

# Introduction of Information Technologies in Educational Process of the National University of Uzbekistan

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ABSTRACT: *The results of a case study of the development of information technologies and their role in the higher education process at the National University of Uzbekistan (NUUz) has been presented. The study focuses on the practice and achievements of international projects in this sphere. A number of problems related to designing, building and maintaining an Uzbekistan Universities Network (UZUNINET/UZNANETU) and implementation of new teaching methods have been discussed.*

## 1 INTRODUCTION

A gap between the level of adoption of modern information technologies in the National University of Uzbekistan (and, to even more extent, in any other educational institution in Uzbekistan) and that of similar universities in the developed countries became a serious obstacle for the development of the whole educational process. It was especially obvious in such disciplines as engineering, computer science, theoretical and computational physics, applied mathematics, etc. A lag in the application of IT in libraries significantly degraded the quality of their services. Lack of opportunities for communication with the world, even in the simple form of e-mail and file exchange, inhibits collaboration between researchers of this country and their partners in the developed countries.

The National Program of Training Cadres and the Government Ordinance on development of information technologies and Internet address the most urgent tasks of development of science and education in Uzbekistan. The key role in this activity is to be played by the universities and other higher education institutions.

The lack of resources in the country in its transitional period did not allow quick significant changes. The necessity was to choose some directions as priorities and concentrate the existing resources in these directions. It was especially important to establish links with similar educational institutions in the developed countries in order to facilitate transition to the information and communication technology of the 21<sup>st</sup> century without the necessity of going through the technological evolution of the last 10 to 15 years. Acknowledging the importance of international collaborations, during the period since 1998 to present a number of international projects either have been completed or are currently in progress. The most important among them are:

1. TACIS-Tempus "UZBEKINFO" (creation of a Local Area Network in NUUz)
2. NATO Science Committee Network Infrastructure Grant - "UZUNINET" Project (creation of inter-university network)
3. Open Society Institute sponsored "Internet Public Access Site" and "Open Learning Computer Center" (free Internet access for students and faculty/staff, basic IT training)
4. TACIS-Tempus "UZNANETU" (advanced IT training for staff of the above mentioned projects, preparation of curricula, knowledge dissemination, content creation)
5. "Informix" educational grant (training on database technologies, educational software granted)

These projects created a base for the development of ICT in NUUz and dissemination of new technologies in education with the help of the universities network.

## **2 DEVELOPMENT OF INTERNET TECHNOLOGIES IN NUUZ**

One of the main problems for the Internet development lies in the geographical location of Uzbekistan. The geographical remoteness of existing high-speed and high-capacity Internet backbones makes the Internet service very expensive. Another significant negative factor was the lack of general knowledge and sufficient experience among computer users. In addition, Uzbekistan lacked a countrywide electronic infrastructure network that is necessary for the initial Internet development. For the Internet development it is essential to develop so-called horizontal connections that connect many separated networks with each other throughout the country. Uzbekistan's country wide and regional networks predominantly have vertical Internet connections that makes it difficult to cover the whole country by the unified network. Finally, there was no efficient legislative base for constructing both local and worldwide information networks [1].

Notwithstanding these problems, by the years 1999-2000 the first scientific and educational network of Uzbekistan – UZSCINET, <http://www.eng.uzsci.net> – was already operational and this fact allowed using its facilities for communication with the external world. Connection to UZSCINET gave advantages to not only Uzbekistan higher educational institutions to contact with the Western ones but also vice versa, where the Western audience had the opportunity to become familiar with the Oriental mentality. NUUZ received access to the Internet, and the educational and research network of Uzbekistan was enlarged by the campus network of NUUZ, the largest of its kind. This was an important development and NUUZ became the major participant of the growing educational network [2].

In order to provide students and faculty/staff with free Internet access, creation of an Internet Public Access Site (Open Learning and Information Center, OLIC) was proposed. This activity was supported by the Open Society Institute Assistance Foundation – Uzbekistan (OSIAF) through its Internet Program. Resources of the OLIC included a computer cluster with 52 modern workstations connected to the Internet, 3 auditoria equipped with computers and multimedia devices for classes and presentations to 100, 70, and 50 people respectively, and advanced network equipment to connect to the UZSCINET backbone [3].

While the capabilities of the OLIC enabled the provision of immediate Internet access for students the problem of computer and Internet illiteracy persisted. That is why, along with providing the Internet access, the second major objective was to introduce a short-term course on the basics of Internet usage. In this, valuable assistance was provided by the Internet Access and Training Program (IATP) funded by the Bureau of Educational and Cultural Affairs of the US Department of State (ECA). Trainers of OLIC had the opportunity to learn from the experience that IATP had in conducting such courses and had access to IATP curriculum and training materials. This facilitated the preparation of a NUUZ specific curriculum “Internet for Beginners” in a very short period of time and to begin further training at OLIC. During the first year of work of the OLIC more than 800 people went through this training, and by the end of 2002 this number grew to 1,400. The training was usually for 1 week, 20 hours long, with a new group starting every week.

Another field of activity was the research on hardware and software solution for connection of educational institutions' LANs to the educational network and Internet. The major issues were that most of the solutions in the market were expensive, did not give the necessary level of integration, and demanded that skilled personnel manage them. Another issue was the localization and multi-language support that was required. The decision was made to develop a comprehensive system that allowed educational institutions to connect their networks to the Internet in an easy and standard way while the system remains cost-efficient and affordable for them. The project, called “A Comprehensive Solution for Connection to the Internet” (CSI project), was based on inexpensive COTS hardware components and a combination of the freely available software and some special pieces of software, such as databases, web-tools, developed at the Open Learning Center. The solution includes PC-routers, an integrated server platform for file, web, e-mail, etc. services, and tools for managing users accounts and other resources. Special emphasis was made on simplicity, affordability, and availability of the solution, as it had to be used by other institutions throughout the country.

Development of UZSCINET, scientific and educational network of Uzbekistan, was focused mainly on creation and maintenance of the physical links and providing Internet access for the participating organizations. A major breakthrough in recent years was UZSCINET/UZUNINET and the participating

organizations' involvement in the NATO Science Committee Silk Highway Project (<http://www.nato.int/science/e/silk.htm>). This allowed improvement of the Internet link capacity to up to 4 Mbps via VSAT satellite terminal that connected UZSCINET to the European DANTE network. Another achievement was in establishing a local Cisco Network Academy.

However, the broadening range of tasks related to managing and maintaining the growing network infrastructure with a shortage of resources for other activities slowed down the progress of the UZSCINET as a full-featured National Research and Educational Network (NREN). Being a physical backbone for inter-university exchange, it does not address issues of the development of the ICT infrastructures of the participating organizations. The limitations of resources combined with a lack of skilled professionals, prevented universities, especially smaller ones or those with predominantly social-science oriented programs, from being the active members of the network and representing their own resources to the educational network community of Uzbekistan. Therefore, a complimentary initiative, focused on inter-university networking, was necessary. This initiative is being realized in the framework of two projects, UZUNINET and UZNANETU.

### **3 INTER-UNIVERSITY NETWORKING**

The first of the above mentioned projects, "Uzbekistan Universities Network – UZUNINET" is being developed under the aegis of NATO Science Committee from which a Networking Infrastructure Grant (NIG) was received in 2001. At the first stage of the project, all participating universities were connected to the common network. The core part of the network, Network Operation Center for the UZUNINET, is located in NUUz and run by NUUz specialists. The campus where the two largest universities, number of schools, lycea are situated it is a significant distance from central Tashkent with poor telecommunication possibilities. This stipulated an Ethernet solution for connection, which enabled fast connection and good throughput. It provides access to UZSCINET and to the Internet for all the participants. The Radio Ethernet (IEEE 802.11) was recognized as the most efficient network technology for this stage, because it is relatively inexpensive and could be deployed quickly, while providing reasonable throughput for basic services, whilst also avoiding complications caused by poor ground channels. Another advantage was that this technology was already familiar to the IT team and had good records. On the other hand, in the next stages of UZUNINET the most bandwidth-demanding links should be replaced by fiber optic channels. Those wireless access points could be easily set up in some less important areas or could be used as reserve links.

The Stage I of the project was successfully completed by mid - 2002. The main result was the creation of an inter-university network with its own operational center and communication channels. At this stage the network served mainly as Internet access for participating institutions, which was a significant breakthrough in itself. Students and faculty of the universities were provided with free Internet services that they did not have previously. Being connected to the UZSCINET backbone, UZUNINET became the largest independent segment of UZSCINET.

Although the first stage of the project produced quick and visible results, it created only the skeleton of the growing university network. There were the two main directions for future growth. First of all, ICT in participating universities should be improved up to the level that exists at NUUz. This would allow integration of campus networks of the largest universities to a common standard. Another direction for development of UZUNINET is in improving its' services. The UZUNINET Project, because of the nature of NATO SC Network Infrastructure Grant, does not address issues like creation of content of the network and making it more valuable for educational purposes through introduction of elements of distance education, educational management systems, electronic libraries. It focuses primarily on buying network and computer equipment. On the other hand, the ultimate goal of all the projects of NUUz in sphere of IT in higher education was not only establishing links between universities and connecting them to the Internet, but also in creating a true high-tech virtual learning environment that would dramatically improve the quality of the educational services and raise them to the level that universities in the developed countries have. That is why there was a necessity for additional projects that would address the above-mentioned problems.

A new TACIS-TEMPUS project called UZNANETU began in May 2002, which was also aimed at the creation of an Uzbek National Network of Universities but with the emphasis on University

Information Management. This made it a very valuable addition to the UZUNINET project. The participants are 8 Uzbekistan universities, with International partners being Fontys Hogescholen (the Netherlands) and University of Central Lancashire (UK). A noteworthy fact is that most of participating institutions are non-technical universities, with underdeveloped ICT infrastructure, and therefore are the most needy institutions for development. The incorporation of such universities in UZUNINET/UZNANETU network had a great impact on their IT development programs and allowed them to approach the standards of the higher level institutions, such as NUUz.

Some of the objectives to be attained by the network are the following:

- Integration of automated library systems of universities into a unified one;
- Organization the inter-university document exchange;
- Certification and evaluation of teaching materials used at the universities;
- Testing the network;
- Creation of a unified center for the teaching process management;
- Distribution of educational, methodological and other information to universities;
- Providing the centralized use of educational application software.

#### **4 INTRODUCTION OF THE ELEMENTS OF DISTANCE LEARNING INTO THE EDUCATIONAL PROCESS**

In 2000 the pilot project of the World Bank Institute called “Implementation of the Components of Distance Learning (DL) in the Higher Education” was started. The basis of this project was the software environment for preparation of on-line courses. Two university courses – “Macroeconomics” and “Microeconomics” are taught in the framework of this project, a number of tutors have been prepared, and more than ten courses are in preparation at NUUz.

Resources of the Open Learning and Information Center enabled the use of an existing multimedia library (collection of educational CD’s, eIFL-Direct Project that was presented by Open Society Institute Assistance Foundation – Uzbekistan) in the most efficient way, via networked storage device. This is the first step toward creation of an electronic library [4].

A remarkable example of the use of DL methods is practice of UNESCO Chair of Physics and Astronomy at NUUz. Since 1998, the best students have been selected on the competition base for studying here. Lessons are delivered by the leading professors and specialists of NUUz and foreign universities in English. The modern ICT are widely used in the educational process in this chair. For instance, a course on computational physics was delivered by a professor from Hiroshima University (Japan), communicating with students via Internet and e-mail. A course on scientific editing software Latex is delivered via Intranet, and students are obliged to prepare their dissertations using this system. A course on computational mathematics is delivered using the newest computer systems, also in the intranet. As a result, our graduates are better prepared for their future studies and work, both in Uzbekistan as well as in foreign countries.

Future plans for the development of the computer network of the Open Learning and Information Center are the creation of our own distributed computing system – cluster of networked computers. This will enable scientific research to be conducted on the base of the UNESCO chair, and also to deliver courses on the theory of parallel computations and programming.

#### **5 CONCLUSION**

Informatization is an expensive process but it is impossible to progress without it. To create the Open Learning Center of NUUz, the universities educational networks, significant amount of funds were invested. The key point of the presented paper was to show the need for creativity in accumulating and concentrating resources of local higher education institutions, government organization, and international donor institutions in the creation of a modern ICT infrastructure for higher education in a developing country. We hope that our case is a good illustration of the success of such approach in this field and our experience would be useful for others facing the same problems.

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