Fostering the digital transformation of European SMEs and Public Administrations: the IN-CLOUD project

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Abstract
The IN-CLOUD project, funded in the framework of the Erasmus+ Programme – Strategic Partnership, aims to raise awareness regarding how cloud computing can boost economical growth and innovation and to qualify professionals able to introduce the Cloud technologies in SMEs and public administrations. The project aims to deliver and award VET qualification, designed according to the EQVET model. This paper describes the main activities carried out by the IN-CLOUD partnership to implement the project activities, realize the planned outcomes and pursue the project objectives.

Keywords: Cloud computing, Digital transformation, Smart education, Open educational resources, Vocational training

1. Introduction

Cloud computing is now defining the future in ICT, facilitating new corporate and entrepreneurship models at all levels. It is a breakthrough paradigm that, applied to companies, public administrations and Universities, can enhance their innovation, cost-effectiveness and competitiveness.

Several studies underline the way European SMEs' growth and empowering entrepreneurship can be boosted by means of Cloud Computing technologies. Still, market trends shows that European SMEs are not making the best of the cost-effective solutions cloud computing has to offer. Virtualization and sharing of resources can drastically reduce the investments in hardware and software, especially for smaller companies. This would facilitate their access to the markets and their resilience to financial crisis.

SMEs are a pillar of the European Union economy: in 2013 about 21.6 million SMEs employed 88.8 million people and generated 3.666 trillion in values added. The European Commission has recognized the Cloud technologies as a booster of the SMEs competitiveness and the consequent impact that such a technology can have for the development of the European Union, both in terms of economic growth and employment opportunities. Therefore, in 2012 it adopted the strategy "Unleashing the Potential of Cloud Computing in Europe", commonly known as European Cloud Computing Strategy, in order to speed up and increase the use of cloud computing across all economic sectors. This strategy is the result of an analysis of the overall policy, regulatory and technology landscapes and of a wide consultation with stakeholders, to identify ways to maximise the potential offered by the cloud.

The European Cloud Computing Strategy includes three key actions, the most effective being the creation of an "European Cloud Partnership" providing strategic options to turn cloud computing into an engine for sustainable economic growth, innovation and cost-efficient public and private services. The European Cloud Computing Strategy final objectives are a net gain of 2.5 million new European jobs, and an annual boost of €160 billion to the European Union GDP (around 1%), by 2020.

The IN-CLOUD project, funded by the European Commission in the framework of the Erasmus+ Strategic Partnership program, intends to pursue the objectives of the European Cloud Computing Strategy. The project general objective is to foster a partnership between Higher Education and the corporate sector, in order to qualify new professionals capable to boost the competitiveness and growth of European Companies and Universities, thanks to the advantages offered by the cloud computing technology.

This objective is reached by pursuing the specific objectives of:

- raising awareness among European Companies, Public Administrations and Universities regarding how cloud computing can boost economical growth and innovation
- creating VET qualifications for professionals inside European Companies and Public Administrations, training them to introduce and manage cloud computing technologies and services inside their systems.

The IN-CLOUD partnership involves 8 partners coming from 6 different countries (Germany, Greece, Italy, Portugal, Spain and United Kingdom). The partners are 3 Universities, 1 SME, 1 Local Development Agency, 1 Technological Park, 1 Business Advisory/Incubator and 1 expert of VET qualifications. The partnership ensures a very good geographical coverage and puts together complementary competences.

The project aims to directly impact on the European companies and public administrations, in terms of staff members trained and qualified to use cloud computing technologies and services, of the European

Universities, in terms of enhancement of the didactic offer on cloud computing, in order to better meet the requests of the labour market, of the students and professionals, in terms of better employability chances. The IN-CLOUD qualifications, designed using the ECVET instrument, will allow the transnational recognition of the acquired competences and will enhance the employability of the qualified users at European level.
The project long terms benefit will be to speed up and increase the use of cloud computing across all economic sectors, according to the European Cloud Computing Strategy, and to foster a close partnership between Universities and companies on cloud computing.

Actually, the first year of the project has been concluded. This paper aims to show the concluded activities, the ongoing ones and the expected results.

2. Main project outcomes

According to the model of the Erasmus+ Strategic Partnership program, the project is organized in Intellectual Outputs, which are tangible project outcomes. Five of such outputs are expected, plus a supporting one.

2.1 Intellectual Output 1 - Training needs and professional skills analysis

This aim is to realize an analysis of the training needs of the labour market and of the state of art of Cloud Computing technologies. The activity has been realized by submitting an online survey, by interviewing experts in the fields and by analysing studies in the sector. The survey has been realized in the different partners' languages in order to encourage the target groups to reply.
More than 700 replies to the survey have been collected in the partnership countries. These data have been the basis to elaborate, together which additional information obtained from other studies, the analysis of the labour market needs. From the survey, a general interest towards the Cloud technologies clearly emergent in all the countries, even though with local differences regarding the applications. The lack of competences seems to be the main cause that has prevented a wider diffusion of the Cloud in the SMEs.

Table 1 – Relevant replies to the online survey realized for the Intellectual Output 1

Q5: Why don't you use cloud computing services in your business/organization?						
	Italy	Spain	Germany	UK	Greece	Portugal
I'm not familiar with cloud computing services	33%	7%	43%	0%	0%	14%
I'm not aware of cloud computing benefits	15%	0%	29%	33%	50%	29%
Cloud computing services bring no benefits for my business/organisation	10%	7%	14%	0%	50%	43%
Migration to cloud computing services is too complex	5%	27%	0%	0%	50%	14%
Financial reasons	10%	20%	57%	0%	25%	29%
Security concerns	23%	33%	57%	0%	50%	14%
Doesn't apply to me	28%	40%	0%	67%	0%	29%

Q7: What benefits does the cloud offer to your business/organization?						
	Italy	Spain	Germany	UK	Greece	Portugal
Cost efficiency	58%	61%	81%	71%	11%	75%
Scalability & flexibility	47%	65%	67%	36%	67%	75%

Sustainability	27%	22%	10%	21%	22%	25%
Maintenance by cloud provider	31%	48%	48%	29%	33%	67%
Security	33%	17%	24%	29%	56%	42%
Improved service delivery	55%	43%	90%	21%	11%	42%

The research has led to the production of a deliverable that summarizes all the results of the study, identifying the main skills lacking in the labour market and grouping them in terms of didactic units. The main identified areas which would requires training activities are:

- Business and financial skills
- Technical skills
- Project management skills
- Contract and vendor negotiation
- Security and compliance
- Data integration and analysis skills
- Mobile app development and management

Then, an analysis of the Cloud services and technologies has been carried out in the partnership countries. This research has led to the release of a deliverable representing a catalogue with more than 60 projects and Cloud providers in the partnership countries. The document intends to support professionals looking for Cloud solutions, for companies and public administrations in need of Cloud services to be integrated in their systems and anybody who wants to have a first idea of the Cloud. As a plus, the partnership has decided to make the catalogue available in all the partnership languages, in order to facilitate its adoption. The deployment of the translated versions is ongoing.

2.2 Intellectual Output 2 - IN-CLOUD Qualifications

This activity intends to design specific VET qualifications on Cloud services and technologies, to design the validation methodologies, the accumulation and transfer instruments and finally to validate them.

The design of the VET qualification has been realized taking into account the analysis of the surveys carried out at European level by the partnership in the Intellectual Output 1, the existing Cloud services and technologies available at European level, current national and international studies and finally the target groups identified in the project proposal (SMEs ICT technicians, public administration managers, instructors, professionals, etc).

As results of these studies, the partnership has identified three main target sectors:

- the business sector, being the main target of the project. Due to the high number of professionals potentially interested to the qualifications, it is reasonable to propose several qualifications with different degrees of complexities and different levels of deepening of the Cloud concepts;
- the public administration sector, due to the high impact that the Cloud services and technologies can have both in the management of the public administrations and as benefits for the citizenship, and due to the widespread need for employees of public administrations to acquire digital skills;
- the education sector, due to the potentiality of the Cloud to enhance the common teaching and learning methodologies and the need for teachers at all levels to improve their digital skills.

For this reason, four valuable qualifications have been identified:

- Certified Cloud Professional for Business: it is a basic qualification for all the operators in the

business sector. It provides the basics of Cloud computing and an entry-level knowledge of the main applications for business. The certified professional, even without advanced ICT competences and skills, is able to use the most common Cloud technologies and services, enabling the persons to evaluate their utility for the company and their cost-effectiveness.

- Certified Cloud Professional for Public Administrations: it is a basic qualification for all the operators in the public administration. It provides the basics of Cloud computing and an outline of the main Cloud applications for the public administration and the citizens. The certified operator is able to adopt (or suggest the adoption) of Cloud services and technologies both for the internal management of the public administration and for the services to the citizenship, evaluating their utility and their cost-effectiveness.
- Certified Cloud Professional for Education: it is a basic qualification for teachers and instructors operating in schools, Universities and training centres. It provides the basics of Cloud computing and an outline of the main Cloud applications for teaching and learning. The certified operator is able to adopt Cloud services and technologies for managing, creating and delivering didactic contents and to organize new Cloud-based didactic activities, evaluating the utility and the cost-effectiveness of the solutions.
- Certified Cloud Technology Professional: it is an advanced qualification for all the operators in the business sector. It provides advanced concepts of Cloud security, Cloud infrastructures and architectures, Cloud virtualization, Cloud storage services. The certified professional is able to introduce and manage advanced Cloud technologies and services, is able to evaluate their utility for the company and their cost-effectiveness.

Fig. 1. IN-CLOUD qualifications

During the project, then the partnership has started to work on the methods for validation of Learning Outcomes and on the accumulation and transfer instruments. Regarding the validation methods, the possibility for each partner to validate and/or officially recognize the learning outcomes has been investigated. This analysis will lead to the definition of the validation methodology. At the same time, an analysis of the different national credit system for VET in the partner countries has been carried out, to check the partial or full compliance with the ECVET system. This will lead to the definition of the accumulation and transfer instruments.

Finally, when all these instruments will be ready, they will be validated and eventually tuned during the delivery of the training courses.

2.3 Intellectual Output 3 - Interviews and showcases

The activity intends to produce a collection of interviews and showcases, in the different partnership countries and languages, to create a set of concrete examples of application of the Cloud technologies. This will be a real support to the training course and an instrument to facilitate the diffusion of the Cloud technologies.

Concise and effective video Interviews (max lenght 15 min each) have be carried out at distance by all the partners and recorded in terms of videos which will be available on the project website www.learn-in-cloud.eu. People to be interviewed will be selected by the partners at national and international level in Europe and the U.S.A. Experts in cloud computing, ICT specialists, managers of ICT infrastructures, researchers, managers of companies and public administrations, experts in technological innovation, creators of ICT start-ups have been selected among the potential people to be interviewed.

Showcases will be used to present practical examples of introduction of cloud computing technology into companies and public administrations in order to enhance their services and efficiency.

At the beginning of the activities, methodologies to collect interviews and showcases have been agreed among the partnership and templates have been provided. Then, a scheduling of the activities has been agreed in order to collect the required contents respecting the project time plan.

In order to increase the visibility of the video interviews, apart from the project website, the partnership has agreed to deploy the collected materials also in a dedicated project Youtube channel. Legal aspects related to copyright and reservation of data has been taken into account: a liability exception for the free publication of the information has been prepared and all the authors of the contents are asked to sign it.

The collection of the interviews and showcases is ongoing. So far, 27 interviews and 15 showcases have been already collected and are in the postproduction phase. Others will be collected in the next two months; each partner has a schedule of the expected activities.

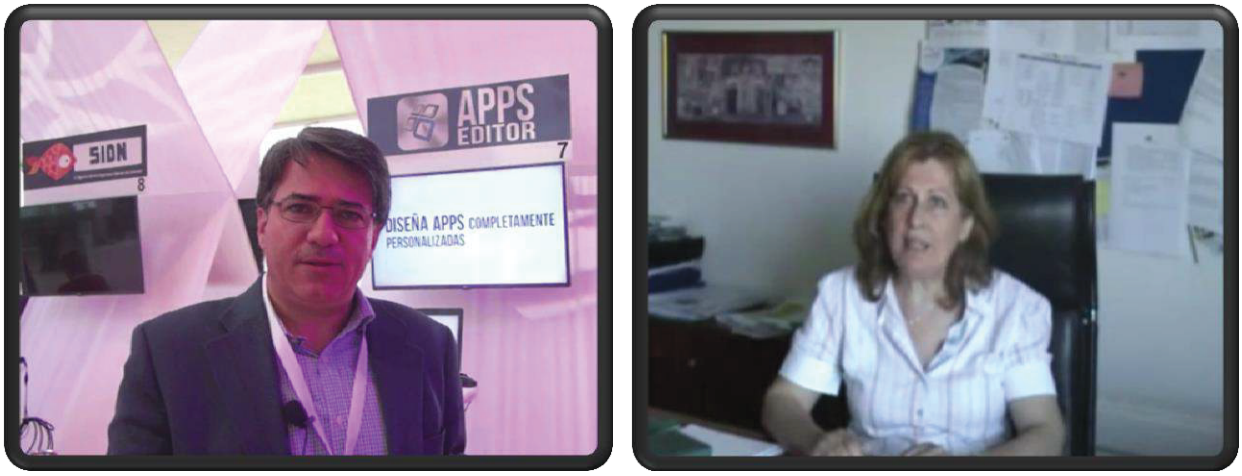

Fig. 2. Interviews to Alberto Ruiz (Apps Editor, Spain) and Fotini-NioviPavlidou (Aristotle University of Thessaloniki,Greece)

2.4 Intellectual Output 4 - Training courses

The activity intends to produce the didactic modules related to the previously identified VET qualifications (IO2). On the basis of contents and of the expected learning outcomes of the qualifications, a total of 14 didactic modules have been identified. They are:

1. Introduction to cloud computing
2. Security basics
3. Cloud models
4. Cloud business services and applications
5. Legal and technical aspects of cloud computing for business
6. Cloud services and applications for education and training (ET)
7. Legal and technical aspects of cloud computing for education and training
8. Cloud services and applications for public administrations and for citizens/community
9. Legal and technical aspects of cloud computing for public administration and for citizens/community
10. Cloud security
11. Cloud models and providers
12. Cloud architecture
13. Cloud virtualization
14. Cloud service and application development and implementation

The learning contents of these modules have to be produced in the partnership languages and delivered at distance. Therefore, the Uninettuno e-learning web platform has been introduced to the partners and general rules for the production of distance learning contents have been provided. Then, an internal scheduling of the production process has been agreed among the partners, sharing the interim results and periodically discussing about the production process in terms of timing, scheduling and products. Each partner will self-produce a certain number of the didactic units. The produced didactic units will consist of video-lessons (variable length according to the course topic), digitalized and hyperlinked to texts, exercises and web-links.

A proper mix of the didactic units and other additional materials (interviews and showcases, other existing OERs) will contribute to the creation of the courses. They will be available as open-online courses.

Once the video lectures and the additional materials will be ready, the delivery process will start on the project e-learning platform, that has been implemented in the project website. In order to perform the activity successfully, delivery procedures will be defined at first including: enrolment procedures, deployment periods, activities during the delivery periods, students' monitoring procedures, technical and administrative issues. Since the courses will be available as OERs, no charges will be asked to the students. At the end of each delivery period, the students who will have completed all the planned didactic activities will be assessed, thanks to the tracking system already implemented in the web-platform, and eventually awarded of the corresponding IN-CLOUD qualifications. At the end of each delivery period, statistics of the didactic activities will be globally analysed. All the partners will have a virtual meeting in order to discuss about delivery period results, in order to point out success aspects and to propose solutions for the identified weaknesses. The impact of the students awarded with the qualification in the labour market will be monitored too, by means of interactions with the stakeholders.

Samples of video-lessons will be also broadcasted on the satellite channel UninettunoUniversity.tv, managed by UNINETTUNO, covering all Europe and neighbouring countries, in order to reach a wider audience.

2.5 Intellectual Output 5 - Virtual bootcamp

The activity intends to implement an online tool to enable a smart and flexible education on the Cloud technologies for everybody. The online tool is able to assess the user's skills, interests, competences, free time and other parameters, finally suggesting him the most appropriate learning path to acquire the wished skills and competences in an efficient way. This solution can prevent the users to look for disordered and unqualified learning resources on the web, but at the same time offers customized learning path taking into account their specific profiles .Following the proposed didactic activities, the user will acquire the required competences in order to introduce the necessary cloud computing solutions in his facilities.

The virtual bootcamp is therefore complementary to the previous outputs and acts as an adaptive learning environment.

Two activities are scheduled, the design of the virtual bootcamp and the next deployment and delivery. The first activity is ongoing and should be concluded in November. It includes both the design and development of the software and the design of the assessment tools. The implementation of the online tool is almost concluded and it is in the testing phase, while the assessment and evaluation tools are almost defined. The delivery activity will start consequently.

The web application will include also an evaluation questionnaire, useful to assess and continuously improve the bootcamp.

2.6 Intellectual Output 6 - Dissemination materials

The activity intends to create the infrastructure for the delivery and the dissemination of the project. It includes the realization of both the project website and the dissemination material.

The project website is not just the place where the outcomes are deployed, but includes a full e-learning platform and the online tool implementing the virtual bootcamp. Its deployment starts at the beginning of the project in a draft form and is improved during the project duration.

The dissemination material includes all the outputs (leaflets, brochures, research papers, newsletters, etc.) realized by the partnership in order to reach the widest impact.

Fig. 3. The IN-CLOUD project website

A key aspect in the dissemination will be the national stakeholders' meetings, planned in all the partnership countries just before the beginning of the delivery period, in order to give awareness of the produced outcomes, of the IN-CLOUD qualification and to attract students for the courses.

3. Relation with other existing qualifications

Cloud Computing is becoming quite a popular technology. Several mayor U.S companies (Microsoft, Amazon, VMware, CISCO, etc) offer some training courses on Cloud Computing, leading to the acquisition of corporate certifications. They don't foresee any credit transfer system and their recognition is just connected to the popularity of the awarding company.

In contrast, the IN-CLOUD project has designed some qualifications designed according to the EQVET, including a system for the accumulation and transfer of learning outcomes and the recognition of the qualifications at European level.

The learner may be struggled choosing between the notoriety of the U.S corporate certifications and the transferability of the IN-CLOUD qualifications. To solve this question, the partnership is trying to sign agreements with the main U.S corporations providing courses on Cloud Computing. A concrete contact already exists with some of them and should lead soon to an agreement. This would allow the IN-CLOUD students to freely access the corporate learning resources, in addition to the ones provided by the project. Therefore, the student would be able to get at the same time the IN-CLOUD qualification and expertise on the corporate Cloud technologies. This would finally enhance the visibility of the project and the adoption of the IN-CLOUD qualifications.

4. Conclusions

The competitiveness and the cost-effectiveness of small and medium enterprises are key aspects to survive, especially in the first years of their life. Sustaining their growth is essential for the European economy and this can be pursued also by improving their digital competences. Cloud Computing is a young technology with a broad range of applications and an immediate usability. This technology can foster the digital transformation of the European SMEs, enhance their competitiveness and create new job places. The IN-CLOUD project is in line with the initiatives put in place by the European Union in order to encourage the largest diffusion of this technology.

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