

## THE IMPACT OF INTRODUCING e-LEARNING SYSTEM IN THE TEACHING PROCESS AT THE FACULTY OF TRAFFIC AND TRANSPORT SCIENCES

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*Abstract: The development of technology has brought to additional improvement in the quality of education by using the e-learning technology. Following the advanced trends of improving the teaching processes the Faculty of Traffic and Transport Sciences started several years ago the development of own e-Learning system modules. The paper presents the phases of the system realization. Special attention has been paid to the analysis of time-independent learning by the students and the work of the teaching staff members using the system. The obtained results indicate an increase in the number of users and their satisfaction in using the system thus saving time and allowing easier and more efficient access to information.*

*Keywords: Internet, web, study, e-Learning*

### 1. INTRODUCTION

Continuous development of information and communication technologies represents the necessary assumption for the realization of project called *e-Learning*, along with the reduction in prices, both of the necessary equipment and of the price for accessing the Internet. Good will, knowledge and volunteer work of a group of students under the mentorship of the head of the pilot project have brought about the start of the project regarding the development of the e-Learning system at the Faculty of Traffic and Transport Sciences through several phases. The entire system consists of several modules that have been designed and implemented into the study system of the Faculty of Traffic and Transport Sciences over the last three years. Generally, the own developed systems consist of the following modules: system for content management (*Content Management System – CMS*), system for managing processes and documents (*Document Management System – DMS*), and system for relationships with students (*Customer Relationship Management – CRM*).

### 2. DEVELOPMENT AND IMPLEMENTATION PHASES

The first and basic phase of introducing the e-Learning system at the Faculty of Traffic and Transport Sciences was the development and implementation of the system of control and authorization (*Sustav autorizacije i nadzora - SAN*) for the control and authorization of the users of PCs in computer classrooms of the faculty. This created the foundation for further development and implementation of the e-Learning system.

The second phase of development and implementation of the e-Learning system saw the design and development of the web system called *e-Student* which allows students to send either from their own or a public PC seminar papers, seminar assignments and to solve entire ranges of pre-tests called *e-Test*, *e-Blic* etc. During this phase a control system of the e-Student system was created and implemented, called *DMSFpz*, which allows the teaching staff to quickly and simply check and mark the topics for seminar papers, seminar assignments, various

tests and to organize, control and carry out practical drills in the faculty computer classrooms. Moreover, this facilitates the publication of the teaching materials, thus making these more available to students.

The current phase of the development and expansion of the functionality of the e-Learning system is directed to the increase of the care for the users i.e. students, such as the development of the CRM system based on the short textual message services (*Short Message Service*, abbreviated *SMS*) and applications for mobile devices. The CRM system is based on the *SMSCentar* application which is used to send and receive SMS messages by means of mobile phones, *smsCRM* application which is used for handling students based on the SMS messages and *FPZmobile* application developed for mobile terminal devices.

All the systems are based on communication by means of the SQL database, thus having achieved modularity, i.e. efficient upgrade and modification of the system, which makes it possible to adapt the system for operating at other institutions.

### 3. E-LEARNING SYSTEM INFORMATION AND COMMUNICATION INFRASTRUCTURE

For the design, development and implementation of the e-Learning system the following information technologies have been used:

- operation systems: Microsoft Windows 2000, 2003 and XP,
- database: Microsoft SQL Server 2000.

For the development of *desktop* applications, the following software tools have been used:

- Microsoft Visual Basic, version 6,
- Borland Delphi, version 7.

For the development of *web* applications the following technologies and applications have been used:

- IIS (Internet Information Services), version 6,
- ASP (Active Server Pages),
- VBScript and JavaScript,
- Macromedia Dreamweaver, version 8,
- Adobe Photoshop, version 8.

All *desktop* applications have been developed for working on the Microsoft Windows platform and therefore IBM PC compatible computers are used to work with them.

The communication infrastructure is based on the CARNet access network and on the intranet (local) network. The Faculty of Traffic and Transport Sciences has its own official premises and lecture-rooms at several locations throughout the city of Zagreb which are interconnected by the CARNet network or by the leased T-Com operator cable.

### 4. EFFECTS OF INTRODUCING E-LEARNING SYSTEM AT THE FACULTY OF TRAFFIC AND TRANSPORT SCIENCES

E-Learning system was experimentally introduced two years ago in the subject of Information Systems in Postal and

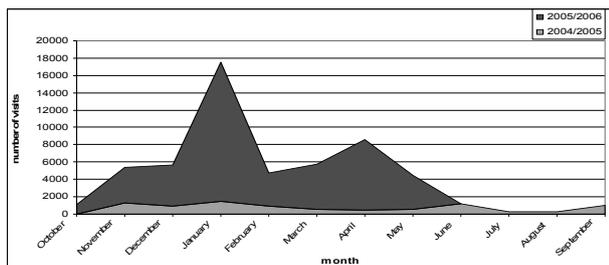
Telecommunication Traffic, when the system was used by approximately some 120 students and one teacher for practical drills and the work on and receiving of seminar papers. Today, the system is used in 29 subjects, by about 3400 students who have accessed the e-Learning system about 57000 times. The system is used by a total of 127 employees of the Faculty of Traffic and Transport Sciences, whereas it has been administrated by 25 teachers who have accessed the system in a total of approximately 5500 times.

The analysis of the system operation has considered the data for the academic years 2004/2005, in the time period from 1 October 2004 to 1 October 2005 and 2005/2006 in the period from 1 October 2005 until 15 April 2006. The statistical data for the academic year 2005/2006 need to be considered only as frame data since these are not complete, i.e. the academic year has not been completed yet. With the analysis of the current trend according to forecasts, a significant increase in the usage rate of the system is expected. However, even these data are sufficient proof of the usage rate and popularity of the e-Learning system at the Faculty of Traffic and Transport Sciences.

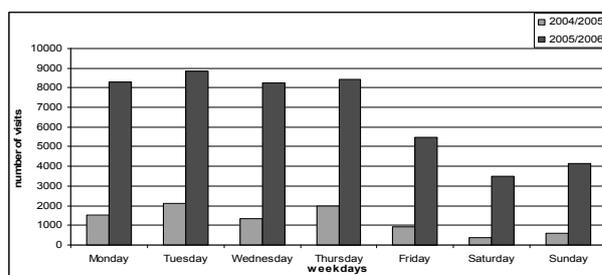
The introduction of the *Bologna System* in the study at the Faculty of Traffic and Transport Sciences has resulted in additional growth of the number of users and the number of visits to the e-Learning system. While in the academic year 2004/2005 a total of 8843 accesses to the e-Learning system were achieved, only in January 2006 there were 16052 accesses (presented in Graph 1) out of a total of 47002 accesses in the academic year 2005/2006 until 15 April 2006.

The analysis of statistical data about the students' papers in the academic year 2004/2005 shows that there was a total of 438 topics submitted for seminar papers, and a total of 378 seminar papers were sent, whereas the teaching staff members published 43 files of teaching materials. The academic year 2005/2006 marks 2200 submitted topics for seminar papers, 1210 sent seminar papers and 753 solved seminar assignments. The number of published *OnLine* pre-tests (e-Test) amounted to 9 whereas a total of 3860 questions were answered. The teaching staff members have published a total of 596 files of teaching materials.

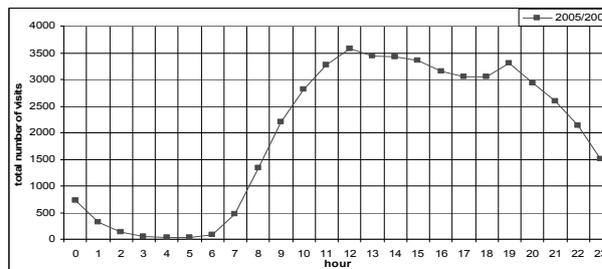
Since the system has been designed so as to "break through" the time and space accessibility barriers, thus allowing the students and professors to work even outside the "working hours", special analysis was done on the accesses to the system during the non-working days and hours. Graph 2 shows the number of accesses of students to the e-Learning system of the Faculty of Traffic and Transport Sciences per days in a week. It may be observed that the system was accessed many times on Saturday and Sunday, or more concretely, out of 47000 visits, as many as 7647 visits, which is 16 percent, were realized on Saturday and Sunday. Graph 3 shows the number of visits per hours in a day, and it may be observed that during the faculty non-working hours, i.e. from 8 p.m. to 8 a.m. there was a total of 11008 visits, i.e. 23 percent of the total number of visits to the e-Learning system. It should be noted that there were as many as 1834 visits in the period from midnight to 8 a.m.



Graph 1: Access rate to e-Learning server per months during the observed academic year



Graph 2: Access rate to e-Learning server during the day in the week of the observed academic year



Graph 3: Access rate to e-Learning server during the day in the observed academic year

## 5. CONCLUSION

The application rate of the own developed e-Learning system implemented at the Faculty of Traffic and Transport Sciences is constantly growing over time. Every month new syllabuses are added thus increasing also the number of accesses to the system, number of students who use the system and the total volume of data that are transferred on the faculty network. The volume of teaching materials is also increasing. The growth of the system has resulted in relocation and replacement of the server. The relocation and the purchase of a new, *more powerful*, server have solved the drawbacks of the limited data transfer speeds.

The presented analysis of data about the operation of the e-Learning system shows that the system has justified its introduction, improved the quality of studying, especially of the teaching process (through easier access to the teaching materials, on-line knowledge testing, and submission of seminar papers as well as numerous other functions) according to the operation model 24/7/365, i.e. non-stop. Continuous monitoring of the work, carrying out surveys among users and analyses of their requirements, will provide the necessary further improvements, upgrades and modifications of the current system.

## 6. LITERATURE

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