Video Conferencing as an Engineering Education System

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Abstract
This paper presents VICES project that will be implemented under the framework of the European TEMPUS programme. The project will establish video conferencing infrastructure as a support of the educational process in higher education in R. Macedonia. It will introduce the usage of novel ICT technologies in engineering education, making the studies more attractive for the students.

Keywords: Video conferencing educational support systems, educational reform, engineering education attractivness.

1. INTRODUCTION

Novel educational practices stimulated by the new information and telecommunication technologies enable almost instant access to latest educational materials. That environment triggers the need for new approaches in providing educational services to the student in order to attract them to engineering curricula.

Within the education process students are usually familiar with the use of different technologies and devices for their studies and research. This fact opens the possibility for creating an education environment, and high end internet based services to implement features and techniques which cannot be implemented in the traditional classroom. Technology itself is not inherently good or bad for educational process support. It's the way it is used that matters [1]. As an example, Blignault shows how multipoint videoconferencing has proven a useful and effective means of bringing healthcare workers together for a common purpose, supplementing face-to-face events and other encounters mediated by communications technology [2].

Video conferencing enabled learning is a new way of acquiring knowledge, which is highly adaptable [3] to different kinds of student profiles, from people that do not have time to attend normal courses to a practical enhancement of ordinary courses with additional access to the knowledge. Exchange of knowledge and consultation process among students and available expert authority (professor/instructor) [4], are very important aspects of learning, in addition to the static contents that are provided in books and different digital multimedia.

The goal of the usage of technology as a support to learning process is to make information instantly available to users. In order a learning process to be effective, a communication and exchange of the knowledge is required. Video conferencing based learning can provide the needed interaction. So it is a logical step to create learning tools that utilize the benefits of the video conferencing technology.

Distance Education System are commonly used to increase effectiveness of educational process by offering solutions that address some of the shortcomings of the traditional classroom.

Colleges and universities are implementing various kinds of Distance Educational Systems. Distance Education System's primary role is to enable and enhance educational process [6]. Learning takes place in a wide range of settings, across the whole life span, and with a variety of aims. Learning is a social process involving the active construction of new knowledge and understanding through individual learning and group and peer interaction. Clear communication and effective communication tools are necessary prerequisites for effective collaborative learning.

Collaborative learning is a term drawn from educational psychology to describe guided support that helps students mindfully engaged in unfamiliar new work [6]. Mindful engagement, in the context of Learning Environment, means actively participating in learning by finding out about the new concepts by asking within certain learning community. In this way students are encouraged to have engagement in the learning process by helping or asking other students (or instructor) to identify important learning concepts. Clear communication and effective communication tools are necessary prerequisites for effective collaborative learning.

Educational process needs various educational materials organized in way that enables autonomous learning process [7]. It is a very appropriate way of sharing educational resources. Classes can share an instructor using multimedia conferencing applications.

The main purpose of this paper is to present the three-year TEMPUS ViCES (Video Conferencing Educational Services) Project that was launched and financed by the European Commission in the frame of the TEMPUS IV Programme.

The second section of this paper describes the basic video conferencing features that should be considered when deploying video conferencing systems as educational support systems. The third section of the paper explains the VICES project background. The fourth section presents the project particulars and potentiality, while the fifth section concludes this paper.

2. VIDEO CONFERENCING FEATURES

When the role of a technology within learning is assessed, there are two separate criteria to consider, those of effectiveness and efficiency. Effectiveness refers to the opportunity that technology offers to improve what is obtainable with traditional methods. Video conferencing is particularly aimed at supporting dialogue as a form of interaction. Efficiency refers to the opportunity that technology offers to improve the access to educational materials. Video conferencing service, used in combination with other educational services significantly eases this access by lowering the cost of original production of educational material and increasing the possibility to update educational materials more frequently.

Video conferencing involves two-way video, audio and data communication between two or more parties over a remote connection. Video conferencing is done over a variety of media, the most popular of which uses Internet Protocol (IP) technology. The cost of video conferencing over IP is getting so low that it has become the most popular means of video conferencing.

Streaming technology is considered to be a very important internet based network technology that enables the deployment of video conferencing services. Streaming technology covers one way transmission of audio, video and possibly other content to an end user. When speaking about videoconference, archiving and subsequent methods of retrieval of archive content must be specified. Real-time streaming of videoconferences is of great importance as a videoconference service. Streaming data delivery can be implemented both with uni-cast or multicast transportation. However, multicast technology needs additional technical expertise from network operators, and in addition inter - domain multicast traffic exchange is rarely implemented among service providers. Thus, it is advisable to enable both uni-cast and multi-cast transportation at media servers.

The components of the learning environment that promote the usage of video conferencing service can be itemized as follow: educational methodology used in the learning process, mapping of video conferencing technology onto the educational methodology, and institutional factors influencing the educational process.

In order to make video conferencing to function effectively, the instruction and course content must be interactive, and the instructor must exhibit flexibility and creativity when teaching the class.

Video conferencing enhanced distance learning increases educational opportunities offered by any institutions. It reduces the costs of teaching and learning, while allowing students to have more access to a variety of degree programmes. The management of video conferencing based education is dependent on the geographical distance of the participants and the number of separate sites involved in the interaction. The more groups are involved, the more complex the interaction and the technological and managerial problems will grow.

In order to make video conferencing educational services function effectively, efforts should be made to adapt the delivery system to best motivate and meet the needs of the students.

3. VICES BACKGROUND

The VICES project, carried out by the University of Florence and the Ss Cyril and Methodius University in Skopje, together with all consortium members (three partner universities of the European Union and different Universities in Albania (AL), Republic of Macedonia (MK) and Serbia (RS)), will introduce a new approach towards the treatment of Information Communication Technologies at University level.

At this time, there are three state Universities in R. Macedonia: “Ss Cyril and Methodius” in Skopje, “St Kliment Ohridski” in Bitola and “State University of Tetovo” in Tetovo. There are also several private Universities, but only three have more than 1000 students: the biggest one is the South Eastern University in Tetovo (SEU), but there are also European University and FON University, both from Skopje. Four out of six Universities have compatible video conferencing equipment, but they lack the organized approach of their usage and the telecommunication infrastructure that will enable relatively high bandwidth of IP traffic needed for video conferencing service.

Macedonian Academic and Research Network (MARNET) is providing optical infrastructure to all the members of the “Ss Cyril and Methodius” University in several location in Skopje. MARNET will soon establish 1 Gbps connection with other South European Countries. There are functional connections with “St Kliment Ohridski” University in Bitola, and “Goce Delcev” University in Stip.

There is evident need for offering educational services that will use the existing IP infrastructure in order to provide such services to wider audience (which is national interest) and help the ongoing MARNET institutional reform by providing means for organizational and financial self sustainability (which is institutional interest). The service with most potential seems to be high end video conferencing system. Such service can: ease staff mobility in the case of Universities spread on more dispersive locations, ease local student mobility within ECTS on regional level, and encourage inter University cooperation on national and international level. The last is becoming especially important when there are international curricula that can offer joint or double degrees between Universities in R. Macedonia and Universities in EU because this kind of video conferencing service can ease the quality monitoring process.

The video conferencing service infrastructure establishment has to be accompanied with the organizational and procedural infrastructure as well. There is an evident need for determining formal and legal procedures that will define the terms of use of such service on regional level. The change of the educational didactical approach is also needed.

The neighbouring academic and research networks of Albania and Serbia have also shown interest for this service. The wider dissemination of the project results can be achieved by building or participating to the networks that offer similar services from educational or technological point of view.

Similar services have already been established in EU countries. The Hungarian academic network trough the NIIF Institute has special organization unit for offering video conferencing services for the needs of higher education in Hungary. Catholic University of Leuven has extensive videoconferencing facilities in many separate sites enabling management and facilitation of complex educational services.

4. VICES PROJECT PARTICULARS

The VICES project will provide one centered Video conference management system and 7 video conference classrooms in R. Macedonia, as well as two video conferencing classrooms in Albania and Serbia. The general scheme of the VICES video conferencing infrastructure is given on Figure 1.

The Video Conference management center will be facilitated by the MARNET, due to the management of the academic network infrastructure. This equipment will consist of three parts: management software, recording and streaming server and multipoint conference unit. Management software will be able to utilize and optimize the network traffic generated by the video conferencing sessions. Recording and streaming server will provide recording capabilities for any video conferencing sessions, thus enabling their later streaming to any web enabled client. It has to be stated, that in this case, the students will not be able to interact with the instructors. Multipoint conference unit should enable parallel and multi cat session among different video conferencing classrooms. In this way students from different Universities will be able to attend different lectures on the same or similar subject. Students will be able to compare different lecturing styles and educational materials as well, and in that why be encouraged to exchange their ideas and educational findings with wider student community that share similar interest. The four classrooms in Skopje will be provided since the majority of the students at this moment are attending the Universities located in Skopje.

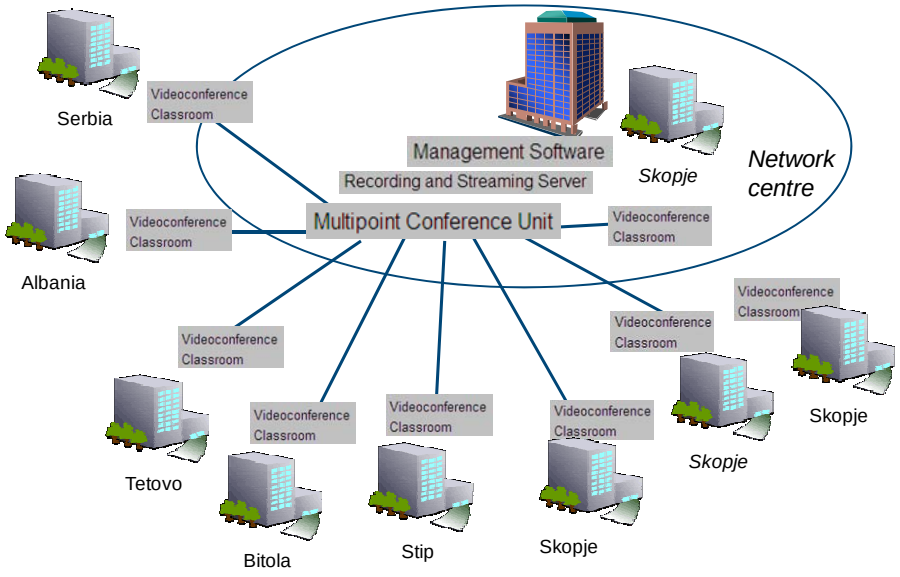
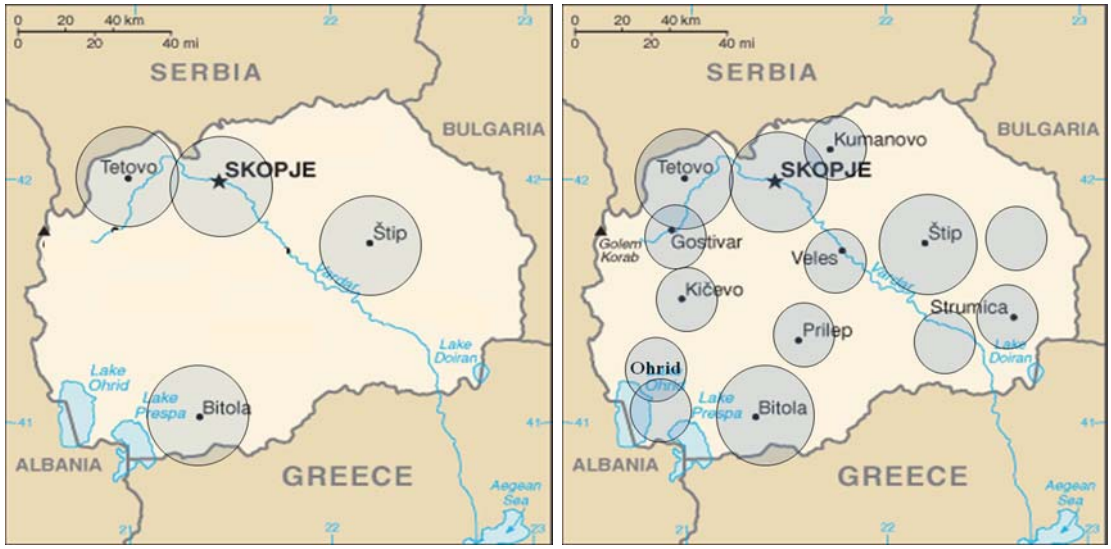


FIGURE 1. The VICES video conferencing infrastructure

Figure 2a presents the initial geographical placement of the video conferencing classrooms within R. Macedonia covered by the VICES project, while Figure 2b presents the potential video conferencing classrooms. The potential classrooms locations are determinated according the locations where the Universities that participate in the project have dispersive centers. As it can be seen from this figure, if the project proves to be sustainable, it can cover the majority of the towns with significant population in R. Macedonia, providing equal access to all students to the higher education facilities.



(a) (b)

FIGURE 2. (a) Initial and (b) potential placement of video conferencing classrooms

The general purposes of the project are to increase the student and academic staff mobility and to enable a higher level of harmonization of different curricula among partner institutions. Since the video conferencing infrastructure can be used to connect to the higher education institutions from other countries, it will influence the harmonization of the curriculum at international level.

The Project also promote an increased usage of new ICT technologies within the educational process, making it more efficient in the same time.

The target group of the projects are students and faculty staff. The first ones should accept the usage of video conferencing technologies in the campus; while the second ones should adopt the way they interact with their students and probably change their teaching style. Direct beneficiaries of the project will be the students. Students that have chosen curriculum demanding mobility with institutions participating in the video conference service portal system will always deal with the similar interfaces and procedures, regardless of their location, thus being able to concentrate on learning rather than administrative issues.

The VICES will be evaluated by students at their last year of undergraduate studies in Information Technologies. These students have prior knowledge of using information and communication technologies in their education. The students will be asked whether the video conferencing is useful for their studies. The questionnaire given to the students will include three types of questions regarding: student experience in using video conferencing technologies in education, multimodal accessibility of the educational content, and Quality of Service of video conferencing.

This project will also influence the lifelong learning process in the Republic of Macedonia. People need lifelong education opportunities to ensure that they will remain competitive in the workplace. The employees are supposed to get the needed technical skills and to be able to access online technologies for advanced training. Most of the employees that are supposed to use those technologies, and are ready to adapt to the new ones, have some kind of University based training.

The establishment of video conferencing infrastructure and corresponding educational methodology will be the basis for further development of an efficient lifelong learning universities' educational system. Both outcomes are measurable by quantity of the implemented video conferencing sessions and the number of students and academic staff that participate in them.

5. CONCLUSIONS

Video Conferencing enhanced distance learning increases educational opportunities offered by any institution. It reduces the costs of teaching and learning, while allowing students to have more access to a variety of degree programmes. We expect that VICES will provide an environment that supports and increase student and academic mobility as well as provide infrastructure that will ease the process of harmonization of different curricula among educational institutions.

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