

# E-LEARNING ISSUES IN EDUCATION & TRAINING DOMAIN OF APULIAN LIVING LABS

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The approach of Living Labs, a concept developed at the Media Lab and School of architecture and city planning of MIT, Boston, represents a user-centric research paradigm for prototyping and validating complex solutions in multiple evolving real life contexts. Apulia Region decided to foster this approach in Apulian ICT Living Labs and the follow up programme SMART PUGLIA 2020 Living Labs to facilitate the growth and the development of Apulia SMEs specialized in the Information and Communications Technology (ICT) field, digital services and contents. The issues of the most advanced paradigms in e-learning, such as social learning, adaptive learning, e-learning 3.0, augmented reality and virtual reality and robotics applications to e-learning have been tackled in Apulian Living Labs projects. This paper introduces the e-learning projects in the Education & Training domain of the Apulian Living Labs and reports the e-learning technologies developed to

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address the end user's needs in the domain above.

## 1 Introduction

The Living Labs approach represents a new way to address the research activities where innovations, such as new services, products or application enhancements, are validated in empirical environments within specific regional contexts (Eriksson *et al.*, 2005). Opportunity of economic, social and cultural development in all Europe, the Living Labs stimulate the innovation, transferring the research from the laboratories to the real life, where the citizens and the users themselves become “co-developers” (Corelabs, 2006). Living Labs have thus shown the ability to mould the opportunities offered by new ICT to the specific needs and aspirations of local contexts, cultures, and innovation potentials (European Commission, 2013). This approach is shaping the agenda of Regional Policy and Territorial Cooperation for 2014-2020, but also HORIZON2020 and the “Smart Specialisation” conditionality requirement, engaging all EU regions. In Europe (European Commission, 2010), the potential and opportunities generated by a Public-Private-People Partnership (PPPP) from ENoLL (European Network of Living Labs) (ENoLL 2010) shifted the scope of Living Labs from pure academic experiences to regional or national innovation systems (Hsuan-Yi, 2012). The Living Labs concept is characterized by the “users as innovators” approach (Eriksson *et al.*, 2006). This means to get access to the ideas and knowledge of the users, and not using the users as “guinea pigs” of experiments. This new approach is emerging in several productive situations at international levels, as defined by the ENoLL network and allows the Small and Medium Enterprises (SMEs) in particular to create experimentation on the real scale in “pilot market”, to advance the current prototypes and anticipate the problems in post-sale phase. This paper tackles the main issues on most innovative aspects of e-learning in Apulia Living Labs coming from the Education & Training (E&T) domain. E&T domain resulted very complex to perform the end users needs analysis because expressed users needs show several and different themes in fields (Avellis, 2012).

Section 2 describes the Living Labs approach in Apulian Living Labs. Section 3 outlines different e-learning technologies adopted by the projects of Apulian ICT Living Labs (Avellis *et al.*, 2014). Conclusions underline the strengths and weaknesses of the Living Labs approach.

## 2 Living Labs Approach in Apulian Living Labs

Apulian ICT Living Labs is an action of the ERDF 2007-2013 of the Apulia Region, which allows Apulian ICT SMEs to experiment innovative ICT solu-

tions and prototypes of new products and services, through shared knowledge and exchange of researchers, enterprises and organized groups of citizens: they are regarded as a way of meeting innovation challenges faced by ICT service providers. Apulian Living Labs concern eight domains of reference, namely Environment, Education and Training, Cultural Heritage and Tourism, Creative Industry, Active aging and Health, Mobility and Transport, E-government, Energy. The model Apulian ICT Living Lab has been conceived as an “open innovation ecosystem” (Pallot, 2009), where the user actively participate to the research and experimentation process of innovative solutions, devised through the use of the ICT. The project entrusted to InnovaPuglia for the execution is organized in two phases as follows:

*Phase 1: Identification of domain specific requirements*

Call For Ideas (Official Journal no. 46 of 29/03/2012) in order to collect and bring together themes, requirements, problems and challenges highlighted by the final users belonging to the extended partnership – thus forming a Requirements Catalogue. Opening-up of the Living Labs Partnership Catalogue, where local Associations, Public Bodies, Research Laboratories could register themselves as proposers of user needs and requirements and at the same time, potential partners of ERDF funded projects aiming to provide solutions to those challenges.

*Phase 2: Design of appropriate solutions*

Call for Proposal (Official Journal of Apulia Region no. 118 of 09/08/2012, no. 136 of 17/10/2013) in order to select and grant competitive project proposals aiming to test and validate new and innovative ICT solutions to face the challenges collected in phase 1. Each project proposal had to be submitted by one or more local ICT SMEs, joining up only partners previously registered in the Living Labs Partnership Catalogue and with the requirement of including at least one Association or Public Body and one Research Laboratory in the formal partnership. The ranking list of approved project proposals has been published on the Official Journals of Apulia Region (nr.43 of 21/03/2013, nr. 247 of 25/7/2013, nr. 65 of 10/3/2014).

The governance model adopted is based on citizen engagement and generally follows the scheme of Public-Private-People Partnerships (PPPPs) or quadruple helix scheme, which opens up innovation systems to new actors such as cities and region with chief innovation officers, local SMEs selling in global markets, social innovators and entrepreneurs, digital artists, and a myriad of urban innovative communities (EU2020, 2010). The most innovative aspect of e-learning projects of Apulian Living Labs is related to the involvement of the end users in all stages of the product development lifecycle, not just at the end

phase, as for example in more classical field trials or user testing of products (Niitamo *et al.*, 2006). Many studies come to the result that one of the most innovative aspects of successful product development is to involve the user into the development process.

SMARTPUGLIA2020 LIVING LABS are the follow up of Apulian ICT Living Labs: they are framed in the building process of the Regional Strategy for the research and innovation based on Smart Specialisation for the programming cycle 2014-2020 with the objective to involve all the regional innovation system in the logic of the four helixes, respectively: Public Administrations, Enterprises, Research Centers, Citizens/Users.

### 3 Overview of the e-learning issues in Apulian ICT Living Labs

In (Avellis *et al.*, 2014) we give an overview of the e-learning projects in the E&T domain of Apulian ICT Living Labs. In this section we outline the main outcomes underlining the most innovative aspects of the projects above and add the ones of SMATPUGLIA 2020 LIVING LABS.

SPLASH (Smart PLAtform for learning and active Social Habitat) project (Chiarella *et al.*, 2014; Pace *et al.* 2014) tackles the social learning paradigm addressed via a web platform flexible, integrated, social, open source, for the implementation of the process of teaching and training of the students, teachers and schools, and for its integration with the classroom activities: ICT tools can help to support the construction and management of a hyper -dimensional space of knowledge, access “intelligent” content authorship and authenticated by the experts, the creation of individual paths in the acquisition of knowledge and skills, enhancing aptitudes and potential of individuals, participation and sharing of the users, with the aim of a continuous development of the instrument, as well as the definition of a social model for the aggregation and authentication of multimedia content, which includes open content that can be acquired from the Web.

The same issue of S.P.L.A.S.H. is addressed by the EDIL\_LEARNING project (Longo *et al.*, 2014) that is an open source social learning platform able to support training in the building industrial sector. The solution consists of modular and integrated functionalities in order to support formal and informal, individual and social learning processes.

Different issues are tackled instead by the ROBIN project (Pistoia *et al.*, 2014) to address the dyslexic children educational needs. It includes an anthropomorphic robot which interface itself with several hardware systems such as tablets, Pc and Notebooks and a LMS platform hosted in a remote server connected via Internet for personalized learning and the production of educational ad hoc contents, for students with specific disabilities, such as dyslexia,

which involves the 4-5% of the school population, on average one every class of 20 students.

A very innovative didactic modules production based on Augmented Reality (AR) and Virtual Reality (VR) is the aim of the INRL project (Interactive Network Remote Learning). It investigates the web3.0 and new media tools, such as augmented reality and informal learning which become a dominant aspect in the evolution of e-learning from the past virtual learning environments, based on the use of LMS/LCMS, with more communicative and flexible personal learning environments. These are user-centred environments supporting informal learning, derived from the resources that can be founded and produced on the web, and formal learning based on well defined schemes of elearning platforms. It also manages the development, testing and integration of specific training modules within elearning platforms already in the market, or “interactive/experiential pills” which allow users to know, using interactive technologies-cognitive and smart (3D augmented reality and interaction) the concept of learning by interacting and remote collaborative learning.

The same technology, namely the AR and VR is at the basis of the EP\_LAB (Easy Perception LAB) project (Invitto *et al.*, 2014), which do not intend to substitute the sensorial experience on the field, but can amplify the possibilities of experimentation and the accessibility to different types of users. In the didactic field the virtual applications allow the teacher and the students to jointly participate to the creation of the knowledge. The student should directly experiment to know a cognitive field, that is this theory are parts of the recent applications of Embodied Cognition. Through the integration between theory and critics, research and experimentation, continuous interaction among students, teachers, enterprises and research, the main objective of the EP\_LAB project is a prototype of GiS based mobile application, which makes use of Augmented Reality and Virtual Reality to define a new paradigm of laboratory and didactic education, but at the same time a versatile platform to be used by the network of museums of the University of Salento, such as MAUS (Museo dell’Ambiente dell’Università del Salento).

Technological supply for agrifood workers’ training aimed at the implementation of ICT tools for certification processes in the value chain of agrifood productions is provided in AGRIPOINTER project.

Scuola Aperta Living Lab offers services for a more efficient management of the administrative processes and the complete education infrastructure.

ASTRO Living Lab provides a humanoid robot for autism spectrum disorders (ASD). Advanced Tool for education and rehabilitation, it is useful in terms of socialization of children, reducing stress due to emotional inference.

CLIOedu 2.0 Living Lab, based on a virtual environment, offers solutions for new management models of knowledge processes at schools, by using a mix

of NGA and cloud computing for a collaborative space of knowledge building.

ALL Living Labs is based on an adaptive system of web-based learning, aimed at offering learning tools to cross cultural gaps and gender gaps. The adaptive system (Marengo *et al.*, 2012) uses the Learning Objects in the most appropriate way, in relation to the student's competence and the course's objective in such a way to build an ad hoc training course for each student.

## Conclusions

The Living Labs methodology with its emphasis on “user involvement” and the “co-creation” process (Eriksson *et al.*, 2009) makes it different from other testing and evaluation methods. In the Living Labs approach for user-driven open innovation (Information Society, 2010; Luotonen, 2008) the integration of end users and other stakeholders into development projects remains a difficult task (Schumaker *et al.*, 2007). We addressed this weakness of the Living Lab approach by organising regular focus groups among the end users and the SMEs and research laboratories, since the requirements phase through design and development, test and experimentation, evaluation of market perspectives, and by monitoring the projects every four months. The main strength of the Living Labs approach, i.e. the users' involvement, is strategic in Apulian Living Labs in terms of co-design of services/products to be realized as solution for user needs, test and validation of services/products, market design for business model developments. Methods and tools adopted for the active involvement of users are operative focus group for sharing problems and difficulties, designing solution perspectives, suggesting strategies for the development of results, further stakeholder involvement, networking actions, workshop for dissemination, and communication plans. Other strengths of Apulian Living Labs are as follows: online forums with end users, blogs on the project web site, end user's needs archive in an open format (with names and addresses of end users), partner catalogue with expressions of interest to participate to experimentation processes and public demolabs, located at users' headquarters, where the deployed technological solutions could be applied every day by a number of users: teachers, students, families, professionals etc. The DemoLab becomes the core of the Living Lab, the connection between knowledge, real life and experience, and technology.

The Apulian Living Labs resulted in a widespread initiative all over the regional territory and this type of approach at our knowledge is different from any similar European initiative. Considering the transnational European plan, we have knowledge and experience of single town level approach with specific local restrictions on single purpose domain.

The Apulian Living Lab initiative has recently been mentioned among some

other implemented best practice initiatives in the toolbox volume for Smart Specialization Strategy edited by the European Commission (IPTS-JRC) (European Commission, 2014).

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