

# Developing Distance Learning Environments in the Context of Cross-Border Cooperation

*Sebastian Fuicu*

Department of Computer and Information Technology, Politehnica University of Timisoara,  
Piata Victoriei Nr. 2, 300006 Timisoara, Romania  
sebastian.fuicu@upt.ro

*Mircea Popa*

Department of Computer and Information Technology, Politehnica University of Timisoara,  
Piata Victoriei Nr. 2, 300006 Timisoara, Romania  
mircea.popa@upt.ro

*Dalibor Dobrilovic*

University of Novi Sad/Technical Faculty "Mihajlo Pupin", Zrenjanin, Serbia  
ddobrilo@tfzr.rs

*Marius Marcu*

Department of Computer and Information Technology, Politehnica University of Timisoara,  
Piata Victoriei Nr. 2, 300006 Timisoara, Romania  
marius.marcu@upt.ro

*Razvan Bogdan*

Department of Computer and Information Technology, Politehnica University of Timisoara,  
Piata Victoriei Nr. 2, 300006 Timisoara, Romania  
razvan.bogdan@upt.ro

## Abstract

By using a plethora of technologies and formats, the distance learning paradigm offers access to education through a large spectrum of subjects which are situated in different geographic areas. This paper presents the successful collaboration between Politehnica University of Timisoara, Romania, and the Technical Faculty "Mihajlo Pupin" of Zrenjanin, Serbia, which offer a low maintenance cooperation model based on a web cast system that allows subjects from both countries to have access to each other's educational material. The aim of this project is to raise the interest of pupils, students and graduates to the latest information regarding technical content used in the IT industry. The access takes place in real time and from the distance without the necessity of being present in order to receive the information. The obtained results are very encouraging regarding the usage of such a distance learning environment and the further development of such tools and cooperation.

**Keywords:** distance learning, cross-border cooperation, courses, webcast system.

## 1. Introduction

The process of acquiring different skills by using distance learning technologies and solutions has started to be a de facto trend in education. Learning Management Systems (LMS), Massive Open Online Courses (MOOC), Personal Learning Environments (PLE) are just a few approaches which are building the distance learning ecosystem (Viunenko, 2016). In all these solutions, the teacher's attention is focused on all the participants, the classical problem of "triangle of influence" (Bogdan, 2016) being overcome due to the usage of this new paradigm. Moreover, distance learning environments offer the possibility to foster the development of cross-border regions across the globe by offering free access to education and information for different subjects.

This paper presents the development of a distance learning platform called EduWebCast. This platform has been developed as a cross-border cooperation between Politehnica University of Timisoara, Romania, and the Novi Sad University/Technical Faculty “Mihajlo Pupin”, Zrenjanin, Serbia. One main issue regards the cross-border cooperation activity which is limited, thus determining low levels of experience amongst the population of the neighboring areas. This project offers a new, innovative, low maintenance cooperation model based on a web cast system that allows subjects from both countries to have access to each other’s educational material. The aim is to capture students and pupils’ interest and to provide them with the latest news and information regarding the technical content used in the IT industry, interconnecting graduates who now work in IT companies in the border area. The access takes place in real time and from the distance without the necessity to be present in order to receive the information. There are used modern IT tools, so very few supplementary costs deriving from travelling and accommodation are required.

Due to the common challenges faced by the communities from both parts of the cross-border cooperation area there is a need for a high level of cooperation in the fields that concern both countries such as the education sector. Using a common platform used for live and on-demand video streaming of learning material provided by two educational institutions, one from Serbia and one from Romania will help overcome the border as a perceived “division”. Furthermore, it will set an important example of promoting greater cooperation and contact between regions and communities on both sides of the border, based on the same principles in other fields of interest. It will also set the necessary infrastructure for possible future accredited distance learning curricula for the universities involved in this project. The common cross-border approach that this solution suggests in the area of education by using specific modern IT instruments will also help overcome specific issues related to the connectedness of the region, both internally, between the border regions, and externally, between the border regions and neighboring areas. This is a consequence of the fact that web cast system could be accessed by interested persons and entities from other neighboring areas that might be interested in cooperating with the two universities.

The rest of this paper is structured as follows: section 2 presents the literature review in terms of distance learning, section 3 offers the used methodology, while section 4 presents the results of using the EduWebCast system. The last part of the article presents the conclusions.

## **2. Literature review**

The problem of cross-border cooperation, in terms of building distance learning environments, has been previously presented in the literature by Klobučar and Gabrijelčič (2014). The STORK 2.0 infrastructure (a Slovenian platform to be presented) is used to build a virtual learning environment, e-surveys, and job selection. In Tsai (2016) it is brought into light a project which is aiming to offer an interactive distance learning plan. The main purpose of this project is to tighten up the gap between the investments in the educational system from the urban vs. the rural Taiwanese environment. While in Lytvyn,(2016) it is offered a distance learning approach towards postgraduate studies and which will improve the scientific output of such students. In Messias and Morgado (2015), the distance learning ecosystem is analyzed by using Social Network Analysis domain, but at the same time, the test scenarios have been optimized to the particular case of Learning Management Systems.

A number of papers such as the ones of Herasymenko (2016), Holotescu & Cretu (2013) and Uzunboylu & Bicen (2011) are analyzing the e-learning and distance learning ecosystem. The analysis is done from the point of view of applied technologies and is also offering guidelines into improving the distance learning experience. Other papers, such as Babori’s&Fassi’s (2016) and Chirila & Ciocarlie’s (2015) are proposing different techniques in which computer science teaching topics can be improved.

A specific category of state-of-the-art papers like Perraton's(2007), Khan & Ally's(2015) and Dorrego's 2016) are dealing with the evaluation of the used technologies and approaches during the distance learning projects. The aim of such studies is to underpin the weaker points of distance learning usage and offer different remedial measures. However, the direct evaluation is not the subject of this paper.

### 3. Methodology

This paper presents the case of EduWebCast project which was developed as a cross-border cooperation between two universities. The aim of this project was to build a proper infrastructure that would ensure free access to different courses, but also the latest news in several technical domains. Several objectives were formulated, in order to develop these educational systems.

*Objective 1: Increasing educational exchanges through a common cross-border approach in the area of technical education by implementing an education webcast system*

This will help achieve a more balanced and sustainable education not only for pupils and students from the cross-border region but also for whoever might have an interest in the developed courses; as well as constant access to technical information through an innovative method. This grants the improvement of the graduates' skills who are employed in the companies from the private sectors, thus directly affecting the socio-economic development of the Romanian-Serbian border area.

*Objective 2: Creating a cross-border partnership between the two universities*

The aim of this partnership would be to implement an infrastructure for live and on-demand video streaming of learning material for the targeted groups and, to this purpose, to establish a long and fruitful cooperation between teachers, pupils, and students on both sides of the border. The joint creation and administration of the webcast project is the ground stone of the partnership between the two universities and will result in more common projects based on the materials obtained through the project, contests between pupils and students, possible periodic educational exchanges.

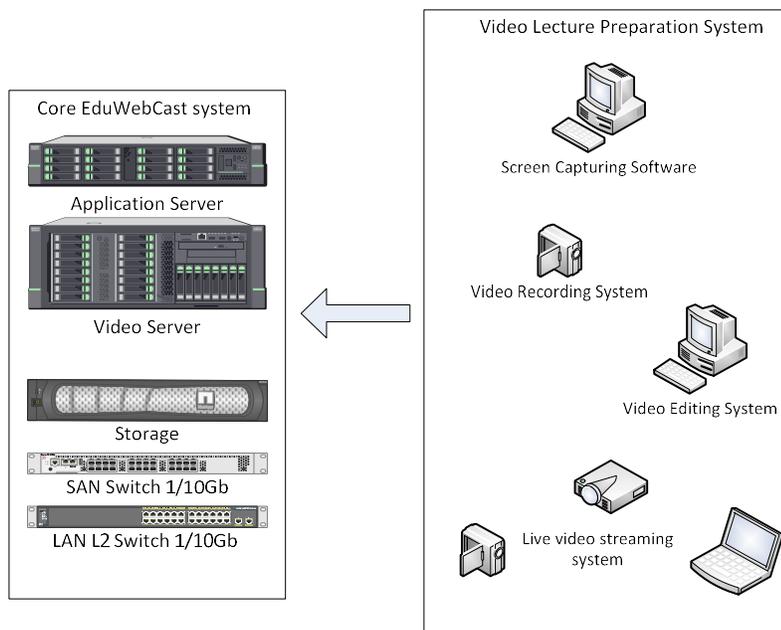


Figure 1. Components of EduWebCast System

*Objective 3: Improving the quality of education for the students and pupils from the border area*

Both students, who attend the courses of the two universities, and the pupils from the schools in the region and outside of it, who manifest an active interest in the technical field, will have access to the educational materials (courses and lectures) provided by the most important technical universities in the cross-border area. In addition to that, our approach is also aiming the academic staff who can exchange information, research ideas, teaching techniques so that the target groups can benefit from this experience.

*Objective 4: Increasing the overall competitiveness of the economy in the border area.*

The IT companies that employ graduates from the two universities will be able to access the latest technologies and information provided on the software portal of the webcast project thus benefiting from the increased competences of their employees and improving their performances on the market they activate in. Therefore, the competitiveness of the IT companies in Romanian-Serbian cross-border area will be enhanced.

The EduWebCast system is formed of two main components (as it can be noticed in Figure 1), namely the Core EduWebCast System (which will include the application server, video server, storage and network infrastructure) and the Video Lecture Preparation System (which include the software and devices needed to record the lectures).

### **3.1. Video lecture creation**

The video lectures for WebCast are created in three approaches:

*Approach 1: Video lectures with PowerPoint slides and narration*

In this video lectures, the lecturer had prepared PowerPoint or similar presentation slides, he started the presentations and using microphone he made an explanation, in accordance to the current slide on the screen. In some cases, lecturers used a graphical table to write on the slide and to point out some parts of the lecture.

The hardware/software combination needed for this approach is:

1. a PowerPoint or similar presentation software;
2. headsets with microphone;
3. a video/audio screen capturing software;
4. a graphical table (optional);
5. a software for video/audio editing.

In some smaller part of lectures, we benefited from professional help provided by video production companies.

*Approach 2: Video lectures with lab exercises*

In this lectures, we used software and other tools like simulation software, programming IDEs etc. for performing lab exercises. The lecturer is, similar to the previous case, working in lab exercise software with simultaneous narration while video/audio screen capturing software is recording the lecture. In this case, because we have a bilingual version of the lecture, the procedure is as follows: the first step is to record the lecture in the native language, after that the video is played with the original sound muted, while lecturer is telling the Lecture in English.

The hardware/software combination needed for this approach is:

1. a lab exercise software;
2. headset with microphone;
3. a video/audio screen capturing software;
4. a graphical table (optional);
5. a software for video/audio editing.

In some smaller part of lectures, we benefited from professional help provided by video production companies.

*Approach 3: Video lectures recorder in the professional studio in the case of using the equipment*

Only a small portion of the lectures is directly recorded in the studio, also video production company recorded, edited and produced the whole video. In some cases, bilingual lectures are recorded in a similar way as in Approach 2.

#### **4. Obtained results**

First of all, the resulted platform (EduWebCast, 2016) comes with a state-of-the-art section of information technology news. But the gem of the project is actually the portal of the courses. A number of 12 courses have been taught and supported by means of this project.

These courses are:

- Digital microsystems;
- Modeling and simulation;
- Mobile computing;
- Computer fundamentals;
- Programming languages;
- Electrical engineering;
- Project management;
- Computer networks;
- Artificial intelligence;
- IT project management;
- Fuzzy systems;
- Machine learning.

System started with public operation on the 14<sup>th</sup> of April, 2015. Before being released for public use the system was tested for almost a month.

The usage of the system can be divided in two periods:

- I. From 14<sup>th</sup> of April until 18<sup>th</sup> of June. This is the period of official project duration.
- II. From 19<sup>th</sup> of June until the present day. This is the period after the finalization of the project.

On following figures, statistic usage is given as Monthly and Weekly statistic for individual users and sessions. The number of the individual users and of the sessions is far better for the 2015 period, especially for the extent of time until the end of June. This is reasonable because it was during the project and the site is frequently put forward in promotional conferences, in press, in direct contacts with schools, and companies. After that period the site was not promoted additionally, and the only pointer to the site is a number of links found on our institutional websites as one of the services we are offering to the students. Considering all that, the figures for 2015 and even 2016, seems to be quite satisfactory. (Figure 1, Figure 4, and Figure 5).

It is also interesting to observe that in Figure 3, where the usage for 2016 is presented, that in the non-promotional period, the site is mostly used in January (before January exam term), in April, May, and June (before the June exam session and during colloquial exams) or in July and August (before the September exam session).

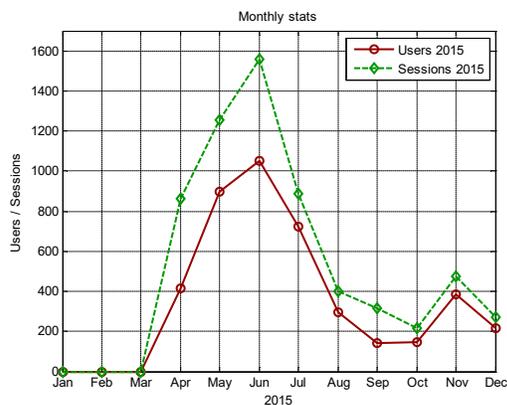


Figure 2. Monthly user/session stats for 2015

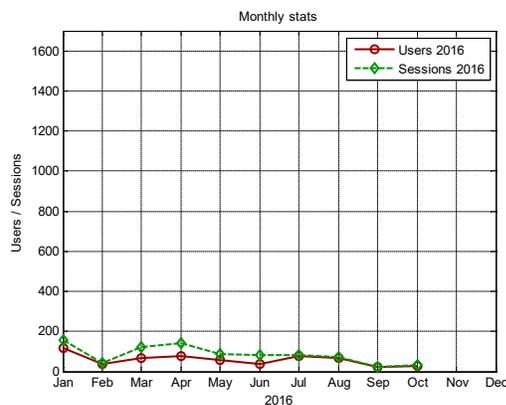


Figure 3. Monthly user/session stats for 2016

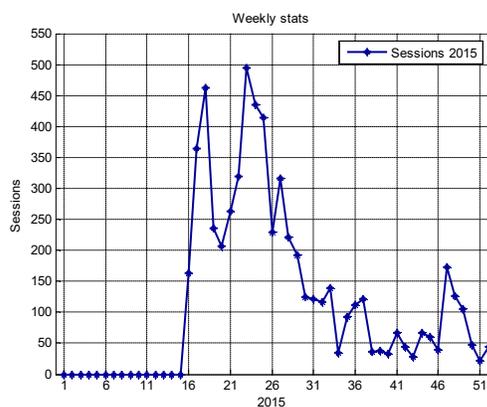


Figure 4. Weekly session stats for 2015

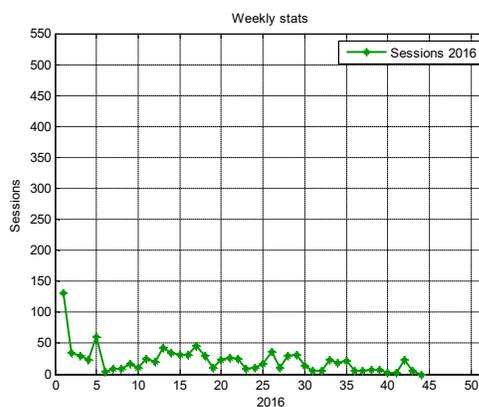


Figure 5. Weekly session stats for 2016

## 5. Conclusion

The main two issues this paper is dealing with is that the cross-border cooperation activity is limited causing a low level of experience amongst the population of the neighboring areas and the low connectedness between the border regions. There is a clear division between the regions in the cross-border area and although they face common challenges their cooperation is insufficient and unproductive.

The presented project of this paper, called EduWebCast, suggests an innovative cooperation model based on a web portal that allows subjects from both countries to have access to common educational materials, know-hows, and practical applications (laboratory materials). The aim is to capture both the students' as well as pupils' interest especially if they are interested in following a technical education. The portal also includes the latest news and information regarding technical content used in the IT industry, interconnecting graduates who work in companies from the border area. Besides providing the information regarding the state of the art in the subjects it tackles, the portal serves as a modern learning tool for the Romanian and Serbian students or pupils to access the lectures without being at the place and time where the courses are held. This platform also enables students/ pupils to view the courses as many times as they like by accessing the portal.

## References

- Babori, A., Fihri Fassi, H., Hariri, A., Bideq M. (2016), *An e-Learning environment for algorithmic: toward an active construction of skills*, World Journal on Educational Technology, Volume 8, Number 2.
- Bogdan, R. (2016), *Guidelines for developing educational environments in the automotive industry*, 1st International Conference on Smart Learning Ecosystems and Regional Developments, Timisoara, Romania.
- Chirila, C.-B., Ciocarlie, H., Stoicu-Tivadar, L. (2015), *Generative Learning Objects Instantiated with Random Numbers Based Expressions*, BRAIN - Broad Research in Artificial Intelligence and Neuroscience, Bacau, Romania, 6(1-2), 1-16.
- Dorrego, E. (2016), *Distance Education and Learning Evaluation*, Revista De Educacion a Distancia, Volume 50.
- EduWebCast Platform*, [online]. Available at: <http://eduwebcast.upt.ro/index.php>, accessed 15 November 2016
- Herasymenko, I. (2016), *Used distance learning technologies*, 13th International Conference on Modern Problems of Radio Engineering, Telecommunications and Computer Science (TCSET), pp. 813 - 816.
- Holotescu, C., Cretu, V. (2013), *Microblogging Platforms in Education: Features, Usages and Architectures*, Microblogging in Educational Settings. How Microblogging Platforms can be used in Formal and Informal Education, AVM Akademische Verlagsgemeinschaft München
- Khan, B.H., Ally, M. (2015), *International Handbook of E-learning*, Volume 1: Theoretical Perspectives and Research. London, New York: Routledge, Taylor&Francis Group, 343 p.
- Klobučar, T., Gabrijelčič, D., Pagon, V. (2014), *Cross-border e-learning and academic services based on eIDs: Case of Slovenia*, eChallenges e-2014 Conference, pp. 1 - 9.
- Lytvyn, V., et al. (2016), *Distance learning method for modern youth promotion and involvement in independent scientific researches*, IEEE First International Conference on Data Stream Mining & Processing (DSMP), pp. 269 - 274.
- Messias, I., Morgado, L., Barbas M. (2015), *Students' engagement in Distance Learning: Creating a scenario with LMS and Social Network aggregation*, International Symposium on Computers in Education (SIIE), pp. 44 - 49.
- Perraton, H. (2007), *Open and distance learning in the developing world* (2nd ed.). London: Routledge, 162 p. §
- Tsai, I-C., et al. (2016), *Developing Taiwan innovative interactive distance learning model: Empirical studies*, 11th International Conference on Computer Science & Education (ICCSE), pp. 911 - 916.
- Uzunboylu, H., Bicen, H., Cavus, N. (2011), *The efficient virtual learning environment: a case study of Web 2.0 tools and Windows Live Space*, Computers & Education, Volume 56, No. 3, pp. 720-726.
- Viunenko, O., et al. (2016), *Information technologies in the educational process as the basis of modern distance learning*, 13th International Conference on Modern Problems of Radio Engineering, Telecommunications and Computer Science (TCSET), pp. 831 - 834.