Systems
Training Topic	The course offers basic knowledge regarding the concept, installation, exploitation and maintenance of Cobots in industrial environment
Training objectives	<ul style="list-style-type: none"> <li>-design, install and configure Cobots cells/applications</li> <li>-provide maintenance services for Cobots and accessories</li> <li>-synchronize Cobots with production equipment</li> <li>-learn/know communication protocols</li> <li>-use controllers and interfaces with equipment</li> <li>-able to program the Cobot</li> <li>-design grippers using CAD software</li> </ul>
Date	15.01.2020-15.06.2020
Location	Continental Automotive Systems, Sibiu, Romania
Certificate	No certification/internal Continental certificates
Method	Theoretical knowledge presented in Technical Training Center (TTC) Laboratory activities in Smart Application Shop (SAS)
Target groups	Student, Automation Engineer, Researcher on technical topics
Recommended	Mix knowledge of engineering and economics, programming knowhow,



Training specification	Explanation
composition	network communication knowledge respecting industrial standards. Due to handling of mechanical and electronic equipment, usually male gender with 1 year of engineering expertise is required. Handling of power-tools for maintenance and lifting Cobot components during installation makes it difficult for women to execute tasks.
Recommended size of groups	Groups of less than 10 person due to limited space in SAS.
Training duration	5 days, 8 hours / day
Mode of tutoring	Lecture for theoretical concepts and participation in practical activities
Mode of provision	Lecture in Technical Training Center Physical, simulation and CAD activities in SAS laboratory
Tools and resources to be used (technological-support tools)	Cobot and accessories (sensors, grippers, actuators, fixtures, stands etc.), controllers, interfaces, CAD station, maintenance tools
Recommended preparation	Good knowledge regarding CAD applications, pneumatical actuators, communication protocols for industrial equipment, ISO/EIA programming
Modes of working in teams	Collaborative activities
Communication and cooperation mode	PowerPoint presentations, web applications, excel files
Necessary abilities to tackle the tasks of open problems	programming skills, technical skills, group working skills, learning skills, CAD skills
Knowledge prerequisites	Minimal engineering information (machine components, materials science, stress analysis, mechanical forces analysis, computer aided design, script programming, industrial protocols)

#### 5.4.2 AGV for modern Logistics in industrial companies

Training specification	Explanation
Organizer	Continental Automotive Systems
Training Topic	The course offers basic knowledge regarding the exploitation and maintenance of AGVs in the logistic field of the industrial environment
Training objectives	-measure time to establish frequency and timing for AGV movements -design routes for AGVs in 3D simulation software -programming script for Fleet Manager -integration of object recognition to avoid obstacles -sensor maintenance/replacement - programming Cobot to communicate with industrial environment (sliding doors, industrial equipment, other Cobots etc.)
Date	15.01.2020 – 15.06.2020
Location	Continental Automotive Systems, Sibiu, Romania
Certificate	No certification/internal Continental certificates
Method	Theoretical knowledge presented in Technical Training Center (TTC) Laboratory activities in Smart Application Shop (SAS)
Target groups	Student, Automation Engineer, Researcher on technical topics

Training specification	Explanation
Recommended composition	Mix knowledge of engineering and economics, programming knowhow, Python programming. Mixed genders, male and female can perform exercises in virtual environment of Fleet Manager software to create routes, docking actions (pick-up/drop-off) and AGV voice programming.
Recommended size of groups	Groups of 10 person due to limited space in Technical Training Center that need to move in Module 6 in 2020.
Training duration	3 days, 8 hours / day
Mode of tutoring	Lecture for theoretical concepts using PowerPoint presentations
Mode of provision	Lecture in Technical Training Center
Tools and resources to be used (technological-support tools)	Access to Fleet Manager software via Continental intranet, PowerPoint presentations for lectures, laptops for testing and simulations
Recommended preparation	No knowledge is required with regard of AGVs or simulation software, but appreciated if there is any
Modes of working in teams	Groups of two will perform small tasks to fulfill one learning objective at a time
Communication and cooperation mode	Collaborative activities
Necessary abilities to tackle the tasks of open problems	Basic programming skills, basic CAD knowledge for simulation
Knowledge prerequisites	Python programming (optional)

### 5.5 Vocational trainings provided by IDPC-Poland

Innovation and Development Promotion Centre (IDPC) provides the following trainings.

#### 5.5.1 Manufacturing Process Improvement with Lean approach

Training specification	Explanation
Organizer	IDPC, Poland
Training Topic	Manufacturing Process Improvement with Lean approach.
Training objectives	The training allows the company's employees to explore the main methods and tools to analyze and improve business processes. Improvement of production processes and ancillary processes, increase in production efficiency,
Date	PM 15 – PM 28
Location	Bialystok, Poland
Certificate	does not provide a certificate
Method	Case study Team working

Training specification	Explanation
Target groups	Professionals from the same company or from different companies
Recommended composition	Mix of jobs, abilities, gender, work experience, various industrial cultures
Recommended size of groups	10 to 15
Training duration	5 days (6 h per day)
Mode of tutoring	Expert input + practical case study
Mode of provision	Workshop
Tools and resources to be used (technological-support tools)	from OMiLAB laboratories (access to computer workstations with Internet access and a basic business package, sheets of paper, post-it notes)
Recommended preparation	Understanding of business management fundamentals
Modes of working in teams	Group working
Communication and cooperation mode	Informal communication and shared documents and models
Necessary abilities to tackle the tasks of open problems	group working skills, Critical analysis
Knowledge prerequisites	Basic features of business processes Fundamentals of enterprise management

## 5.6 Vocational trainings provided by ULBS

Lucian Blaga University of Sibiu (ULBS) provides the following trainings:

### 5.6.1 Workplace safety – Employees emotion recognition

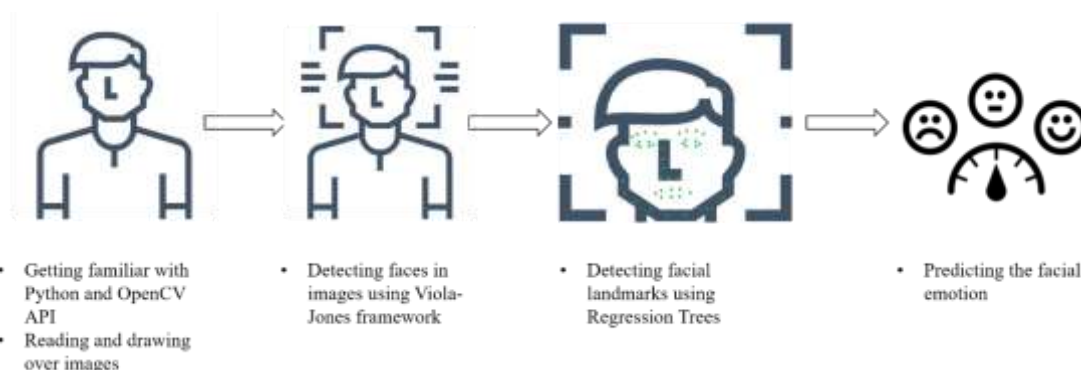


Figure 3 Employees emotion recognition

Training specification	Explanation
Organizer	ULBS, Romania
Training Topic	Workplace safety – Employees emotion recognition
Training objectives	<ul style="list-style-type: none"> <li>• Understand how emotions affect risk perception and behavior</li> </ul>

Training specification	Explanation
	<ul style="list-style-type: none"> <li>Understand, design and implement a method to recognize human emotions from live video sequences</li> </ul>
Date	January 2020
Location	OMiLAB laboratory ULBS
Certificate	No
Method	<ul style="list-style-type: none"> <li>Case study: losing control of your emotions means losing control of your safety</li> <li>Work in teams</li> </ul>
Target groups	<ul style="list-style-type: none"> <li>Employees of Continental company</li> <li>Software engineers</li> </ul>
Recommended composition	Individuals with basic programming knowledge
Recommended size of groups	10 to 15
Training duration	12 hours
Mode of tutoring	Expert input + practical case study
Mode of provision	Workshop / Classroom
Tools and resources to be used (technological-support tools)	Computer room with Java/Python or C# installed
Recommended preparation	Get familiar with OpenCV
Modes of working in teams	Collective work with distributed role
Communication and cooperation mode	Informal communication
Necessary abilities to tackle the tasks of open problems	Ability to work in team
Knowledge prerequisites	Basic programming knowledge

### 5.6.2 Computer Vision for Manufacturing Industry Application



Figure 4 Computer vision for manufacturing industry

Training specification	Explanation
Organizer	ULBS, Romania
Training Topic	Vocational training on Computer Vision for Manufacturing Industry Application
Training objectives	<ul style="list-style-type: none"> <li>▪ Knowledge of the basic and common algorithms</li> <li>▪ Understanding the phases of image processing for product control</li> <li>▪ Skills for future implementation of computer vision manufacturing control points</li> </ul>
Date	March 2020
Location	Laboratory of Takata Sibiu company
Certificate	No
Method	<ul style="list-style-type: none"> <li>▪ Algorithms and tools</li> <li>▪ Case studies on different images from production lines</li> <li>▪ Practical work in team</li> </ul>
Target groups	<ul style="list-style-type: none"> <li>• Employees of Takata company</li> <li>• Professionals on quality and control systems</li> </ul>
Recommended composition	Various industrial cultures (production, programming, control and testing)
Recommended size of groups	10 to 15
Training duration	4 hours to 6 hours on the same day or on 2 separately days
Mode of tutoring	Presentation, practical image processing
Mode of provision	Workshop
Tools and resources to be used (technological-support tools)	Computer room with MATLAB
Recommended preparation	Basic knowledge of image processing
Modes of working in teams	Individual work and collaborative
Communication and	Informal communication

Training specification	Explanation
cooperation mode	
Necessary abilities to tackle the tasks of open problems	Programming skills
Knowledge prerequisites	Image processing

### 5.7 Vocational trainings provided by UNIBG-Italy

University of Bergamo (UNIBG) provides the following trainings.

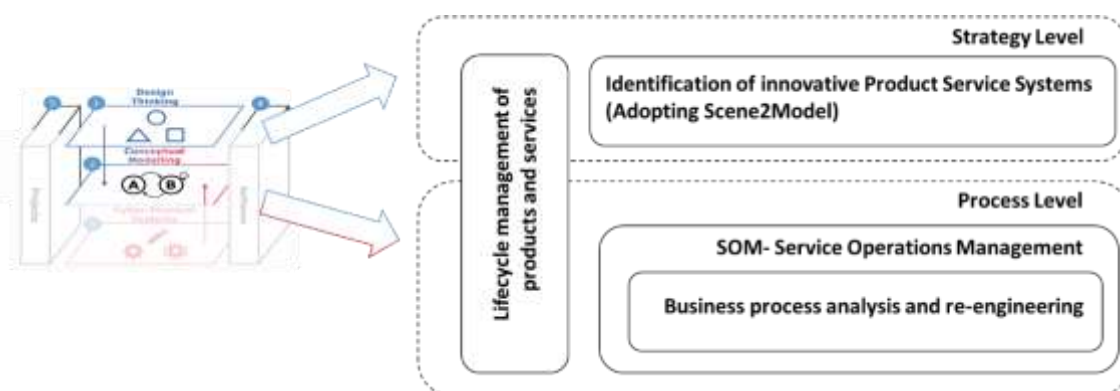


Figure 5: Vocational trainings provided by UNIBG

#### 5.7.1 Identification of innovative Product Service Systems (Adopting Scene2Model).

Training specification	Explanation
Organizer	University of Bergamo
Training Topic	Vocational training on the identification of innovative Product Service Systems (Adopting Scene2Model). The training aims at delivering design thinking and process oriented competences to the participants.
Training objectives	The participants will be able to define a Scene2Model within the context of PSS
Date	End 2020
Location	University of Bergamo
Certificate	No
Method	<ul style="list-style-type: none"> <li>▪ Case study</li> <li>▪ Practical work in team</li> <li>▪ Model creation</li> </ul>
Target groups	Professional from different companies
Recommended composition	Heterogeneous: product manager, service manager, marketing
Recommended size of groups	less than 10 persons
Training duration	1 day
Mode of tutoring	Lecture
Mode of provision	Physical
Tools and resources to be used (technological-support tools)	OMiLAB laboratory.

Training specification	Explanation
Recommended preparation	N.a.
Modes of working in teams	individual Q&A
Communication and cooperation mode	Presentation and report; elearning platform
Necessary abilities to tackle the tasks of open problems	critical analysis, report writing, presentation skills, group working skills,
Knowledge prerequisites	Preliminary understanding of PSS

### 5.7.2 Lifecycle management of products and services.

Training specification	Explanation
Organizer	University of Bergamo
Training Topic	Vocational training on the lifecycle management of products and services. The training aims at delivering process oriented competences to the participants to be able to understand and model the lifecycle of products and services.
Training objectives	The participants will be able to model a product and service lifecycle.
Date	Mid 2021
Location	University of Bergamo
Certificate	No
Method	<ul style="list-style-type: none"> <li>▪ Case study</li> <li>▪ Practical work in team</li> <li>▪ Model creation</li> </ul>
Target groups	Professional from different companies
Recommended composition	Heterogeneous: product manager, service manager, marketing
Recommended size of groups	less than 10 persons
Training duration	1 day
Mode of tutoring	Lecture
Mode of provision	Physical
Tools and resources to be used (technological-support tools)	OMiLAB laboratory.
Recommended preparation	N.a.
Modes of working in teams	individual Q&A
Communication and cooperation mode	Presentation and report; elearning platform
Necessary abilities to tackle the tasks of open problems	critical analysis, report writing, presentation skills, group working skills,
Knowledge prerequisites	Preliminary understanding of Lifecycle management

### 5.7.3 Service Operations Management

Training specification	Explanation
Organizer	University of Bergamo
Training Topic	Vocational training on the service operations management. The training

Training specification	Explanation
	aims at delivering process oriented competences to the participants to be able to understand and model a service process.
Training objectives	The participants will be able to model and manage a service process.
Date	Start 2021
Location	University of Bergamo
Certificate	No
Method	<ul style="list-style-type: none"> <li>▪ Case study</li> <li>▪ Practical work in team</li> <li>▪ Model creation</li> </ul>
Target groups	Professional from different companies
Recommended composition	Heterogeneous: product manager, service manager, marketing
Recommended size of groups	less than 10 persons
Training duration	1 day
Mode of tutoring	Lecture
Mode of provision	Physical
Tools and resources to be used (technological-support tools)	OMiLAB laboratory.
Recommended preparation	N.a.
Modes of working in teams	individual Q&A
Communication and cooperation mode	Presentation and report; elearning platform
Necessary abilities to tackle the tasks of open problems	critical analysis, report writing, presentation skills, group working skills,
Knowledge prerequisites	Preliminary understanding of service characteristics

#### 5.7.4 Business process analysis and re-engineering

Training specification	Explanation
Organizer	University of Bergamo
Training Topic	Vocational training on Business process analysis and re-engineering. The training aims at delivering process oriented competences to the participants to be able to describe and analyze a business process. Re-engineering competences will be also provided
Training objectives	The participants will be able to model a business process, identify business weaknesses and define possible improvement actions.
Date	Mid 2020
Location	University of Bergamo
Certificate	No
Method	<ul style="list-style-type: none"> <li>▪ Case study</li> <li>▪ Practical work in team</li> <li>▪ Model creation</li> </ul>
Target groups	Professional from different companies
Recommended composition	Heterogeneous: product manager, service manager, marketing
Recommended size of groups	less than 10 persons



Training specification	Explanation
Training duration	1 day
Mode of tutoring	Lecture
Mode of provision	Physical
Tools and resources to be used (technological-support tools)	OMILAB laboratory and simulation tools
Recommended preparation	n.a.
Modes of working in teams	individual Q&A
Communication and cooperation mode	Presentation and report; elearning platform
Necessary abilities to tackle the tasks of open problems	critical analysis, report writing, presentation skills, group working skills,
Knowledge prerequisites	Preliminary understanding of service characteristics

### 5.8 Vocational trainings provided by UNIBIAL-Poland

Bialystok University of Technology (UNIBAL) provides the following trainings.

#### 5.8.1 Business model canvas for FoF strategy creation

Training specification	Explanation
Organizer	Bialystok University of Technology, Poland
Training Topic	Business model canvas for FoF strategy creation
Training objectives	Improving the ability to create and develop business models; improving skills of identifying weaknesses of current solutions, seeking opportunities for the development, planning, visualization; improvement of skills of teamwork and presentation of prepared solutions.
Date	VI 2020-XII 2021
Location	Bialystok University of Technology, Faculty of Engineering Management
Certificate	No
Method	Presentation of basic theoretical content and example case study, division of teams, clarification of the subject matter of each team – 45 minutes; 9 blocks: discussion of a given model element and its individual creation – 9 x 30 minutes; summary and presentation – 45 minutes
Target groups	Professionals of the same or different companies
Recommended composition	homogeneous or heterogeneous
Recommended size of groups	between 10 and 20
Training duration	1 day (6 hours)
Mode of tutoring	lecture, case study discussion, solving the problem under the guidance of the tutor
Mode of provision	Face to face workshop
Tools and resources to be used (technological-support tools)	from OMILAB laboratories (access to computer workstations with Internet access and a basic business package, sheets of paper, post-it notes)
Recommended	none

Training specification	Explanation
preparation	
Modes of working in teams	collaborative problem-solving
Communication and cooperation mode	word documents, the group workspace
Necessary abilities to tackle the tasks of open problems	critical analysis, problem solving, presentation skills, communication skills, group working skills, presentation skills
Knowledge prerequisites	fundamentals of business management

### 5.8.2 Design thinking for product and service design

Training specification	Explanation
Organizer	Bialystok University of Technology, Poland
Training Topic	Design thinking for product and service design
Training objectives	Improving the skills of designing new products, creating innovative solutions, planning their implementation in practice; solving problems; basic analysis of selected elements of the organization's environment; improving the skills of teamwork, communication and presentation of prepared solutions
Date	VI 2020-XII 2021
Location	Bialystok University of Technology, Faculty of Engineering Management
Certificate	No
Method	Presentation of basic theoretical content, division of teams, clarification of the design challenge – 1 hour and 30 minutes; implementation of the individual steps of the design thinking process – 3 hours; presentation of results – 1 hour; evaluation round and ideas for improvement – 30 minutes
Target groups	Professionals of the same or different companies
Recommended composition	homogeneous or heterogeneous
Recommended size of groups	between 10 and 20
Training duration	1 day (6 hours)
Mode of tutoring	lecture, discussion, solving the problem under the guidance of the tutor
Mode of provision	Face to face workshop
Tools and resources to be used (technological-support tools)	from OMiLAB laboratories (creative space, magnetic board, sheets of paper, post-it notes, materials to create a prototype)
Recommended preparation	none
Modes of working in teams	collaborative problem-solving
Communication and cooperation mode	the group workspace, messaging and texting
Necessary abilities to tackle the tasks of open problems	critical analysis, problem solving, presentation skills, communication skills, group working skills, presentation skills

Training specification	Explanation
Knowledge prerequisites	fundamentals of business management

### 5.8.3 Cloud manufacturing for modelling virtualized resources

Training specification	Explanation
Organizer	Bialystok University of Technology, Poland
Training Topic	Cloud manufacturing for modelling virtualized resources
Training objectives	Acquainting participants with knowledge regarding fundamentals of cloud manufacturing paradigm; defining the vision, conceptual framework and service models for cloud manufacturing; shaping the ability of identification of data sources and data acquisition; indicating resources and capabilities enabled to be virtualized and shared 'on demand'
Date	VI 2020-XII 2021
Location	Bialystok University of Technology, Faculty of Engineering Management
Certificate	No
Method	Presentation of fundamental theoretical contents – 4 hours examples of data acquisition and data sources identifications, identifying data sources; data acquisition – 1/2 hour identifying virtualizable resources and capabilities – 1 hour discussion and summary – 1/2 hour
Target groups	Professionals of the same or different companies
Recommended composition	homogeneous or heterogeneous
Recommended size of groups	between 10 and 20
Training duration	1 day (6 hours)
Mode of tutoring	lecture, case study discussions
Mode of provision	Face to face workshop
Tools and resources to be used (technological-support tools)	from OMiLAB laboratory (computer workstations with Internet access and a basic business package)
Recommended preparation	none
Modes of working in teams	Individual Q&A, collaborative problem-solving
Communication and cooperation mode	Excel documents, the group workspace
Necessary abilities to tackle the tasks of open problems	critical analysis, problem solving, presentation skills, communication skills
Knowledge prerequisites	fundamentals of business management

#### 5.8.4 Artificial intelligence tools for Industry 4.0 transformation

Training specification	Explanation
Organizer	Bialystok University of Technology, Poland
Training Topic	Artificial intelligence tools for Industry 4.0 transformation
Training objectives	Acquainting participants with knowledge about fundamentals of Industry 4.0 technologies and trends; introducing the basics of artificial intelligence tools enabling industrial transformation; shaping the ability of modelling and simulations with the use of chosen artificial intelligence tools; developing the skills of designing expert systems and neural models
Date	VI 2020-XII 2021
Location	Bialystok University of Technology, Faculty of Engineering Management
Certificate	No
Method	Presentation of basic theoretical content – 2 hours grouping participants into teams, explaining the assumptions of the designed expert systems – 1/2 hour working in groups – 2 and 1/2 hours presentation of the results – 1 hour
Target groups	Professionals of the same or different companies
Recommended composition	homogeneous or heterogeneous
Recommended size of groups	between 10 and 20
Training duration	1 day (6 hours)
Mode of tutoring	lecture, participant's role
Mode of provision	Face to face workshop
Tools and resources to be used (technological-support tools)	from OMiLAB laboratory; open source AI software (Sphinx – PC Shell, Neuronix)
Recommended preparation	none
Modes of working in teams	collaborative problem-solving
Communication and cooperation mode	the group workspace
Necessary abilities to tackle the tasks of open problems	problem solving, presentation skills, communication skills, group working skills, presentation skills
Knowledge prerequisites	fundamentals of business management

#### 5.8.5 Fundamentals of Business Process Management (BPM)

Training specification	Explanation
Organizer	Bialystok University of Technology, Poland
Training Topic	Fundamentals of Business Process Management (BPM)
Training objectives	Understanding the key aspects of process management in the enterprise. Hands-on learning process understanding and knowledge of the principles of analysis, designing and documentation processes. Understanding of modern IT systems supporting the process management and digitalization. Developing creativity and contextual thinking.
Date	VI 2020-XII 2021

Training specification	Explanation
Location	Bialystok University of Technology, Faculty of Engineering Management, OMILAB, Poland
Certificate	Does not provide a certificate
Method	lecture - presentation of basic theoretical content – 4h working in groups, case study and discussion – 1 1/2h discussion and summary – 1/2h
Target groups	Professionals of the same or different companies
Recommended composition	Mix of jobs, abilities, gender, work experience
Recommended size of groups	Less than 10 persons
Training duration	1 day (6 hours)
Mode of tutoring	Lecture, case method
Mode of provision	Face to face training
Tools and resources to be used (technological-support tools)	IT tools for BPM.
Recommended preparation	Understanding of fundamentals business management and its internal and external factors for development
Modes of working in teams	Collaborative problem-solving, Team/individual Q&A
Communication and cooperation mode	Presentations, sharing documents, discussions
Necessary abilities to tackle the tasks of open problems	Critical analysis skills, Group working skills
Knowledge prerequisites	Fundamentals of organization/business unit management

### 5.9 Vocational trainings provided by UNIOULU

University of Oulu (UNIOULU) provides the following trainings.

#### 5.9.1 Robotics application in Virtual Laboratory

Training specification	Explanation
Organizer	University of Oulu (UNIOULU) Finland
Training Topic	Robotics application in Virtual Laboratory
Training objectives	Have knowledge of robotics process conceptual modelling based on ADOxx platform Be capable of implementing some hands-on tools (adopting Bee-up) to design the models Get the basic ideas how robots cooperate in the real settings Cultivate more sense of robotics
Date	The estimated planned date for the training
Location	University of Oulu
Certificate	No
Method	Modelling practice case study
Target groups	Vocational training: professionals on automation Master students (Advanced Computing Systems)
Recommended composition	Mix of jobs, abilities, gender, work experience

Training specification	Explanation
Recommended size of groups	Less than 10 people
Training duration	6 hours
Mode of tutoring	Lecture, case study
Mode of provision	Workshop/laboratory-based training
Tools and resources to be used (technological-support tools)	Modelling tools
Recommended preparation	Basic knowledge about modelling and robotics
Modes of working in teams	Group discussion
Communication and cooperation mode	Informal communication Problem solving capacities
Necessary abilities to tackle the tasks of open problems	Problem solving
Knowledge prerequisites	Basic knowledge about robotics

### 5.9.2 Robot-robot collaboration

Training specification	Explanation
Organizer	University of Oulu (UNIOULU) Finland
Training Topic	Robotics application in Virtual Laboratory
Training objectives	Get the basic ideas how robots cooperate in the real settings Cultivate more sense of robotics Understanding time considerations in collaborative systems Understanding robot-robot communication
Date	The estimated planned date for the training
Location	University of Oulu
Certificate	No
Method	Modelling practice case study
Target groups	Vocational training: professionals on automation Master students (Advanced Computing Systems)
Recommended composition	Mix of jobs, abilities, gender, work experience
Recommended size of groups	Less than 10 people
Training duration	6 hours
Mode of tutoring	Lecture, case study
Mode of provision	Workshop/laboratory-based training
Tools and resources to be used (technological-support tools)	Modelling tools
Recommended preparation	Basic knowledge about modelling and robotics
Modes of working in teams	Group discussion
Communication and cooperation mode	Informal communication Problem solving capacities
Necessary abilities to tackle the tasks of open problems	Problem solving
Knowledge prerequisites	Basic knowledge about robotics

### 5.9.3 Robot-human collaboration

Training specification	Explanation
Organizer	University of Oulu (UNIOULU) Finland
Training Topic	Robot human collaboration
Training objectives	Get the basic ideas how robots and humans cooperate in the real settings Cultivate more sense of robotics Understand design considerations of human robot collaboration
Date	The estimated planned date for the training
Location	University of Oulu
Certificate	No
Method	Modelling practice case study
Target groups	Vocational training: professionals on automation Master students (Advanced Computing Systems)
Recommended composition	Mix of jobs, abilities, gender, work experience
Recommended size of groups	Less than 10 people
Training duration	6 hours
Mode of tutoring	Lecture, case study
Mode of provision	Workshop/laboratory-based training
Tools and resources to be used (technological-support tools)	Modelling tools
Recommended preparation	Basic knowledge about modelling and robotics
Modes of working in teams	Group discussion
Communication and cooperation mode	Informal communication Problem solving capacities
Necessary abilities to tackle the tasks of open problems	Problem solving
Knowledge prerequisites	Basic knowledge about robotics

## 6 Conclusions

This deliverable has provided the details of vocational trainings that will be provided by the DigiFoF partners. These trainings result from academy-industry collaboration and fulfill the required skills to transform or advance in FoF. This document is part of the global training plan, which is defined in D3.1. The content of these vocational trainings will be detailed in D3.2.

This document will be revised when the trainings dates are fixed.