

COMPUTING INNOVATION FOR TECHNOLOGY ENTREPRENEURSHIP

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Abstract

Entrepreneurship is recognized nowadays as the driving force of a market economy, while technology-driven entrepreneurship tends to become a standard for early-stage businesses in Europe and worldwide. Information and Communications Technology (ICT) holds a major part of any business nowadays and it is either the primary factor or a major one in any technology driven business enterprise.

We describe in this paper the project “Computing Innovation for Technology Entrepreneurship” developed by University POLITEHNICA of Bucharest (UPB) from Romania and Østfold University College (ØUC) from Norway. The project addresses the development in Romania of education for Information and Communications Technology Entrepreneurship (ICTE), aiming to increase the development of new businesses, based on innovation and new technologies. The Faculty of Engineering in Foreign Languages (FILS) is the faculty from UPB which prepares bilingual and multilingual specialists in engineering with a wide area of expertise, capable of filling the needs of Romanian companies with partnerships from abroad and foreign enterprises established in Romania. Østfold University College, created in 1994, is a modern higher education institution in Norway and will act as the Donor State Partner in this project. Faculty of Computer Sciences in ØUC offers bachelor and master courses in the area of Computer Science (CS), including the master of applied computer science, considered one of the top three master programs in computer science in Norway.

The project will introduce two new subjects – “Information and Communications Technology Entrepreneurship” for the Engineering and Management master students and “Information and Communications Technology based Innovation” for the Computer and Information Technology master students. The lectures will be developed by a large number of Romanian academic staff, the authors of this paper. Each one is acting in his area of expertise, ensuring the multidisciplinary approach of this complex undertaking. This will be attended by lectures delivered by the Norway partners, common research efforts with implication of the students, mobilities for the students and professors and access to the knowhow and experience of the ØUC partners.

The impact envisaged in this project addresses foremost a change of habits in the Romanian learning system. Professors should prepare the students for the professions required by the market since a good training represents a welcome advantage for the graduate in launching a business or on the labor market. The key of success for this project consists in the existence at FILS of Master Programs in the Computer and Information Technology and in the Engineering and Management fields, the existence of a successful subject of Technology Entrepreneurship and the existence of an Entrepreneurship Hub at FILS.

The existing good results of the graduates as entrepreneurs in IT and communications will be enriched by the excellence in CS research of the ØUC partners, by the dedicated know-how of the Romanian professors and by the relations to be developed within the project.

Keywords: Computing Innovation, Technology Entrepreneurship.

1 INTRODUCTION

1.1 Innovation and Technology Entrepreneurship

Entrepreneurship is recognized nowadays as the driving force of a market economy and technology-driven entrepreneurship tends to become a standard for early-stage businesses in Europe and worldwide. Entrepreneurship and innovation are considered an essential basis for competitive advantage in a rapidly changing international business environment, enhancing capabilities for sustainable business growth and economic activity [1].

We will describe in this paper the project “Computing Innovation for Technology Entrepreneurship” - CITE, developed by University POLITEHNICA of Bucharest (UPB) from Romania and Østfold University College (ØUC) from Norway. The project addresses the development in Romania of education for Information and Communications Technology Entrepreneurship (ICTE), aiming to increase the development of new businesses, based on innovation and new technologies.

1.2 The circumstances in Romania

In Romania, there is interest for entrepreneurship and innovation at both central and local level. For the entrepreneurship, the results are still frail and there is need for concentrated actions to alleviate the results. On the Global Entrepreneurship Index (GEI) developed by the Global Entrepreneurship and Development Institute (GEDI Institute), Romania raised from position 50 out of 118 countries (the last from the EU) in 2011 to position 46 out of 137 countries in 2018, surpassing Greece and Hungary [5].

Some of the weaknesses for the entrepreneurial ecosystem are the low volume of new firm creation, the low survival rate beyond the five-year period and the lag of Romanian SMEs behind the European average in terms of innovation [9] apud [6]. The limitation in innovation is substantiated by the European Innovation Scoreboard, which shows that the European performance in innovation increased and it is for the second consecutive year ahead of USA, but Romania took the last place among the 27 member states, with limited progress concerning the innovation [10].

On the Digital Platform Economy Index (DPE Index), a country level composite indicator of the global digital ecosystem, Romania is placed on the last position in EU [11], which shows the need to increase the efforts for innovation on the digital side and to use it for business creation and enrichment.

1.3 The local situation

University POLITEHNICA of Bucharest is the oldest and most prestigious technical university in Romania. With around 30000 BSc. and MSc. full time students plus 1000 PhD students from 15 engineering faculties, it is also the largest technical university in Romania.

The Faculty of Engineering in Foreign Languages (FEFL) is the faculty from UPB where teaching is given fully in one of the main languages: English, French or German. FILS prepares bilingual and multilingual specialists in engineering with a wide area of expertise, capable of filling the needs of Romanian companies with partnerships from abroad and foreign enterprises established in Romania. The faculty has undergraduate programs that covers engineering domains like computer science, electronics, mechanics and chemistry and master programs aiming at interdisciplinary studies, with accent on information technology and management.

The project CITE targets several master programs from FILS from the Engineering and Management and from the Computer Science domains:

- Business Administration and Engineering (BAE) - Engineering and Management domain, English language.
- Software Engineering (SE) - Computer Science domain, English language.
- Management, innovation et technologies des systèmes collaboratifs/ Management, Innovation and Technologies of Cooperative Systems (MITSC) - Computer Science domain, French language.
- Geschäfts- und Industrieverwaltung/ Business Administration and Engineering (GIVE) - Engineering and Management domain, German language.
- Nachhaltige Geschäfts Exzellenz und Leadership in der Industrie/ Sustainable Business Excellence and Leadership in Industry (NGELI) - Engineering and Management domain, German language.

Østfold University College, created in 1994, is a modern higher education institution in Norway and will act as the Donor State Partner in this project. Faculty of Computer Sciences in ØUC offers bachelor and master courses in the area of Computer Science (CS), including the master of applied computer science, considered one of the top three master programs in computer science in Norway.

The main objective of the project is to develop materials for the Information Technology Entrepreneurship discipline in two versions – for master programs in Management and Engineering, as well as for master programs in Computer Science. It will be an extension of the existing discipline of “Technology Entrepreneurship” started at MBAE in 2006 by Prof. Mark Harris and a transfer of knowledge for the Innovation subject from ØUC to FILS.

2 PROJECT DESCRIPTION

The project is financed through The Education, Scholarships, Apprenticeships and Youth Entrepreneurship Programme (ESAYEP), 2014-2021. The Programme is part of the European Economic Area (EEA) and Norway Grants, which are funded by Iceland, Liechtenstein and Norway and have two goals – to contribute to a more equal Europe, both socially and economically – and to strengthen the relations between Iceland, Liechtenstein and Norway, and the 15 beneficiary countries in Europe [12].

The project addresses the development in Romania of education for Information and Communications Technology Entrepreneurship (ICTE), aiming to increase the development of new businesses, based on innovation and new technologies. The transfer of knowledge in ITE from the Norway side to the Romanian academic staff will help the professors to deal with this challenge in the years to come. Teaching materials like case studies for ITE in Romania and in Europe will be provided to the Entrepreneurial Hub from FILS. Another objective of the project partners is to perform research in IT, benefitting from the synergy of the two groups.

The project integrates well in the efforts to increase the economic, educational and research capabilities of Romania through a cooperation project in higher education, targeted towards the education in Information Technology Entrepreneurship. The objectives of the project, together with the activities which will permit their achievement are presented in the following. The activities, shown also in the timeline of activities, belong to the classes of management and implementation activities (A), intellectual outputs/activities (O), multiplier events (E) and learning/ teaching/ training activities (C).

The project objectives and activities are:

Objective 1. Develop the ICTE domain at UPB. The activities which will target the objective are

O1. Develop the curriculum, including teaching materials for the “Information and Communications Technology Entrepreneurship” discipline to be included in the curricula of FILS, to be included in the Engineering and management master programs BAE, GIVE and NGELI

O2. Develop the curriculum, including teaching materials for the “Information and Communications Technology based Innovation”, to be included in the Computer science master programs SE and MITSC. For the O2 objective, which exists as a discipline at OUC, on the website of the project will be organized an initial online training of trainers initiative.

O3. Prepare materials for the Entrepreneurship HUB at FILS. They will include case studies and business models in ICTE. Former students will participate at the creation and at the assessment of the materials. Practical results from the ended projects will be included. This represents a lifelong learning strategy, reinforcing the link between higher education and the working force.

O4. Prepare web portal with learning materials, included in the website of the project. Include also success stories.

E1. Multiplier Event - Presentation of the project at the partner institution, Østfold University College

E2. Multiplier Event - Completion symposium for the project, organized at the applicant institution

Objective 2. Strengthen the relationships between the Department of Engineering in Foreign Languages from FILS and the Faculty of Computer Science Department from OUC, taking advantage of the Norway part excellence in ICT based innovation. The activities to target this objective are:

C2. Training Romanian academic staff at the partner university. Three persons from FILS will spend 10 days each at Østfold in order to learn from the experience and the organization of Norway partners.

O5. Create jointly research papers in ICT and look for ideas that can be transformed in practice. There will be proposed jointly at least 5 joint papers to prestigious journals or conferences.

Objective 3. Prepare the Romanian students in an established and competitive environment. The activities to target this objective are:

A1. At the first project management meeting in Romania, start the procedures for an Erasmus+ agreement between UPB and OUC. This will greatly influence the results of cooperation between the partners beyond the lifetime of the project.

C1. Three short lectures given by the Norway partners in the period of Project meeting A1 and the starting symposium of the project in hot ICT domains. It will show to the Romanian students the level of science in Europe and it will serve for advertising purposes.

C3. Short term mobility of master students or undergraduate students in Norway, for the subjects which are given in English at UOC or for Research 1-4 subjects from the master students. There will be 8 mobilities of 30 days each.

O4. Constant training using the web portal

O5. Involve the students to create jointly research papers in ICT and look for ideas that can be transformed in practice. From the joint research papers to be proposed, at least 3 will have master students as co-authors.

3 RESULTS

3.1 Current development status

The project CITE started in October 2019 and it was devised for 24 months. The preparation phase was covered in the summer of 2019 by emails exchange and discussions on virtual meetings to refine the project management team and to arrange the initial transnational project meeting in Romania.

At the end of October 2019, it was organized the first staff mobility, from Norway to Romania. The partners from Norway come and participated at the project opening ceremony and at the first transnational project meeting. With this occasion, the CITE project and the ØUC partner was presented to the students and to the members of the Department of Engineering in Foreign Languages. There were organized three small lectures/presentations - "Software Engineering: Interdisciplinarity & Challenges", "The need of research in IT" and "Academia-Industry collaboration: a view from IT".

The development of material for the two new subjects – "Information and Communications Technology Entrepreneurship" and "Information and Communications Technology based Innovation" – is going on. Lectures are developed in a collaborative way, because of the multidisciplinary domain. The authors of this paper are some of the lecturers which are preparing the subjects for the new disciplines. There will be 4 common lectures and 10 dedicated lectures for each of the subjects.

The website of the project [13] is functional and content is added to it. There has been signed a Socrates Plus agreement between UPB and ØUC. The mobilities program was delayed because of the Covid-19 pandemic. We requested the extension of the timeline with 12 months and the expansion was accepted.

3.2 Envisioned results and project impact

The objectives of this project will enhance the human capital and the entrepreneurship initiatives, as stated in the EEA Grants Programme area no. 3: Education, Scholarships, Apprenticeships and Youth Entrepreneurship. The primary targets are the master programs (curricula, students and academic staff) which train students in the domain Management and Engineering and in the domain of Computer Science. Increasing the quality and quantity of Romanian information technology driven business initiatives focusses directly the first two priority sectors of the EEA grants: Innovation, Research, Education and Competitiveness, as well as Social Inclusion, Youth Employment and Poverty Reduction. The Romanian students will benefit from mobilities in the partner University and the development of teachers is aimed by direct involvement between the professors from both parties and the direct implication of students. Former students which created successful start-ups will participate from the world of work in the creation of case-studies and of the lecture materials as evaluators. In [9] it is given endorsement to the Romanian government "on possible reform to stimulate innovative entrepreneurship and to create an environment conducive to the growth of technological start-ups". There is a clear recognition in this report of the need for the uplifting the role universities in the Romanian entrepreneurial ecosystem.

The desired impact of the project on the Romanian economy will be an increased number of start-ups based on Innovative Technology and ICT, while the impact on the education system will be a rightful change to a domain that is currently spectacular for the economy, technology and science [14]. As a result, the scientific contribution will increase, together with the interest of applying big or small discoveries to practice. At a larger scale, the increased importance rendered to entrepreneurship will create jobs and the conditions for a prosperous society.

4 CONCLUSIONS

The impact envisaged in this project addresses foremost a change of habits in the Romanian learning system. Professors should prepare the students for the professions required by the market and provide them with the ability to innovate since a good training represents a welcome advantage for the graduate on the labor market or in launching a business. "Information and Communications Technology based Entrepreneurship" and "Information and Communications Technology based Innovation" are two multidisciplinary subjects which will prepare the masters students them for the future.

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