Fostering skills for digital social innovations in entrepreneurship education

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ABSTRACT
The Digital transformation of society, industry requires new approaches in education to prepare students to deal with technological change. Digital Social Innovation (DSI) is an emerging field, and little known about digital social innovators, organizations, and activities which support them and the use of digital tools for social change.

Education must be at the core of society’s response to these powerful forces. Digital social innovations and corresponding skills should be used in all sectors of education and training, because technology skills are essential for global citizenship. Such innovations can be particularly efficient in teaching entrepreneurial skills. In this paper after a presentation of the connection between DSI and entrepreneurship education we give some methods to improve it and examples of projects in this context.

Keywords: digital social innovation (DSI), entrepreneurship education, Cloud Computing, Problem Based Learning (PBL).

BACKGROUND
Studies show that since the begin of economic recession in 2008, the younger generation—i.e. those just leaving school and looking for their first real work experience have many difficulties.

This is due to lack of job options in their domain, resulting in unemployment or forcing students to take jobs below their skill levels. Today nearly 26 million people in the European Union are unemployed and actively seeking work.

This situation has also long-term repercussions, as an early period of joblessness can affect a person’s earnings and employability for life. Digital Social Innovation (DSI), i.e. digital innovation with a strong social impact, encourages people to examine how to apply innovative technology to address societal problems. This involves the digital transformation of society and industry. It requires new approaches in education to prepare students for technological change (Kuratko & Goldsby, 2004; Hamburg & Bucksch, 2017). The digital transformation often referred to the fourth industrial revolution, following the technology revolutions based on steam engines, electricity and the Internet era. Industry 4.0 (Hannover 2011), Internet of Things, Cyber-Physical Systems and Big Data have emerged and affected traditional industry jobs but also create new opportunities and business models.
DIGITAL SOCIAL INNOVATION AND CORRESPONDING SKILLS

The development of open data infrastructures, knowledge co-creation platforms, wireless sensor networks, decentralized social networking, free software and open hardware, can provide opportunities to address societal issues (Dykes, Groff, Renfrew-Knight & Sutch, 2013). The fast development of digital services has created an imbalance between the scale and reach of commercial Internet models. There is a significant weakness in alternatives which mainly filling marginal niches and are unable to gather a critical mass of users that can adopt the services (Imreh, Kosztopulosz & Imreh-Tóth, 2013).

In recent years innovators in civil society, tech and social entrepreneurs developed digital solutions for social issues in areas such as health, democracy, consumption, money, transparency, and education. Digital Social Innovation (DSI) is an emerging field, and there is little known about digital social innovators, organizations, and activities which support them and the use of digital tools for social change (Jenner, 2013). It is clear that “Education must be at the core of society’s response to these powerful forces. Which depends on each of us applying knowledge and skills, particularly scientific knowledge and skills, to address societal and environmental issues? It is critical that we develop a pervasive culture of innovation, not only inside schools, colleges and universities but also within and across communities of students and educators, to drive positive social, economic and technological change” (Dykes, Groff, Renfrew-Knight & Sutch, 2013).

The innovative ecosystem model (Vladut, 2016) which brings together new companies, experienced business leaders, researchers, government officials, established technology companies, and investors has also a strong social impact.

This environment provides those new companies with a wealth of technical expertise, business experience, and access to capital that supports innovation in the early stages of growth. However to sustain growth this environment needs improvements in entrepreneurship education (European Commission, 2009; David & Hamburg, 2017).

Digital social innovations and corresponding skills should be used in all sectors of education and training, because technology skills are essential for global citizenship (European Commission, 2009). Such innovations can be particularly efficient in encouraging young people to look for new opportunities and become more entrepreneurial.

Entrepreneurship is a competence that can be learned and it is necessary to support an innovative entrepreneurship education program to prepare people to become self-sufficient if needed. Entrepreneurship education is a lifelong learning process (David & Hamburg, 2017).

In order to support a successful Lisbon strategy for growth and employment, Europe needs to promote entrepreneurial mind-sets, encourage innovative business start-ups and foster a culture friendly to entrepreneurship and diversity (Aarchus, 2013).

Recommendations of the European Parliament and of the council of 18th December 2006 on key competences for lifelong learning include beside others digital competence, entrepreneurship and cultural expression (European Union, 2006).

In this paper after a presentation of the connection between DSI and entrepreneurship education we give some methods to improve it and examples of projects in this context.
Entrepreneurship is the art of being able to turn ideas into action. This implies creativity, innovation, risk taking, and the competence to plan and manage projects in order to achieve proposed objectives (David & Hamburg, 2017).

In this context, some of the most important aspects to be considered in entrepreneur education are entrepreneurial culture which encourages companies and employees to support economic, social and environmental innovation.

One of the important issues is to know the main objectives of entrepreneurial education.

Hytti and O’Gorman (2004) affirm that it has three objectives; one of them is to increase the understanding of what entrepreneurship is about.

The second objective of entrepreneurial education is to assure that the potential workforce, i.e., people that do not intend to set up their own company, but work in businesses started by others, know entrepreneurial approaches and look for new opportunities for their organization (intrapreneurship) (Hytti & Gorman, 2004).

The third objective of entrepreneurial education is to prepare individuals for their future career as entrepreneurs by strengthening their entrepreneurial competencies and attitudes which are needed for managing new businesses successfully (Kuratko & Goldsby, 2004).

To reach such objectives of entrepreneurial education it is necessary to restructure curricula in entrepreneurial education to develop the skills, knowledge and competences necessary for DSI. Table 1 shows the connections with work to achieve such objectives.

| Ways of thinking | Ways of working | Tools for working | Living in the world |
|------------------|-----------------|-------------------|--------------------|
| Creativity and innovation | Communication | Information literacy | Citizenship—local and global |
| Critical thinking, problem solving, decision making | Collaboration (teamwork) | Information and communications technology literacy | Life and career |
| Learning to learn, meta-cognition | | | Personal & social responsibility—including cultural awareness and competence |

In addition, providing a supportive environment within the education sector that allows students to experiment with setting up businesses may encourage entrepreneurial activity.

The entrepreneurship competence is relevant not only for those who would like to start/carry up a business but for all who would like to support changes in individual, collective, economic and social environments and is particular relevant for youths (Youth Pass, 2006).

Entrepreneurship education is important in particular to younger people, because “young people with entrepreneurship education are more likely to set up their own companies. Up to 20% of students who participate in a mini-company programme in secondary school will later start their
own company. That is up to five times higher than in the general population. Businesses started by these students are also more ambitious” (David & Hamburg, 2017).

Such entrepreneurial educative programmes should offer students also digital tools to be creative, to solve problems efficiently, to analyse a business idea objectively, and to communicate, cooperate, lead, develop and evaluate projects.

Caroline Jenner, entrepreneur and educator affirms that “Some of the challenges this younger generation faces are systemic—lack of teacher training in entrepreneurial learning methods, limited access to education for 21st-century skills in schools, the need to modernize vocational training, etc.—and there are countless debates on how to tackle those issues. She identified in her career as an entrepreneur and educator, a number of missed educational opportunities that schools and teachers could implement immediately, with minimal effort or expense, to improve lives and employment options for these students (European Union, 2015).

One of the best options for making such improvements in education is to build partnerships, from education institutions, and private sector to train teachers and engage the expertise of practitioners and local networks also for improving the curriculum and entrepreneurship learning. One of the important factors with a long positive impact of entrepreneurship education is the engagement from the community and cooperation of many involved actors (Istenic-Staracic, 2009).

Konrad Tollmar, researcher at KTH ICT School and coordinator of the EIT Digital Master School programmes at KTH, promoted a new concept in education that combines technical skills with hands-on training in innovation and entrepreneurship. On top of this the latest in research and business on societal and technological specific topics are added such as Health & Wellbeing, Smart Energy systems, Smart Spaces and Privacy, Security and Trust.

EXAMPLES
Cloud Computing is a digital technology that enables access to different kind of virtual services, depending on the users’ needs (Assante, Castro, Hamburg & Martin, 2016). Cloud Computing promotes new entrepreneurship and corporate models and should be adopted into the entrepreneurial education model as it has significant potential for DSI. According to several studies, the lack of proper training in the area of Cloud Computing and the lack of qualified professionals are the main limitations to the diffusion of this technology which could have many advantages for companies and education (Hamburg, 2015).

The Erasmus + European partnership IN-CLOUD (www.) 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 results of the realized analysis, the existing Cloud services and technologies available at European level, the current national and international studies and finally the target groups identified in the project proposal have finally allowed the partnership to design four VET qualifications for cloud experts in different sectors and corresponding digital didactic modules to be included in entrepreneurship education.

An added value of the project is the so called “virtual boot camp”, that intends to provide a smart and adaptable education through a virtual environment. In the project design phase, the partnership has identified 13 different learning paths, associated to 13 different standard users, related to 13 different level of assessment of the domains. The architecture of the virtual boot camp includes a front-end and a computation tool, interfaced by different xml files including information both on the assessment and the courses. The architecture is shown in Fig. 1. The front-end is used both to perform the assessment of the user and to show the result of the evaluation. It also provides a link to the area of the e-Learning web-platform where the proposed learning path is hosted. The xml files allow the partnership to dynamically modify the assessment instruments, the weights of the
questions of the standard profiles/courses according to the feedbacks that the users may provide. Finally, the virtual boot camp includes a tracking service, in order to collect statistics on its usage, and a feedback service, in order to allow the user to provide a level of satisfaction of the tool and eventual suggestions. The virtual boot camp could be used in entrepreneurship education as well as in SME training.

![Diagram of the virtual boot camp architecture](image)

**Figure 1: Architecture of the virtual boot camp.**

The European project Cyber Security (www.cybersecurityplus.org) aims to improve the knowledge and skills about cyber security in entrepreneurship education. Some aims of our project are as follows:

- Disseminating cyber security issues in formal and non-formal education
- Adding cyber security to the curriculum of computer programming departments in entrepreneurial education and corresponding training modules
- Raising awareness about secure use of internet and secure internet services
- Fostering Research-Development activities in this context, particularly referring social and ethical aspects
- Broadening the pool of skilled entrepreneurs capable of supporting a cyber-secure nation
- Fostering development and skills of teachers and trainers and founding partnership by focusing on the education of company trainers and partners in work-based education, school teachers and company trainers
- Supporting strong partnerships in business community and educational institutions

The other example of projects we present is about innovative digital solutions for entrepreneurial learning like Problem Based learning (PBL) (Hamburg & Vladut, 2016). It encourages innovation, both individual and cooperative work and thinking, a greater understanding of a topic due to active learning, engaging in the material and in use of digital platforms. PBL increases motivation to learn thus developing a learning culture, developing skills in critical thinking, leadership, communication, problem solving, ethical and social issues. The Archimedes project (www.archimedes2014.eu) is an Erasmus project with partners from research, education and industry aimed at investigating the use of PBL supported by a digital platform (http://archimedes-tiki.eu/tiki-index.php) in entrepreneurship education and SMEs.

**CONCLUSIONS**

In this paper after a presentation of the connection between DSI and entrepreneurship education we already gave some methods to improve it and examples of projects in this context.
It is necessary to consider education, entrepreneurial culture, and personal formation, on different stages of development of digital social innovation and to build partnerships of all actors involved in entrepreneurship education.

Cloud Computing is an IT technology enables the access to different kind of virtual services, depending on the users’ needs. It promotes new entrepreneurship and corporate models and should be trained in entrepreneurial education. According to several studies, the lack of proper training in Cloud Computing and the lack of qualified professionals are the main limitations to the diffusion of the technology.

We want to remember a quote by Victor Hwang (author of Innovation Rainforest) who said that “Economies thrive when culture (...and formation is part of the entrepreneurial culture) overcomes social barriers and fosters connectivity, trust, and collaboration between diverse people…” Think about that.

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