SEnDIng

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

Vocational Training Program
IoT & Data Science

Workshop with Industry Representatives
30 November 2019, Borovets, Bulgaria

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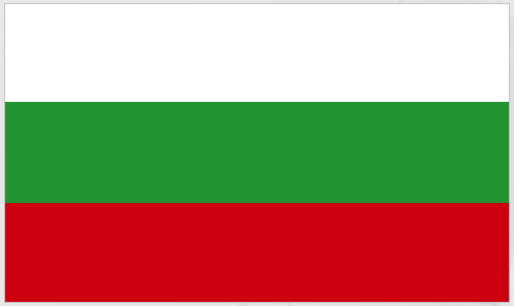
Agenda

- SEnDIng project: objectives, concepts, background and stakeholders
- Learning outcomes and educational modules
- Training Delivery
  - eLearning platform
  - Face to face training
  - Work based learning
- Skills certification mechanism
- Feedback and learning program assessment

Project overview

- **Program**: Erasmus+ KA2: Cooperation for innovation and the exchange of good practices - Sector Skills Alliances
- **Call ID**: EACEA-04-2017
- **Lot**: Lot 2, SSA for Design and Delivery of VET
- **Project Number**: 591848-EPP-1-2017-1-EL-EPPKA2-SSA
- **Grant Agreement Number**: 2017-3184/001-001
- **Project Coordinator**: University of Patras
- **Duration**: 36 months
- **Number of Partners**: 12
- **EU grant**: 982.537 €
- **Start Date**: 1st December 2017
- **End Date**: 30th November 2020

ΠΑΝΕΠΙΣΤΗΜΙΟ ΠΑΤΡΩΝ
UNIVERSITY OF PATRAS



DS and IoT scenery

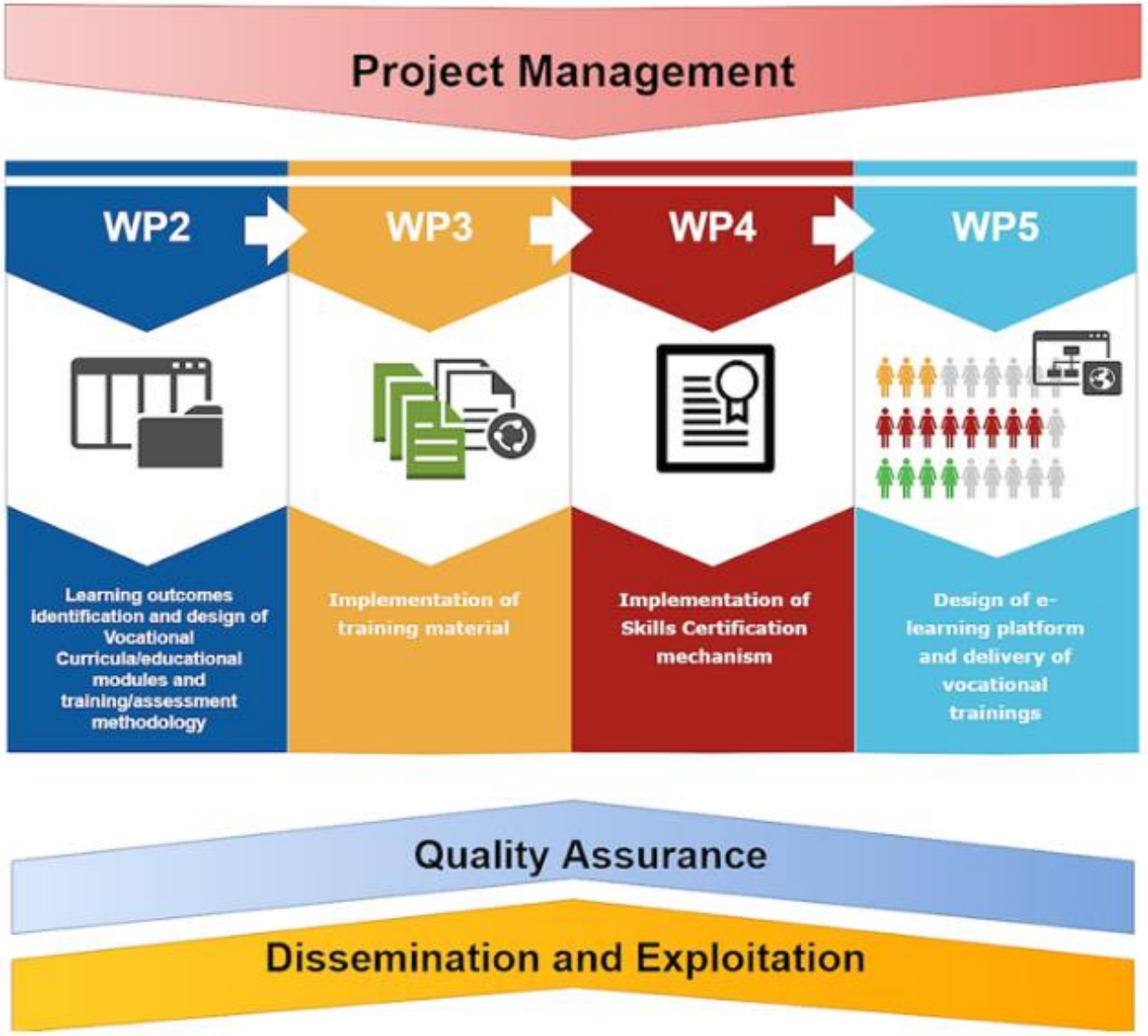
- Rapid and continuous evolution of DS and IoT technologies and their application in many industries (ICT, banking, energy, marketing, etc.)
- Their value for the EU economy is huge;
  - it is projected that the value of the EU Data Economy will reach 739 billion by 2020
  - IoT with a value of €120 billion will solely contribute to an increase of 7 points of European GDP by 2025
- SKILLS GAP
  - the demand for Data Scientists will increase by 28% in 2020, with the unfilled DS positions at the same time estimated at 485,000
  - the need for IoT skills is huge, as 68% of businesses struggle to hire IoT experts

SEnDIng objectives

- Address the **skills' gap** of ICT professionals in the domains of Data Science (DS) and Internet of Things (IoT)
- Contribute to the **increased demand** of industry's sectors other than ICT (e.g. banking, energy, logistics) for highly-qualified DS and IoT professionals
- Provide the DS and IoT professionals with skills and competences, that are **transferable** and **recognized** among European countries
- Make the vocational trainings more relevant to the actual **needs of the labor market**

Target Groups

- ICT professionals and associations
- VET providers
- Certification bodies
- Higher Education Institutes
- Companies & SMEs
- Policy-makers


Project Management
WP2
WP3
WP4
WP5
Learning outcomes identification and design of Vocational Curricula/educational modules and training/assessment methodology
Implementation of training material
Implementation of Skills Certification mechanism
Design of e-learning platform and delivery of vocational trainings
Quality Assurance
Dissemination and Exploitation

LEARNING OUTCOMES AND EDUCATIONAL MODULES

DS learning outcomes

Knowledge

- Describe the key concepts of Data Science
- Describe ICT methods and tools applicable for the storage and retrieval of data
- Describe methods and tools applicable for the statistical analysis of data
- Explain basic concepts and requirements related to information security and privacy (e.g. how to deal with people profiling in the context of GDPR)

Skills

- Analyse domain specific trends and present them as structured information
- Create code to statistically analyse data
- Apply data statistics and data visualization
- Deploy simple machine learning techniques
- Deploy data storage and retrieval techniques;
- Implement data models validation techniques
- Ensure that IPR, security and privacy issues are respected

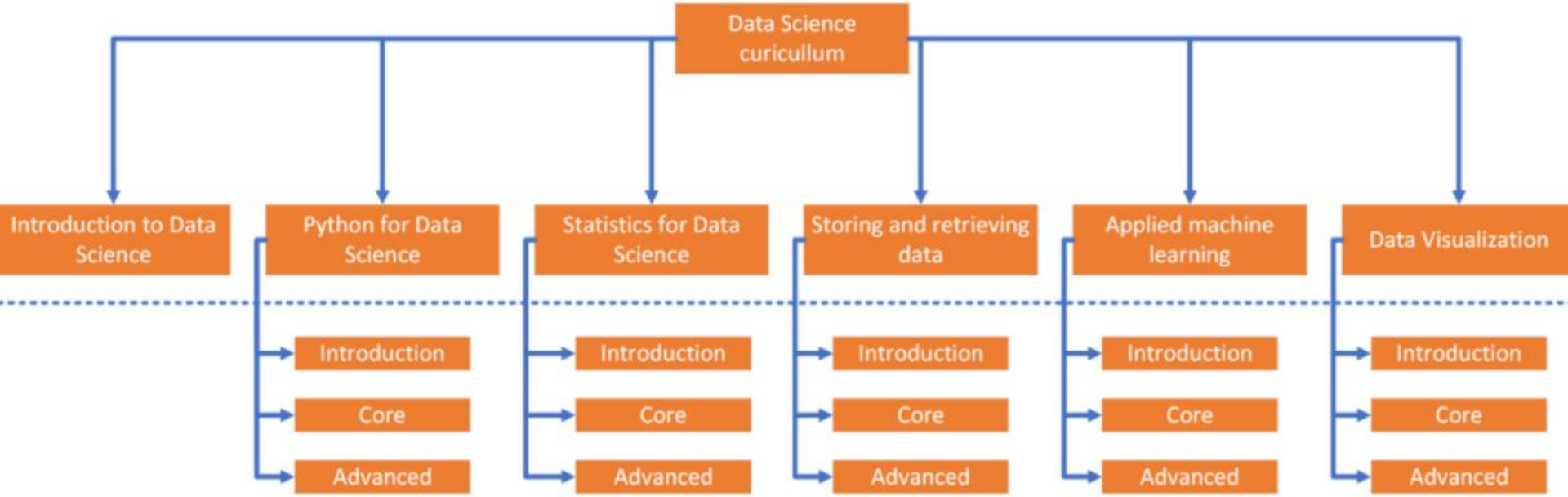
Competences

- Exercise self-management within the guidelines of work or study contexts that are usually predictable, but are still a subject to change
- Supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities

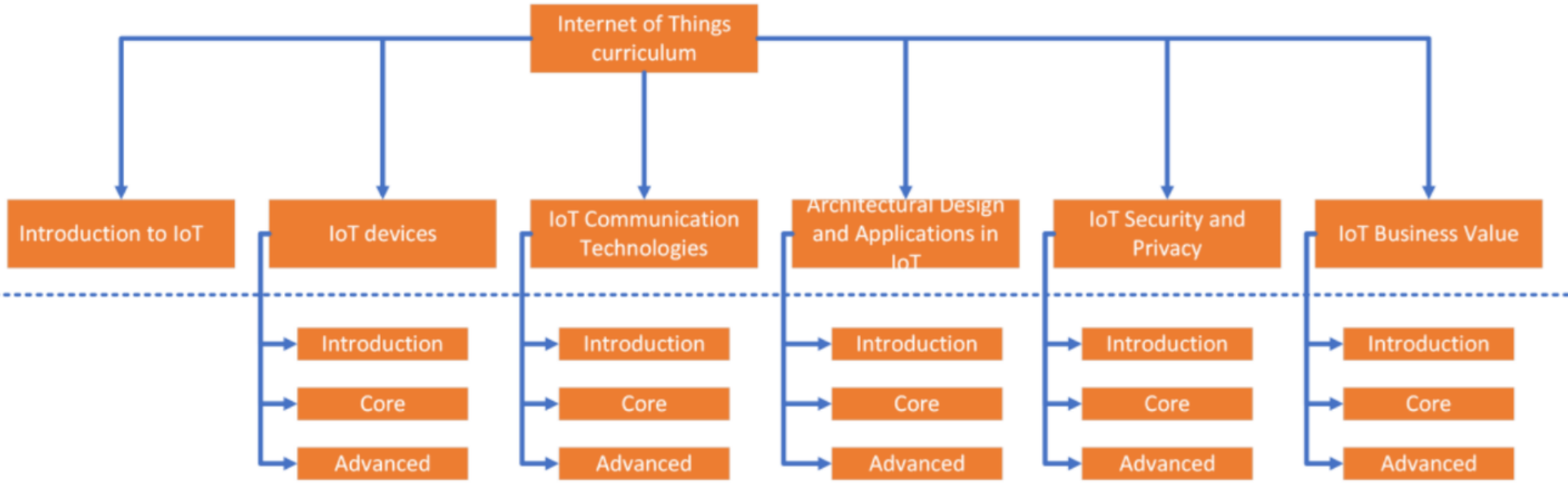
IoT learning outcomes

Knowledge	Skills	Competences
▪ Describe the value that IoT delivers in different business domains ▪ Explain the business processes related to IoT in specific domains ▪ Understand IoT architectures and the related network and communication protocols ▪ Recognize different types of sensors, actuators, displays and related embedded electronics ▪ Design the application level (e.g. use protocols that support different IoT applications) of IoT in the context of big data, cloud technologies and data science ▪ Formulate requirements about IoT information security	▪ Analyse, argue and describe the business value of a particular IoT system ▪ Design an IoT system that includes sensors, controllers, actuators and displays, connected to a cloud platform through internet connection ▪ Develop and deploy workflows and dashboards for an IoT system that includes sensors, controllers, actuators and displays, connected to a cloud platform through internet connection ▪ Develop working code for an IoT system that includes sensors, controllers, actuators and displays, connected to a cloud platform through internet connection ▪ Apply IoT information security concepts	▪ Exercise self-management within the guidelines of work or study contexts that are usually predictable, but still are a subject to change ▪ Supervise the routine work of others, taking some responsibility for the evaluation and improvement of work or study activities

DS Curriculum



IoT Curriculum



Key competences in terms of soft skills

- Communication skills
- Adaptable to change
- Team work
- Ability to present in front of colleagues and clients
- Goal-oriented
- Thinking outside the box
- Agile mindset

Data scientist roles

[adapted from the proposal done by the EDISON project for the extension of Data Science occupations at ESCO classification]

- **Data Analyst**. Analyses large variety of data to extract information about system, service or organization performance and present them in usable/actionable form.
- **Data Architect.** Designs and maintains the architecture of Data Science applications and facilities. Creates relevant data models and processes workflows.
- **Database Administrator.** Designs and implements or monitors and maintains large scale cloud databases.
- **Machine Learning Engineer.** Designs and applies machine learning algorithms.
- **Data Scientist.** Gathers and interprets rich data sources, manages large amounts of data, merges data sources, ensures consistency of data-sets, and creates visualizations to aid in understanding data. Builds mathematical models, presents and communicates data insights and findings.

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Mapping of DS training unit level to professional roles

Data Science Training Units	Data Analyst	Data Architect	DB Administrator	Machine Learning Engineer	Data Scientist
Introduction to DS	I	I	I	I	A
Python for DS	A	C	I	A	A
Statistics for DS	C	C	I	A	A
Storing and Retrieving Data	C	A	A	C	A
Applied Machine Learning	I	I	I	A	A
Data Visualization	A	I	I	C	A

IoT Engineer roles

- **IoT Product Manager**. Supervises the execution part of the project. Collaborates with the development teams to take care of business requirements and implementations.
- **IoT Architect**. Manages the functional requirements gathering, technology (hardware, software, protocols) selection and solution architectural design for IoT systems and applications. The IoT Architect is responsible for creating effective, efficient, scalable, secure, and innovative IoT Solutions.
- **IoT Software Developer.** Implements IoT systems and applications according to approved designs and conducts rigorous testing of the applications. Deploys the systems and applications to the cloud as well as app stores.

IoT Engineer roles

- **Data Scientist.** Finds and interprets rich data sources, manages large amounts of structured and unstructured data, merges data sources, ensures consistency of data-sets, and creates visualizations to aid in understanding data collected from IoT systems and applications.
- **IoT Cloud Engineer**. Deploys the IoT system infrastructure on the cloud, from middleware to data storage (e.g. databases) for collecting, storing and processing data from the IoT devices in the network
- **IoT Industrial Engineer**. Looks into the hardware components involved in IoT systems and applications, programs robots and smart embedded devices.

Mapping of IoT training unit level to professional roles

IoT Training Units	IoT Product Manager	IoT Architect	IoT Software Developer	Data Scientist	IoT Cloud Engineer	IoT Industrial Engineer
Introduction to IoT	I	I	I	I	I	I
IoT Devices	C	C	I	C	C	A
IoT Communication technologies	C	C	C	C	A	C
Architectural design and applications in IoT	C	A	A	C	A	C
IoT Security and Privacy	I	C	C	I	A	C
IoT Business Value	A	I	I	I	I	C

TRAINING DELIVERY

Trainees

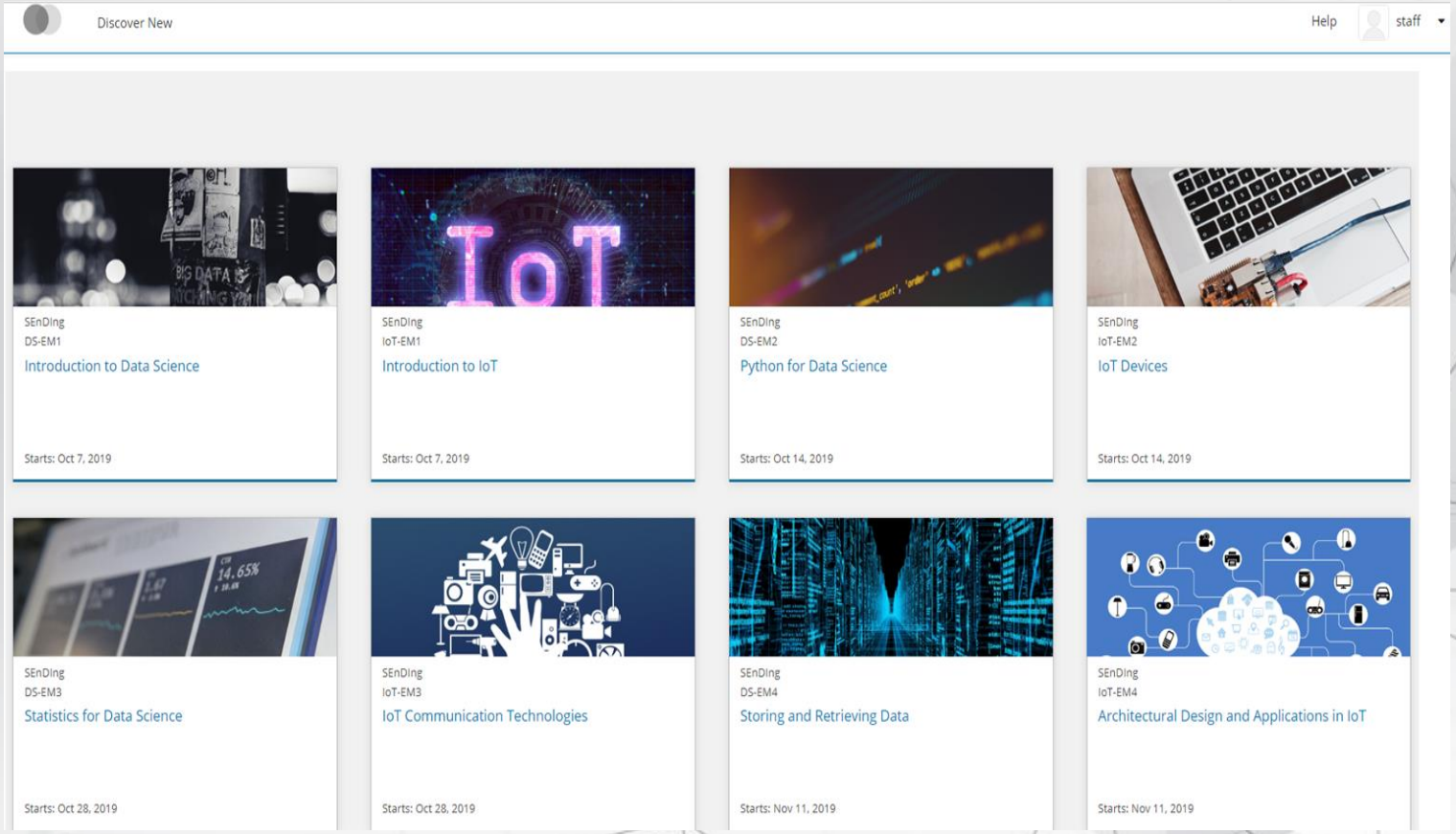
Trainees come from SEnDIng partners, ICT companies, and companies involved at other sectors active at the areas of Data Science and Internet of Things

- Expected 50 beneficiaries per country
- More than 60 beneficiaries from Bulgaria already registered
- More than 40 beneficiaries from Bulgaria in process of registration

eLearning Platform

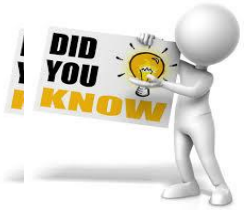
- In the final stage of development
- Expected to be operational in December 2019
- Potential features
  - Collaboration
  - Content Development & Management
  - User Management
  - Reports and progress follow-up
  - Usability
  - Maintenance & support

Data Science and IoT online courses



20 h face to face training

Theory



Fact
s

External
information

Reflection
exercise

Application

Peer
learning

Review

Self
assessment

Face to face training topics

- ✓ Effective Communication and Presentation (TS-EM1)
- ✓ Change Management (TS-EM2)
- ✓ Team Working (TS-EM3)
- ✓ Goal Setting (TS-EM4)
- ✓ Creative Thinking (TS-EM5)

Expected to start mid March 2020

Work based Learning

- Duration: 4 months (320 working hours)
- Expected to start: April 2020
- Be implemented in companies
- Type: On the Job Training
- At least 1 in-company trainer per company (depending on the groups of employees/trainees)
- 1 supervisor per company
- Manual

Preparation

- Information and agreement upon all partners involved (company, training provider, employee /trainee)
- Supervisor assignment
- Development of the training guide (list of tasks that need to be trained, schedule, administration information, etc.)
- Selection of in-company trainers
- In-company trainers training

In company trainers' training

- 3-4 hours training
- On-line training
- 2 weeks before the beginning of WBL training (beginning of March 2020)
- Material to be distributed: a) D3.3 Training material for transversal skills development, b) access in e-learning platform, c) real-life case studies, d) D2.4 Training methodology, e) D2.5 Training monitoring & assessment methodology, f) monitoring and assessment tools

Implementation

- Companies will involve the trainees according to their task description
- In-company trainers based on the training guide, methodology, tasks and training material will implement the training, making adaptation or providing additional training material if needed
- In-company trainers will determine the frequency and the extent of training techniques, taking into account the characteristics and learning styles of learners and the enterprises' needs.
- Support and individual coaching to in-company trainers by the training providers
- Communication between the training provider and the companies (in-company trainers, supervisors), via phone or visits at the company, at least twice per month

Monitoring

- Observation by in-company trainers
- Attendance sheets
- Diaries filled by trainees (weekly basis) and in-company trainers (monthly basis)
- Final Report per trainee filled by in-company trainers and supervisors

SKILLS CERTIFICATION MECHANISM

Prerequisites

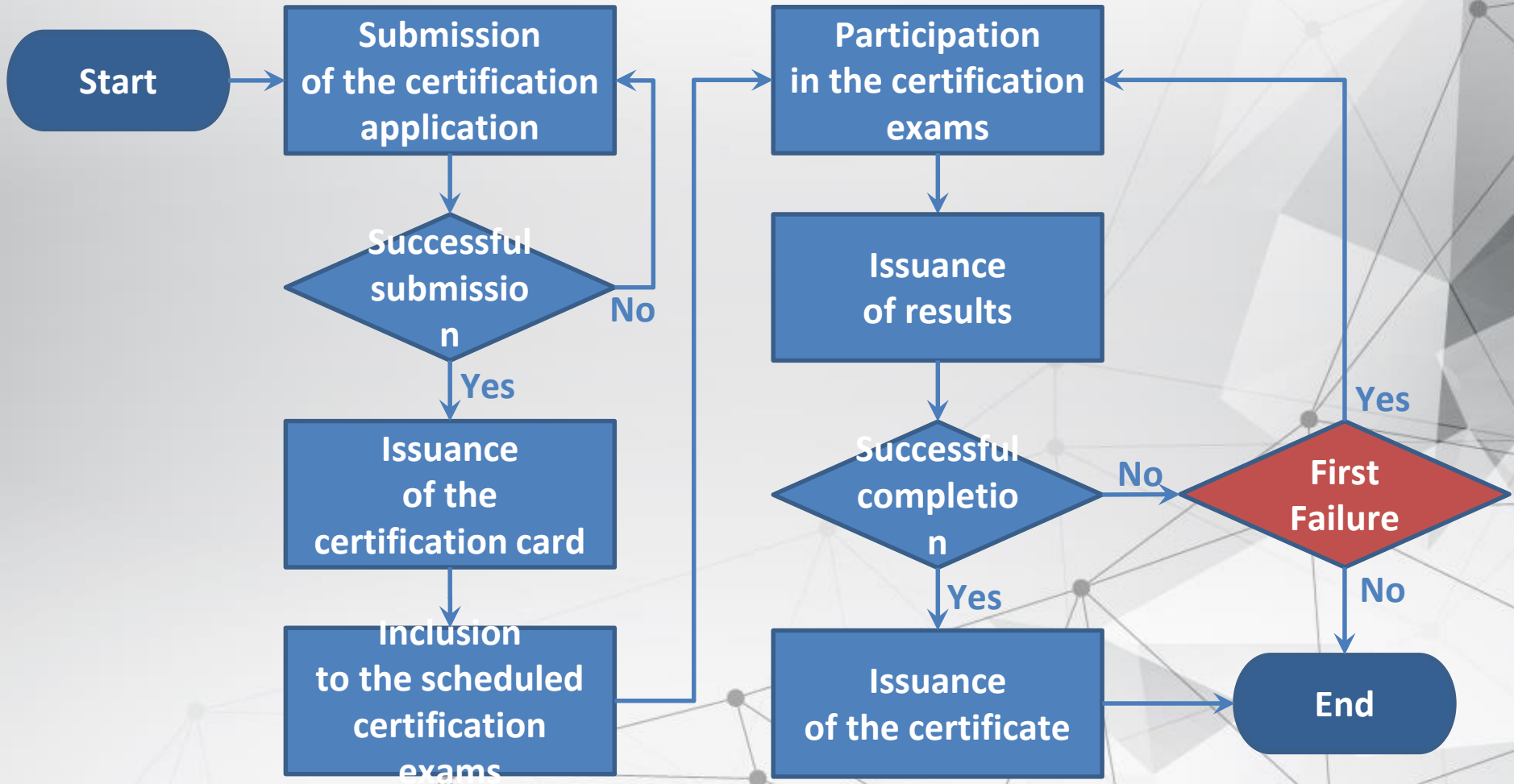
	Diplomas	Work experience in the field of ICT (in years)			
		0	>=1	>=2	>=3
Qualifications	General Upper Secondary Education				✓
	Vocational Upper Secondary School or Post-Secondary Education (both in ICT fields)				✓
	Bachelor in the field of ICT from a Higher Educational Institute		✓		
	Bachelor in the field of engineering (other than ICT), physical sciences, life sciences, mathematics, financials and business administration from a Higher Educational Institute			✓	
	Post-graduate degree (MSc and/or Phd) in the field of ICT from a Higher Educational Institute	✓			
	Post-graduate degree (MSc and/or Phd) in the field of engineering (other than ICT), physical sciences, life sciences, mathematics, financials and business administration from a Higher Educational Institute		✓		

Certification

Only those who will have ***successfully completed the three phases*** *of the training program (online, face to face and work-based learning) will be eligible to participate in the final exams leading to certification*

D4.2 & D4.3

Certification Process



FEEDBACK AND LEARNING PROGRAM ASSESSMENT

Feedback and learning program assessment

- How do you evaluate the program?
- What do you like?
- What can we improve?
- Any comments…

Please, invest some time to fill out questionnaires ☺ !

Thank you for your attention!

For further information please contact

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