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SEnDIng

D6.6.1

WP2 QUALITY REPORT

FOR THE TIME PERIOD

NOVEMBER 1, 2017 – MAY 31, 2019

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Deliverable factsheet

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Delivery Slip

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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.

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1 Introduction

The scope of the deliverable is to report in narrative form the Quality Assurance activities that were applied for WP2 during the time period November 1, 2017 – May 31, 2019. Quality Assurance includes all those planned and systematic actions necessary to provide adequate confidence that a product or service will satisfy given quality requirements. Quality Assurance evaluates the performance of the project and produces recommended actions and change requests, while quality control applies all the operational techniques and activities that are used to fulfil requirements for quality.

The Quality Assurance Report follows the same structure as the corresponding plan.

2 Deliverables Quality Standard

During the reported time period the Project consortium produced the following deliverables within WP2:

D2.1 Learning outcomes in terms of knowledge, skills and competences

We developed the learning outcomes for the Internet of Things (IoT) and Data Science (DS) vocational trainings that will be piloted during the project. We performed a desktop research on existing DS and IoT studies, curricula and courses in order to formulate the first draft version of the Learning Outcomes. Then, the Learning Outcomes were discussed among project partners and key experts in the respective fields and finally they were validated in an online survey with stakeholders. Based on the above, we are confident that the Learning Outcomes are relevant to the current trends in DS and IoT and they serve the needs of the industry.

D2.2 Reference model of skills, e-competences and qualifications needs of Data Scientists and IoT Engineers

We designed a reference model for Data Scientist and Internet of Things Engineer occupations which outlines the main components of the training environment, in terms of qualifications, skills, certifications, learning outcomes and professional profiles. As main inputs we used the defined learning outcomes for Data Science and Internet of Things from one hand, and the structure of European e-Competence Framework (including the results of CEN Workshop on ICT Skills as European ICT Professional Role Profiles: http://www.ecompetences.eu/cen-ict-skills-workshop/) and ESCO IT occupations (https://ec.europa.eu/esco/portal/occupation) from another.

D2.3: Vocational curricula/educational modules for Data Science and Internet of Things VET program

We designed VET curricula for the Data Science and Internet of Things program. The key characteristics of the curricula are:

- Multi-disciplinarily. The modules developed cover three disciplines: Data Science, Internet of Things and Transversal Skills.
- Modular. For each discipline, the curricula are separated in educational modules. Each module is further divided in learning units at tree levels: Introduction, Core and Advanced. This permits the learners to create their own learning paths according to their needs.
- Learning outcomes oriented. The learning outcomes of each learning unit have been defined based on the macro level learning outcomes design previously done (deliverable D2.1). Learning outcomes-oriented curriculum is an effective way to avoid potential mismatches between academia and industry, and furthermore to promote active learning and inclusive teaching.

D2.4 Training Methodology

We designed the training methodology applied for the delivery of SEnDIng VET program. It provides to trainers and VET providers the guidelines and suggestions regarding training methodology and tools suitable for the delivery of the three phases of SEnDIng VET programs a) on-line training, b) face to face training and c) work-based learning. Furthermore, companies will be consulted on the implementation of work-based learning procedures in order to guarantee the up-skilling of their employees.

D2.5 Training Monitoring and Assessment Methodology and competences

We designed the monitoring and assessment methodology applied during the delivery of SEnDIng VET program aiming to provide the guidelines and suggestions regarding training monitoring and assessment methodologies and tools suitable for the three phases of SEnDIng VET programs: a) on-line training, b) face to face training and c) work-based learning. Through the monitoring and assessment processes all stakeholders involved in SEnDIng training will know if the objectives of the training have been fulfilled and the intended learning outcomes have been achieved.

The objectivity of the review process is ensured by two criteria – (1) the reviewer is not directly involved in the development of significant part of the deliverable (2) the reviewer uses standard quality criteria, documented in advance in the review form in order to check the quality of the deliverable.

For each of the aforementioned deliverables, the relevant stakeholders applied the following review procedures:

- Work Package Leader or Project coordinator appoints reviewers.
- Final draft of the deliverable was reviewed by the appointed reviewers.
- Where necessary, the deliverables authors were asked promptly to modify the document to ensure that it is with the expected high quality.
- The authors of the deliverable addressed the comments and recommendations of the reviewers, if any and submitted the final version of the deliverable.
- The reviewers checked of the final deliverable in and documented their findings in the specially designed review forms.
- The reviewers uploaded the review forms in the Review/Forms folder under the folder in which the respective deliverable was stored.

2.1 Corrective actions

There were not significant deviations from the quality plan that required corrective actions.

2.2 Review criteria

The criteria that were applied for deliverables' review were the following:

- Clarity of the deliverable
- Compliance with defined work plan
- Quality of evidence and analysis
- Uniformity
- Quality of writing and presentation
- Potential impact to the target groups

Detailed information about the review criteria are given at project quality assurance plan. Compliance to the review criteria per each deliverable was checked and documented by at least two appointed reviewers in the corresponding review forms for each deliverable. The review forms were uploaded in the Review/Forms folder under the folder in which the respective deliverable was stored.

3 Documentation Quality Standards

The following documentation standards were followed during the project lifecycle.

- **Text**. All text documents should use Microsoft Word format or OpenOffice format. In the case of a document's review the "Track Changes" option should be activated.

- **Tables**: All tables incorporating calculations should use Microsoft Excel or OpenOffice format.
- **Diagrams or figures**. Complex diagrams or figures should be designed using Microsoft Visio format.
- **Presentations**. All presentations should use Microsoft PowerPoint or OpenOffice format.
- **Images**. In general all images should use the JPEG format. In order also to minimize the size and optimize the quality of project related videos, recent video codec (e.g. DivX) should be used.

All deliverables were written using the template provided in the "Annex – SENDING deliverable template" of project quality assurance plan. Compliance to the documentation quality standards per each deliverable was checked and documented by at least two appointed reviewers in the corresponding review forms for each deliverable.

4 Transparency

The project partners have ensured the transparency on both processes for the development of WP2 deliverables and the relevant work products.

Transparency of the process was ensured for all deliverables in the scope of this report. Each partner responsible for the respective deliverable communicated in advance the process of deliverable development with the lead partner and the partners involved in the respective tasks during the monthly skype meetings and/or during a specific skype meeting initiated by the project leader or a partner. The partners achieved consensus about each deliverable.

All partners assured transparency of the work products and respective deliverables through its continuous sharing with all stakeholders in the structured repository accessible.

5 Continuous Improvement

All partners were involved in a communication aiming to further improve the quality of the deliverables and the respective process, by trying to combine the feedback collected by each partner.

6 Communication Standards

While working on the deliverables in WP2, all partners took into account the accepted communication standards:

- The common way of communication among partners was via e-mail.
- In the case that an email is addressed to all project partners, the mailing list sendig-all@ceid.upatras.gr was used.
- At the topic of each email included the name of the project.
- All the documents and files were stored at the google drive folder.
- All emails should be notified (with cc) to the project manager and technical manager.

7 Monitoring tools

While working on the WP2 deliverables the project partner reported progress permanently to assure the quality of work and deliverables.

The following monitoring tools and mechanisms were utilized:

- **Six-monthly internal reports per partner**
- **Monthly skype meetings**. Monthly skype meetings was organized with the participation of all SEnDIng partners. The main scope of these meetings is to keep all partners informed about project progress and running deliverables, problems occurred and mitigations steps taken.
- **Specific skype meetings**. Specific skype meetings were held on to discuss the status and the process of producing the WP2 deliverables.
- **Face to face meetings**. During the two face to face meetings organized in the reported period the partners paid a special focus on the WP2 deliverables.
- **Timesheets**. The timesheets provided by the partners reported the efforts invested for successful completion of WP2 activities and tasks and production of the corresponding deliverables.

8 WP2 Impact evaluation report

Below is presented the impact evaluation report for WP2 according to the template defined in project impact evaluation methodology.

D2.1 Learning outcomes in terms of knowledge, skills and competences

WP No	No of deliverable/ result(s)	Evaluation tools used	Target groups/ potential beneficiaries	Impact	Quantitative Indicators measured	Qualitative indicators measured	Impact for the sector concerned/ Comments/ Recommendations/ Corrective actions proposed or/and implemented
2	2.1	Surveys and Questionnaires Interviews Observation	Trainees Companies VET providers Higher education institutes Partners of SEnDIng project; Trainers Other stakeholders	- Development of a more aware and flexible mind-set amongst ICT professionals - Development of a learning network within a transnational context - Strengthening the interconnection between higher education institutes, business world and vocational education and training, creating the conditions for an all-around, up-to-date vocational education and training of ICT specialists in targeted occupational profiles; - Better matching between labor workforce supply and demand in the ICT sector and other sectors where Data Science and Internet of Things have broad applications;	1.1a. Number of surveys conducted - 71 1.2a. Number of stakeholders involved in the surveys - 38 1.3a. Number of interviews conducted - 2 1.4a. Number of stakeholders involved in the interviews - 7 1.5a. Number of learning outcomes defined - 38	1.1b. Profile of participants - (industry, size, profile) - Smart cities –10 of 36 (28%) respondents; - Utilities - 10 of 36 (28%) respondents; - Health - 9 of 36 (25%) respondents; - Energy and renewable - 9 of 36 (25%) respondents; - Agriculture - 8 of 36 (22%) respondents; - Transport - 7 of 36 (19%) respondents; - Wearable - 7 of 36 (19%) respondents; - Communication media and entertainment – 8 out of 27 respondents (30%); - Finance and banking - 7 out of 27 respondents (26%); - Manufacturing and natural resources - 5 out of 27 respondents (19%); and; - Retail and wholesale trade 5 out of 27 respondents (19%). 1.3b. Extensiveness of research for the development of the learning outcomes - the respondents added new definitions of learning outcomes	Although the number of respondents is not big (43 entries), the quality of the answers could be considered high. Most of the respondents in the survey (67%) hold a high-level management position (CEO, Deputy CEO, Director, and others) and determine the strategic perspective of the organizations. The remaining respondents hold technical, academic or mid-management roles such as developer, project manager, professor, and team-lead, etc., which could represent the learners in the program. Most of the respondents are from Bulgaria (21), followed by Greece (7) and Cyprus (6). In addition, there were respondents from Finland, India, Italy, Malaysia, Saint Lucia, South Africa, Turkey, UK and the Former Yugoslav Republic of Macedonia. 18 out of 43 respondents represent companies from the software development sector (42%), followed by System Integration (2%).

WP No	No of deliverable/ result(s)	Evaluation tools used	Target groups/ potential beneficiaries	Impact	Quantitative Indicators measured	Qualitative indicators measured	Impact for the sector concerned/ Comments/ Recommendations/ Corrective actions proposed or/and implemented
2	2.2	Observation	Partners of SEnDIng project;	- Development of a more aware and flexible mind-set amongst ICT professionals - Development of a learning network within a transnational context - Strengthening the interconnection between higher education institutes, business world and vocational education and training, creating the conditions for an all-around, up-to-date vocational education and training of ICT specialists in targeted occupational profiles; - Better matching between labor workforce supply and demand in the ICT sector and other sectors where Data Science and Internet of Things have broad applications;	1.5a. Number of learning outcomes defined - 38	1.1b. Profile of participants - industry project partners 1.3b. Extensiveness of research for the development of the learning outcomes - - the reviewers from industry partners added new requirements for the curricula	The domain of Internet of Things encompasses skills and domains, that, at first glance might be considered unrelated, as noted by one of the end-users and partners of the SEnDINg consortium, "the IoT edge computing systems play a key role especially in industrial and enterprise IoT solutions and a curricula that will be created must take this into account".

D2.3: Vocational curricula/educational modules for Data Science and Internet of Things VET program

WP No	No of deliverable/ result(s)	Evaluation tools used	Target groups/ potential beneficiaries	Impact	Quantitative Indicators measured	Qualitative indicators measured	Impact for the sector concerned/ Comments/ Recommendations/ Corrective actions proposed or/and implemented
2	2.3	Observation	Partners of SEnDIng project;	- Development of a more aware and flexible mind-set amongst ICT professionals - Development of a learning network within a transnational context - Strengthening the interconnection between higher education institutes, business world and vocational education and training, creating the conditions for an all-around, up-to-date vocational education and training of ICT specialists in targeted occupational profiles; - Better matching between labor workforce supply and demand in the ICT sector and other sectors where Data Science and Internet of Things have broad applications;	1.6a. Number of curricula produced - 3 1.7a. Number of educational modules produced - 17	1.4b. Correspondence of training modules with learning outcomes 1.5b. Correspondence of online training to industry needs	As the professional roles involved in a Data Science and IoT are many and are characterized by different training needs, we propose a mapping between each professional role and DS training unit.

D2.4 Training Methodology

WP No	No of deliverable/ result(s)	Evaluation tools used	Target groups/ potential beneficiaries	Impact	Quantitative Indicators measured	Qualitative indicators measured	Impact for the sector concerned/ Comments/ Recommendations/ Corrective actions proposed or/and implemented
2	2.4	Observation	Partners of SEnDIng project;	- Development of a more aware and flexible mind-set amongst ICT professionals - Development of a learning network within a transnational context - Strengthening the interconnection between higher education institutes, business world and vocational education and training, creating the conditions for an all-around, up-to-date vocational education and training of ICT specialists in targeted occupational profiles; - Better matching between labor workforce supply and demand in the ICT sector and other sectors where Data Science and Internet of Things have broad applications;	1.6a. Number of curricula produced - 3 1.7a. Number of educational modules produced - 17	1.4b. Correspondence of training modules with learning outcomes 1.5b. Correspondence of online training to industry needs	This deliverable provides recommendations for training methods and techniques, mainly for the work based learning which is the most complex element of the training methodology

D2.5 Training Monitoring and Assessment Methodology and competences

WP No	No of deliverable/ result(s)	Evaluation tools used	Target groups/ potential beneficiaries	Impact	Quantitative Indicators measured	Qualitative indicators measured	Impact for the sector concerned/ Comments/ Recommendations/ Corrective actions proposed or/and implemented
2	2.5	Observation	Partners of SEnDIng project;	- Development of a more aware and flexible mind-set amongst ICT professionals - Development of a learning network within a transnational context - Strengthening the interconnection between higher education institutes, business world and vocational education and training, creating the conditions for an all-around, up-to-date vocational education and training of ICT specialists in targeted occupational profiles; - Better matching between labor workforce supply and demand in the ICT sector and other sectors where Data Science and Internet of Things have broad applications;	1.6a. Number of curricula produced - 3 1.7a. Number of educational modules produced - 17	1.4b. Correspondence of training modules with learning outcomes 1.5b. Correspondence of online training to industry needs	The deliverable provides full guidelines for monitoring and assessment of the 3 components of the SENDING training programs