Training of ICT professionals in soft skills: the case of SEnDIng

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ABSTRACT

IT professionals need to have the technical skills to practice their profession but in order to improve their career prospects in their working environment, they should also cultivate their soft skills to interact effectively with others and manage efficiently projects and teams. This paper highlights the process that was followed for the design and delivery of a VET training program on specific soft skills for IT professionals within the framework of SEnDIng project. It provides details about the different phases of the training cycle that were followed, adopting the ADDIE model, to design and deliver a 20h program that addresses the needs of IT professionals in soft skills specialized in the domains of Internet of Things and Data Science.

CCS CONCEPTS

• **Social and professional topics, Professional topics, Computing education, Adult education**;

KEYWORDS

Soft skills, VET curriculum, training cycle, ADDIE model

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1 INTRODUCTION

In the context of the rapid development of the ICT sector, which follows the rapid economic and social changes, the development of the skills of human resources is essential. A number of studies related to the investigation of the competencies required by employees in the ICT sector propose two main categories of skills named the technical skills which are considered in the first stage of hiring and the soft skills that are evaluated later at the decisive stage [1]. Soft skills have been positively linked to a strong performance level of professionalism. Experts argue that specialists in the ICT sector possess well developed technical skills but they have skill gaps in soft skills [2]. According to a survey conducted by Adecco [23], a Human Resources business organization responsible for job placements, among senior executives,

> "only 22% felt that their subordinates lack technical skills, while double of them (44%) believed that they should need better soft skills".

In another survey conducted by the consulting firm West Monroe Partners [3] among 1,250 HR and line of business executives in the US, 98% of them hired people for IT positions according to their soft skills while 66% of them had rejected IT professionals due to lack of soft skills. In addition, 71% of respondents pinpointed the lack of collaboration skills among IT professionals as the main factor that led to delayed projects' delivery. Furthermore, Burning Glass Technologies [24] recently analyzed over 25 million online job listings and found that one in four of the most sought-after skills among IT listings were soft skills.

Even though there is lack of consensus on how to define soft skills [4], there is a common understanding that soft skills are the interpersonal human and behavioural skills needed by someone to apply technical skills and knowledge in the workplace [5]. Five categories of soft skills constructs have been identified by academics [6] such as communication skills, problem-solving and thinking skills, leadership and team working skills, ethical and moral values, and self-management. The EQAVET working group [4] suggested another typology introducing three interrelated categories of soft skills: a) communication skills, including aspects like oral communication and conversation, b) interpersonal skills, namely the ability to work in teams, relate to people, manage/mediate conflicts, discussions, negotiations and bargaining, and c) problem-solving.

Taking into consideration the aforementioned needs in the frame of the SEnDIng project, a training approach was developed for the development of soft skills for ICT professionals in the domains of Data Science (DS) and Internet of Things (IoT), as complementary to the development of their technical skills. For the design of this training program, the principles of the ADDIE model [7] were followed ensuring the effective and efficient development of a VET curriculum that addresses the real needs of IT professionals on soft skills.

2 THE SENDING METHODOLOGY FOR DEVELOPING VET CURRICULUM ON SOFT SKILLS

According to Branch [7], ADDIE is an Instructional Systems Design (ISD) that

> "is being applied for performance-based learning"

while as a process is characterized as

> "interdependent, synergistic, cybernetic, systematic and systemic".

It consists of five phases such as Analyze, Design, Develop, Implement, Evaluate that provides to VET curriculum designers with clearly defined, useful stages for developing effective educational products [8] whilst promoting and facilitating active, multifunctional, situated and inspirational approaches to learning [7].

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The detailed description of the ADDIE model and its application in the SEnDIng project settings are described in the following paragraphs.

2.1 Analyze

This first step of the procedure provides the basis for the definition of learning outcomes, the organization and formulation of training objectives, the selection of training content, training methods and evaluation in accordance to trainees' needs. The term "Need" describes the gap between current and desired (or required) results or in another way the gap in results between what is and what should be [9–11]. In addition, Training Needs Analysis (TNA) is

> "a process that identifies the learning gaps in compliance with standards or external requirements and that can be resolved wholly or partly by training" [12].

The main purpose of training needs analysis is to perform a systematic exploration of the way things are and the way they should be; it is about the definition of the performance gap. It consists of surveillance, investigation, and data analysis. Within this framework, the SEnDIng TNA enabled: (a) The identification of the specific soft skills that IT professionals should have and (b) The identification of the general content of the training, training methods and material.

In order to provide a comprehensive TNA, the SEnDIng partnership conducted desktop research that focused on specific aspects of the project, which were: (a) To perform a desktop review of existing studies in IoT and DS and to formulate the scope of the training in the respective domains; (b) To perform a desktop review of good practices applied for the definition of learning outcomes in VET education, including the domain of soft skills and to apply them to the process of formulating the Learning outcomes of DS and IoT vocational training.

Furthermore, this research revealed that according to a study commissioned by the European Commission on "Crosscutting business models for IoT" for DG CONNECT [25], that focused on existing and possible IoT cross-cutting business models and their implementation in Europe, the demand for the acquisition of specific soft skills is growing rapidly. Having as a starting point the impact of IoT jobs in Europe, it focused on two major directions, the traditional jobs related to IoT in other industries and the new jobs related to IoT. It was revealed that jobs will rely on specific human skills such as creativity, problem-solving skills, design thinking, systems thinking and communications skills.

2.2 Design

According to Branch [7], the design phase is expected to verify the desirable performance and the testing strategies. The main objective of this step is to identify what it should be accomplished and how the learning outcomes (LO) will be defined. This term actually refers to

> ". . .statements of what an individual should know, understand and/or be able to do at the end of a learning process" (Recommendation of the European Parliament and the Council, 2008, C 111/4) [13].

In the subsequent policies and initiatives for the improvement of the quality of education of the European Commission, the learning outcomes-based approaches are becoming increasingly influential. Learning outcomes are commonly used to: define the levels of qualifications frameworks, set qualification standards, describe programs and courses, orient curricula and define assessment specifications. Learning outcomes are also influencing teaching methods, learning environments and assessment practices. This growing influence of learning outcomes in most European countries, and in (almost) all education and training sectors, reflects a strong political consensus on the perceived usefulness of this approach. [22]

In the case of SEnDIng, the desirable LOs on soft skills for IoT and DS professionals were developed based on the TNA implemented in the Analysis phase and focused on a) their compliance with the pedagogies applied in VET and b) all the relevant stakeholders involved in the process, such as companies that represent the industry's demand for IoT and DS qualified employees, learners, educators and VET providers, policymakers and other stakeholders.

Special focus was given in defining LOs in practical terms, in a sense that they could be easily understood by professionals and instructors. Initially, desktop research on the state of art in DS and IoT was carried out, to extract the most relevant to the project objectives and indicative topics and definitions. The definitions were discussed with specialists in both domains and disseminated among DS and IoT related companies and organizations in Bulgaria, Greece, Cyprus and other countries to receive feedback from potential participants in the pilot training and other stakeholders.

In addition, a validation procedure was established with the industry through comprehensive review in direct meetings with domain leaders and a specially designed survey among more than 40 organizations. The Validation procedure consisted of the following levels:

- Level 1 Verification of the Approach among partners.
- **Level 2 Verification of the first draft of the LOs** by project partners. A dedicated meeting was held as well to discuss the provided comments, notes and suggestions.
- **Level 3 Validation of the LOs and the survey's format** with leading experts in DS and IoT domains aiming to a) assess the potential value (usefulness) for the companies that would employ IoT and DS professionals and b) improve the format and content of the survey's questionnaires[1]. The proposed LOs on soft skills were common for both IoT and DS sectors: communication, adaptability to change, teamwork; ability to present in front of colleagues and clients, goal orientation, thinking outside of the box, and agile mindset.
- **Level 4 Validation of LOs through a survey** where quantitative and qualitative data from more than 40 respondents were obtained and analyzed.

In general, SEnDIng designed and distributed an online survey among companies active in the IoT and DS domains to explore their plans and needs (skills and knowledge) in IoT, Data Science and soft skills within more than 40 companies and organizations all over the world. The received data validated the defined skills and knowledge. The SEnDIng team received 36 responses for DS learning outcomes, where the proposed soft skills, with one exception,

[1] As part of levels 1 to level 3 of this process, 21 improvements were done on the form and/or the content of the learning outcomes and the respective questionnaires for the survey

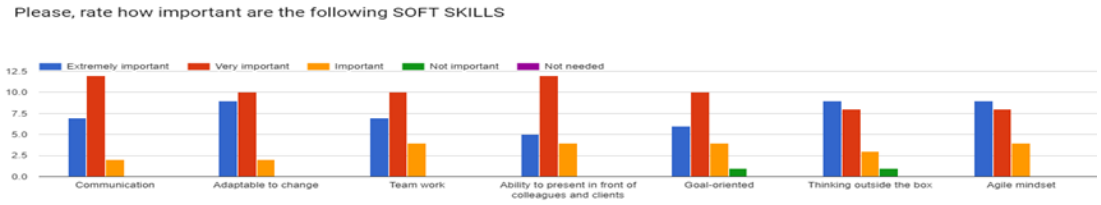

Figure 1: Survey results about the importance of the proposed DS soft skills

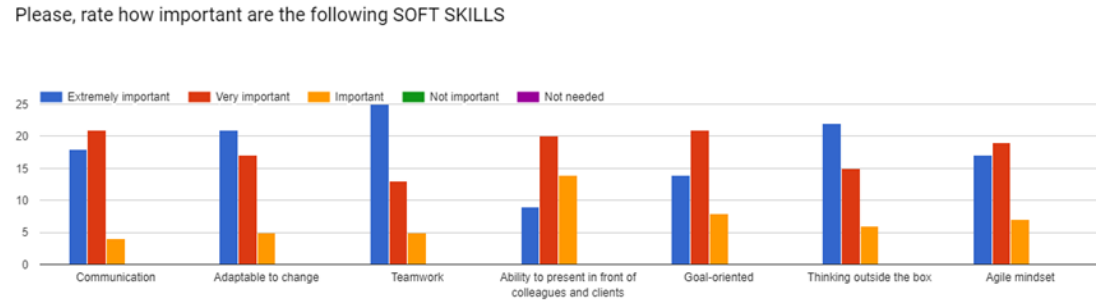

Figure 2: Survey results about the importance of the proposed IoT skills

were also evaluated as extremely important and very important, by 74%-93% of the respondents (Figure 1).
43 responses for IoT learning outcomes were also received, where the proposed soft skills, with one exception, were also evaluated as extremely important and very important by 81%-90% of the respondents. The only exception was the ability to present in front of colleagues and clients, which was evaluated as extremely important or very important by 67% of the respondents (Figure 2).

2.3 Develop

The third phase of the ADDIE model consists of the actual development of the training program. Noteworthy is that the methodology applied for the development of SEnDIng VET curriculum was combined with the constructive alignment approach [14] for the curriculum design to maximize the conditions for quality learning throughout the process, from the forming of learning outcomes to the choice of teaching methods and assessment. It assumes that when learning objectives, assessment methods, and teaching and learning activities are intentionally aligned, the outcomes of learning are improved substantially [14].

The main pillars of the theoretical background for the SEnDIng training methodology, related to the soft skills were: a) the constructivist approach, b) the principles of adult education, c) the principles of soft skills training, d) the principles of e-learning and e) the principles of work-based learning.

As a result, the proposed training methodology is based on both theoretical and empirical approaches that have been proven successful in adult education and training in the field of ICT. Moreover, the development of SEnDIng curriculum includes details about the selected teaching methods, forms of assessment, the definition of actual training goals and learning outcomes, the development of the training material as well as the selection and training of the trainers.

The structure of each training unit includes the following elements:

- **Objectives**. The objectives of the training unit that indicate its general direction or orientation in terms of its content
- **Learning outcomes**. The learning outcomes of the training unit in terms of knowledge, skills and competences
- **Content.** The content of the training unit
- **Learning methodologies.** The learning methodologies applied for the delivery of the training unit. The soft skills modules included face-to-face learning and Work-Based Learning (WBL)
- **Assessment of methodologies.** The methodologies applied for the assessment of the learning outcomes
- **Duration.** The duration of the five training units, namely, Effective communication and presentation (TS-EM1), Change management (TS-EM2), Team working (TS-EM3), Goal setting (TS-EM4) and Creative thinking (TS-EM5)

2.4 Implement

The implementation phase consists of the actual delivery of the training program. Initially, the soft skills curriculum had been planned to be implemented face-to-face in classrooms in the three partner countries (Greece, Bulgaria and Cyprus). However, due to the coronavirus pandemic, the delivery of the soft skills training had to be redesigned in terms of:

- **Method of delivery** - the training program was revised to be conducted via online instruction-led (synchronous) conferences via zoom
- **Modification of self-assessment and further activities** of the initial training material that couldn't be applied via online training
- **Time of the interventions** - the deadline of the training completion had to be extended due to social distancing, safety measures and eventually lockdowns that all partner countries were faced with
- **The number of participants** - initially the participants were supposed to attain classes of 25 persons, but in the online delivery, there was a decrease in the number of attendants so as the groups of learners to be more manageable
- **Number of courses** - more courses have been delivered that were depended on the participants' availability (three different courses delivered according to schedule in the mornings, in the evenings and on weekends)

The components that remained the same were:

- **Training material** - it was adjusted to the online environment with minimum changes
- **Training methods and techniques** - the training methods of soft skills were initially selected in such a way so as: to promote experiential, collaborative, active, transformational and self-directed learning; to cater for different learning styles when used in combination; to be differentiated according to the type of learning activity (i.e. exploitation activities, presentation of information and application in practice). The recommended techniques for the training in soft skills were indicative and the lecturer had the opportunity to use some of them according to the participants' learning styles based on their unique characteristics and their ability to be used online. The most frequently used techniques by the trainers were: brainstorming, case studies, questions, reflections, group discussions, lectures, action plan, group activities, memory activation, working in teams and self-assessment.

2.5 Evaluate

The final phase of the training cycle model is the evaluation which is considered to be the systematic process of delineating, obtaining, reporting, and applying descriptive and judgmental information about some object's merit, worth, significance and/or equity [15]. On the other hand, evaluation is the process of objectively understanding the state or condition of a thing by observation and measurement. In the case of training, evaluation means taking a measure of its effectiveness [16], focusing on learning, teaching and outcomes and providing information for improving the learning and teaching process.

Within the framework of SEnDIng, a holistic evaluation procedure has been followed based on formative and summative assessment, as well as on self-assessment. Formative assessment refers to an evaluation that aims at improving the internal function of the training program and its expected results [17]. The process is conducted during the development and the implementation of a program, or intervention and its main purpose is its continuous improvement [15, 18–20]. The term summative is about an assessment undertaken to get a summary judgment on certain critical aspects of a program's performance; for instance to determine if specific goals and objectives are met [21].

> "Self-assessment is relatively autonomous and deliberate engagement in reviewing and critiquing one's work in an appraisal of progress made over some time" [26]

and is essential since learners can achieve their learning goals if they understand it and can assess what they can do to reach it.

Within SEnDIng, the three different types of assessment are designed to be conducted for the evaluation of the fulfilment of the learning outcomes as follows:

- Formative and self-assessment take place throughout the phase of soft skills training, while summative assessment takes place at the end of it. The assessment tools had been selected based on their compatibility with the principles of constructivism and adult learning and they included case studies, presentations, peer- evaluation, checklists and portfolio.
- Summative assessment will be carried out in two ways. First, the results of the ongoing (formative) assessment are collected in the personal files of each learner, so that the individual learner profile is constructed. Second, after the completion of each of the training phases (online training on DS and IoT, soft skills training, work-based learning) of the courses the learners will be asked to demonstrate how they will be able to combine and integrate multiple aspects of training in complex situations and also to pass a final test leading to certification.
- The combination of cumulative assessment and final tasks compiles the final assessment of each learner.

Moreover, in SEnDIng, evaluation and monitoring of other aspects of training are also applied following a combination of objective and subjective approaches. Data from the implementation of training are collected and analyzed as well as qualitative data are collected using relevant questionnaires. As a process, it is ongoing and also uses findings from formative assessment and self-evaluation of the accomplishment of the learning outcomes. It also employs the measurement of other aspects of training, setting several indicators such as the rate of successful completion of the training, the attendance rate in training, the rate of trainees that abandon training.

Additional tools used for the monitoring of the soft skills training process are observations, checklists, analysis of attendance and complementary data, questionnaires. In general, more than 100 IT professionals from the three partner countries participated in the training with the dropout rate being especially high due to the COVID-19 pandemic. Therefore, it is anticipated that at the end of the WBL a complimentary training session will take place, for those who didn't manage to participate and complete the training. Noteworthy is that the last part of SEnDIng training is still in progress (WBL), therefore, the assessment process has not yet completed having results.

3 CONCLUSION

This paper presents the development and delivery of Soft Skills Training to ICT professionals by adopting the training cycle ADDIE model. The advantages of following this model are a) the well-designed and clear structure that enhances the training program development, b) the ability to be applied in multiple forms of learning types (online, face-to-face, work-based learning, blended), c) the possibility for continuous assessment of the training programs components (objectives, results) that facilitates further improvements, d) the comprehensive design that fosters learners motivation and engagement. The SEnDIng training program is expected to end on 31st October. At this point, we will have the opportunity to examine the final findings and results, to have more input from the implementation and evaluation phase and evaluate whether the model is working effectively.

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REFERENCES

[1] Janusz Stal & Grazyna Paliwoda-Pękosz. 2018. Fostering development of soft skills in ICT curricula: a case of a transition economy. Information Technology for Development, DOI: 10.1080/02681102.2018.1454879

[2] Szekely Szilárda, Adriana Benedek, Lucian- Ionel Cioca. 2018. Soft Skills Development Needs and Methods in Micro-Companies of ICT Sector. Procedia - Social and Behavioral Sciences 238 (2018) 94 – 103

[3] Minda Zetlin. 2019. IT's soft skills shortage — and how to train up for success. Available at: https://www.cio.com/article/3410049/its-soft-skills-shortage-and-how-to-train-up-for-success.html

[4] EQAVET 2015. Supporting adult learning, continuing VET and soft skills development by using quality assurance descriptors and indicators. Working Group. Available at: https://ec.europa.eu/epale/sites/epale/files/al_-cvet_results_june_2015.pdf

[5] Melvin Weber, Dori Finley, Alleah Crawford & David Jr. Rivera. 2009. An exploratory study identifying soft skill competencies in entry-level managers. Tourism and Hospitality Research, 9(4):353-361

[6] Rouxelle De Villiers. 2010. The incorporation of soft skills into accounting curricula: preparing accounting graduates for their unpredictable futures. Meditari Accountancy Research 18(2):1-22

[7] Robert Maribe Branch. 2009. Instructional Design: The ADDIE Approach. New York: Springer

[8] Christina Peterson. 2003. Bringing ADDIE to Life: Instructional Design at Its Best. Jl. of Educational Multimedia and Hypermedia (2003) 12(3), 227-241

[9] Roger Kaufman. 1994. "A needs assessment audit". Performance & Instruction. Vol. 33 No. 2, pp. 14-16

[10] Swedish Civil Contingencies Agency (MSB). 2012. Training Material Development Guide. DanagårdLiTHO. Available at: https://www.msb.se/siteassets/dokument/publikationer/english-publications/training-material-development-guide.pdf

[11] Muhammad Zahid Iqbal & Rashid Ahmad Khan. 2011. The growing concept and uses of training need assessment. A review of proposed model. Journal of European Industrial Training. Vol. 35 No. 5, pp. 439-466

[12] Irwin Goldstein. 1993.Training in organizations: Needs assessment, development, and evaluation. 3rd ed. California, US:Thomson Brooks/Cole Publishing Co. In: Nelly Bencheva, Teodora Stoeva, Stela Todorova. 2018. International Journal of Organizational Leadership 7(2018) 413-425, pg.417

[13] Recommendation of the European Parliament andof the Council of 23 April 2008 on the establishment of the European Qualifications Framework for lifelong learning, pg.C 111/4

[14] Phyllis Blumberg. 2009. Maximizing learning through course alignment and experience with different types of knowledge. Innovative Higher Education 34:93-103

[15] Daniel Stufflbeam, Anthony Shinkfield. 2007. Evaluation Theory, Models & Applications. San Francisco: Jossey- Bass Publishers, pg.698

[16] Academia Edu (nd). Difference between "Assessment" and "Evaluation". Available at: https://www.academia.edu/28852459/DIFFERENCE_BETWEEN_ASSESSMENT_AND_EVALUATION_

[17] Raymond Noe. 1999. Employee Training and Development. Boston: Irwin/ McGraw- Hill

[18] Deniz Eseryel. 2002. Approaches to evaluation of Training: theory and practice. Educational Technology and Society, Vol.5, No.2, pp.93-98

[19] George Madaus, Daniel Stufflebeam,Thomas Kellaghan. 2000. Evaluation models: viewpoints on educational and human services evaluation, 2nd edition. Boston/ Dordrecht/ London: Kluwer Academic Publishers

[20] Ingrid Guerra- Lopez. 2008. Performance Evaluation. Proven Approaches for Improving Program and Organizational Performance. Jossey- Bass

[21] Peter Rossi, Mark Lipsey, Howard Freeman. 2004. Evaluation: A Systematic Approach. Thousand Oaks: SAGE

[22] CEDEFOP 2017. Defining, writing and applying learning outcomes, Luxembourg: Publications Office of the European Union, pg.14

[23] Georgetown University, School of Continuing Studies. 2020. The Growing Importance of Soft Skills in IT. Retrieved October 2 from https://scsonline.georgetown.edu/programs/masters-technology-management/resources/growing-importance-of-it-soft-skills

[24] Burning Glass Technologies. 2015. The Human Factor: The hard time have employers finding soft skills. Burning Glass. Available at: https://www.burning-glass.com/wp-content/uploads/Human_Factor_Baseline_Skills_FINAL.pdf

[25] PricewaterhouseCoopers EU Services EEIG 2017. Cross- Cutting Business Models for IoT. Final Report. Final Report No. DI/07171 – Lot 2, SC367. European Commission, Directorate-General of Communications Networks, Content & Technology

[26] Harm Tillema. 2010 Formative Assessment in Teacher Education and Teacher Professional Development. In: International Encyclopedia of Education (Third Edition), Elsevier pp.563-571