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SEnDIng

D7.4

SENDING PROJECT WEBSITE

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PROJECT SUMMARY

SEnDIng project aims to address the skills' gap of Data Scientists and Internet of Things engineers that has been identified at the ICT and other sectors (e.g. banking and energy) at which Data Science and Internet of Things have broad applications. To achieve this goal, SEnDIng will develop and deliver to the two aforementioned ICT-related occupational profiles two learning outcome-oriented modular VET programmes using innovative teaching and training delivery methodologies.

Each VET program will be provided to employed ICT professionals into three phases that include: (a) 100 hours of on-line asynchronous training, (b) 20 hours of face-to-face training and (c) 4 months of work-based learning. A certification mechanism will be designed and used for the certification of the skills provided to the trainees of the two vocational programs, while recommendations will be outlined for validation, certification & accreditation of provided VET programs.

Furthermore, SEnDIng will define a reference model for the vocational skills, e-competences and qualifications of the targeted occupational profiles that will be compliant with the European eCompetence Framework (eCF) and the ESCO IT occupations, ensuring transparency, comparability and transferability between European countries.

Various dissemination activities will be performed – including the organization of one workshop at Greece, Bulgaria and Cyprus and one additional conference at Greece at the last month of the project – in order to effectively disseminate project's activities and outcomes to the target groups and all stakeholders. Finally, a set of exploitation tools will be developed, giving guides to stakeholders and especially companies and VET providers, on how they can exploit project's results.

TABLE OF CONTENTS

TABLE OF FIGURES

1 Introduction

This document describes the SEnDIng website, its supporting infrastructure, structuring and contents. The project website is a major dissemination tool that collects all the relevant news, results, documents, and events of the project. The main aim of the website is to strengthen project visibility through explaining the project objectives and disseminating information. The website published completed public deliverables so that all relevant stakeholders have access to project outputs, namely: Higher Education Institutions, VET providers, SMEs, Policy Makers/Associations, as well as Certification Bodies.

The setup of the website was responsibility of the University of Patras and was reviewed and approved by all partners in all national languages (Greek, Bulgarian and English). The website hosts informative material about the project and its public deliverables. Furthermore, it provides information about the project, the partners, the products; newsletters, presentations, articles, and other dissemination material are uploaded there, as well.

The website integrates functionality for the provision of e-newsletters. In addition, it incorporates appropriate social networking characteristics to promote the project into various well-known networks (LinkedIn, Twitter, and Facebook). The SEnDIng website was envisioned to play a dual role; be one of the dissemination tools and the central point for publishing project information and reached outcomes and also, as a file sharing space for partners and the EC.

The website of the project has been constantly updated throughout the project lifetime and reflected the project current state of progress. This has led to several changes and additions to the initial form of the website (contents and structure) as it was depicted in the previous version of D7.4 (submitted with the Interim Report of the project).

2 Technical infrastructure

2.1 Infrastructure

The SENDIng website resides on the following infrastructure:

- Static hostname: sending-project.eu
- Icon name: computer-vm
- Chassis: vm
- Virtualization: qemu
- Operating System: Debian GNU/Linux 9.3 (stretch)
- Kernel: Linux 4.9.0-3-amd64
- Architecture: x86-64

2.2 Web Server and Language

The SEnDIng website uses the Apache HTTP Server 2.4.25, which is a powerful, flexible HTTP/1.1 compliant web server. It is highly configurable and extensible with third party modules and implements features like:

- DBM databases, relational databases and LDAP for authentication.
- Password protected pages with enormous numbers of authorized users.
- Customized responses to errors and problems.
- Flexible URL rewriting and aliasing.
- Content negotiation.
- Virtual hosts.
- Configurable reliable piped logs.

The scripting language of the server is PHP (ver 7.1.13). PHP can be used on all major operating systems and has support for most of the web servers today. It is not limited to output HTML but includes outputting images, PDF files and even Flash movies (using libswf and Ming) generated on the fly. It also outputs easily any text, such as XHTML and any other XML file. PHP can autogenerate these files, and save them in the file system, instead of printing it out, forming a server-side cache for your dynamic content.

One of the strongest and most significant features in PHP is its support for a wide range of databases. Writing a database-enabled web page is incredibly simple using one of the

database specific extensions (e.g., for mysql), or using an abstraction layer like PDO, or connect to any database supporting the Open Database Connection standard via the ODBC extension. Other databases may utilize cURL or sockets, like CouchDB.

PHP also has support for talking to other services using protocols such as LDAP, IMAP, SNMP, NNTP, POP3, HTTP, COM (on Windows) and countless others. You can also open raw network sockets and interact using any other protocol. PHP has support for the WDDX complex data exchange between virtually all Web programming languages. Talking about interconnection, PHP has support for instantiation of Java objects and using them transparently as PHP objects.

PHP has useful text processing features, which includes the Perl compatible regular expressions (PCRE), and many extensions and tools to parse and access XML documents. PHP standardizes all of the XML extensions on the solid base of libxml2, and extends the feature set adding SimpleXML, XMLReader and XMLWriter support.

2.3 Database Server

The DB server that supports the operation of the SEnDIng website is MySQL (ver 5.5.9999). The main characteristics of MySQL comprise:

- Written in C and C++.
- Tested with a broad range of different compilers.
- Works on many different platforms.
- For portability, uses CMake in MySQL 5.5 and up. Previous series use GNU Automake, Autoconf, and Libtool.
- Tested with Purify (a commercial memory leakage detector) as well as with Valgrind, a GPL tool.
- Uses multi-layered server design with independent modules.
- Designed to be fully multi-threaded using kernel threads, to easily use multiple CPUs if they are available.
- Provides transactional and non- transactional storage engines.
- Uses very fast B-tree disk tables (MyISAM) with index compression.
- Designed to make it relatively easy to add other storage engines. This is useful if you want to provide an SQL interface for an in-house database.
- Uses a very fast thread-based memory allocation system.
- Executes very fast joins using an optimized nested-loop join.

- Implements in-memory hash tables, which are used as temporary tables.
- Implements SQL functions using a highly optimized class library that should be as fast as possible. Usually there is no memory allocation at all after query initialization.
- Provides the server as a separate program for use in a client/server networked environment, and as a library that can be embedded (linked) into standalone applications. Such applications can be used in isolation or in environments where no network is available.

2.4 Content Management System

The SEnDIng website is built using the Joomla! Content Management System (CMS). Joomla! enables building web sites and powerful online applications. A content management system is software that keeps track of every piece of content on a website (simple text, photos, music, video, documents, etc). Joomla! is an open-source solution that is freely available, and this also means that the source code can be modified according to specific project needs. Joomla! is a good option for online projects for reasons that include:

- Flexible system, easy to extend and customize (verified third party extensions, high quality templates available, easy to create customized solutions).
- Optimized search engine (metadata and keywords, mod_rewrite support, menu creation process that makes clear and consistent sitemaps)
- User management with different groups (unlimited user-defined groups, a user can be assigned to multiple groups, unlimited user-defined access levels, groups are assigned to access levels)
- Multilingual support (over 70 translation packs available for the core, multilingual content management. language associations)
- Cache management that speeds up website (page caching, view caching, module caching)
- Design Features (template override, Jlayouts, render HTML from objects/arrays of data, template assignment, responsive, custom templates)
- Content editing (publishing tools, WYSIWYG editor, content versioning, article management, media manager, categories)

- Rich core functionality (easy redirect urls, banners, departments and contact form, tags, syndication with rss feeds, news feed, custom fields to add to articles, users and contacts, messaging in between administrators)
- Administrative management (core updates, extensions updates, user registration, sitemap)

2.4.1 Joomla extensions

We used the following Joomla extensions to integrate specific functionalities to SEnDIng website:

- '**Attachments**' extension allows files to be uploaded and attached to articles, categories, or other types of content items. The 'Attachments' extension includes a plugin to display the attachments and a component for uploading and managing attachments, as well as other plugins. There are options to control who can see the attachments and who can upload them, along with many options to increase its flexibility and usefulness. Note: all options are controlled through the component manager.
- **'Akeeba Backup'** extension is a complete site backup solution for Joomla! powered website. It is designed to put entire site – files and database data – in a backup archive file that can be restored on the same or a different server. The restoration uses a web installer script. You do not have to mess with the command line or database management tools – or even edit configuration files by hand. More than that, Akeeba Backup is putting you in control of your data. If you so with you can fine-tuning your backup choosing which directories, files or database tables to exclude.

3 Website layout

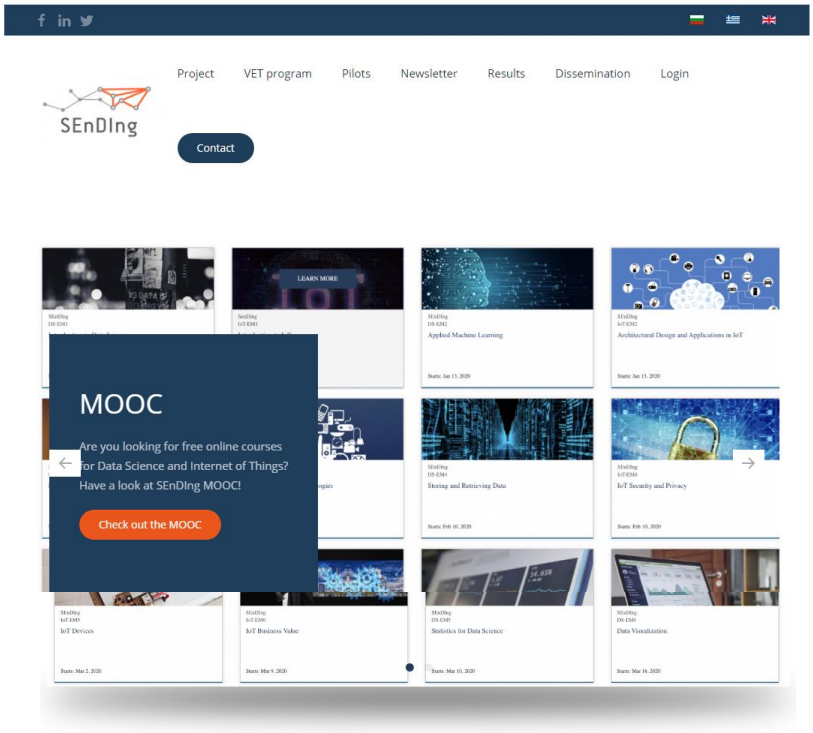
The wireframe of the website in its initial form comprised the following structural parts:

1. Upper part (header, same for all site pages): contains a group of social media icons (linking to project pages on Facebook, LinkedIn and Twitter) and a second group of icons for language selection (EN, GR, BL). Bellow on the left there is the SEnDIng Logo and the 1st- level menu options, namely Project, News, Partners, Public Documents, Login and Contact.
2. Middle part (main page contents): this is the place where all page-specific content is displayed in the form of text, images, video, links, applets or downloadable independent files (documents in pdf, etc.).
3. Footer (same for all site pages): in compliance with the Erasmus+ publicity obligations, it provides the **Erasmus+ logo**, the co-financing **statement** ("*Co-funded by the Erasmus+ programme of the European Union*") and the **disclaimer** ("*The European Commission support for the production of this publication does not constitute endorsement of the contents which reflects the views only of the authors, and the Commission cannot be held responsible for any use which may be made of the information contained therein*". Moreover the footer includes the social media icons of Facebook, LinkedIn and Twitter linking to respective SEnDINg project social pages.

This structure for the initial website version (i.e., in the Interim Report) is depicted in Figure 1, and has remained unchanged in the current version of the website (Figure 2). What has changed though is the main menu options, as well as the contents of the middle part on the home page, where the following parts have been added:

- A slider that circulates a predefined set of images along with a short description and relative links
- 8 animated numbers depicting information on crucial project outputs (number of trainees on the MOOC, hours of work-based training, produced Open Educational Resources, enterprises that hosted work-based training, online courses on Data Science and IoT, hours on transversal training, hands-on projects).
- Selected testimonials from SEnDIng partner companies that participated in the trainings
- Focused features of the project activities (learning outcomes, reference models, MOOC, transversal skills, Data Science and IoT curricula)
- Live feed from the project Facebook page

Figure 1. Website layout (structural parts), Interim Report version



+200
trainees on MOOC

320
hours work based learning

+250
OERs

25
enterprises on work based learning

6
online courses on IoT

6
online courses on Data Science

20
hours training on transversal skills

20
hands-on projects

TESTIMONIALS FROM SENDING PARTNERS

Atanas Yanev | Dimiter Shalvardjiev | Dimitropoulou Panagiota | Teresa Papagiannopoulou | Nikos Kostis | Evanthia Tsitsoka | Niki Loukeri

Atanas Yanev

Software Engineer at Code Runners

> *Living in an age of IoT and computing, it is important to get the fundamentals in order to be able to manage and develop next generation of connected factories, industries and domains. The training was definitely useful for me, since my keen interests are in IoT domain.*

CODE RUNNERS

82%

of the trainees believe that the SEnDIng online courses enhanced their knowledge at the Data Science and IoT domains

80%

of the trainees believe that the SEnDIng online courses will be useful to their work

[Figure continues on the next page]

Figure 2. Website layout, final version

4 Website map and pages

The initial overall information architecture of the SEnDIng website is depicted in Figure 3, where nodes represent webpages. Nodes with red outline (i.e., News and Public Documents) can be updated with new entries by all partners having an account in the website (those that can be authenticated via Login). Also authenticated users see the Private Docs page which acts as a private file repository that stores deliverables in draft version or other working/private documents produced by the project. Project Officers will also be granted access to the Private Docs page to be able to see produced deliverables before the Interim/Final Report. The rest of the pages can be modified by an admin account which is held by the Coordinator (University of Patras team).

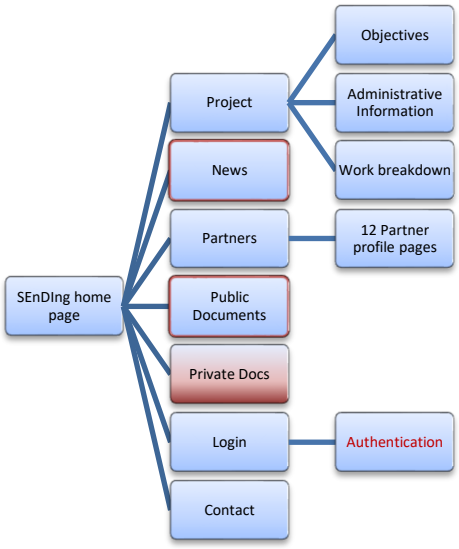


Figure 3. Sitemap initial version (Interim Report)

Figure 4 depicts the final sitemap version with newly added pages marked in yellow.

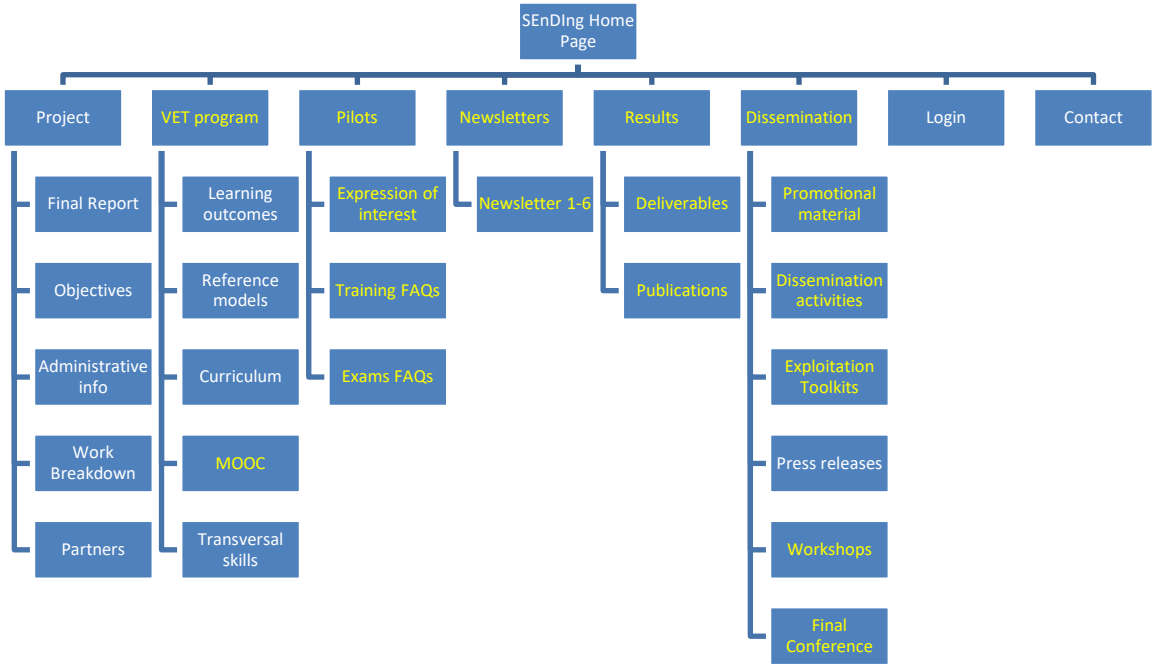


Figure 4. Sitemap, final version

In the following paragraphs we present the newly added pages (the rest of the pages have been presented in the Interim Report version of this deliverable).

4.1 VET program submenu

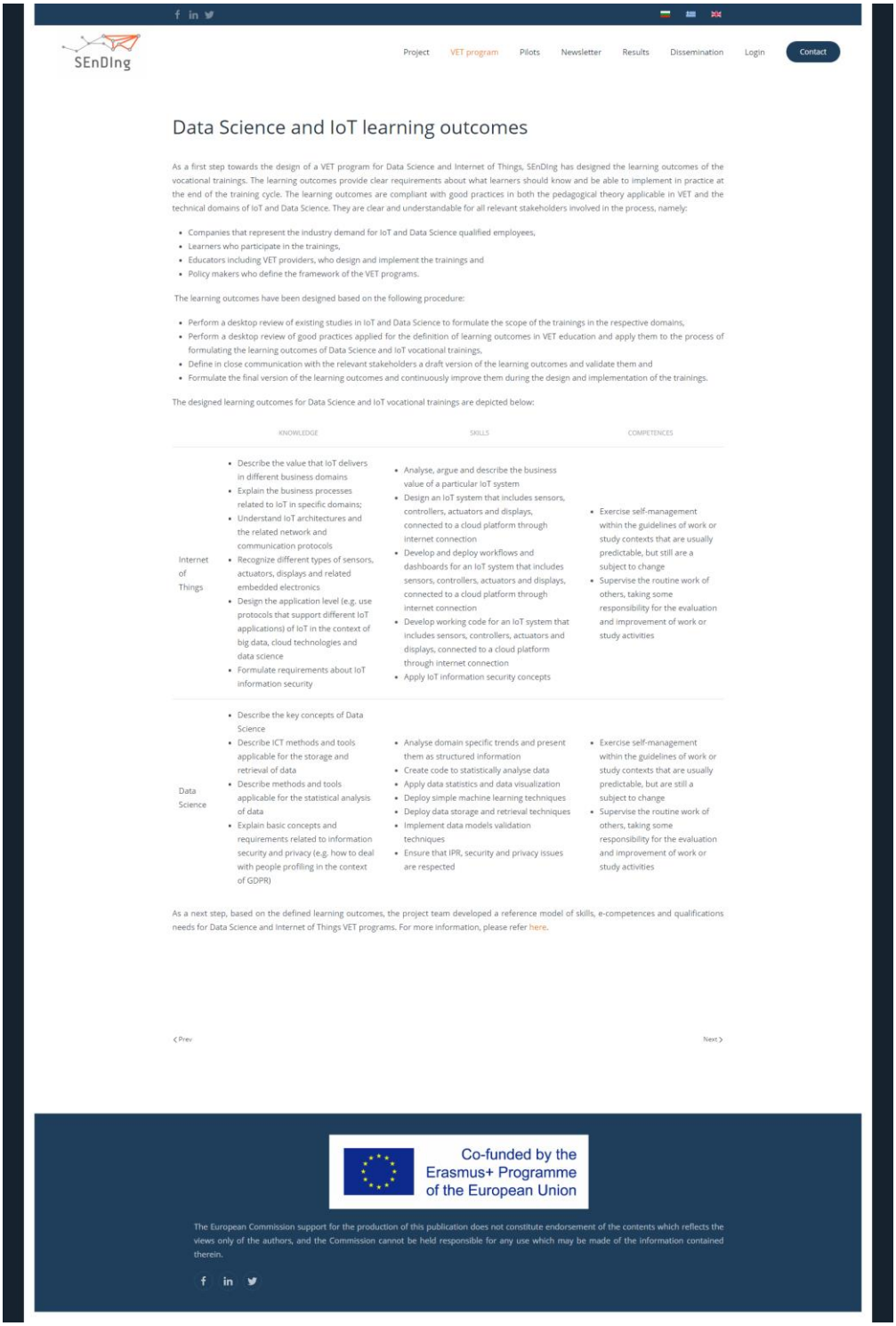


Figure 5. Learning outcomes page (http://sending-project.eu/index.php/en/vet-program/learning-outcomes)

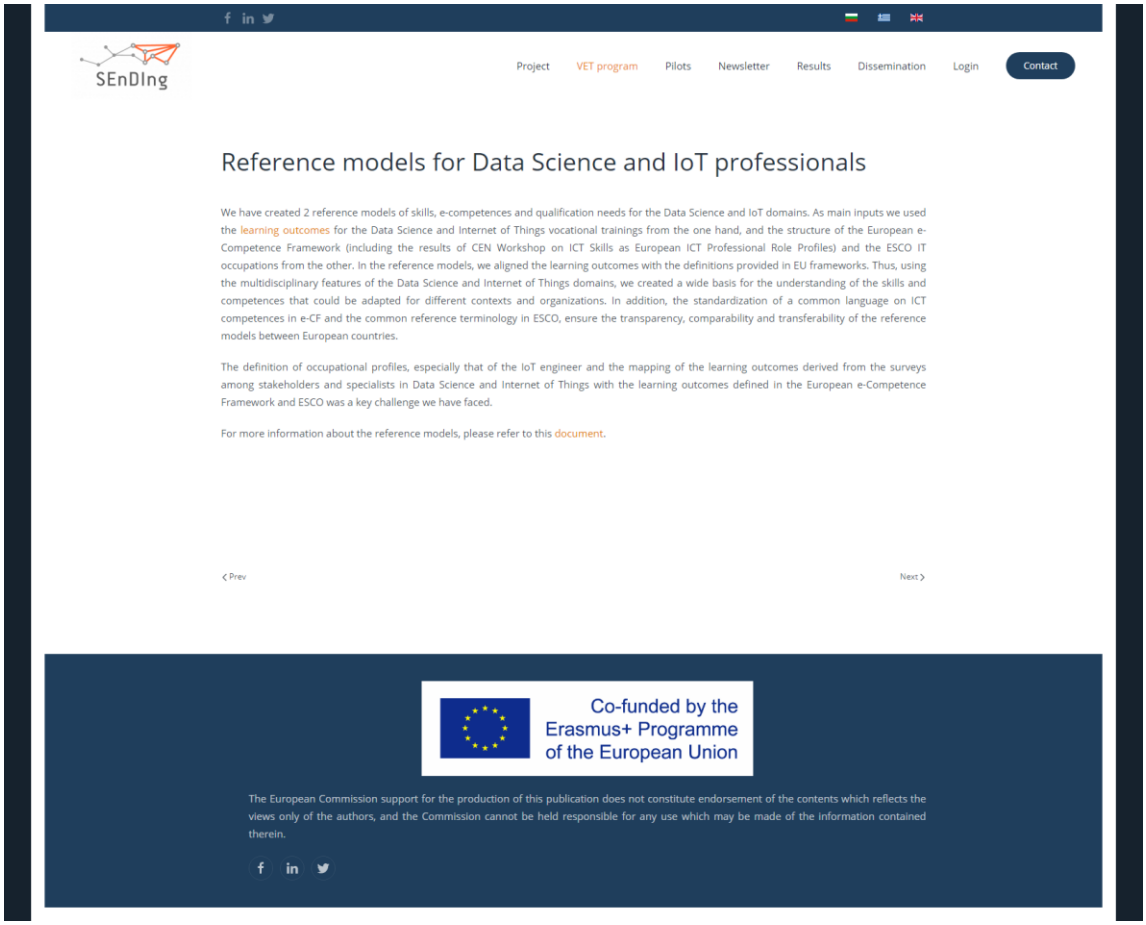


Figure 6. Reference models page (http://sending-project.eu/index.php/en/vet-program/reference-models)

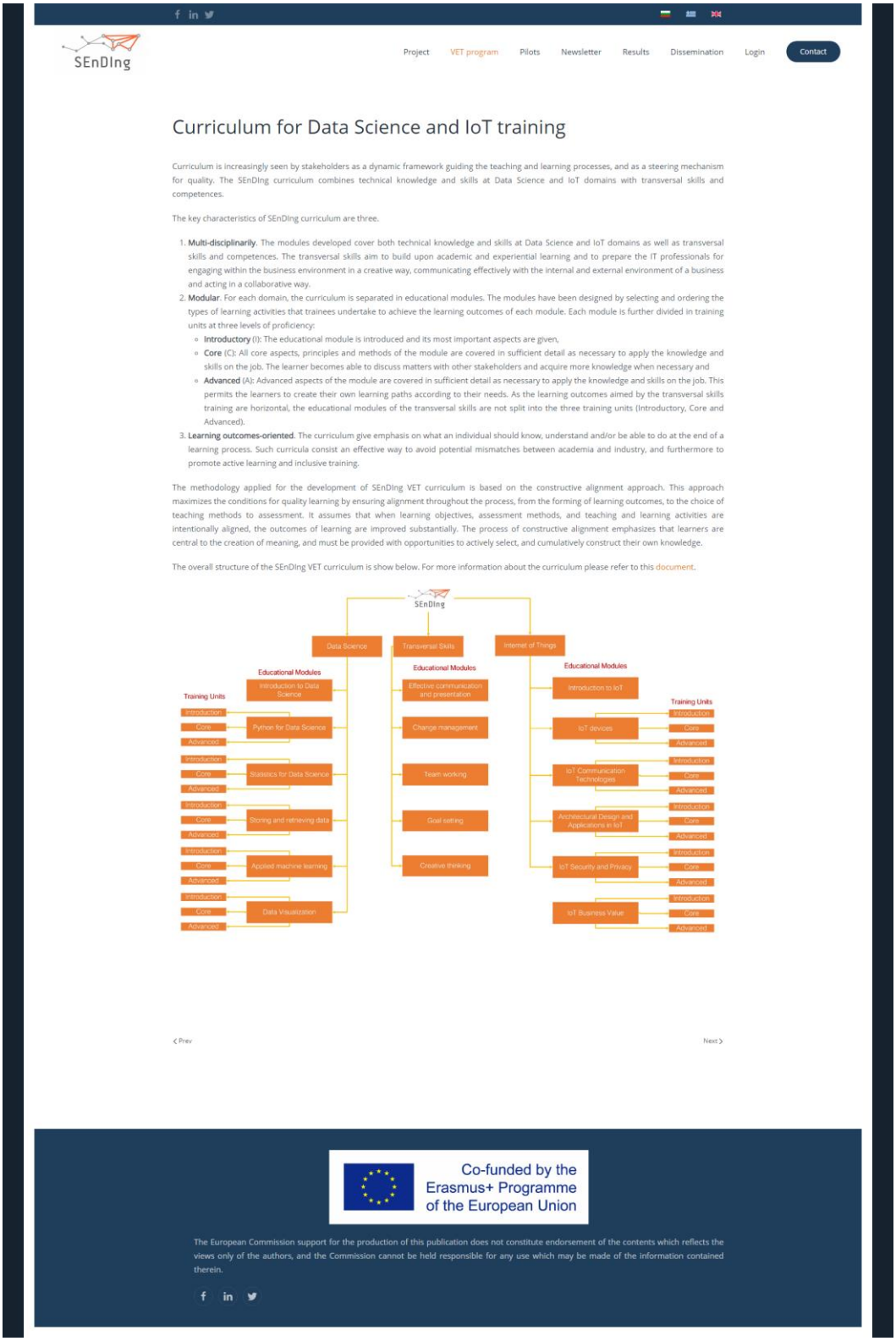
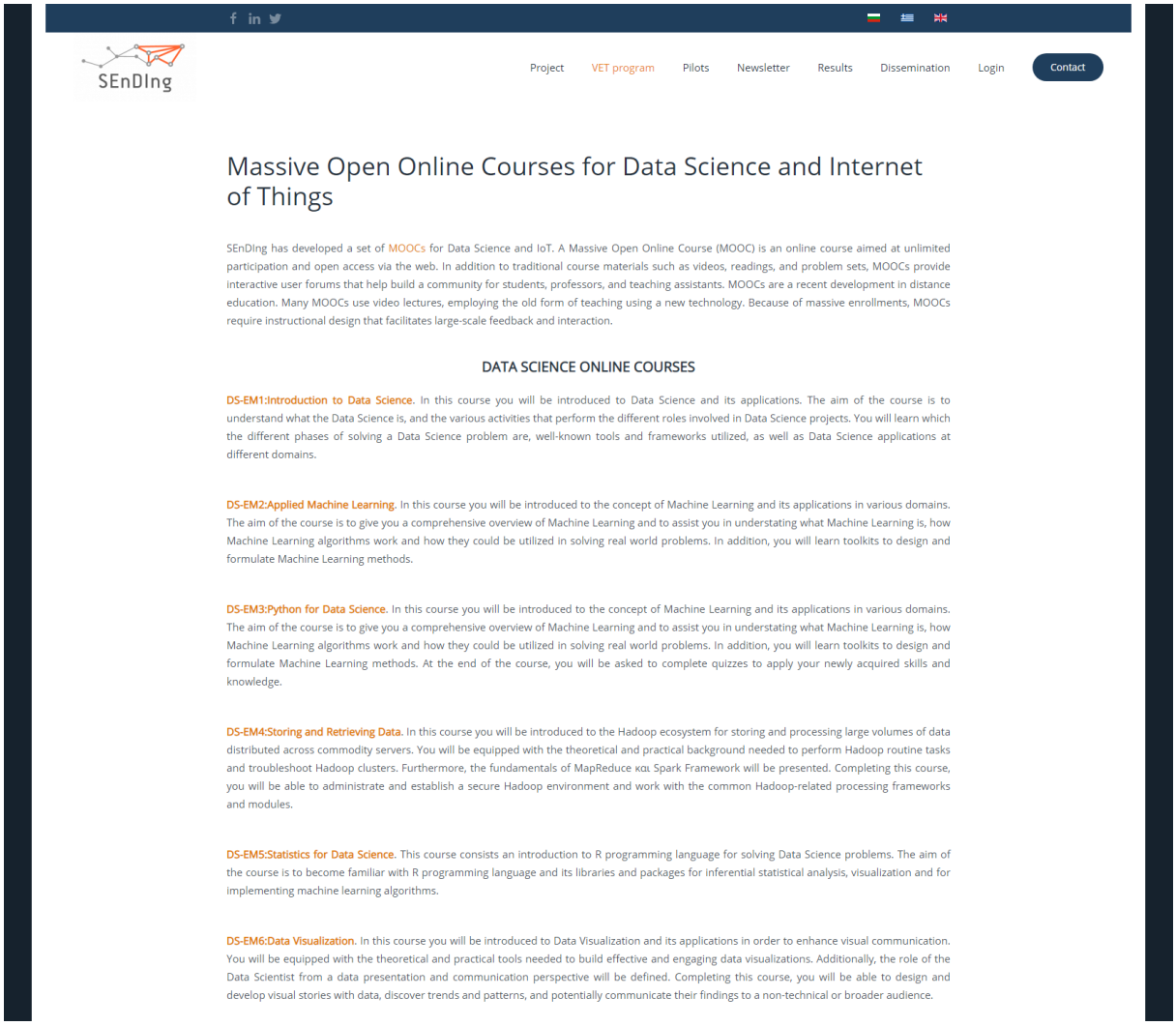


Figure 7. Curriculum page (http://sending-project.eu/index.php/en/vet-program/curriculum)



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Massive Open Online Courses for Data Science and Internet of Things

SEnDIng has developed a set of MOOCs for Data Science and IoT. A Massive Open Online Course (MOOC) is an online course aimed at unlimited participation and open access via the web. In addition to traditional course materials such as videos, readings, and problem sets, MOOCs provide interactive user forums that help build a community for students, professors, and teaching assistants. MOOCs are a recent development in distance education. Many MOOCs use video lectures, employing the old form of teaching using a new technology. Because of massive enrollments, MOOCs require instructional design that facilitates large-scale feedback and interaction.

DATA SCIENCE ONLINE COURSES

DS-EM1:Introduction to Data Science. In this course you will be introduced to Data Science and its applications. The aim of the course is to understand what the Data Science is, and the various activities that perform the different roles involved in Data Science projects. You will learn which the different phases of solving a Data Science problem are, well-known tools and frameworks utilized, as well as Data Science applications at different domains.

DS-EM2:Applied Machine Learning. In this course you will be introduced to the concept of Machine Learning and its applications in various domains. The aim of the course is to give you a comprehensive overview of Machine Learning and to assist you in understating what Machine Learning is, how Machine Learning algorithms work and how they could be utilized in solving real world problems. In addition, you will learn toolkits to design and formulate Machine Learning methods.

DS-EM3:Python for Data Science. In this course you will be introduced to the concept of Machine Learning and its applications in various domains. The aim of the course is to give you a comprehensive overview of Machine Learning and to assist you in understating what Machine Learning is, how Machine Learning algorithms work and how they could be utilized in solving real world problems. In addition, you will learn toolkits to design and formulate Machine Learning methods. At the end of the course, you will be asked to complete quizzes to apply your newly acquired skills and knowledge.

DS-EM4:Storing and Retrieving Data. In this course you will be introduced to the Hadoop ecosystem for storing and processing large volumes of data distributed across commodity servers. You will be equipped with the theoretical and practical background needed to perform Hadoop routine tasks and troubleshoot Hadoop clusters. Furthermore, the fundamentals of MapReduce και Spark Framework will be presented. Completing this course, you will be able to administrate and establish a secure Hadoop environment and work with the common Hadoop-related processing frameworks and modules.

DS-EM5:Statistics for Data Science. This course consists an introduction to R programming language for solving Data Science problems. The aim of the course is to become familiar with R programming language and its libraries and packages for inferential statistical analysis, visualization and for implementing machine learning algorithms.

DS-EM6:Data Visualization. In this course you will be introduced to Data Visualization and its applications in order to enhance visual communication. You will be equipped with the theoretical and practical tools needed to build effective and engaging data visualizations. Additionally, the role of the Data Scientist from a data presentation and communication perspective will be defined. Completing this course, you will be able to design and develop visual stories with data, discover trends and patterns, and potentially communicate their findings to a non-technical or broader audience.

[Figure continues on the next page]

Figure 8. MOOC page (http://sending-project.eu/index.php/en/vet-program/c)

Figure 9. Transversal skills page (http://sending-project.eu/index.php/en/vet-program/transversal-skills)

4.2 Pilots submenu

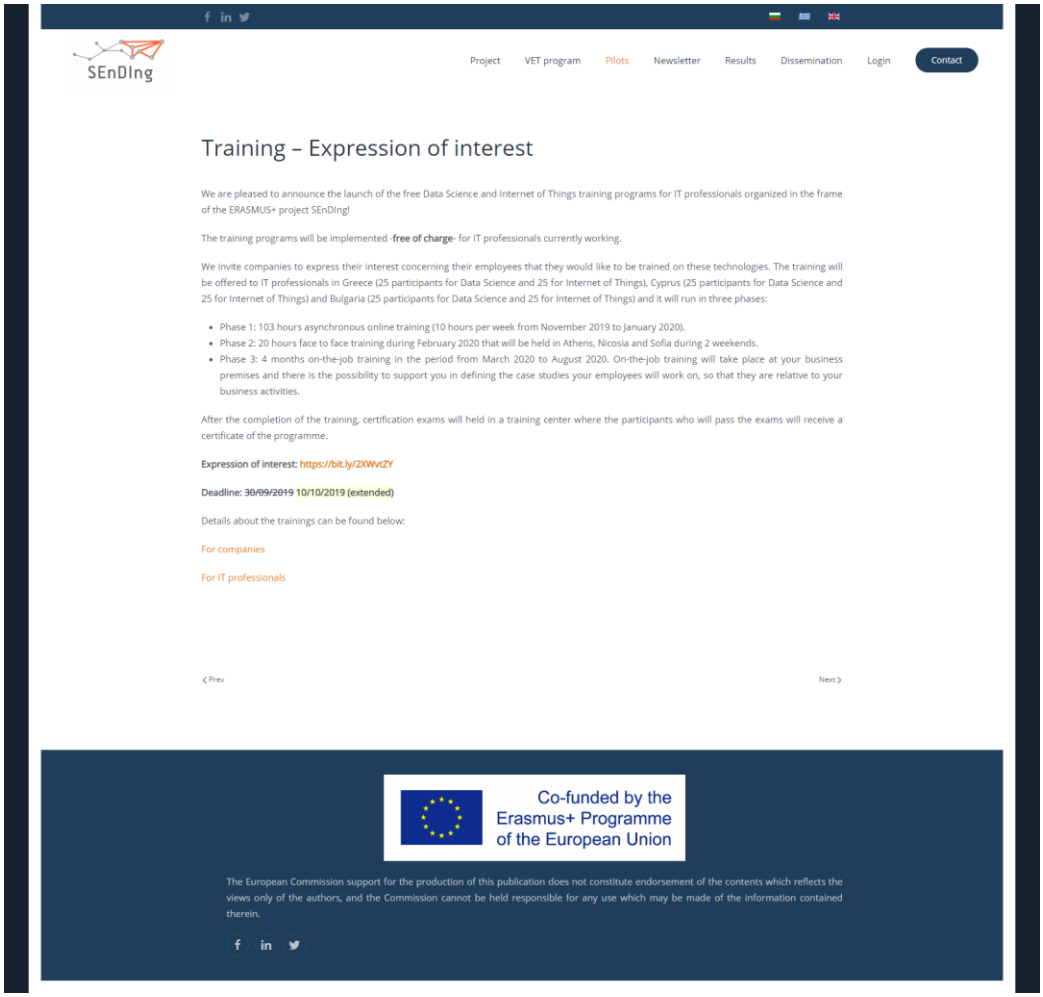


Figure 10. Expression of Interest for the trainings page (http://sending-project.eu/index.php/en/pilots/training-phases)

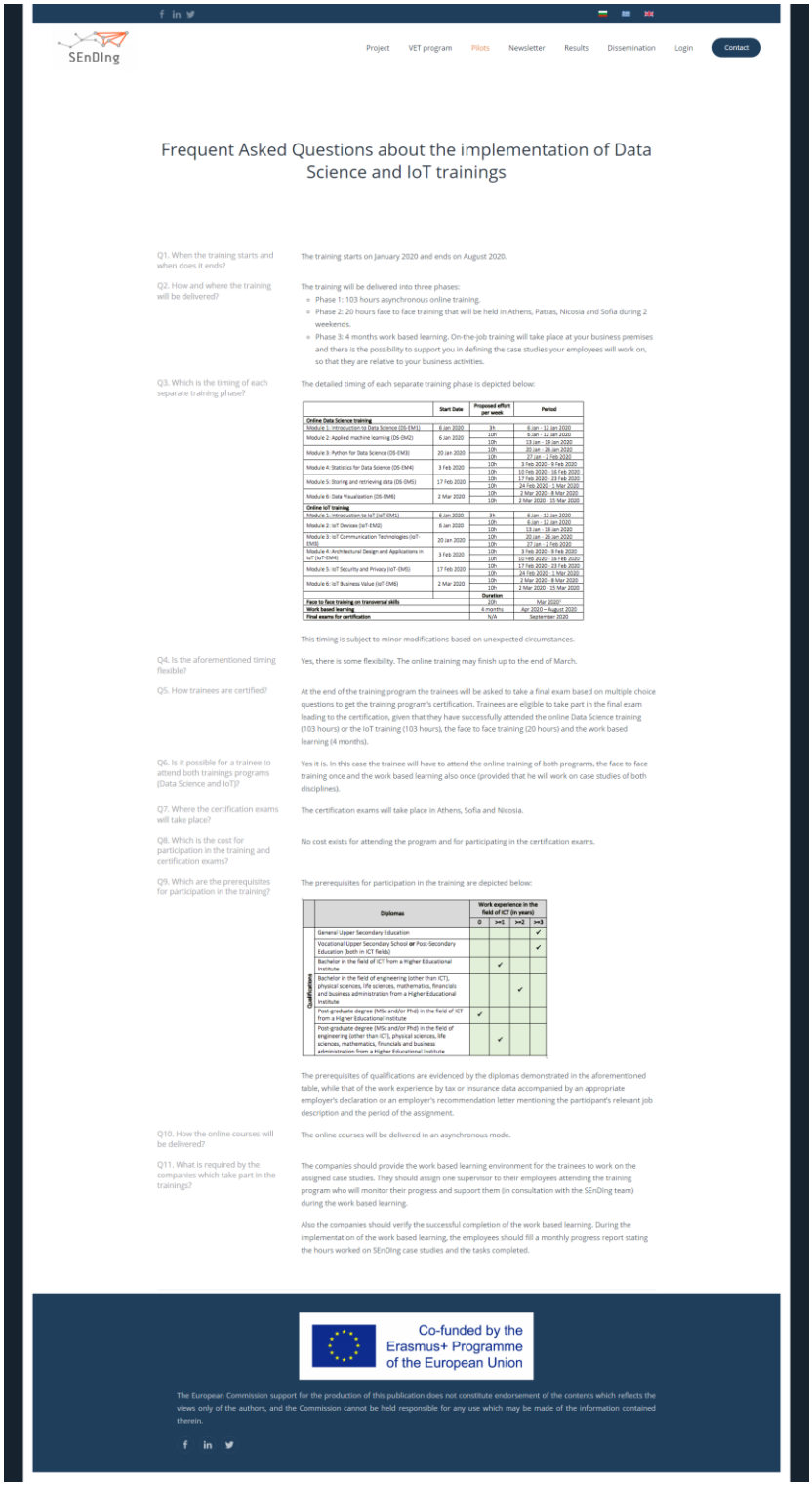
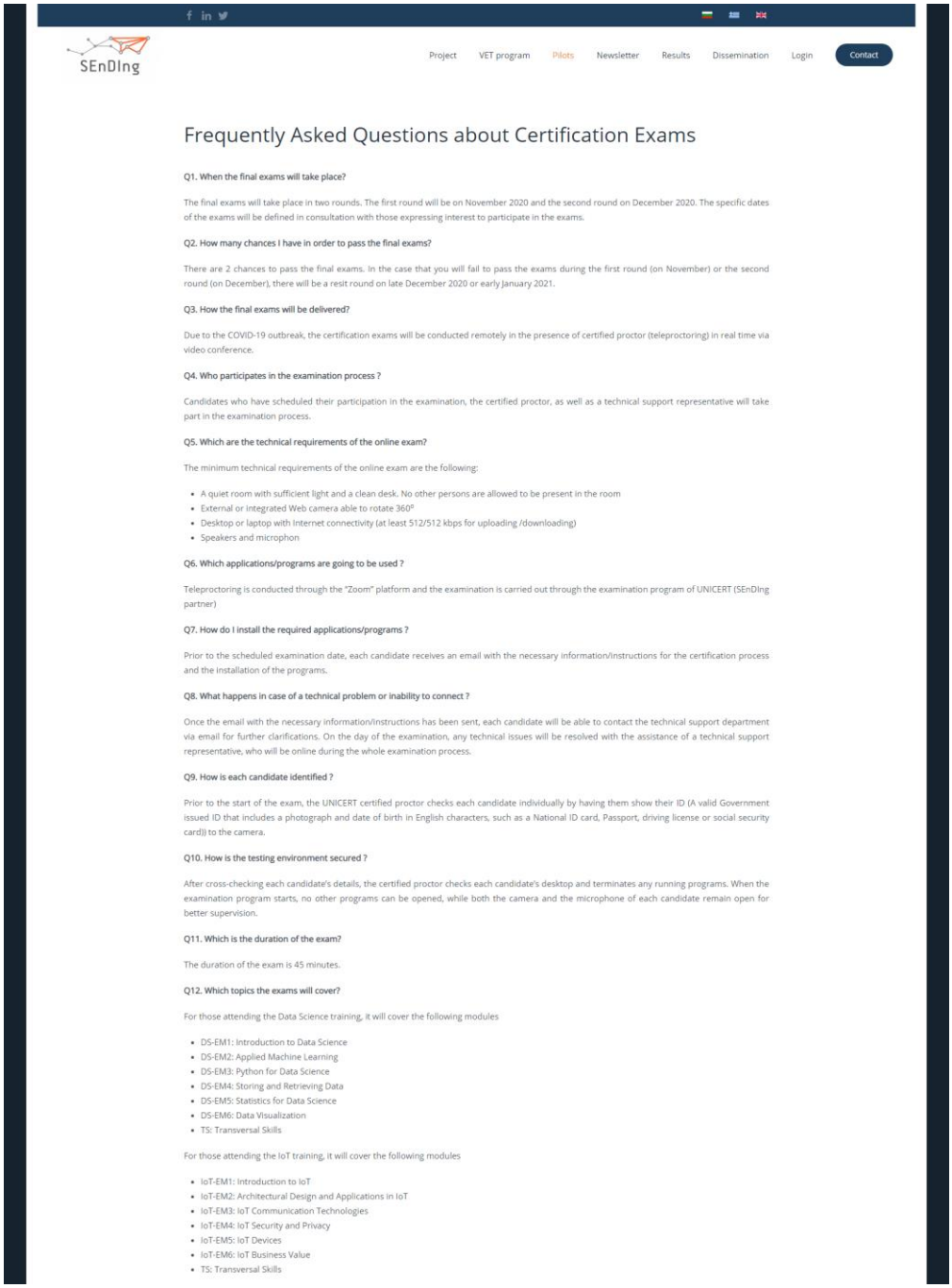


Figure 11. FAQs for the trainings page (http://sending-project.eu/index.php/en/pilots/training-faqs)



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Frequently Asked Questions about Certification Exams

Q1. When the final exams will take place?

The final exams will take place in two rounds. The first round will be on November 2020 and the second round on December 2020. The specific dates of the exams will be defined in consultation with those expressing interest to participate in the exams.

Q2. How many chances I have in order to pass the final exams?

There are 2 chances to pass the final exams. In the case that you will fail to pass the exams during the first round (on November) or the second round (on December), there will be a resit round on late December 2020 or early January 2021.

Q3. How the final exams will be delivered?

Due to the COVID-19 outbreak, the certification exams will be conducted remotely in the presence of certified proctor (teleproctoring) in real time via video conference.

Q4. Who participates in the examination process ?

Candidates who have scheduled their participation in the examination, the certified proctor, as well as a technical support representative will take part in the examination process.

Q5. Which are the technical requirements of the online exam?

The minimum technical requirements of the online exam are the following:

- A quiet room with sufficient light and a clean desk. No other persons are allowed to be present in the room
- External or integrated Web camera able to rotate 360°
- Desktop or laptop with Internet connectivity (at least 512/512 kbps for uploading /downloading)
- Speakers and microphon

Q6. Which applications/programs are going to be used ?

Teleproctoring is conducted through the "Zoom" platform and the examination is carried out through the examination program of UNICERT (SEnDIng partner)

Q7. How do I install the required applications/programs ?

Prior to the scheduled examination date, each candidate receives an email with the necessary information/instructions for the certification process and the installation of the programs.

Q8. What happens in case of a technical problem or inability to connect ?

Once the email with the necessary information/instructions has been sent, each candidate will be able to contact the technical support department via email for further clarifications. On the day of the examination, any technical issues will be resolved with the assistance of a technical support representative, who will be online during the whole examination process.

Q9. How is each candidate identified ?

Prior to the start of the exam, the UNICERT certified proctor checks each candidate individually by having them show their ID (A valid Government issued ID that includes a photograph and date of birth in English characters, such as a National ID card, Passport, driving license or social security card)) to the camera.

Q10. How is the testing environment secured ?

After cross-checking each candidate's details, the certified proctor checks each candidate's desktop and terminates any running programs. When the examination program starts, no other programs can be opened, while both the camera and the microphone of each candidate remain open for better supervision.

Q11. Which is the duration of the exam?

The duration of the exam is 45 minutes.

Q12. Which topics the exams will cover?

For those attending the Data Science training, it will cover the following modules

- DS-EM1: Introduction to Data Science
- DS-EM2: Applied Machine Learning
- DS-EM3: Python for Data Science
- DS-EM4: Storing and Retrieving Data
- DS-EM5: Statistics for Data Science
- DS-EM6: Data Visualization
- TS: Transversal Skills

For those attending the IoT training, it will cover the following modules

- IoT-EM1: Introduction to IoT
- IoT-EM2: Architectural Design and Applications in IoT
- IoT-EM3: IoT Communication Technologies
- IoT-EM4: IoT Security and Privacy
- IoT-EM5: IoT Devices
- IoT-EM6: IoT Business Value
- TS: Transversal Skills

[Figure continues on the next page]

Q13. Which will be the format of the exam?

The format of the exam is the following:

- It will be delivered in English.
- It contains 28 multiple choice questions.
- All the questions should be answered.
- Each question is worth one mark.
- Wrong answers will not have negative impact at your score.
- The distribution of the questions among the various modules is the following

For those attending the Data Science training

Difficulty	DS-EM2	DS-EM3	DS-EM4	DS-EM5	DS-EM6	Transversal Skills
Easy	3	3	2	2	2	2
Moderate	1	1	2	1	1	1
Difficult	1	1	1	1	2	1
Total	**5**	**5**	**5**	**4**	**5**	**4**

For those attending the IoT training

Difficulty	IoT-EM2	IoT -EM3	IoT -EM4	IoT -EM5	IoT -EM6	Transversal Skills
Easy	3	3	2	2	2	2
Moderate	1	1	2	1	1	1
Difficult	1	1	1	1	2	1
Total	**5**	**5**	**5**	**4**	**5**	**4**

Q14. Which is the score that I should achieve in order to pass the final exams.

The minimum score that you should achieve in order to pass the final exams is 70% (20 correct answers out to 28).

‹ Prev Next ›

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Figure 12. FAQs about the certification exams page (http://sending-project.eu/index.php/en/pilots/certification-exams-faqs)

4.3 Newsletters submenu

This submenou offers links to all 6 newsletters produced throughout the project lifecycle. We indicatively depict on of them on the following figure.

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The SEnDIng project has officially completed!

This is the last newsletter of the SEnDIng project as the project ended on 31st January 2021. The University of Patras as the coordinating organization, along with all project partners have signed an MoU stating their intention to continue their cooperation towards the sustainability of SEnDIng outputs by (a) keep running the main outputs produced (e.g., the project website and the MOOC), (b) incorporate the VET programs into their training offers where applicable, (c) disseminate the project through their networks and (d) designing a follow-up project.

The main project objectives achieved are following:

- Design 2 VET programs for Data Science and IoT that are based on multi-disciplinary and learning-outcomes oriented curricula and combine technical knowledge and skills with transversal skills and competences.
- Design 2 reference models of knowledge, skills and competences for Data Scientists and IoT professionals in accordance with well-known European frameworks, such as the e-Competence Framework and the European Skills, Competences, Qualifications and Occupations.
- Pilot the VET programs in three phases (online Data Science/IoT training, online transversal skills training and work-based learning) and certify the learning outcomes obtained.
- Disseminate the project results to target groups and engage them with the project to maximize its potential impact.
- Take actions towards the sustainability of project outputs and their exploitation by relevant stakeholders.

For more information, please read the project final report.

SEnDIng in numbers

250+ OERs available for downloading

- Data Science: https://bit.ly/3BxIUOy4
- IoT: https://bit.ly/22EapGX
- Transversal skill: https://bit.ly/3ulLFBF

13 Online courses at http://mooc.sending-project.eu/ with +200 users

- 6 on Data Science
- 6 on Internet of Things
- 1 on Transversal Skills

+440 hours of training

- 103 Data Science or 103 hours IoT online courses
- 20 online training on transversal skills
- 320 hours on work-based learning

Success rates in the Data Science and IoT pilot trainings

- 39% of the trainees have successfully completed the online training on Data Science and gained a Certificate of Achievement
- 37% of the trainees have successfully completed the online training on IoT and gained a Certificate of Achievement
- 31% of the trainees have successfully completed the online training on transversal skills
- 100% of the trainees have successfully completed the work-based learning and gained the SEnDIng certification

What trainees said about SEnDIng MOOC

- 77% declared that enjoyed the courses
- 71% declared that the courses met their expectations
- 68% declared that the quality of the courses was high
- 80% declared that the courses will be useful in their work
- 78% declared that the objectives of the courses were clearly defined
- 77% declared that the time allocated for the courses was reasonable
- 82% declared that the courses enhanced their knowledge of the subject matter
- 73% declared that they have been challenged to learn more than they expected

SEnDIng PCI 2020 Special Session papers published at ACM's ICPS series

The SEnDIng Final Conference co-organized the special session "Education and training on Data Science and IoT" in conjunction with the 24th Pan-Hellenic Conference on Informatics (PCI 2020).

PCI 2020 Proceedings are published in the ACM ICPS Series, are available through the ACM Digital Library and are indexed through high-quality citation databases. The ISBN assigned to PCI 2020 proceedings volume is 978-1-4503-8897-9.

ICPS Published by ACM

Special session presentations can be found here.

SEnDIng Certificates

The participants in the pilot Data Science and IoT training have been awarded two different certificates. The certificate of achievement was awarded to those participants that successfully completed (i.e., achieved a score of 70% or more at all self-assessment quizzes of the programme modules) the Data Science and/or IoT online courses at the SEnDIng MOOC.

Certificate of Achievement

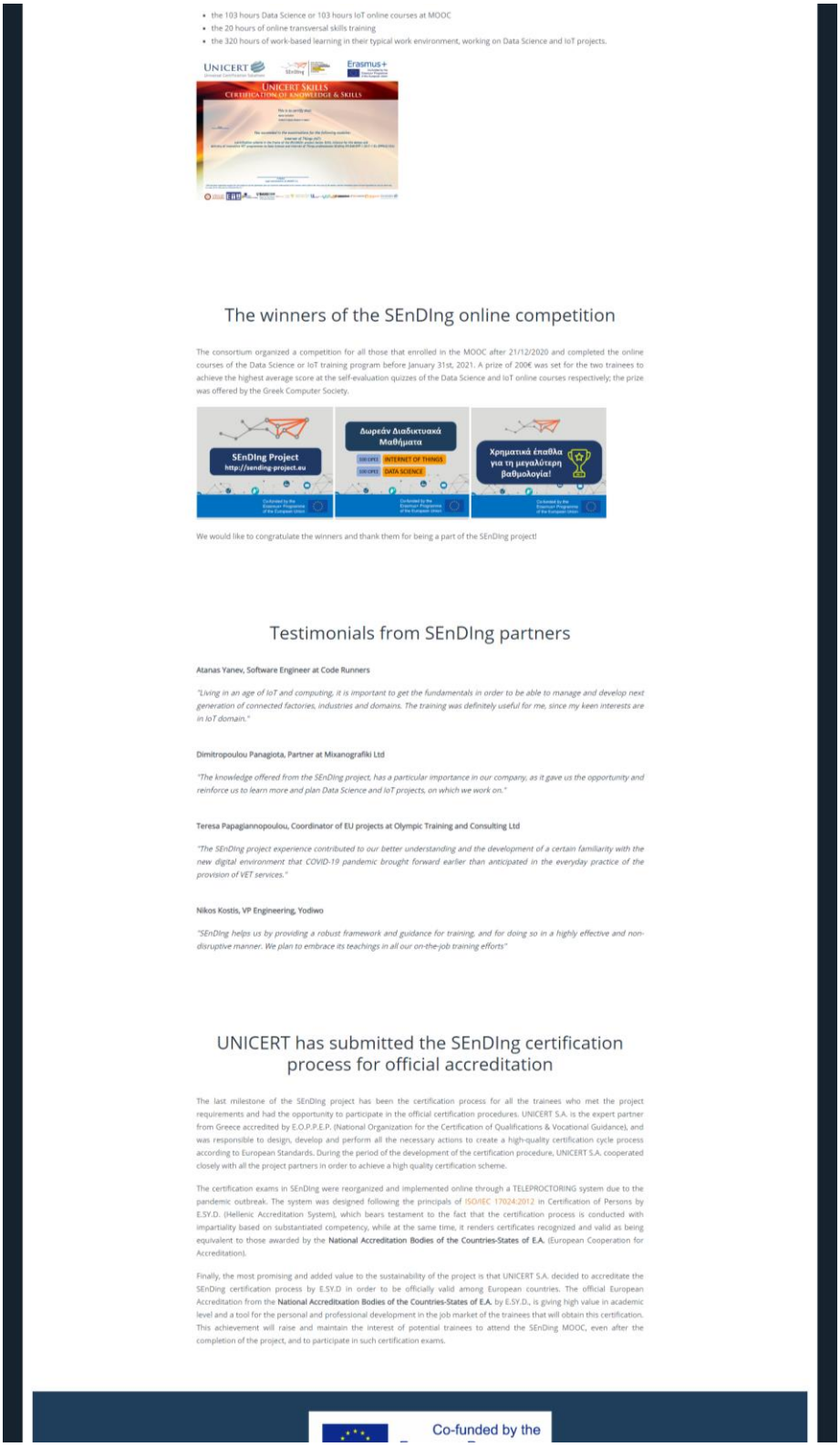
This is to certify that

Jane Doe

"Data Science for IT Professionals"

The formal SEnDIng certificate was awarded to those that succeed at the certification exams which took place at the end of the training for the trainees who successfully completed:

[Figure continues on the next page]



- the 103 hours Data Science or 103 hours IoT online courses at MOOC
- the 20 hours of online transversal skills training
- the 320 hours of work-based learning in their typical work environment, working on Data Science and IoT projects.

The winners of the SEnDIng online competition

The consortium organized a competition for all those that enrolled in the MOOC after 21/12/2020 and completed the online courses of the Data Science or IoT training program before January 31st, 2021. A prize of 200€ was set for the two trainees to achieve the highest average score at the self-evaluation quizzes of the Data Science and IoT online courses respectively; the prize was offered by the Greek Computer Society.

We would like to congratulate the winners and thank them for being a part of the SEnDIng project!

Testimonials from SEnDIng partners

Atanas Yanev, Software Engineer at Code Runners

"Living in an age of IoT and computing, it is important to get the fundamentals in order to be able to manage and develop next generation of connected factories, industries and domains. The training was definitely useful for me, since my keen interests are in IoT domain."

Dimitropoulou Panagiota, Partner at Mixanografiki Ltd

"The knowledge offered from the SEnDIng project, has a particular importance in our company, as it gave us the opportunity and reinforce us to learn more and plan Data Science and IoT projects, on which we work on."

Teresa Papagiannopoulou, Coordinator of EU projects at Olympic Training and Consulting Ltd

"The SEnDIng project experience contributed to our better understanding and the development of a certain familiarity with the new digital environment that COVID-19 pandemic brought forward earlier than anticipated in the everyday practice of the provision of VET services."

Nikos Kostis, VP Engineering, Yodiwo

"SEnDIng helps us by providing a robust framework and guidance for training, and for doing so in a highly effective and non-disruptive manner. We plan to embrace its teachings in all our on-the-job training efforts"

UNICERT has submitted the SEnDIng certification process for official accreditation

The last milestone of the SEnDIng project has been the certification process for all the trainees who met the project requirements and had the opportunity to participate in the official certification procedures. UNICERT S.A. is the expert partner from Greece accredited by E.O.P.P.E.P. (National Organization for the Certification of Qualifications & Vocational Guidance), and was responsible to design, develop and perform all the necessary actions to create a high-quality certification cycle process according to European Standards. During the period of the development of the certification procedure, UNICERT S.A. cooperated closely with all the project partners in order to achieve a high quality certification scheme.

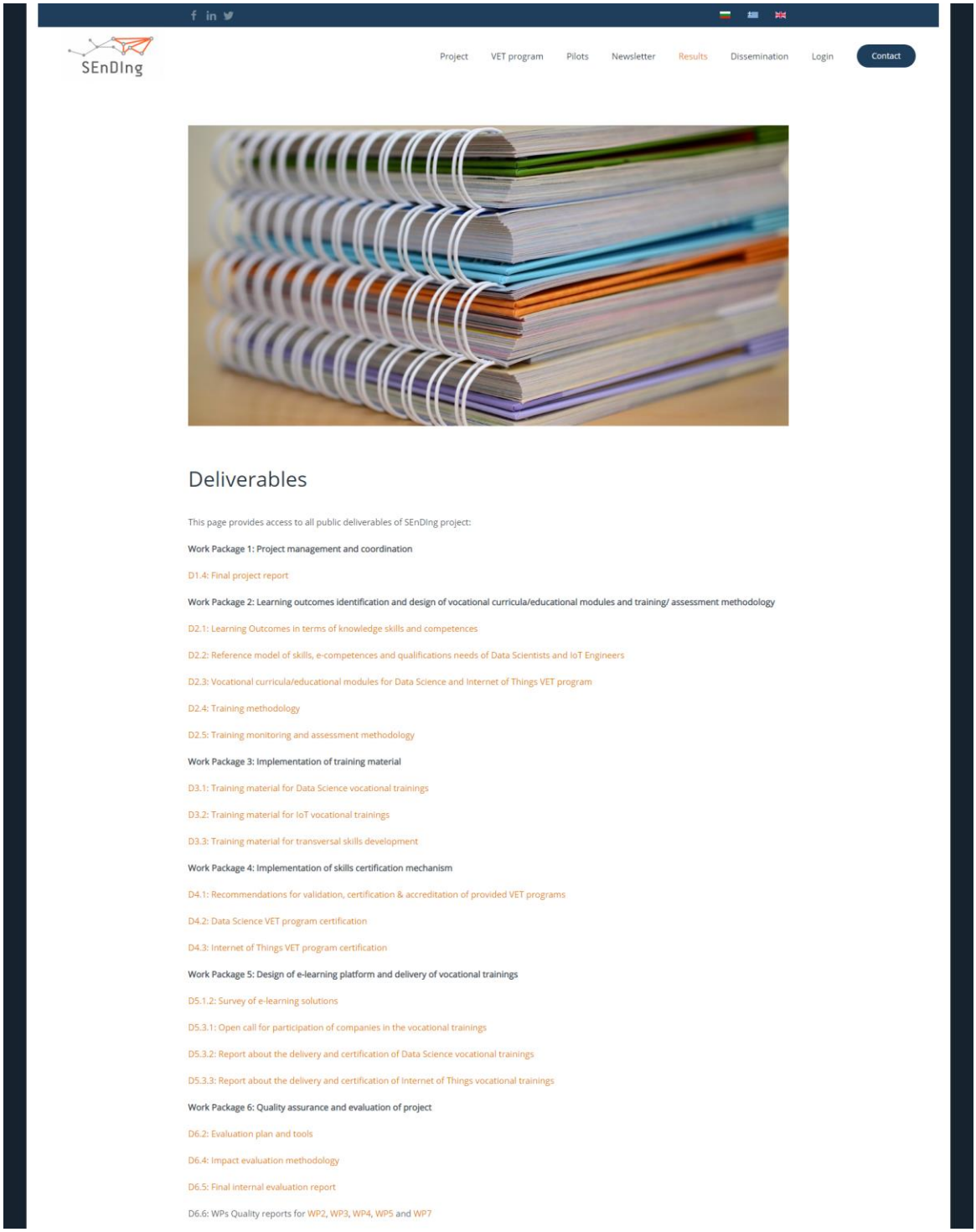
The certification exams in SEnDIng were reorganized and implemented online through a TELEPROCTORING system due to the pandemic outbreak. The system was designed following the principals of ISO/IEC 17024:2012 in Certification of Persons by E.SY.D. (Hellenic Accreditation System), which bears testament to the fact that the certification process is conducted with impartiality based on substantiated competency, while at the same time, it renders certificates recognized and valid as being equivalent to those awarded by the **National Accreditation Bodies of the Countries-States of E.A.** (European Cooperation for Accreditation).

Finally, the most promising and added value to the sustainability of the project is that UNICERT S.A. decided to accreditate the SEnDIng certification process by E.SY.D in order to be officially valid among European countries. The official European Accreditation from the **National Accreditxation Bodies of the Countries-States of E.A.** by E.SY.D., is giving high value in academic level and a tool for the personal and professional development in the job market of the trainees that will obtain this certification. This achievement will raise and maintain the interest of potential trainees to attend the SEnDIng MOOC, even after the completion of the project, and to participate in such certification exams.

Co-funded by the

Figure 13. 6th Newsletter page(http://sending-project.eu/index.php/en/journal/newsletter-6)

4.4 Results submenu



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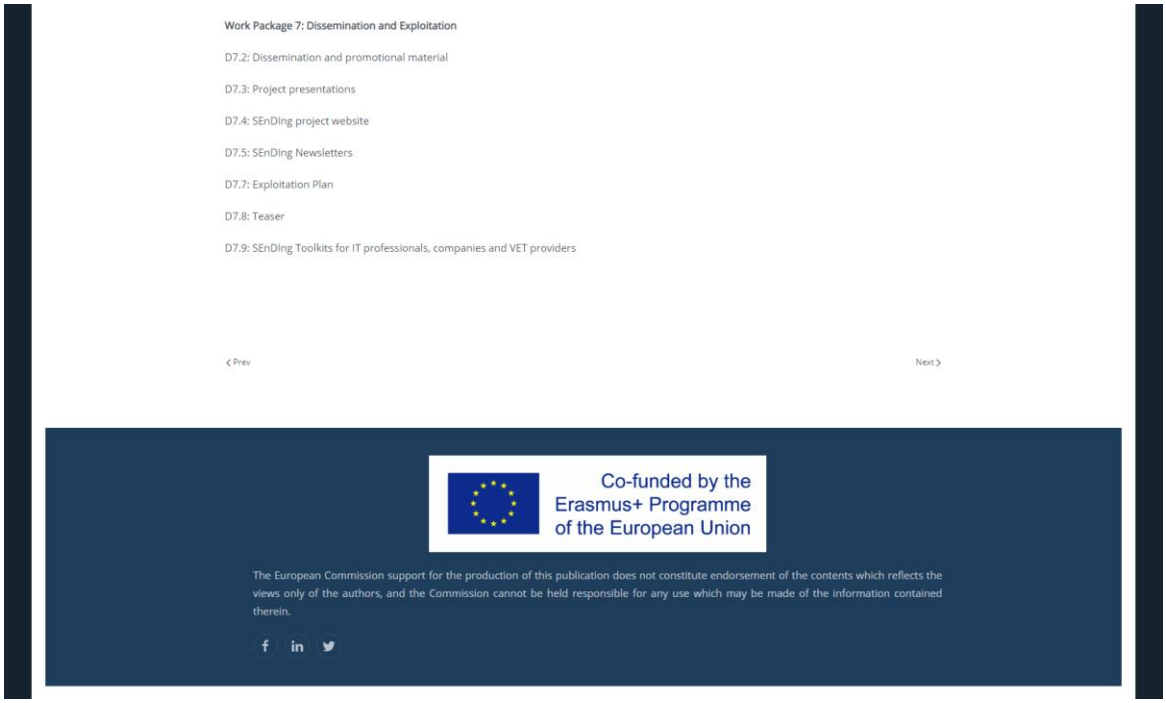


Figure 14. Deliverables page (http://sending-project.eu/index.php/en/public-documents/deliverables)

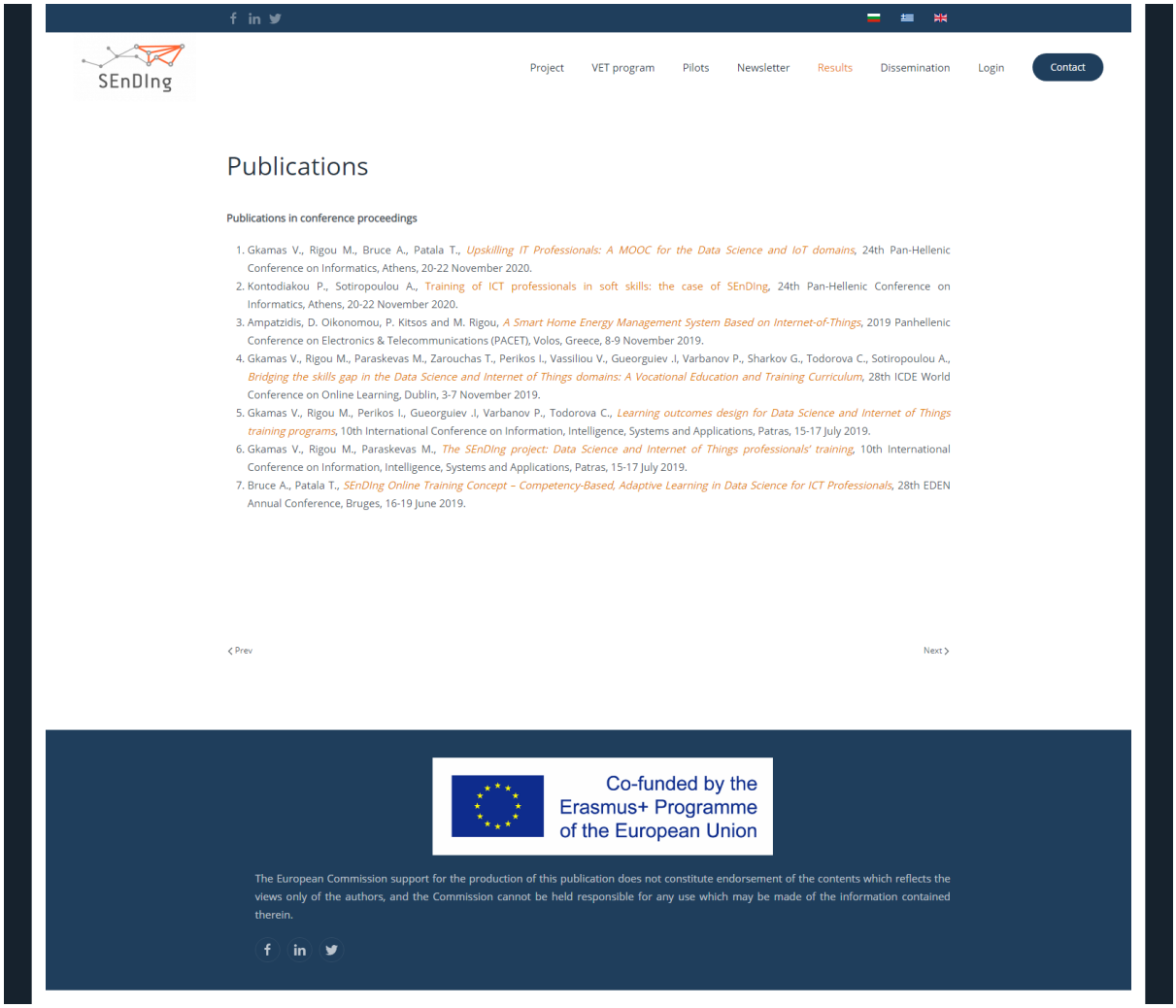
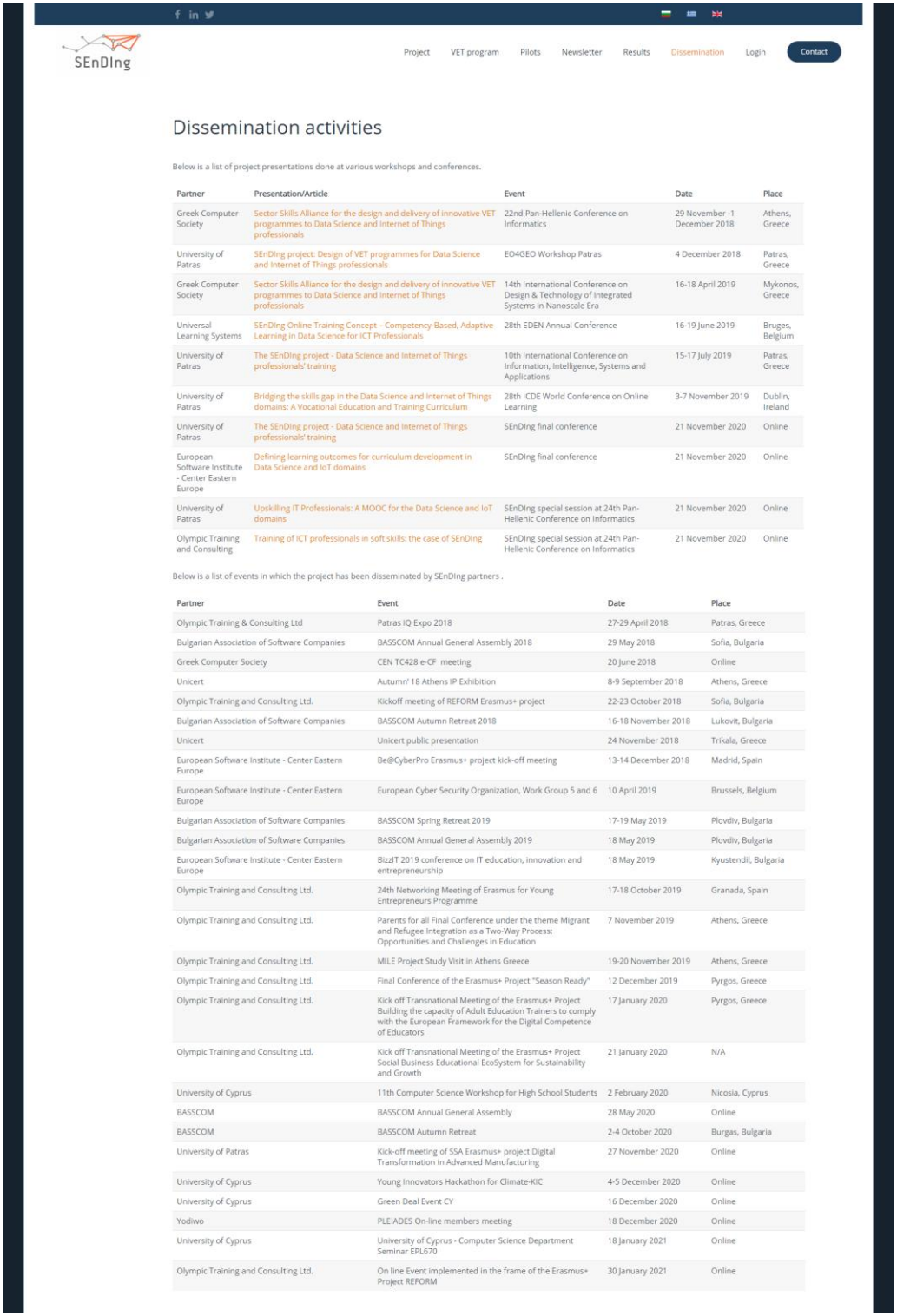


Figure 15. Publications page (http://sending-project.eu/index.php/en/public-documents/publications)

4.5 Dissemination submenu

This submenu gathers all dissemination activities and produced material (promotional material, dissemination activities, exploitation toolkits, press releases, national workshops and the project final conference). In the figures below we indicatively depict the pages of dissemination activities, national workshops and the final conference.



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Project VET program Pilots Newsletter Results Dissemination Login Contact

Dissemination activities

Below is a list of project presentations done at various workshops and conferences.

Partner	Presentation/Article	Event	Date	Place
Greek Computer Society	Sector Skills Alliance for the design and delivery of innovative VET programmes to Data Science and Internet of Things professionals	22nd Pan-Hellenic Conference on Informatics	29 November -1 December 2018	Athens, Greece
University of Patras	SEnDIng project: Design of VET programmes for Data Science and Internet of Things professionals	EO4GEO Workshop Patras	4 December 2018	Patras, Greece
Greek Computer Society	Sector Skills Alliance for the design and delivery of innovative VET programmes to Data Science and Internet of Things professionals	14th International Conference on Design & Technology of Integrated Systems in Nanoscale Era	16-18 April 2019	Mykonos, Greece
Universal Learning Systems	SEnDIng Online Training Concept – Competency-Based, Adaptive Learning in Data Science for ICT Professionals	28th EDEN Annual Conference	16-19 June 2019	Bruges, Belgium
University of Patras	The SEnDIng project - Data Science and Internet of Things professionals' training	10th International Conference on Information, Intelligence, Systems and Applications	15-17 July 2019	Patras, Greece
University of Patras	Bridging the skills gap in the Data Science and Internet of Things domains: A Vocational Education and Training Curriculum	28th ICDE World Conference on Online Learning	3-7 November 2019	Dublin, Ireland
University of Patras	The SEnDIng project - Data Science and Internet of Things professionals' training	SEnDIng final conference	21 November 2020	Online
European Software Institute - Center Eastern Europe	Defining learning outcomes for curriculum development in Data Science and IoT domains	SEnDIng final conference	21 November 2020	Online
University of Patras	Upskilling IT Professionals: A MOOC for the Data Science and IoT domains	SEnDIng special session at 24th Pan-Hellenic Conference on Informatics	21 November 2020	Online
Olympic Training and Consulting	Training of ICT professionals in soft skills: the case of SEnDIng	SEnDIng special session at 24th Pan-Hellenic Conference on Informatics	21 November 2020	Online

Below is a list of events in which the project has been disseminated by SEnDIng partners .

Partner	Event	Date	Place
Olympic Training & Consulting Ltd	Patras IQ Expo 2018	27-29 April 2018	Patras, Greece
Bulgarian Association of Software Companies	BASSCOM Annual General Assembly 2018	29 May 2018	Sofia, Bulgaria
Greek Computer Society	CEN TC428 e-CF meeting	20 June 2018	Online
Unicert	Autumn' 18 Athens IP Exhibition	8-9 September 2018	Athens, Greece
Olympic Training and Consulting Ltd.	Kickoff meeting of REFORM Erasmus+ project	22-23 October 2018	Sofia, Bulgaria
Bulgarian Association of Software Companies	BASSCOM Autumn Retreat 2018	16-18 November 2018	Lukovit, Bulgaria
Unicert	Unicert public presentation	24 November 2018	Trikala, Greece
European Software Institute - Center Eastern Europe	Be@CyberPro Erasmus+ project kick-off meeting	13-14 December 2018	Madrid, Spain
European Software Institute - Center Eastern Europe	European Cyber Security Organization, Work Group 5 and 6	10 April 2019	Brussels, Belgium
Bulgarian Association of Software Companies	BASSCOM Spring Retreat 2019	17-19 May 2019	Plovdiv, Bulgaria
Bulgarian Association of Software Companies	BASSCOM Annual General Assembly 2019	18 May 2019	Plovdiv, Bulgaria
European Software Institute - Center Eastern Europe	BizzIT 2019 conference on IT education, innovation and entrepreneurship	18 May 2019	Kyustendil, Bulgaria
Olympic Training and Consulting Ltd.	24th Networking Meeting of Erasmus for Young Entrepreneurs Programme	17-18 October 2019	Granada, Spain
Olympic Training and Consulting Ltd.	Parents for all Final Conference under the theme Migrant and Refugee Integration as a Two-Way Process: Opportunities and Challenges in Education	7 November 2019	Athens, Greece
Olympic Training and Consulting Ltd.	MILE Project Study Visit in Athens Greece	19-20 November 2019	Athens, Greece
Olympic Training and Consulting Ltd.	Final Conference of the Erasmus+ Project "Season Ready"	12 December 2019	Pyrgos, Greece
Olympic Training and Consulting Ltd.	Kick off Transnational Meeting of the Erasmus+ Project Building the capacity of Adult Education Trainers to comply with the European Framework for the Digital Competence of Educators	17 January 2020	Pyrgos, Greece
Olympic Training and Consulting Ltd.	Kick off Transnational Meeting of the Erasmus+ Project Social Business Educational EcoSystem for Sustainability and Growth	21 January 2020	N/A
University of Cyprus	11th Computer Science Workshop for High School Students	2 February 2020	Nicosia, Cyprus
BASSCOM	BASSCOM Annual General Assembly	28 May 2020	Online
BASSCOM	BASSCOM Autumn Retreat	2-4 October 2020	Burgas, Bulgaria
University of Patras	Kick-off meeting of SSA Erasmus+ project Digital Transformation in Advanced Manufacturing	27 November 2020	Online
University of Cyprus	Young Innovators Hackathon for Climate-KIC	4-5 December 2020	Online
University of Cyprus	Green Deal Event CY	16 December 2020	Online
Yodiwo	PLEIADES On-line members meeting	18 December 2020	Online
University of Cyprus	University of Cyprus - Computer Science Department Seminar EPL670	18 January 2021	Online
Olympic Training and Consulting Ltd.	On line Event implemented in the frame of the Erasmus+ Project REFORM	30 January 2021	Online

Figure 16. Dissemination activities page (http://sending-project.eu/index.php/en/dissemination/dissemination-activities)

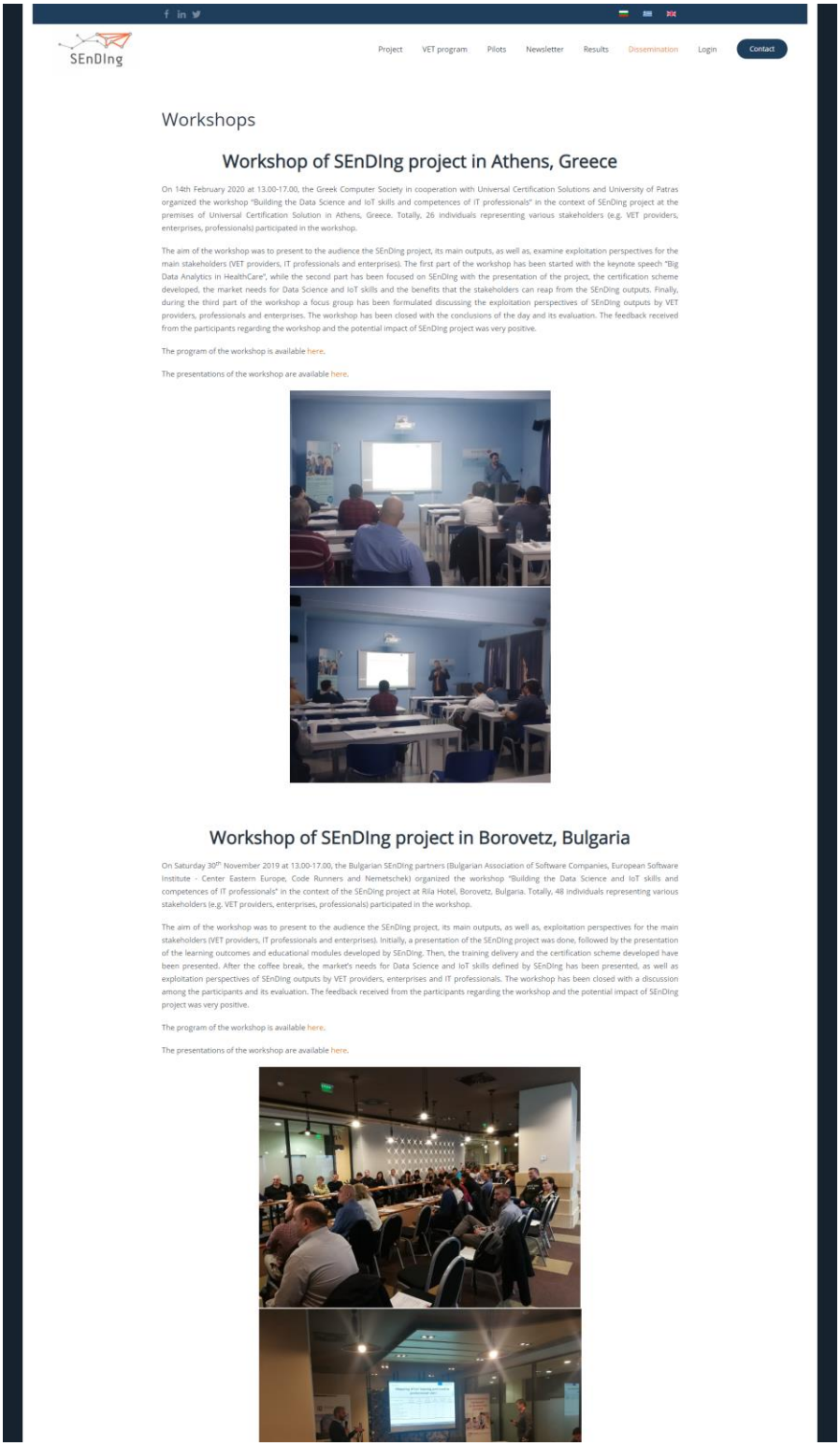
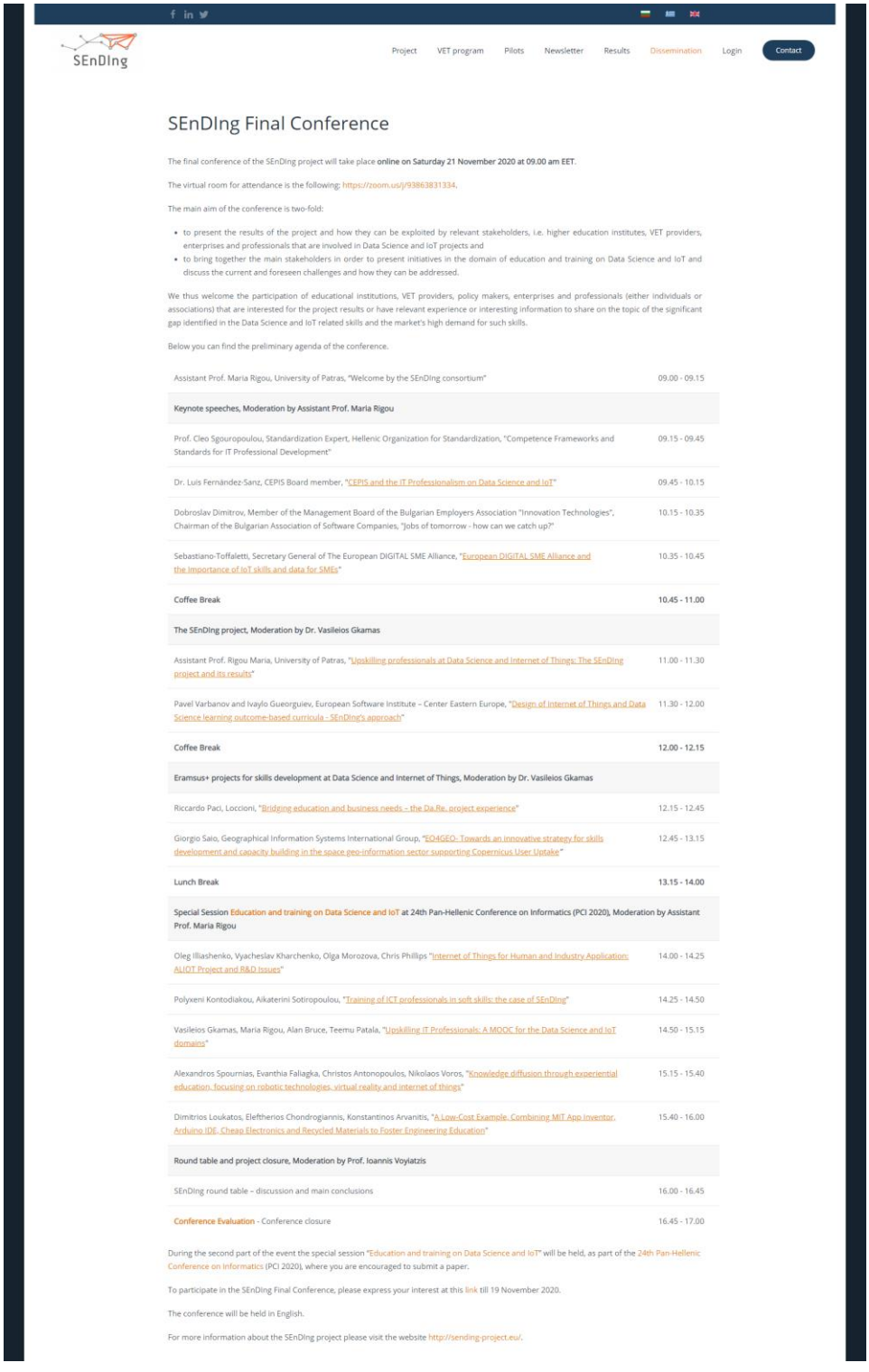


Figure 17. SEnDIng workshops page (http://sending-project.eu/index.php/en/dissemination/workshops)



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Project VET program Pilots Newsletter Results Dissemination Login Contact

SEnDIng Final Conference

The final conference of the SEnDIng project will take place **online on Saturday 21 November 2020 at 09.00 am EET.**

The virtual room for attendance is the following: https://zoom.us/j/93863831334.

The main aim of the conference is two-fold:

- to present the results of the project and how they can be exploited by relevant stakeholders, i.e. higher education institutes, VET providers, enterprises and professionals that are involved in Data Science and IoT projects and
- to bring together the main stakeholders in order to present initiatives in the domain of education and training on Data Science and IoT and discuss the current and foreseen challenges and how they can be addressed.

We thus welcome the participation of educational institutions, VET providers, policy makers, enterprises and professionals (either individuals or associations) that are interested for the project results or have relevant experience or interesting information to share on the topic of the significant gap identified in the Data Science and IoT related skills and the market's high demand for such skills.

Below you can find the preliminary agenda of the conference.

Assistant Prof. Maria Rigou, University of Patras, "Welcome by the SEnDIng consortium"	09.00 - 09.15
Keynote speeches, Moderation by Assistant Prof. Maria Rigou	
Prof. Cleo Sgouropoulou, Standardization Expert, Hellenic Organization for Standardization, "Competence Frameworks and Standards for IT Professional Development"	09.15 - 09.45
Dr. Luis Fernández-Sanz, CEPIS Board member, "CEPIS and the IT Professionalism on Data Science and IoT"	09.45 - 10.15
Dobroslav Dimitrov, Member of the Management Board of the Bulgarian Employers Association "Innovation Technologies", Chairman of the Bulgarian Association of Software Companies, "Jobs of tomorrow - how can we catch up?"	10.15 - 10.35
Sebastiano-Toffaletti, Secretary General of The European DIGITAL SME Alliance, "European DIGITAL SME Alliance and the Importance of IoT skills and data for SMEs"	10.35 - 10.45
Coffee Break	**10.45 - 11.00**
The SEnDIng project, Moderation by Dr. Vasileios Gkamas	
Assistant Prof. Rigou Maria, University of Patras, "Upskilling professionals at Data Science and Internet of Things: The SEnDIng project and its results"	11.00 - 11.30
Pavel Varbanov and Ivaylo Gueorguiev, European Software Institute – Center Eastern Europe, "Design of Internet of Things and Data Science learning outcome-based curricula - SEnDIng's approach"	11.30 - 12.00
Coffee Break	**12.00 - 12.15**
Eramsus+ projects for skills development at Data Science and Internet of Things, Moderation by Dr. Vasileios Gkamas	
Riccardo Paci, Loccioni, "Bridging education and business needs – the Da.Re. project experience"	12.15 - 12.45
Giorgio Saio, Geographical Information Systems International Group, "EO4GEO: Towards an innovative strategy for skills development and capacity building in the space geo-information sector supporting Copernicus User Uptake"	12.45 - 13.15
Lunch Break	**13.15 - 14.00**
Special Session Education and training on Data Science and IoT at 24th Pan-Hellenic Conference on Informatics (PCI 2020), Moderation by Assistant Prof. Maria Rigou	
Oleg Illiashenko, Vyacheslav Kharchenko, Olga Morozova, Chris Phillips "Internet of Things for Human and Industry Application: ALIOT Project and R&D Issues"	14.00 - 14.25
Polyxeni Kontodiakou, Aikaterini Sotiropoulou, "Training of ICT professionals in soft skills: the case of SEnDIng"	14.25 - 14.50
Vasileios Gkamas, Maria Rigou, Alan Bruce, Teemu Patala, "Upskilling IT Professionals: A MOOC for the Data Science and IoT domains"	14.50 - 15.15
Alexandros Spournias, Evanthia Faliagka, Christos Antonopoulos, Nikolaos Voros, "Knowledge diffusion through experiential education: focusing on robotic technologies, virtual reality and internet of things"	15.15 - 15.40
Dimitrios Loukatos, Eleftherios Chondrogiannis, Konstantinos Arvanitis, "A Low-Cost Example, Combining MIT App Inventor, Arduino IDE, Cheap Electronics and Recycled Materials to Foster Engineering Education"	15.40 - 16.00
Round table and project closure, Moderation by Prof. Ioannis Voyiatzis	
SEnDIng round table – discussion and main conclusions	16.00 - 16.45
Conference Evaluation - Conference closure	16.45 - 17.00

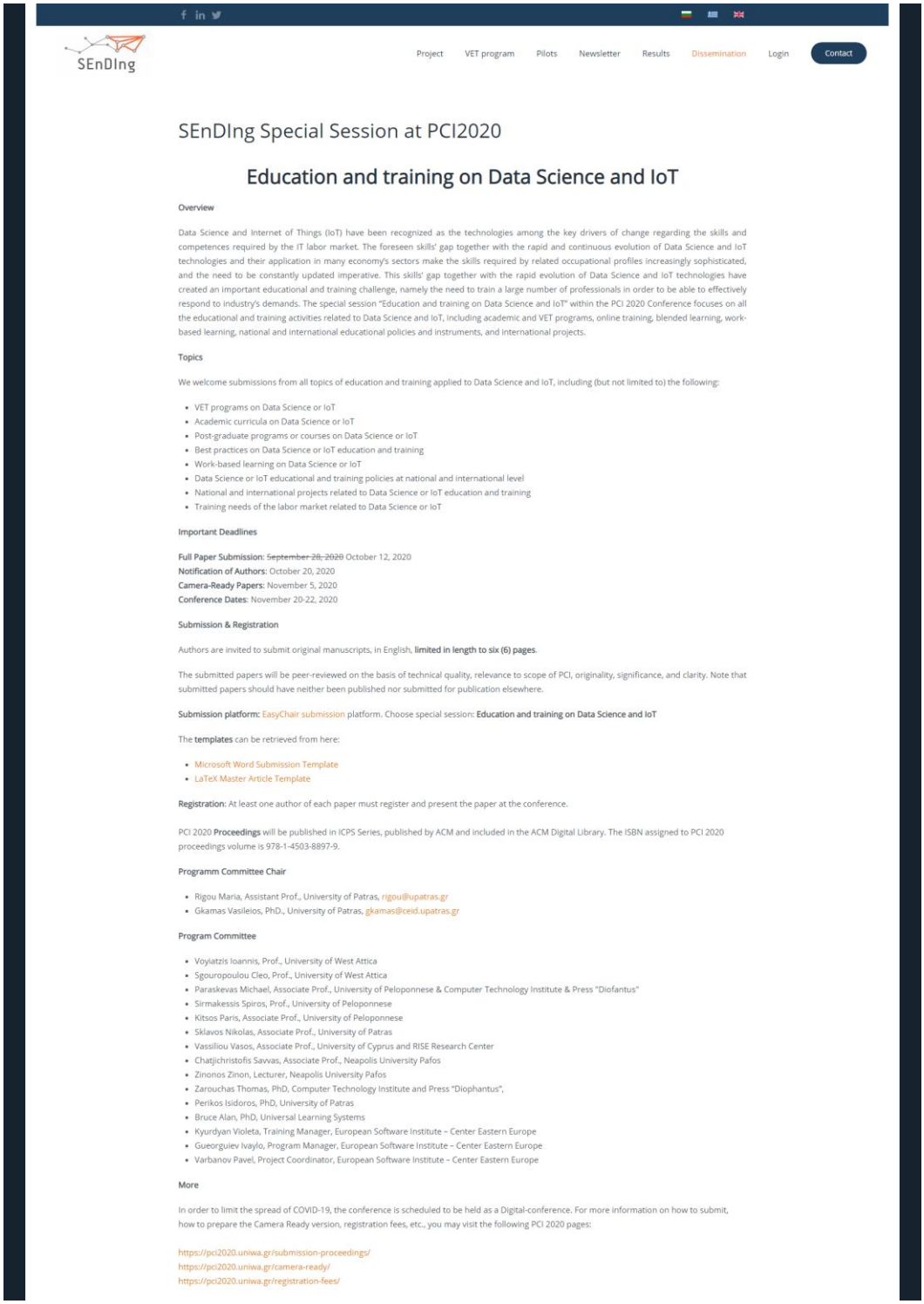
During the second part of the event the special session "Education and training on Data Science and IoT" will be held, as part of the 24th Pan-Hellenic Conference on Informatics (PCI 2020), where you are encouraged to submit a paper.

To participate in the SEnDIng Final Conference, please express your interest at this link till 19 November 2020.

The conference will be held in English.

For more information about the SEnDIng project please visit the website http://sending-project.eu/.

Figure 18. SEnDIng Final Conference page (http://sending-project.eu/index.php/en/dissemination/final-conference)



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Project VET program Pilots Newsletter Results Dissemination Login Contact

SEnDIng Special Session at PCI2020

Education and training on Data Science and IoT

Overview

Data Science and Internet of Things (IoT) have been recognized as the technologies among the key drivers of change regarding the skills and competences required by the IT labor market. The foreseen skills' gap together with the rapid and continuous evolution of Data Science and IoT technologies and their application in many economy's sectors make the skills required by related occupational profiles increasingly sophisticated, and the need to be constantly updated imperative. This skills' gap together with the rapid evolution of Data Science and IoT technologies have created an important educational and training challenge, namely the need to train a large number of professionals in order to be able to effectively respond to industry's demands. The special session "Education and training on Data Science and IoT" within the PCI 2020 Conference focuses on all the educational and training activities related to Data Science and IoT, including academic and VET programs, online training, blended learning, work-based learning, national and international educational policies and instruments, and international projects.

Topics

We welcome submissions from all topics of education and training applied to Data Science and IoT, including (but not limited to) the following:

- VET programs on Data Science or IoT
- Academic curricula on Data Science or IoT
- Post-graduate programs or courses on Data Science or IoT
- Best practices on Data Science or IoT education and training
- Work-based learning on Data Science or IoT
- Data Science or IoT educational and training policies at national and international level
- National and international projects related to Data Science or IoT education and training
- Training needs of the labor market related to Data Science or IoT

Important Deadlines

Full Paper Submission: ~~September 28, 2020~~ October 12, 2020
Notification of Authors: October 20, 2020
Camera-Ready Papers: November 5, 2020
Conference Dates: November 20-22, 2020

Submission & Registration

Authors are invited to submit original manuscripts, in English, **limited in length to six (6) pages**.

The submitted papers will be peer-reviewed on the basis of technical quality, relevance to scope of PCI, originality, significance, and clarity. Note that submitted papers should have neither been published nor submitted for publication elsewhere.

Submission platform: EasyChair submission platform. Choose special session: **Education and training on Data Science and IoT**

The **templates** can be retrieved from here:

- Microsoft Word Submission Template
- LaTeX Master Article Template

Registration: At least one author of each paper must register and present the paper at the conference.

PCI 2020 **Proceedings** will be published in ICPS Series, published by ACM and included in the ACM Digital Library. The ISBN assigned to PCI 2020 proceedings volume is 978-1-4503-8897-9.

Programm Committee Chair

- Rigou Maria, Assistant Prof., University of Patras, rigou@upatras.gr
- Gkamas Vasileios, PhD., University of Patras, gkamas@ceid.upatras.gr

Program Committee

- Voyiatzis Ioannis, Prof., University of West Attica
- Sgouropoulou Cleo, Prof., University of West Attica
- Paraskevas Michael, Associate Prof., University of Peloponnese & Computer Technology Institute & Press "Diofantus"
- Sirmakessis Spiros, Prof., University of Peloponnese
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- Zinonos Zinon, Lecturer, Neapolis University Pafos
- Zarouchas Thomas, PhD, Computer Technology Institute and Press "Diophantus",
- Perikos Isidoros, PhD, University of Patras
- Bruce Alan, PhD, Universal Learning Systems
- Kyurdyan Violeta, Training Manager, European Software Institute – Center Eastern Europe
- Gueorguiev Ivaylo, Program Manager, European Software Institute – Center Eastern Europe
- Varbanov Pavel, Project Coordinator, European Software Institute – Center Eastern Europe

More

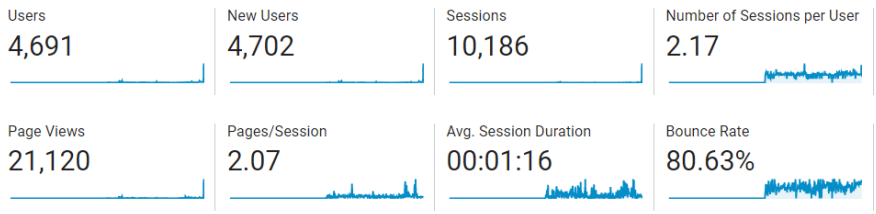
In order to limit the spread of COVID-19, the conference is scheduled to be held as a Digital-conference. For more information on how to submit, how to prepare the Camera Ready version, registration fees, etc., you may visit the following PCI 2020 pages:

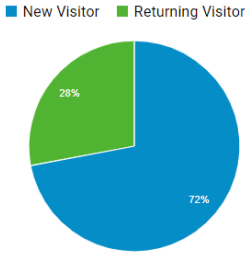
https://pci2020.uniwa.gr/submission-proceedings/
https://pci2020.uniwa.gr/camera-ready/
https://pci2020.uniwa.gr/registration-fees/

Figure 19. SEnDIng Special Session at PCI Conference page (http://sending-project.eu/index.php/en/dissemination/final-conference/sending-special-session-at-pci2020)

5 Website analytics

Some key indicators regarding the audience of the website during the period December 2017 – January 2021 are depicted below.





It is observed that more than 4,690 users have visited the project website and viewed more than 21,200 web pages. The distribution of visitors per country is depicted at the following table. The top five countries are:

- Greece: 1,692 visitors (35.90%)
- Bulgaria: 670 visitors (14.22%)
- United States: 292 visitors (6.20%)
- China: 238 visitors (5.05%)
- India: 107 visitors (2.27%).

Moreover, 54.15% of the visitors are male, while 45.85% are female. This is encouraging given the gap that exist in Europe among men and women at STEM-related jobs. Finally, the majority of the visitors (33.50%) fall under the age category 25-34, followed by the age group 18-24 (27.50%).

	Country	Users	% Users
1.	Greece	1,692	35.90%
2.	Bulgaria	670	14.22%
3.	United States	292	6.20%
4.	China	238	5.05%
5.	India	107	2.27%
6.	(not set)	98	2.08%
7.	Germany	97	2.06%
8.	Cyprus	79	1.68%
9.	Palestine	76	1.61%
10.	United Kingdom	71	1.51%

6 Website updating

The SEnDIng throughout the duration of the project has been a live 'organism' and changed contents and structure serving as the central reference point for information on current project status and achieved outputs. The University of Patras as the project coordinator undertook the main responsibility of supporting and updating the website but also all partners were granted accounts so that they could post news, access and upload private and public documents.

The website will continue to exist online at least for 5 years after the completion of the project and the University of Patras will make sure to provide all the necessary technical and financial requirements for this purpose. Moreover, the University of Patras will update with new information the website if needed.

REFERENCES

[1] https://httpd.apache.org/

[2] http://php.net/

[3] https://www.mysql.com/

[4] https://www.joomla.org/