

A Model of a Virtual University – some problems during its development

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Abstract: *A short analysis and classification of models of a virtual university today are made in the paper. A generalization of some problems occurring in the process of the virtual university development is given. A modular approach for creating a virtual university is proposed and the pilot project Rousse Virtual University is presented. Conclusions are made for possible perspectives and for future project development.*

Key words: *E-learning, Virtual University, Virtual Environments*

INTRODUCTION

In the recent years we have seen exponential growth of Internet-based learning. The transition to online technologies in education provides the opportunities to use new learning methodology and more effective methods of teaching. The major perspectives of using e-learning can be generalized as follows: an opportunity for overcoming the limitations of traditional learning, such as large distance, time, budget or busy program; equal opportunities for getting education no matter where you live, how old you are, what your health and social status is; better quality and a variety of lecture materials; new consortia of educational institutions, where a lot of specialists work in collaboration, use shared resources and the students get freedom to receive knowledge, skills and experience from other universities [1].

In the conditions of a rapid introduction of information and communication technologies, a natural necessity arises for reorganization in education and creation of new educational institutions. The idea of the Virtual University (VU) gets more and more popular in many countries. Some of the famous VUs are: UK Open University, Fern University – Germany, Finland University Online etc.

The universities in Bulgaria bring new instruments of information society in the education process step by step. There are some projects for different aspects of development and use of VUs [3, 4, 5]. In particular, about the united efforts of departments of computing in Bulgaria and in Europe for creating Virtual European Department in Computing can be mentioned.

The experience shows that the research in the field of virtual learning technologies is not summarized and there is no common strategy and approach for VU model development.

LAYOUT

Most VUs focus mainly on offering internet-based educational courses. They consider VU as a virtual environment for development, editing and reading learning materials. According to [5], these are systems for virtual education first generation, which are characterized by web interface for the learner, Data Base (DB) with learning materials, test system, discussion forum, e-mail system and so. In accordance with the same characteristics, second generation systems for virtual education have an administrative system of intergraded DB and a platform for e-learning with structured educational process.

The system “Virtual University” is third generation. A VU has no physical building. It is a model of a real university in the virtual space and offers all its services to the learners in an integrated way through Internet, so it becomes a complete system. These services include online learning materials – different types, specialized virtual centers for development educational courses, library and administrative functions, interactive environment for asynchronous and synchronous communications and online collaboration (work in groups, seminars, forums, practical exercises, video and audio conferences) [1].

There exist different types of VUs and they can be classified by the following criteria:

1. According to territorial span

- *global VUs* – such as international Virtual Universities;
- *national VUs*;
- *regional VUs*;
- *VU – portal toward other VUs*.

2. According to pedagogical and administrative methods

- *VUs focusing on quality in learning*;
- *VUs established with commercial goals*;
- *combined* – virtual and traditional university (one VU for one real university);
- *virtual campuses* (Howard Community College [12] offers virtual visitation of 15 buildings using VRML technology).

3. According to the target group

- *broad-span (universal)*;
- *professional VUs* (military и др.);
- *VUs for corporations* (Price Waterhouse Virtual University [13], established for the educational needs of one company).

4. According to the number of programs and courses

- small (up to 20 courses);
- medium (from 20 to 2000 courses);
- large (over 2000 courses).

Examples of good practice

A large percentage of VUs are global, national or regional. They usually consist of several universities, which are included as partners in a common consortium. These universities are presented in the Internet in a general portal site, which informs students about the wide range of educational courses, various library resources, a lot of specialists in different fields and etc. The project “European Virtual University” [11] is based on regional and transnational collaboration between five European university networks, which are very active in the field of distance and online learning: EUROPACE, EUNITE, ECIU, COIMBRA group and EUA. Such examples can be given for other international leaders in virtual educational technologies: Canadian Virtual University (portal for 13 Canadian universities, offers 250 online programs and over 2000 courses [9]), UK Open University (one of the oldest virtual universities, which teaches over 200 000 students [17]), African Virtual University (established in 1997, teaching students from 17 Africans countries [7]), California Virtual Campus (offers a list of 3,800 online courses and 45 accredited institutions in California [8]) and others.

The public interest about the large variety of new technologies in education is somewhat reserved because of the problem with the quality of learning. A prestigious university, such as the University of Illinois is, for example, invests in his project “Virtual University” over 5 millions USD to develop more effective online educational courses [15]. It focuses mainly on the quality of its learning materials, instead of reducing its expenses. Unfortunately, many examples of recently opened “virtual universities” exist, whose educational approach is education from a distance or “learning by correspondence”. These universities use Internet as a place where they can publish learning materials, rather than as educational environment. Such methods can extend the number of students and incomes for the institutions, but this happens at the expense of effective educational approach. Hence, the requirement for quality in education is the key for a competitive virtual university model.

Most VUs are oriented mainly to the needs of the learners. They follow the interests of the clients for which they have been deigned. University of Phoenix Online [16] has a great success as the leader in virtual education, because of its idea to give more opportunities for learning to the working people. The courses of additional professional

preparation are consistent with the learner's needs, which are as follows: without deadline for reception, they are organized in a more convenient time and place without the need for traveling, the course duration is consistent with their overburdened program. In addition, the project "eArmyU", in which development 500 million USD have been invested, can serve as such an example. Due to the virtual technologies, the young people who have chosen to serve in the US Army can be "soldiers in the day, online students in the night"[10].

The combined VU model is one of the most widely spread models. These VUs appear when the traditional institution invests in a definite number of e-learning courses, for which there are prepared materials and e-learning can be implemented. Some of the humanities, such as the medical or most of the technical ones, have a lot of practical exercises, where the students need practice in real situations. In these cases lectures are published in the virtual space and part of the practice exercises are in real laboratories. The combined VU model is expected to become more and more widespread, because of the necessity of traditional universities to find a way to respond to the growing need of education for this part of inhabitants, who for any reasons did not have a chance to learn by traditional methods.

On the basis of analysis done for existing VU models the following main unresolved problems of organizational and technical substances are formulated:

- **Accreditation** – the problem for accredited VUs and their academic admission is a essential moment in the process of VU development. For example, in USA there exists Accreditation Governing Commission, whose main task is the admission of new virtual institutions [6].

- **Copyright Issues** – VUs, which are made of multitude partners encounter difficulties in defining the rights of learning materials, which are offered. Preliminarily agreements and contracts must solve these problems in a straightforward manner.

- **Quality Assurance in learning** – there is a need of a system for evaluating the quality of: the educational environment and resources, the curriculum, learning materials, methods, pedagogical and didactic approaches. One of the methods, which are used, is statistical data recording for: student development, their marks and results.

- **Systematic education and consultations** – academic staff, students and all other participants in the virtual learning need systematic education and consultations. The investments in such introductory courses are unfortunately rare in the existing VUs.

- **Mechanisms for student examination and evaluation** – The test system is the most used form of exam in the virtual education. There are quite a few universities, which invest in more rapid communication technologies and provide audio and video conferences in real time for their students (e.g., Sony Space Collaboration System [14]). The main problem here is provision of adequate and objective control.

- **Price** – Three main strategies to reduce the higher price for the assertion of virtual educational structures are used: existing technologies are used (hardware, networks); communal expenses are reduced (current, central heating, water, taxes, rent, lighting); a joint use of a physical (material) and human resources is quite common.

- **Communications** – The simplest discussion mechanism is e-mail. For educational purposes this kind of communication is insufficient and other more effective ways for connection between teacher and students are searched for, such as: online chat, scheduling, audio and video conference, news servers etc.

- **Administration** – The management of registration and administrative data bases may be a serious problem for big virtual structures.

- **Language** – The interface of VU has to suggest possibility for the learner to choose the language for his learning. The most common models of VUs are adapted mainly to English-speaking people.

- **Common credit system** – The unified credit system and standards for evaluation of students are very important for their virtual mobility and freedom in choosing VU. The credit system used by real universities must be adopted by VU after standartizing.

- **Content of learning materials** – A great part of the teaching staff have difficulties during the process of internet base learning materials creation. A disadvantage of many VU models is the absence of a system for automated creation of learning materials and some mechanisms for converting standard text into HTML format. The organization of learning content is another essential problem.

- **Virtual laboratories** – The publication of information in software platforms and the addition of different discussion mechanisms is a good decision for virtual learning. More modern approaches include development of virtual environments (virtual laboratories) with the use of VRML technologies. These are interactive virtual simulations, where the students can practice some skills.

- **Hardware and software requirements** – The learning in the VU is related to different user's investments for their personal computer systems. Usually this becomes a problem for the learners, especially in the cases when VU requirements to the software and hardware are high.

On the basis of the summary made, a model VU structure is proposed, which allows the solution of the above-mentioned problems, to a great extent.

Structure of VU

The structure of VU will be presented by physical and logical models.

Physical VU model

First of all, the tools for creating and implementing a VU should be chosen very carefully, because it is often difficult to make changes after the implementation, due to the huge investments in programming. There exist, however, programming solutions, which are distributed freely on the net, do not require big investments and possess good functional capacities. These are the so called "Open Source" software products. The VU model presented is designed with free software, such as: PHP programming language and Data Base MySQL Server. On fig.1 a physical VU model is presented by using multi-layered architecture.

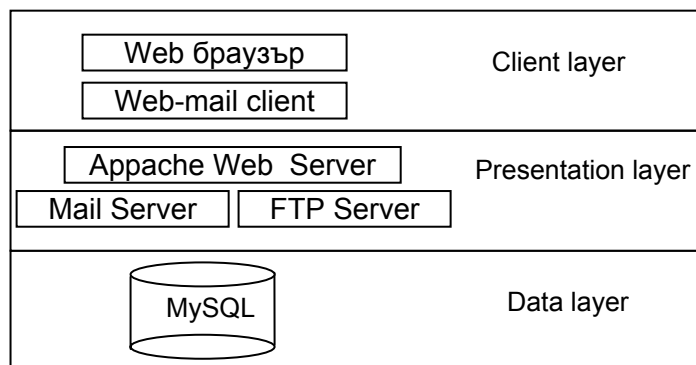


fig.1. Physical VU model

Logical VU model

The modular approach for design is one of the most widespread standards for classic administrative hierarchy structure. The system is designed from separate functional parts, which form the whole construction. This approach is closer to the requirements for a VU i.e.: to be functionally completed and at the same time, to allow for innovation and expansion. The proposed VU structure includes six modules: Informative, Communicative, Administrative, Learning administration Module, Student Module and Teacher Module (fig. 2).

It is considered that one VU isn't satisfying the modern requirements if it does not allow adjustment of the design and functional properties according to the needs of the users. At this stage the VU has several types of users: visitors, administrators, students,

teachers and technical staff. Each of the users types receive personalizes profile and adjust interface for work by the profile management system after his registration in the VU. The VU is developed in two languages – Bulgarian and English. The navigation is simple and consistent with the most used services by the users.

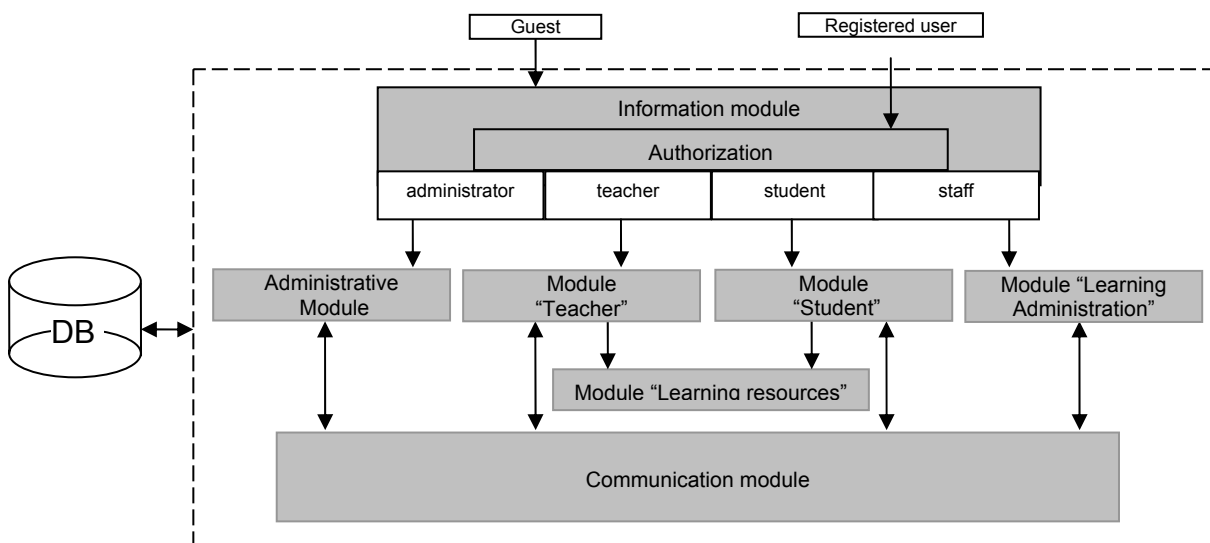


fig.2. Logical VU model

Each of the modules has a definite number of functions and tasks.

The Information Module provides:

- General information about the university;
- Information of scientific and professional specialties, bachelor and master degree programmes, for which there exist educational degrees;
- News and coming events;
- Help information;
- Information about the teacher staff, personal data and contact information;
- Admission requirements (tuition fees, exams, duration of learning).

Learning Resources Module: Concerning the teachers, this module can be a virtual center for creating and developing educational courses for subjects, and concerning the students, it is a virtual library with learning materials. E-Learning Software Platform ELSE [2] is developed to serve the needs of such a module and according to the recommendations of the Directorate-General for Education and Culture of the European Commission it gives an opportunity for publishing, adding and editing materials, including: abstract, syllabus, literature, lectures, exercises, tests, tasks, timetable, conspectus, discussion forum. This module includes a test system and statistics.

Communication Module: The module provides synchronous and asynchronous communication between: teacher and students; teacher and a group of students; administration and students; administration and teachers; between students. At this stage, the following opportunities for communication are offered: calendar; online chat; news; forums for every subject; message system. Requests for creating new specialties or new subjects are included in the module "Communication": requests from the teacher to the system administrator and requests "Learning administration - system administrator". As a perspective for future development of this module a video and audio real time conference connection for exams is going to be provided. Due to this module educational communication like the one in a physical university is maintained.

Student Module: After registering in a VU portal and paying the tuition fee using a virtual payment system every student receives access to the Student Module, which is personalized for his needs. Some services are provided for him: choice for curriculum according to the credit system adopted; personal virtual space for notes and work files;

data base for the history of his learning (the last lecture, exercise visited); statistics with results about his marks; editing data in his personal profile; direct access to modules "Communication" and "Learning materials", a search system in the data base of the university and in the Internet.

Teacher Module: The teachers are registered by a system administrator, who adjusts their personal profiles for normal work with the learners and subjects. The services, which are offered to the teachers in this module are: data base with full statistics about the results of the students and their activity in his subjects included in the module "Learning resources"; opportunities for sending requests for new subjects toward the system administrator; personalized interface for direct connection with his students. More specifically, the communication between teacher and students include: Calendar System (announcement of date and hour for online consultation, exams etc.), Schedule System (publishing some news about coming events on the news server), online chat for consultation, messaging, etc.

Learning Administration Module: This module has been borrowed from the well-planned administrative organization of traditional universities. Its functions are: blocking and activating student accounts; student profile support; transcripts of exam grades and continuous testing; students' admission; granting diplomas and issuing certificates to the students; keeping documentation about the specialties; answering students' questions; maintaining the system for virtual fee and services payment.

Administrative module: The Administrative module is every system's kernel. The VU is a complex system, whose programming code and potentials have to be updated and rewritten regularly. This module provides a possibility for team work of many administrators, who have the following functions: system administration, synchronization between the modules, requests confirmation, users' registration, data base archives monitoring the security and ethics in the VU. Further, in the Administrative module the regular functioning of all the modules is controlled. Organizationally, this is the most complex module, technically it is the most essential one for the existence of the system.

For every module "Help Center" is designed to answer the user's need of consultations and education in the specific of virtual educational environment.

All modules listed above build the VU model functioning in full synchronization through complex interrelations in the Data Base. Portal sites of two pilot projects (Rousse Virtual University (RVU) and Bulgarian Virtual University (BVU)) are presented on fig.3 and fig.4.



Fig. 3. RVU



Fig.4. BVU

CONCLUSIONS AND FUTURE WORK

The Vu model proposed has been designed to answer the needs of the Bulgarian higher education and the national and global requirements for new type of education. It combines the features of:

- Combined model (traditional university and VU). The communications and the processes in the VU are similar to these in the traditional university. The module "Learning Resources", known as E-learning Shell, has been for used almost a year in universities in the country and abroad with a great success;

- National model: The model proposed has been designed irrespective of the type of educational institution and can be adapted to the needs of all university in Bulgaria. The information module, for example, can be modified as common information portal for all the partners of one future Bulgarian Virtual University.

- Corporative module: for the educational needs of every corporation. The functionality of the VU can be adjusted according to the specific wok in the corporation. The learning begins at once, continuing as long as the user needs it and is conducted at times convenient for the employees. The learning methods are not connected with group work, hence the requirements for forming groups in advance does not exist.

REFERENCES

[1] Тодоров, Г, Г. Георгиева, А. Смрикарров. Влияние на информационните и комуникационните технологии върху развитието на висшите училища., Сб. н. тр. научна конф. РУ, Русе, 2002.

[2] Hristov, T., S. Smrikarova, A. Vasileva, A. Smrikarov. *An Approach to Development of an e-Learning Software Platform*. Proceedings of the CompSysTech'2002, Sofia, 2002.

[3] Kossekova, G., Course Generator – On-Line Web-Based System with Dynamic Database for Problem-Solving Oriented Distance Learning in Biochemistry, Proceedings of the CompSysTech'2002, Sofia, 20-21 June 2002.

[4] Nikolov, R., Nikolova I., A Virtual Environment for Distance Education and Training, IFIP WG3.6 Conference, Vienna, 1996

[5] Totkov G., E. Somova, A MULTIPURPOSE ENVIRONMENT OF TYPE "VIRTUAL UNIVERSITY, Information and communications technologies in programming", Sofia 2001

[6] Accreditation Governing Commission-USA - <http://www.agc-usa.org/index.html>

[7] African Virtual University – <http://www.avu.org/>

[8] California Virtual Campus - <http://www.california.edu/>

[9] Canadian Virtual University – <http://www.cvu-uvc.ca/english.html>

[10] eArmyU Website - <http://www.earmyu.com/>

[11] European Virtual University – <http://www.cevu.org/home.html>

[12] Howard Community College Website - <http://www.howardcc.edu/>

[13] Price Waterhouse Virtual University - <http://www.vu.pw.com/>

[14] SCS, The Space Collaboration System in Japan - <http://www.nime.ac.jp/SCS/>

[15] University of Illinois - <http://www.online.uillinois.edu/about.uionline.html>

[16] University of Phoenix Online - <http://www.uophx.edu/>

[17] UK Open University - <http://www.open.ac.uk/>

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