Project Management Handbook

Project:	Education 4.0: Living Labs for the Students of the Future (LLSF)
Action Type:	KA220-HED - Cooperation partnerships in higher education
Contract number:	2021-1-RO01-KA220-HED-000032176
Responsible:	University POLITEHNICA of Bucharest

List of participants

Participant No *	Participant organisation name	Acronym	Country
1 (Coordinator)	University POLITEHNICA of Bucharest	UPB	RO
2	Universidade NOVA de Lisboa	NOVA	PT
3	Universita Politecnica delle Marche	UPM	IT
4	Universidad Nacional de Education a Distancia	UNED	ES
5	Tel Aviv University	TAU	IL

Revision history:

Rev	Date	Partner	Description	Name
1	25/March/2022	UPB	Final draft	Ciprian Dobre

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Contents

Executive Summary

This project management handbook contains all the relevant information and rules in order to successfully execute the project. It documents the project, its management and procedures according to the selected project management standard. The project management handbook is intended to be a work of reference for the involved project participants and facilitates project management by providing structured processes that can be followed.

Abstract

Universities went through a period of rapid transformation and demonstrated that technology has already become an essential part of the learning and teaching process. Living labs, artificial intelligence, virtual and augmented reality are the future of technical universities and we must enhance learning and teaching and remain relevant for the most diverse, informed and digitally connected generation yet. According to the World Economic Forum, 34% of students believe their schools are not preparing them for success in the job market. We need to fix the bridge from education to employability. 60% of future jobs haven't been developed yet and 40% of nursery-age children (kindergarteners) in schools today will need to be self-employed to have any form of income.

A new hybrid model of education is emerging from the pandemic-driven experience, with significant benefits. There have already been successful transitions in many universities. Remote laboratories, where students could find relevant learning materials over the internet already exist. We are introducing smart laboratories, where the learning experience is centered around DATA as well.

The project's general objective is the development of an international network of interconnected smart labs for new Digital Education and Innovation programmes and engineering opportunities in Internet of Things and Data Engineering.

Our project sets the foundation for the fourth industrial revolution with several pillars: by encouraging accelerated remote learning, which is the idea that students will learn theoretical knowledge remotely using digital means, whilst ensuring any practical skills are still learnt face-to-face. We set the stage for a more personalised way of learning, while also expanding upon student independence. This is a more flexible way of learning that requires accountability and good time management; skills that will be relied on due to the rise in the freelance economy. Project-based learning highlights the importance of studying a wide set of skills that can then be

applied to each scenario, as opposed to sticking to a set of skills directly linked to a specific job role.

1. Partnership Members

Five universities will work together to create a training environment where students learn at their own pace through experimentation and the use of digital technologies, by actively working with data and applications over smart remote laboratories.

The partner universities are:

Partnership composition					
	Name of organisation	Type of institution	Country	Role in the project	Contact person
1	University Politehnica of Bucharest, UPB	Public organisation	Romania	Coordinator	Mihnea Costoiu, Rector
2	Universidade NOVA de Lisboa, UniNova	Public organisation	Portugal	Partner	João Sàágua, Rector
3	Università Politecnica delle Marche, UnivPM	Public organisation	Italy	Partner	Gian Luca Gregori, Rector
4	Tel Aviv University, TAU	Public organisation	Israel	Partner	Eyal Zisser, Vice Rector
5	Universidad Nacional de Educación a Distancia, UNED	Public organisation	Spain	Partner	Laura Alba Juez, Vice-rector

P1 oversees all activities and project phases and leads Project Management, and is finally responsible for the quality of all outputs produced as well as for narrative and financial reporting to the Agency. Will lead IO3 - Joint Design of Training Programme on IoT and Data Engineering, activities A.1. and A.9., will coordinate the organisation of E1 - eLearning Smart Digital Labs launch event and E4 - Final conference, and lead LTTA C2 and C3;

P2 will lead IO1 - eLearning smart digital labs and will organize the LTTA C1, as well as will coordinate A.2. Development of extensions and technologies to allow for secure remote access and usage of the instruments and tools to be included in the project; and A.8. Training of the Trainers; P3 will lead IO2 - eLearning smart digital labs and A.6. Analysis of the set of existing disciplines in the participating entities and of the training needs; lead E3 - Living labs for the industry: skills for the fourth industrial revolution;

P3 will be involved in all LLTAs; P4 will lead A.6.- Analysis of the set of existing disciplines in the participating entities and of the training needs; leads E2 - Change the future together: Co-creating platform for sustainable digital labs;

P4 leads A4 - Development of the inter- coupled smart labs with automated catalogue/dashboard and A7 - Adapting the set of teaching Master classes from participating universities to Education 4.0, and development of the teaching materials for the Master programme, and of the dedicated training dashboard; will be involved in all LLTAs;

P5 will lead A.3. Methodological Toolkit for Training on smart labs, and A.5. Training and testing the inter-connected smart labs with PhD research activities, and will be involved in all LLTAs.

2. Project plan

ID	Activity type	Time/date	Activity Title
1	Project Results	M1-M3	IO1: Internet of Things and Data Engineering Training Methodological Toolkit (eLearning smart digital labs)
2	Project Results	M1-M36	IO3: Joint Design of Training Programme on IoT and Data Engineering
3	Transnational Project Meeting	M1	First Transnational Project Meeting
4	Transnational Project Meeting	M10	Second Transnational Project Meeting

5	Project Results	M11 – M36	IO2: Distributed eLearning Training Platform for Internet of Things and Data Engineering (Inter-connnected Living Labs)
6	Transnational Project Meeting	M18	Third Transnational Project Meeting
7	Learning Teaching	M20	C1: Train the Trainers Education Week Short-term joint staff training events
8	Multiplier Event	M20	E1: eLearning Smart Digital Labs launch event
9	Learning Teaching	M25	C2: Students Winter School Intensive programmes for higher education learners
10	Transnational Project Meeting	M25	Fourth Transnational Project Meeting
11	Multiplier Event	E26	E2 The second multiplier event "Change the future together: Co-creating platform for sustainable digital labs" - online
12	Multiplier Event	E31	E3: Living labs for the industry: skills for the fourth industrial revolution
13	Transnational Project Meeting	M34	Fifth Transnational Project Meeting
14	Multiplier Event	M34	E4: Final conference
15	Learning Teaching	M34	C3: Student Training Week Short-term joint staff training events

2.1. Project Start and End Dates

The project will run for a period of 36 months, starting from 01.02.2022 and ending on 31.01.2025.

2.2. Project objectives

Specific objectives are:

- ➢ OS1. Creation of the interconnected smart labs
- ➢ SO2. Creation of the digital programme on IoT and data engineering with applications supported by the smart labs (living labs) - IO3

Through the development of the international network of interconnected smart labs that we are proposing, we aim to provide students from Master and PhD levels, from different parts of the World (Romania, Portugal, Italy, Israel and Spain), with flexible digital study options. Through this, the project will ensure a more accessible higher education by providing the right conditions for students of different backgrounds to succeed, but also by using a delivery technology that is accessible all around the world.

LLSF will thus provide digital readiness (in terms of IoT studies) to the universities promoting the project, but also resilience of educational services in the face of unexpected events, like the COVID-19 pandemic. In order to better address the digital transformation and resilience priority, we also aim to implement courses that will offer access to online learning. This aspect of the project will thus refine the user experience and content so that the online platform provided through the project can contribute to a better digital capacity for universities.

At the same time, as universities are in the pursuit of defining new models of education for the fourth industrial revolution, and in the context of job disruption, demand for new skills and increased socio-economic polarisation, innovative learning and teaching practices play a critical role in preparing the global citizens and workforces of the future. Education models must thus adapt to equip students with the skills to create a more inclusive, cohesive and productive world. In this sense, the project supports universities in their search for stimulating educational practices.

The project is also compatible with integrated institutional strategies for inclusion, gender equality and study success for graduation, as it provides easy and friendly access to resources that are highly relevant for the labour market of the future. Also, in order to ensure accessibility, the project aims to develop a methodology that will guide the usage of the platform, for students and professors alike, thus facilitating the further adoption of the international network of interconnected smart labs. Lastly, the project provides partner institutions with a platform where ECTS points can be awarded to students who will participate. In this sense, we are supporting the digital capabilities in the higher education sector.

The Living Lab will enable students through active research activities to realize the actual impact of their choices on a real life establishment with real people living/working inside. Moreover, private companies will be able to take advantage of the Living labs, for example by putting into test new related products (e.g. new smart meters, thermostats, controlled plugs) in real environments.

During the project, three digital laboratories will be developed in the University of Politehnica in Romania, Universidade NOVA de Lisboa in Portugal and Università Politecnica delle Marche, Italy. At UPB, a virtual infrastructure will allow for remote teaching of ICT disciplines, from Big Data / Cloud concepts, to mobile computing and Internet of Things. The UPB Research Institute PRECIS is equipped with a smart building management unit which will be provided as a virtual infrastructure. All around the building there are various sensors that will be able to be read and worked with remotely. Students will be able to form competences over emulators of such a system, and with the right security clearances even interact with live environments. Scientists will be able to create their own experiments, for example to test their theories on energy influence in the building. This is an example of a digital ecosystem fostering a living lab culture at UPB.

At UnivPM, the digital lab will focus on audio applications and electronic measurements, with the possibility to get access to specific measurement instruments (such as a binaural mannequin, or a high-sampling rate digital acquisition system) and design different experiments to test the effects of surrounding environment on audio perception, and to measure several ambient and physiological parameters during experimental test campaigns involving subjects.

At the Universidade NOVA de Lisboa in Portugal the digital lab will focus on the integration of digital equipment into IoT applications and services, like tools for Smart Cities and eHealth and several others. Through the laboratories and connected dashboard, students, researchers and teachers from partner universities will be able to connect and extract data from the various sensors installed within the infrastructure. This will support not only research activities but also practical learning applications. All results will be readily available to the open public.

2.3. Unit Costs and Real Costs

Project Budget Summary

- Project Management and Implementation 54000
- Transnational Project Meetings 28425
- Project Results 153907
- Multiplier Events 21150
- Learning/Teaching/Training Activities 66383
- Inclusion support 0.00
- Exceptional costs 0.00
- Total grant 323865

Project Management and Implementation	Grant per month	No	Grant
Coordinator	500	1	18 000
Partner	250	4	36 000
Total			54 000

Transnational Project Meetings	Country	No. Of Participants	Grant
Tr1 Romania Tr2 Madrid Tr3 Italy Tr4 Portugal Tr5 Romania	Portugal	8	5340
	Romania	9	6285
	Spain	8	5340
	Italy	8	4600
	Israel	10	6860
Total			28425

Project Results	
IO1	47635
IO2	52400
IO3	53872

Total	153907

Multiplier Event	Country of Venue	No. of Local Participants	No. of Foreign Participants	No. of Virtual Participants	Total grant
1	Romania	30	20	20	7300
2	Portugal	0	0	100	1500
3	Portugal	0	0	70	1050
4	Romania	30	40	20	11300
Total					21150

Learning/Teaching/Training	Budget
LTTA C1: Train the Trainers Education Week Short-term joint staff training events	11130
LTTA C2: Students Winter School Intensive programmes for higher education learners	8700
LTTA C3: Student Training Week Short-term joint staff training events	8700

Budget per Participating Organisation

1. TEL AVIV UNIVERSITY (E10209144 - Israel)
   - Project Management and Implementation 9000
   - Transnational Project Meetings 6860
   - Project Results 27485
   - Learning, Teaching Training Activities 14686
   - Total grant 58031

2. UNIVERSITA POLITECNICA DELLE MARCHE (E10208852 - Italy)

➢ Project Management and Implementation 9000

➢ Transnational Project Meetings 4600

➢ Project Results 43240

➢ Multiplier Events 1500

➢ Learning, Teaching Training Activities 13051

➢ Total grant 71391

3. UNIVERSIDAD NACIONAL DE EDUCACION A DISTANCIA (E10208821 - Spain)

➢ Project Management and Implementation 9000

➢ Transnational Project Meetings 5340

➢ Project Results 27485

➢ Learning, Teaching Training Activities 14411

➢ Total grant 56236

4. UNIVERSITATEA POLITEHNICA DIN BUCURESTI (E10208641 - Romania)

➢ Project Management and Implementation 18000

➢ Transnational Project Meetings 6285

➢ Project Results 28212

➢ Multiplier Events 18600

➢ Learning, Teaching Training Activities 10580

➢ Total grant 81677

5. UNIVERSIDADE NOVA DE LISBOA (E10153935 - Portugal)

➢ Project Management and Implementation 9000

➢ Transnational Project Meetings 5340

➢ Project Results 27485

➢ Multiplier Events 1050

➢ Learning, Teaching Training Activities 13655

➢ Total grant 56530

2.4. Activities, Results and Delivrables

IO1 - IoT and Data Engineering Training Methodological Toolkit (eLearning smart digital labs)

A.1. Analysis of existing digital HW/SW products and services that will be included in the smart labs and of missing elements to enable their interconnection

R.1.1 Set of available products and services identified

R.1.2 Missing components/elements/services to enable interconnection identified

A.2. Development of extensions and technologies to allow for secure remote access and usage of the instruments and tools to be included in the project

R.2.1. Set of components, extensions and technologies identified to enable interconnection

R.2.2. Authorisation mechanism for secure authentication and access to remote labs

R.2.3. *Methodology to integrate the identified mechanisms into existing security procedures already adopted by partners*

A.3. Methodological Toolkit for Training on smart labs

R.3.1. A methodological toolkit to use for sustainable development of smart labs

Output Description:

To thrive in a rapidly evolving, technology-mediated world, students must not only possess strong skills in areas such as language arts, mathematics, and science, but they must also be adept at skills such as critical thinking, problem-solving, persistence, collaboration, and curiosity. The Methodological Toolkit will not only emphasize the core technical skills needed, but it will also nurture STEM talent and 21st century skills needed nowadays. The Toolkit will enable the synergy between foundational (hard) skills and (soft) 21st century skills. Such synergy has been tested throughout the suite of IoT and Data Engineering programmes at the universities involved in the project, where modules have been delivered using a range of teaching and learning strategies with a view to fostering a deeper knowledge of subject areas and creating transferable 21st century skills such as critical thinking, problem solving, creative thinking, communication, teamwork, and research skills.

In this objective, we plan to perform an analysis that will help identify and explore the multiple dimensions that affect the training needs (the set of necessary

skills towards the development of IoT and Data Engineering quality practices and people) and training requirements (what and how these skills can better be served based on local / context conditions). This analysis will lead to the development of smart digital labs, supporting digital tools to be used by students to learn the necessary skills for the directions of the project.

The area of Internet of Things is strongly supported by the European Commission, and a set of supporting policy actions have thus been adopted, with the purpose of accelerating the adoption of IoT and of unleashing its potential in Europe. The Alliance for Internet of Things was launched by the EC in 2015 for this exact purpose, and we plan on aiding with this by introducing IoT and Data Engineering as part of our objectives. The introduction of education and training tailored for students in this area must be done through the inclusion of IoT and Data Engineering credit-based modules in all European university training programmes. This is considered in IO1, where we focus on creating an analysis and development of all the different facets of the training needs and skills for IoT and Data Engineering.

Following an analysis in O1/A1, O1/A2 is dedicated to the organization of the toolkit around the existing tools to be included in an online digital collection of tools relevant for the formation of competences on IoT and Data Engineering. O1/A3 is then focusing on the structuring and writing of the toolkit. The training methodological toolkit will use the matrix models developed on many variables (on dimensions and possible subdivisions).

A1: Analysis of existing digital HW/SW products and services that will be included in the smart labs (M1-M3)

All the training needs and routes for skills development show identified separate categories of professionals working with IoT and Data Engineering are not mutually exclusive. O1/A1 is dedicated to the analysis of these aspects and how they are to be mapped on the cultural and local specifics. By means of questionnaires, we will be able to learn: 1) what are the digital tools that each partner plans to include in the panoply of learning instruments in the project made available to all others, and 2) understand the modern training needs that are relevant to each partner's local professional environment. For example, in Romania the engineering skills could be more focused on securing data, and as such UPB will work with Univ. of Tel Aviv on such aspects. While in Italy electronic measurement instruments need to be coupled with adequate training interfaces, made available in Spain.

A2. Development of extensions and technologies to allow for secure remote access and usage of the instruments and tools to be included in the project (M3-M12)

This activity proceeds with the development of their extensions for academic purposes. UPB developed NETIoT, an IoT platform able to support easily developed data-engineering applications. The platform includes components for getting data from multiple sources, speaking from modbus to BACNET or OPC (all these are IIoT protocols already incorporated), http or LoRA data (the wireless technology). The platform is coupled with a smart building within the UPB campus, getting sensor data from rooms and from all equipment's in the building (it is coupled with the Building Management System). As an application, UPB equipped a plant with sensors (in soil and environment). In TEL-MONAER, the same platform is used to monitor PM air quality data. UPB plans to open both the platform (and components) and data to allow for teaching activity. Similarly, UPB will open the Sim2Car simulator for smart cities, the MobEmu simulator for wireless networks, and others. The set of all these instruments will need to be adapted such that to allow their use over the Internet (either in virtual labs or over Web-based interfaces). Thus, A2 deals with the construction of the Smart digital Labs.

A3. Methodological Toolkit for Training on smart labs (M11-M20)

O1/A3 is dedicated to the organization of the toolkit around the dimensions particularly relevant to the skills training needs of partners in the consortium. A first dimension for organization of the specific needs, resources and requirements for the training focuses on the envisioned audience and the relevant disciplines the training is based on. This focuses on the "who". The second dimension of the training needs is what kind of tools are considered as "relevant" for the formation of specialists in IoT and Data Engineering. This is the "what" dimension. Finally, the third dimension answers the "how", and refers to the training types and formats.

Using these three dimensions, a matrix model will be developed to create a clear image of the actual training needs and routes for skills development for each participant, complemented with the identified digital tools that are made available (or will be) in the Smart Digital labs.

The training methodological toolkit will use the matrix models developed on many variables (on dimensions and possible subdivisions). The analysis will be completed with a fourth dimension, the place of the training (university, laboratories, campuses, training institutes) that will be correlated with the audience (Master / PhD), and the format of training and size.

IO2 - Distributed eLearning Training Platform for IoT and Data Engineering (Inter-connnected Living Labs)

A.4. Development of the intercoupled smart labs with automated catalogue/dashboard
R.4.1.   **One   dashboard   for   interconnected   tools**
R.4.2. 4 meetings

A.5. Training and testing the inter-connected smart labs with PhD research activities
R.5.1. 6 PhD students enrolled during the project's duration developing themes on top of the
research   infrastructure
R.5.2. 4 **coauthored journal articles** (between universities)

The Training Platform will be at the forefront of all Training Activities because it will be used to share online digital training materials with Students and Early-Stage Researchers, to host online Training Sessions and to collect feedback. It will work as a Living Lab for fostering hands-on activities on IoT domains. Each project partner will set up its own platform node, where software used locally for online teaching activities and eLearning material sharing will be used. Each node will need to be opened to the other organizations participating in the project, at least at the level of authentication and authorization. Where needed (and because UPB has most expertise on it), the platform will be built on top of Moodle, a versatile and mature Open-Source platform for e-Learning. Each partner will create an instance dedicated to sharing knowledge to other members of the consortium in this project. For example, UPB will set up a dedicated Moodle instance for the project, where it will organize all the classes dedicated to training on Internet of Things and Data Engineering topics, and all partners will organize similarly. Following this, the training materials will need to be supported. This means that for streaming activities, complementary technologies (like Microsoft Teams or Google Classroom) will be integrated. For various activities, the training platform will need to be set up, and components will need to be developed to make the training effort as smooth as possible.

The dedicated distributed platform will also support an Open Living Lab, which means that training activities will need to be performed in joint group exercises, hackathons, and research practices. For this, the platform requires dedicated technologies to be developed. At UPB, we can start from the NetIoT platform, which was developed as an IoT Platform-as-a-Service that allows users to easily plug in their own devices and add logic on top of them. Such a platform allows for interesting experiments to be performed by trainers and students alike, which can be a good setup for a more practical approach. Moreover, the MobEmu simulator (https://github.com/raduciobanu/mobemu) is also a good tool that can be used to simulate mobile device interactions at a large scale, which would allow students to devise their own communication logic and complete their experiments. Both these tools can be extended with remote capabilities that would allow them to be used by all partners in the project.Having identified the training needs in IO1 and following IO3 that deals

with the construction of the means to meet the identified training needs, here we develop the training platform and tools. Different studies suggest that, for most categories of Academia trainees, it is necessary to think of training allowing for European Credit Transfer and Accumulation System (ECTS) credit points, and professional courses to be offered (the same ones a University would offer to its own students). We can use training events, in-class training courses on campus, organized as a workshop, the conference (lecture) or a seminary sometimes supported by educational resources and materials in the institutional intranet (Moodle for example). For each member of the consortium, we will identify the training programs of the graduate schools, research laboratories or other training units (ex. campus-wide structures) on IoT and Data Engineering-related content.Following the realization of the training materials, methodologies, the training of trainers to deliver the best impact in terms of competencies and skills on IoT and Data Engineering, constant feedback will be collected (through feedback forms on the eLearning platform or live and real-time feedback), that will be analyzed such that to create the structure where the content is constantly adapted and changed, to meet the best delivery quality. Technology changes (like what repositories and tools are available, what instruments for IoT or methods for data engineering are available), rules change (e.g., the movement towards standardization), and so we need to constantly adapt the training materials to face these changes. Students also change, e.g., students today learn better by using learn-by-doing it, they favor training memes or gamification techniques, all being applied in our curricula and training materials.

A4: Development of the inter-coupled smart labs with automated catalogue (dashboard) (M13-M36)

We first start with an analysis of the requirements for such a distributed (meaning each partner will host it, and still share content within the network and beyond) training platform. The analysis would most likely assess the possibility of developing add-ons on-top of already existing open source software like Moodle (several partners in the projects use Moodle internally for online teaching). We will conduct surveys and focus groups to find out what is really needed, from teachers and policy makers and research stakeholders that would be able to profit from this online platform. Following these intense two month, we expect to be able to extract both technical and non-technical requirements, identifying the missing puzzles that would be developed in-house in this project.

Next, the inter-coupled smart labs will be developed into a prototype that will be able to host one or two training sessions in parallel with a limited number of online Trainees, while here we intend to introduce scalability up to 10 training sessions in parallel and hundreds of Trainees accessing in the same time the distributed set of interconnected

smart labs. For the interconnected smart labs, we will need to set the tools to integrate security access policies local to each university: a PhD student in Italy will use her own university credential to access the digital tools at UPB for example.

A5: Training and testing the inter-connected smart labs with PhD research activities (M11-M36)

Next, the inter-coupled smart labs will be continuously tested up-to-the-phase where we take the prototype and transform it into a working product that will be able to support high Quality of Service. We have chosen for this testing phase the activity where PhD students will be able to work on research projects combining digital instruments from all partners. For example, she will use security components from Univ. of Tel Aviv and building data from UPB to propose a PhD theme on automatic recognition of intruders attacking a BMS / modern building.

IO3 - Joint Design of Training Programme on IoT and Data Engineering

A.6. Analysis of the set of existing disciplines in the participating entities and of the training needs

R.6.1. *Report of collected data through questionnaire*

R.6.2. Set of identified disciplined (at least the 4 disciplines identified in the preproposal analysis)

A.7. Adapting the set of teaching Master classes from participating universities to Education 4.0, and development of the teaching materials for the Master programme, and of the dedicated training dashboard

R.7.1. set of classes adapted to the online remote teaching

R.7.2. *Guidelines for the development of training materials*

R.7.3. Set of materials for at least 4 disciplines

A.8. Training of the Trainers

R.8.1. At least 8 training sessions done through STSM

R.8.2. 2 training workshops organised

R.8.3. 10 trainers trained (2 trainers from each university)

A.9. Training of students - Organisation of the classes for at least one academic year

R.9.1. 1 final workshop

R.9.2. More than 200 students participating in the pilot Master selected classes between the partner universities

Output Description (including: needs analysis, target groups, elements of innovation, expected impact and transferability potential)

The output of IO2 aims to develop a joint training programme on IoT and Data Engineering according to the outputs identified in intellectual objectives IO1 and IO3. The training programme and its modules will be determined based on the requirements of the ECTS credit system, with emphasis placed on the development of the optimal training formats, considering and involving modules already offered by the consortium, as well as the ones identified following IO1.

The coordinators of IO2 are highly experienced in setting up appropriate teaching and training formats, on-site and online. Planned formats in this project will be mainly organized either as lectures, workshops, or seminars, on-site or online, according to the requirements of IO1 and IO2. These teaching formats will be supported by suitable educational resources, such as scripts, books, and other written documents, as well as through material which will be also available online in the institutional intranet (e.g., the eLearning training platform that will be developed and/or configured in in IO3). In terms of content, basic 101 courses will be integrated, as well as specific disciplinary and interdisciplinary aspects of IoT and Data Engineering. The latter will be based on the results of IO1, which will specify the needs for the toolkit. These specific skills will be integrated to the programme based on the outputs in IO1.

For each member of the consortium, we will identify the corresponding training program in relation to the target groups: MSc & PhD students, early-stage researchers, trainers, and further research community stakeholders. In order to tailor the training module content based on the conclusions of IO1 and IO3, several other attributes will be customizable, including:

Objectives (in terms of the toolkit needs identified in IO1 and technical requirements identified in IO3)

- Format and didactics (class size, face-to-face vs. online classes, innovative features of teaching)
- Duration
- Domain (specific, disciplinary, interdisciplinary, multidisciplinary, as well as basic content of IoT and Data Engineering)
- Programme target group (target group specific content for MSc & PhD students, early-stage researchers, trainers, and further stakeholders)

In addition to the development of the training objectives and outcomes, IO2 focuses strongly on choosing the best training methodologies relevant for the IoT and Data Engineering toolkit developed in IO1, and the technical requirements of the training platform developed in IO3. These methodologies will relate to domain-specific training needs, skills and gaps examined in IO1 and will also contain corresponding teaching strategies on

university level, such as strategies for teaching of a large/small audience, flipped classroom/blended learning, problem-based teaching etc., especially regarding IO2.

The project partners will apply the international Innovative Doctoral Training Principles (IDTP) within the framework of IoT and Data Engineering, considering good training practice, such as the involvement of attractive and existing institutional environments including IoT and Data Engineering infrastructures and policies, international networking, and quality assurance. The training program will clearly distinguish between raising awareness, the acquisition of basic and innovative knowledge and expertise, as well as skills development (including transferable skills training) and will offer broad learning opportunities in IoT and Data Engineering for all levels and various target groups.

The training programme will also contain dedicated modules for training the trainers and teachers themselves, which aims to ensure the delivery of the best impact in terms of existing and novel methodologies, materials, competences, and skills on IoT and Data Engineering. Thus, the proposed project will also permit the exchange and integration of best practices in the context of IoT and Data Engineering within all target groups and stakeholders involved. This will be guaranteed using the outcomes of the research conducted in IO1. This way, the project progress can be adapted to changes during the project phase, such as the integration of novel and innovative aspects due to the use of novel tools and methods for IoT and Data Engineering, as well as changes in legal requirements.

Furthermore O3 will be coupled with LTTA C1: Train the trainers Education Week, LTTA C2: Students Winter School and LTTA C3: Students Training Week.

The teaching and training programme, as well as the "Train the Trainers" modules, will be developed and updated constantly in accordance to the outcomes of O1 and O2 to guarantee a flexible response to changes during the implementation of the project.

A6: Analysis of the set of existing disciplines in the participating entities and of the training needs (M1-M6)

A6.1 is led by Università Politecnica delle Marche and contains an analysis of training needs for modules to be included in the Master set of classes that are to be digitalized and coupled in the pilot classes in the project, based on the inputs collected from each participating partner. The analysis and the identification of the training needs will be conducted based on the complementarity of the skills and competencies each partner brings into the project, in order to come up with an harmonized design of the classes to be piloted.

A7: Adapting the set of teaching Master classes from participating universities to Education 4.0, and development of the teaching materials for the Master programme, and of the dedicated training dashboard (M7-M18)

Following the analysis in O3/A6, Tel Aviv University is responsible to set up the training classes in collaboration with the project partners, to guarantee the fulfilment of the content and the framework conditions for it: objectives, format and didactics, duration, basic and domain specific content, content tailored to the project target groups, as well as ensuring the compliance of the developed training programme and its modules regarding the requirements of the ECTS credits. This will be developed in close collaboration with all project partners, considering the requirements and needs and tools identified. Corresponding specific on-site and online teaching/training methodologies and material will be applied for all modules. The activity will set up the training content for the modules of the toolkit and its target groups also according to the technical requirements, and target group specific content. Furthermore, the will combine needs of cross-disciplinarity, for example project management, career planning, documentation, ethics and job skills training. Partners will integrate specific requirements of the modules to the toolkit which will to be integrated to the programme regarding the outputs in O1 and O2.

A8: Training of the Trainers (M18-M20)

A8 is led by Universidade NOVA de Lisboa and contains the development of the "Train the Trainers" modules and its content, with corresponding training methodologies and material of the programme needs. The modules will be developed in close collaboration with the project partners and the needs, requirement and tools developed in IO1 and IO3. Teachers and trainers will be selected to have a high knowledge and professional background regarding: 1) objectives of the programme, such as the state of the art and novel knowledge about IoT and Data Engineering, 2) proper application of the defined formats and didactics 3) corresponding duration of the modules regarding the content of the modules, 4) broad range of diverse levels of knowledge in IoT and Data Engineering and transferable skills, as well as basic and inter-, multi- and disciplinary knowledge in these domains and beyond and finally 5) in accordance to the content of the identified project target groups and their specific needs. Thus, the activity involves the organization of the Train the Trainers Education Week.

A9: Student training with MSc classes at partnering universities (M18-M36)

UPB is furthermore responsible to manage, in close collaboration with all partners, a first pilot on the application of the digital Living Labs to Master classes in all partnering universities. The Activity will lead to the actual training of a first generation of students, as a pilot application, over the digital smart labs and tools provided between universities. In addition, this activity also

involves the organization of the LTTA C2 Students Winter School and LTTA C3 Students Training Week.

2.5. Transnational project Meetings

There will be 5 transnational partner meetings and minimum 7 online meetings will be held between project partners. From each partner two members of staff will travel to transnational partner meetings and three from UPB. The partner meetings allow communication on a personal level about upcoming activities and intellectual outputs, discussion and also for input from one partner (lectures, workshops etc.). The meetings are chaired and documented in minutes by the coordinator (UPB).

Meeting venues and travel destinations:

1st: Bucharest/RO (M1) - with the aim of introducing the project team, giving an overview of the projects main objectives, the results to be expected, and first steps and activities to be taken on this behalf; decision making and joint working style; risk analysis

2nd: UNED/ES (M10) - discussing results of IO1, planning the activities of IO2 and the status of implementation of IO3/A6 and IO3/A7;

3rd: Ancona/IT (M18) - discussing results of IO2/A4 and IO2/A5 and IO3/A7 and the results of IO1/A3;

4th: Lisbon/PT (M25) - discussing the developments done within IO2/A4 and IO2/A5;

5th: Bucharest/RO (M34) - discussing the final achievements of the project and planning the final reporting together with the sustainability actions;

ONLINE MEETINGS: Besides partner meetings, regular online meetings will take place with a limited number of participants (6-8 people) in order to assure decision making processes are effective and current problems are discussed in an orderly manner. Online meetings will also be documented in short minutes by the coordinator (UPB).

2.6. Multiplier Events

E1: eLearning Smart Digital Labs launch event

The first multiplier event "eLearning Smart Digital Labs launch event" will be organised at the University Politehnica of Bucharest and will include an estimated total of 70 participants. The event will take place in the M20 of the project and will aim to launch and promote the new

eLearning Smart Digital Labs. The launch event will include both a presentation of how the living lab will work and the benefits of the newly created infrastructures. P1 will present the Analysis of the hardware and software products and services that will be included in the smart labs (A1), and how this analysis is relevant to the students, teachers and labour market. Guests from the industry will present the ways in which they plan to use and experiment with the services offered by the eLearning Smart Digital Labs, and the manner in which the skills acquired through the labs could increase the integration rate of the students in the labour market. The event will also emphasize the various IoT and Data Engineering applications that could be useful for companies. The program of the event will include: Opening address; Presentation of the project and expected results (P1); Presentation of the hardware and software products that will be included in the eLearning Smart Digital Labs (P1); Presentation: security of the remote access (P2); Presentation: Education 4.0 - Training with smart labs (P5); Discussion with stakeholders: improving the integration of students on the labour market; The discussion will be moderated by P3. Conclusions

E2 "Change the future together: Co-creating platform for sustainable digital labs"

The second multiplier event "Change the future together: Co-creating platform for sustainable digital labs" will be organised by Università Politecnica delle Marche, in online format, and we propose to gather more than 100 particpants. The event will take place in the M26 of the project and will aim to launch the dashboard developed within the project. P3 will present the dashboard, the benefits and its functionalities. Also, a live demo of the Dashboard will be presented during the event. The participants will be students, researchers and teachers from partner universities and also stakeholders from various domains, representatives of the companies, education sector and from public administration. The program of the event will include: Opening address (P1); Presentation of the dashboard and expected results (P3); Live demo of the Interconnected living labs (P4); Stakeholder discussion: Synchronising with the labour market (moderated by P3); Presentation: Education 4.0 - Training with smart labs (P5); Conclusions.

E3: Living labs for the industry: skills for the fourth industrial revolution

The third multiplier event will be organised in format online by P2 in the 31th month of the project and it will be dedicated to stakeholders like education and training organisations, social partners, authorities, policy makers or industry actors. The event is propose to gather more than 70 participants. The main purpose of the event is both to raise awareness with regard to the interconnected smart labs and to involve as many stakeholders as

possible by collecting relevant information with regard to needs, partnership requirements and opportunities. The event will take place online and will involve demos of the living labs and workshops involving students, teachers and industry representatives, where the teams will seek and share ideas of how the living labs can be specifically applied in a manner that is relevant to the labour market. The event will be scheduled as follows: Opening remarks; Presentation of the project (P2); Discussion 1: Data engineering in companies - IoT and Data engineering skills for the future (stakeholders); Discussion 2: Living research - projects and opportunities (P3); Discussion 3: Living education - inspiring visions for the Education 4.0 (P4) Closing remarks.

2.7. Learning, Teaching, training Activities

LTTA C1: Train the Trainers Education Week Short-term joint staff training events

Teachers in Higher Education and PhD researchers who want to be involved in training activities have the possibility to learn about the need of training in using digital tools, especially in the domains of IoT and Data Engineering. What is needed are credited models and professional courses, and this event will follow a thorough analysis of best practices and teaching materials that made a strong impact in training. Thus, the training of trainers will be developed on credit models and will also include Practical training.

The format of the training programme will be tailored for the specific working and learning conditions of the Master and PhD students. While general and cross-disciplinary awareness raising and knowledge acquisition can be organized via MOOCs and similar learning opportunities, accompanied by short face-to-face sessions for debate and feedback, skills development should be organized on-the-job, near-to-the-research-bench (i.e. laboratory).

The training staff to be trained will be organized as mixed teams of scholars, teachers, scientists, and technical and administrative staff. This event will practical training with staff from inside or outside the university (such as conference series and seminaries).

The training will be organized using two different sets of activities:

1) The first set will involve different sessions structured in a set of activities under a daily focal point presented by expert speakers – inputs on conceptual methods to train the trainer based mainly on the use of the IO1 toolkit matrix model and the class deployment of IO3. Methodologies will be explored in small and mixed groups and evaluated against their usefulness in practice, accessibility of material (i.e. open access), and structural framework conditions to use the material. The training course will be prepared and developed during the partner meeting.

Participants can register via the project partners only and will have to write a short motivational letter, why they want to attend the training course.

Session 1: Identifying the training needs on the 4th dimensions of Education (applying the IO1 digital tools)

Session 2: Matching the needs with an appropriate form of training (applying IO3 methods)

Session 3: Presenting what participants have learnt from their conversations with the other members of the group. Each group member looks at identifying key choices in planning the training and at the issues around selecting and using the best tools on IoT and Digital Engineering (depending on the level of training, whether it is low-level embedded equipment design or high-level IoT and data crunching AI applications). At the end of the day, the participants will be given group exercises to prepare the next session.

Session 4: Presenting what is new on each subject (e.g. introducing a new area, approach or issue) by the leading trainer. This is coupled with the group activities and will lead to the final task of creating a course plan template on how to respond to the key aspects of the chosen subject. This plan would be done in small groups working together outside the workshops to prepare their response and also a brief presentation to be delivered at the final workshop.

2) The second set of activities will involve the design of a draft course template to introduce the future trainees to the subject (e.g. IoT data transfer, or Data Cleaning techniques). The template consists of a series of presentation slides, a lesson plan and guidance to deliver the course. The assessment of the learning outcomes will consist in the assessment of the templates drafted by the participants and submitted on the last day of the training. Experts will provide feedback and support for improvement/further development. A certificate of attendance with the logo of the organizing university will be distributed on the last day of the training (on condition that participants attend at least 80% of the total hours of the training).

LTTA C2: Students Winter School Intensive programmes for higher education learners

The event is jointly organized for PhD students (A2.2) and MSc students (A3.4). In order for MSc and PhD students to actively engage in Education 4.0 concepts and the use of digital tools to enhance their practice on IoT and Data Engineering, the winter school serves as an opportunity for exchanging experiences among the students and fostering European cooperation. 5 students and 1 PhD from partner universities will take part. Project partners will be the trainers. Objectives of this training events in terms of skills and knowledge (expertise) are designed to raise awareness and to provide knowledge on smart digital labs: the use of IoT and Data Engineering tools for education, and practices on how to best use such tools to enhance the learning

experience (MSc students) and research and innovation opportunities (PhD students), contributing to a better understanding and a higher expertise. All these training goals are described as "to learn more about", "for a better understanding", "to enhance awareness" etc.

Some key words of training goals in terms of awareness and knowledge are representative on specific Education 4.0 relevant topics: - IoT tools for learning: designing and working with embedded equipment, connected measurement instruments, digital components, IIoT communication, wireless technology, measurements and data collection, Cloud/Edge platforms, mobile development, service-driven models, micro-service design, service engineering, application development, security, HCI and UI/UX aspects. - Data Engineering: data capturing, data cleaning, data deluge, data reusability, repository, data analytics, ML/AI models, data-driven designs and problem solving, case studies, Python and R programming, using tools for CNN logistics, etc. - Education 4.0: direct scientific communication, open repositories, predatory publishing, open licensing (Creative Commons), digital identity, research data management (context, challenges, data repositories, data management plans, best practice), principles of collaborative projects with civil society, social and responsible innovation, participative management, open intellectual property.

The Sessions will be the following (but are subject to title change in the course of the project):

- SESSION 1): Learning about Smart Digital labs and tools for IoT / Data Science relevant topics (IO1)

- SESSION 2) Session on training needs model (IO1)

- SESSION 3) Presentation session of experiences and good practice examples of students in IoT and Data Engineering best practices and applications (eHealth, Industry 2.0, factory pipelines, Smart Cities, Wireless Broadband, etc.)

- SESSION 4) Practical training session on IoT and related applications

 - SESSION 5) Practical training session on Data Engineering training offer The training will last for 5 days, having as trainers experts from the partner HEIs. Each partner HEI will bring 5 students and 1 PhD (=30 in total) that will be selected from the cohorts enrolled for the courses taught by teachers selected.

The assessment of the learning outcomes of the training activity, performed by experts from the project partners, will consist in the assessment of an essay submitted by the trainees on the last day of the activity. A certificate of attendance with the logo of the organizing university will be distributed on the last day of the training (on condition that students attend at least 80% of the total hours of the training). The certificate will be free of charge. On the first day of the training each participant will receive a welcome package (a pencil, a folder, sheets, handouts etc.). The

training can be accredited with ECTS credits (European Credit Transfer and Accumulation System) distributed as follows: 30 h course = 3 ECTS. Each sending university has to decide on this policy matter.

LTTA C3: Student Training Week Short-term joint staff training events

Regarding the objectives of training events in terms of skills and knowledge (expertise) in a general way, it is obvious that all actions are designed to raise awareness and to provide knowledge on the digitalization of Education in the post-covid era.

We have chosen two very relevant domains: IoT - deals with all the necessary tools to get from sensing data relevant for various phenomena, to seeing it in some aggregated form; Data Engineering next - deals with the right understanding of phenomena hidden within the patterns of numbers. Together, these two are key factors in allowing students from many backgrounds to get close to the use of digital tools in their daily life, to encourage formation of digital competences with students and encourage Lifelong learning. Then, Education 4.0 is all about giving education competences over the Internet, but not only as a teaching activity, but actually allowing for tutorial training and personalized education pace. All these are made possible through this project, and this event is exactly designed to raise awareness around all these aspects, to encourage people (existing students, but also wanna-be students) to start their Education today. The event is organized for both MSc and PhD students. Both student categories will participate in training activities on the use of digital tools and the online course platform. Because the PhD students (and ESR for the matter) would represent for a university the key actors for promoting Education 4.0 and IoT/Data Engineering and the reuse of data and tools (Living Labs), besides the training itself to develop their skills, they should also be trained to actively participate in the achievement / development of some training programmes / modules, at least at the PhD and ESC level. Each member partner will send 5 students and 1 PhD MSc students and 2 or 3 members of their doctoral programme to attend the training week, the intention being that having received training they could then return to their organisations and spread that knowledge to local students and prospect doctoral candidates.

SESSION 1) Identify the training needs for MSc students and PhD (IO1) The format of the Programme is to aim for a mixture of keynote speakers on specific topics, speakers to lead in particular thematic areas and student presentations/discussions. The Training Week will highlight a number of issues, which are likely to form the core of the IoT/Data Science training activity going forward.

SESSION 2) The students themselves present the case studies using their own research data on the topics identified (balance between formal presentations and opportunities for students to present their results).

SESSION 3) The students themselves present experiences and good practice examples in the use of digital tools and data.

SESSION 4) Develop a draft template of a future training module/event on one of the learning needs identified in the present training (IO3), etc.

SESSION 5) Practical training session on the developed training offer and presentation of training platform (IO2) The assessment of the learning outcomes of the training activity will consist in the evaluation of the draft template(s) for future training, A certificate of attendance with the logo of the organizing entity will be distributed on the last day of the training (on the condition that students attend at least 80% of the total hours of the training). The certificate will be free of charge. On the first day of the training each participant will receive a welcome package (a folder, sheets, handouts etc.). The training can be accredited with ECTS credits (European Credit Transfer and Accumulation System) as follows: 30 h course = 3 ECTS. Each sending university has to decide on this policy matter.

2.8. Project delivrables

The Living Lab will enable students through active research activities to realize the actual impact of their choices on a real life establishment with real people living/working inside. Moreover, private companies will be able to take advantage of the Living labs, for example by putting into test new related products (e.g. new smart meters, thermostats, controlled plugs) in real environments.

The following intellectual outputs, learning/teaching/training activities and multiplier events will be developed/organized during the project lifetime:

INTELLECTUAL OUTPUTS:

IO1: Internet of Things and Data Engineering Training Methodological Toolkit (eLearning smart digital labs)

IO2: Distributed eLearning Training Platform for Internet of Things and Data Engineering (eLearning smart digital labs)

IO3: Joint Design of Training Programme on IoT and Data Engineering

LEARNING/TEACHING/TRAINING ACTIVITIES

LTTA C1: Train the Trainers Education Week

LTTA C2: Students Winter School

LTTA C3: Student Training Week

MULTIPLIER EVENT

E1 (M20): eLearning Smart Digital Labs launch event

E2 (M26): "Change the future together: Co-creating platform for sustainable digital labs"

E3 (M31): Living labs for the industry: skills for the fourth industrial revolution

E4 (M34): Final conference

3. Project Coordination

3.1. Procedures

The project coordinator (PC) will prepare clear and concise project management guidelines that will be developed, followed by setting up of the management and administration structure, comprehensive preparation with regards to the contents of the intellectual outputs (preliminary research, gathering of information) and preparation of the planned meetings/training events.
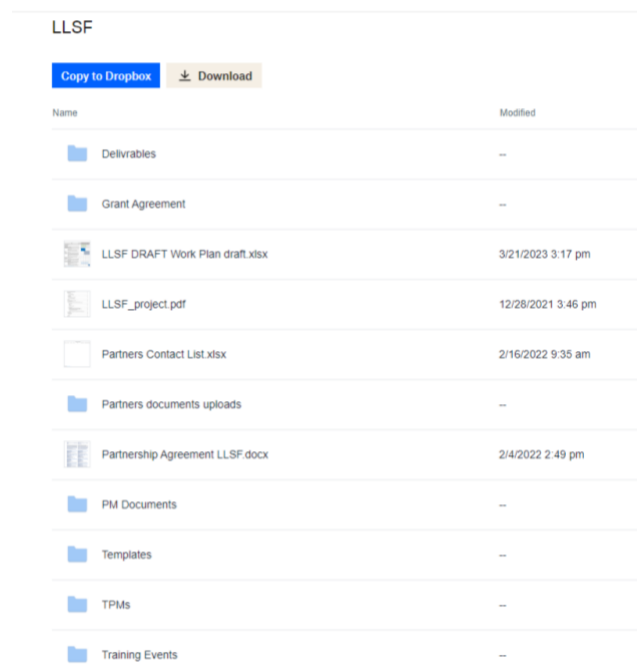
Key responsibilities and tasks of MT include overall project coordination, making of major management decisions and setting quality principles. MT will review criteria for deliverables and project activities, lead communication and administrative procedures and determine dissemination strategies. The Management Team will monitor continuously the fulfillment of the objectives-results-indicators assumed, in close correlation with the activity schedule, efficient management of financial, material and human resources, and preparation of specific monitoring reports of the project. MT will also ensure the correct identification of project costs, breakdown of tasks into easily manageable work packages, and dividing cost budgets so that each package of tasks corresponds to one percentage set from the total budget.

The project members will meet 5 times during the project to officially adapt and update the progress report, agree on the next tasks & to discuss financial and other issues.

The Coordinator institution appoints one contact person for local project administrator's responsibility. This person coordinates and manages project issues at his/her institution and will be responsible for timely delivery of all requested info, financial & administrative documents to overall project management. An external communication platform (e.g. Google Drive) will be used to assure transparency and optimal communication within throughout the project. The management of the project is based on the principle of partnership.
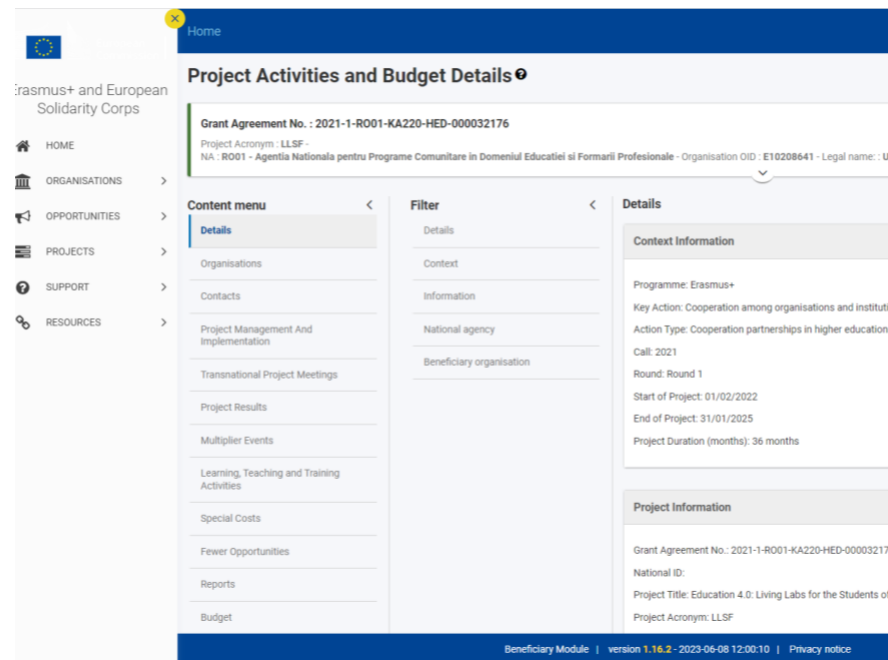
3.2. Document repository

https://www.dropbox.com/sh/uunh5yq4sc8yxlp/AACxUyzmr0gP48vSoazQNdloa?dl=0

https://webgate.ec.europa.eu/beneficiary-module/project/#/project-list

3.3 Risk Analysis

Risk management will be a continuous process throughout the lifetime of the project and will address the planning of risks identification, analysis, monitoring and control. This document outlines procedures for identifying and handling risks.

Risk assessment will be conducted throughout the project lifecycle as unexpected risks can be identified at any time. It is the objective of the risk management plan to decrease the probability and impact of events adverse to the project. On the other hand, any event that could have a positive impact will be exploited.

This document represents the Risk Management Plan (RMP) for the project Education 4.0: Living Labs for the Students of the Future (LLSF) and addresses the entire project implementation period. RMP is an integral part of the Management Plan.

The Project Manager together with the management team are responsible for the regular review of this document and for its updating during the project lifespan, so that this document corresponds to the real risks that the project faces.

The objective of the Risk Plan is to identify potential threats to the project, before thay come into effect, in order to plan response actions to avoid or minimize the negative effects. The negative aspects represent the consequences that can result in the impossibility to reach the project results and indicators, exceeding costs, time frames agreed in the project proposal.

The specific objectives of RMP are:

- identifying risks;
- evaluating risks, the probability of occurence of the risk and the impact of the risk on the project;
- issuing an action response plan to avoid risks or minimize the negative effects;
- elaboration of procedures for periodic reassessment of project risks.Each partner is responsible for executing the risk mitigation activities which relate to the activities they lead.

The management team will make sure all partners are involved in each step because all perspectives are important for a comprehensive and holistic risk mitigation response.

Monitoring risk over the course of the project will be an ongoing and proactive part of risk analysis. The risk assessment is done on a quarterly basis (every 3 months). Risk monitoring is done on a monthly basis and is correlated with the Activity Reports of the members of the implementation team.

The risk register will be continuously updated, from risk identification through risk response planning and status update during risk monitoring and control. This project's risk register is the primary reporting tool and is also available online, accessible to all partners.

The main cathegories of risk for our project are :

1. Technical (risks based on requirements, the technology being used, interfaces, performance, and quality)
2. Management (risks that arrise from planning, scheduling, estimating, or communication)
3. Organizational (dependencies, logistics, resources, budget, etc.)
4. External (risks that come from benefficiaries and industry).

Risk details:

No.	Category	Identified risk	Implications
R1		Lack of overall coordination	can decrease productivity, complicate processes and delay the completion of tasks
R2		The number of employees is insufficient / inadequate	cause stress and tiredness and eventually lack of attention

R3	management	Failure to reach the indicators related to the target group	wasting huge amounts of time and money collecting information that is not going to benefit the project
R4		Lack of regular meetings with the entire team	no access in real time to all project results and vital information
R5	organizational	Conflicts between team members	can negatively impact morale and productivity
R6		Timely communication of key findings and project process issues	inefficient continuing of activites
R7		Making decisions without first consulting management	possibility of affecting project activites and results
R8		Failure to comply with the project implementation deadlines	failure to meet deadlines can lead to ineligibility of expenses
R9		Unbalanced loading of staff tasks	cause stress and tiredness and eventually lack of attention
R10	technical	Elaboration of inappropriate documents from the perspective of the data they contain	rejection from the National agency and possible stoping of further funding
R11		Promotional materials without impact to the public	impossibility to grow and disseminate the results
R12		Insufficient technical resources for project activities	inability to realize some project results
R13		Inability to prepare the supporting documents for training activities	porely prepared teachers
R14		Small number of participants in the dissemination events	impossibility to grow and disseminate the results

R15		Lack of desire of the target group to get involved in project activities	impossibility to assess the impact and usefulness of the project results
R16		The non-involvement of the socio-economic partners	impossibility to grow and disseminate the results
R17	external	Rejection or partial approval of reimbursement requests by the National authority	inability to move further with project activies

Risk assessment is done by:

➢ estimating the probability of occurrence of the risk, on a three-step scale, as:

• low -1, the risk may manifest in the next 2-3 years;

• medium -2, the risk can manifest itself in an interval of 1-2 years;

• high -3, the risk may manifest several times in the last year;

➢ estimating the impact on the objective, on a three-step scale, as:

• low -1, the risk may have a low impact;

• medium -2, the risk may have a medium impact;

• high -3, the risk may not reach the target, having a major impact.

No.	Identified risk	Probability of occurence of the risk	Impact of the risk on the project	Evaluation
R1	Lack of overall coordination	low	high	4
R2	The number of employees is insufficient / inadequate	medium	medium	4
R3	Failure to reach the indicators related to the target group	low	high	4

R4	Lack of regular meetings with the entire team	low	low	2
R5	Conflicts between team members	medium	medium	4
R6	Timely communication of key findings and project process issues	medium	medium	4
R7	Making decisions without first consulting management	low	medium	3
R8	Failure to comply with the project implementation deadlines	low	high	4
R9	Unbalanced loading of staff tasks	medium	medium	4
R10	Elaboration of inappropriate documents from the perspective of the data they contain	low	high	4
R11	Promotional materials without impact to the public	low	low	2
R12	Insufficient technical resources for project activities	low	medium	3
R13	Inability to prepare the supporting documents for training activities	low	medium	3
R14	Small number of participants in the dissemination events	medium	low	3
R15	Lack of desire of the target group to get	low	high	4

No.	Identified risk			
	involved in project activities			
R16	The non-involvement of the socio-economic partners	medium	medium	4
R17	Rejection or partial approval of reimbursement requests by the National authority	low	high	4

The Project Manager and management team established a risk mitigation plan.

Different types of risk mitigation strategies will be used, depending on the issue raised.

- Risk acceptance (a risk will be accepted for a given period of time to prioritize mitigation effort on other risk).
- Risk transfer (the management team will allocate risks between all partners, consistent with their capacity to protect against or mitigate that specific risk).
- Risk avoidance (all measure will be taken to avoid the occurence of a risk beforehand)
- Risk reduction (the management team will assign highly skilled project personnel to manage the respective activity or process).

Risk can affect the performance and/or scheduling; therefore, different strategies will be used to address risks based on the way they affect the relisation of the project. The management team will employ a risk acceptance strategy, temporarily prioritizing risks that affect performance more heavily.

Each partner is responsible for executing the risk mitigation activities which relate to the activities they lead. If a mitigation action cannot be effectively carried out or does not solve the risk, the visibility of the risk will be highlighted by the Project Manager and the mitigation measure modified in an efficient way.

The management team will make sure all partners are involved in each step because all perspectives are important for a comprehensive and holistic risk mitigation response.

No.	Identified risk	Risk mitigation measures
R1	Lack of overall coordination	Effective coordination is ensured by the managerial structure and through the project

		work plan. UPB has extensive experience in coordinating large EU and national projects. In case of unforeseen events, other experienced persons at the coordinating institute or at other partners can take over coordination tasks.
R2	The number of employees is insufficient / inadequate	The periodical meetings will point out the activities that have insufficient staff allocated, and there will be a reevaluation of staff per activity
R3	Failure to reach the indicators related to the target group	the dissemination staff will conduct thorough planning of dissemination
R4	Lack of regular meetings with the entire team	A montly meeting is set up in the first Project meeting, and all partners will be informed in due time.
R5	Conflicts between team members	Each partner will organize regularly team meetings, formal and informal, and UPB will motivate the team by mentioning common goals and achievements.
R6	Timely communication of key findings and project process issues	Permanent communication within the project, both horizontally and vertically. The smooth running and progress of LLSF relies on good communication and use of appropriate communication tools. Regular meetings bring the staff together to discuss such issues. Partners are encouraged to communicate and ensure timely delivery of activities, milestones, deliverables and reports.
R7	Making decisions without first consulting management	Additional meetings between partners
R8	Failure to comply with the project implementation deadlines	The periodical meetings will point out the activities or results that are not according to schedule, and there will be a reevaluation of tasks

R9	Unbalanced loading of staff tasks	The periodical meetings will point out the activities that have insufficient staff allocated resulting in overloading of staff, and there will be a periodical reevaluation of staff per activity
R10	Elaboration of inappropriate documents from the perspective of the data they contain	the reporting staff will make to sure to collect all data in due time, revise and require further necessary information
R11	Promotional materials without impact to the public	the dissemination plan will contain all measures and activities needed to achieve maximum impact
R12	Insufficient technical resources for project activities	Before the launch of the project, all partners assessed their technical facilites and resources and made sure they have all technologies required in the project
R13	Inability to prepare supporting documents for training activities	the reporting staff will make to sure to collect all documents in due time, and provide feed back
R14	Small number of participants in the dissemination events	the dissemination plan will contain all measures and activities needed to achieve maximum impact
R15	Lack of desire of the target group to get involved in project activities	In order to reduce / remedy the impact of this risk, it has been established that the information activities for students regarding the activities and opportunities offered within the project will be carried out intensively. GT experts will play an important role in permanently motivating them.
R16	The non-involvement of the socio-economic partners	The involvement of economic agents in the development and support of the project is one of the most important objectives for consolidating the basis on which all the activities regarding the orientation, design and implementation of the specific actions of the project will be carried out.

		The partnership has planned various initiatives to attract economic agents, strengthen relations with them and create a network.
R17	Rejection or partial approval of reimbursement requests by the National authority	The experts will be permanently involved in the elaboration of the technical documentation justifying the activities performed, the coordinator of each partner will perform monthly checks of the technical and financial reports from his own team, checking the general report, before being sent to the Applicant.
		The project manager will also check the reporting partners, and reporting on their own organization, before forwarding it to the competent authority.

Monitoring risk over the course of the project will be an ongoing and proactive part of risk analysis. The risk assessment is done on a quarterly basis (every 3 months). Risk monitoring is done on a monthly basis and is correlated with the Activity Reports of the members of the implementation team.

Risk monitoring and control include:

➢ Identifying new risks and planning them;
➢ Keeping track of existing risks to check if:
  — Reassessment of risks is necessary
  — Any of risk conditions have been triggered
  — Monitor any risks that could become more critical over time
  — Tackle the remaining risks that require a longer-term, planned, and managed approach with risk action plans;
➢ Risk reclassification;
➢ Risk reporting.

The risk register will be continuously updated, from risk identification through risk response planning and status update during risk monitoring and control. This project's risk register is the primary reporting tool and is also available online, accessible to all partners.

3.4 Minutes

The minutes of the physiscal LLSF project meetings will include:

- ➢ Subject of meeting
- ➢ Location (if relevant)
- ➢ Date and time
- ➢ Attendees
- ➢ Agenda items
- ➢ Status of action items
- ➢ Date and time of the next meeting
- ➢ Expected actions by the next meeting
- ➢ Items to be discussed during the next meeting

They will be shared with the absent members of the project and will serve as a record of discussion for future reference and reminders of action steps.

The virutal meetings will be recorded.

3.5 Communication

The dissemination and communication strategy and guidelines for stakeholder mapping will be planned in consultation with all partners. Mainly, the plan will be structured as to include Availability (making the project results easily accessible by all potentially interested users and stakeholders), Awareness (making sure that the various stakeholders are informed with regard to the benefits of the project), Sustainability (ensuring the capacity to provide Accessibility and Awareness after the end of the project funding) and Metrics (instruments and indicators by which to measure the effectiveness of dissemination). The project website will be the main communication outlet for the entire project.

All partners will promote the project and the project website on their websites contributing to the spread of the information and of the promotion of the programme. Social media and communication materials (banners, posters, newsletters, articles and conference materials) will be created in advance for this. Moreover, student achievement, and learning outcomes will also be shared online in a joint promotion and dissemination strategy. A newsletter will be used in order to inform those who are interested in the project, but also to help the participants and partners remain synchronised with regard to the ongoing activities

of the project. Also a greater range of dissemination will be achieved through the multiplier events, which will target the various stakeholders and raise awareness in both students and industry communities. The dissemination materials and activities planned to be implemented will be described in the Communication strategy.

Those social media channels will be updated regularly by the partners of the project. Students associations of all partners as well as scientific associations related to digitalisation will also be contacted in order to promote LLSF. Each partner will also communicate with each professor and researcher involved in LLSF in order to promote the program during their seminars and conferences abroad through their presentations. The transferability potential will further increase by initiating the necessary procedures to enroll the project's living labs into the European Network of Living Labs, in which only a small number of Living labs exist in Southern East European countries.

Each partner must use the European Commission's Erasmus+ logo and associated wording for any project outputs and promotional materials and publicly acknowledge the support received from the European Union. The preferred option to communicate about EU funding is to record 'Co-funded by the European Union' next to the EU emblem on the communication material where the EU emblem is used.

Any communication or publication of a Beneficiary, in any form and on any medium, including on the Internet or at a conference or seminar, must mention the following disclaimer: *„The European Commission support for the production of this publication does not constitute an endorsement of the contents which reflects the views only of the authors, and the National Agency and Commission cannot be held responsible for any use which may be made of the information contained therein."*

3.6. Quality

The purpose of the Quality Management Plan (QMP) is to outline the following activities: define roles and responsibilities; provide guidelines to perform the Quality Assurance (QA), provide the standards and practices used in carrying out QA, Quality Control (QC), and quality improvement activities for the Project; provide the tools, techniques, and methodologies to support QM activities and reporting.

LLSF project team is committed on assuring high quality results. In order to achieve these high standards, the Management team has defined the roles and responsabilities for each partner and

the processes to be followed, creating this QMP with realistic objectives achievable throughout the project lifecycle.

The QMP will be reviewd within the project execution by the Management Team. The review will be done periodically. The following items will be taken into consideration:

- project results;
- processes and methodology for quality assurance;
- project delivrables;
- corrective and preventive actions.

The outcomes of these activities will be discussed during the partner meetings, and the results will be gathered in a reporting document.

To ensure every quality aspect required in the project, the Management Team will regularly monitor and control all activities and processes.

Official project delivrables should follow the same structure throughout the project, in order to be considered consistent and regular. A template for external delivrables has been shared among the partners, containing the logo and page layout suggested.

The review procedure is executed in parallel to the delivrable production process and applies to all project delivrables.

The Management Team will send periodical reminders about the upcoming activities and inform the partners on the project's development.

4. Reporting and Monitoring

The Coordinator will ensure that appropriate reporting and monitoring procedures are in place. Partners must gather and retain all necessary information and documentary evidence, which demonstrates clear and transparent management of the project.

All partners will provide a Progress Report. This will enable the coordinator to monitor the technical progress of the project in relation to work package plans, deliverable submission and project milestones as well as providing an overview of resources committed by all partners.

Over the course of the project, two formal Reports will be submitted to the European Commission.

All partners must keep time records of the hours worked on the action in accordance with the rules outlined for Erasmus Plus projects.

In accordance with the criteria of Erasmus Plus, it is the responsibility of all partners to complete the financial report for their organisation.

5. Conclusions

This project management handbook outlines the project plans for LLSF conceived before the project start (as part of the project proposal) and documents the key information for each of the component processes of the project management process. It is the reference document for all project participants to quickly find key information relating to the LLSF project. It is a living document and will be updated as part of regular project controlling.