National University of Uzbekistan on the Way to the Smart University

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Abstract. The case study of e-learning evolution in National University of Uzbekistan (NUUz) is represented. The review of ICT implementation and Universities infrastructure creation is done. The analysis of projects directed towards e-learning is described. The results on virtual learning environment (VLE) creation process are reviewed. The future development prospects are discussed. Integrating the higher education system of Uzbekistan into the global educational space is noted, based on recent innovative educational reforms.

Keywords: Higher education system · Educational space · National qualifications framework · European higher educational area · Bologna process · E-learning · Virtual learning environment (VLE) · LMS MOODLE · Digital competence

1 Introduction

The educational reforms carried out in the independent Uzbekistan as part of its approximation to the ideas of the Bologna Declaration, were aimed at building the Uzbek national education system that would be comparable to the educational systems of Western countries. As a result, the higher education (HE) system Republic of Uzbekistan (RUz) in its present form has become much closer to the ideas of the Bologna declaration. Namely, similar structure of the higher and postgraduate education has been implemented, and a rating system has been established for assessing and monitoring students’ knowledge, in line with the European Credit Transfer System. The accession of Uzbekistan to the Bologna process gives a new impetus to the modernization of higher professional education, and to the integrating of the Uzbek lifelong learning system into the world educational sphere. It opens additional opportunities for Uzbek universities to participate in projects funded by the European Union, and for students and staff of HE institutions to participate in academic exchange with foreign universities.

Recently several important decisions were taken by the Uzbek governing bodies that will accelerate the integration of the national HE into the world educational space:
1) A number of instructions was published by the Ministry of higher and secondary specialized education of RUz (MHSSE RUz) in the beginning of 2019, describing organizational measures for the Ministry of HE and HEIs that will contribute to the implementation of the Bologna principles in the national HE. Since the academic year 2020/2021, all of the HEIs of the RUz are switching to the credit-modular system. These events were reflected in the Decision of the President on the flagship status of the National University of Uzbekistan [1].

2) Decree of the President of the RUz that established the concepts of development of the HE system until 2030 [2]. This document defined the strategic goals, the priority directions, the tasks and development stages of the HE for the medium and long term, setting the environment for the development of the industrial and educational policies. The basic principles defined in this decree include:
   - Maximum academic and economic independence to HEIs and their transition to self-financing;
   - Credit-modular system for the organization of the educational process in HEIs;
   - Academic (credit) mobility for students and teachers;
   - Educational standards and qualification requirements, under phased transition to NQF environment;
   - HEI ranking;
   - Creation of branches of foreign universities, double-degree and joint-degree programs;
   - International scientific and pedagogical cooperation.

3) Resolution of the Cabinet of Ministers RUz [3] on adoption the concept of National Qualifications Frameworks for Continuing education system of RUz necessary to make the national HE degrees comparable to foreign degrees, and one of the key components of the Bologna process [4, 5].

The educational process of a modern university is difficult to imagine without the functioning of distance learning. The move into e-Learning requires understanding the technological requirements as well as the pedagogical requirements. These will depend on the nature of the e-learning course – which subject, blended or purely online, which level? Online learning can be used to support our face-to-face teaching, a mode which is often called blended learning. It can also be used as the only delivery mode, typically in the case of distance learning. There are many versions of online learning, and many different tools that can support delivery, as part of VLE. Although ordinary web pages can be used to deliver a complete online learning experience, this requires all participating staff to have a high level of technical expertise at producing advanced web pages. For most teachers, the use of the built-in tools and facilities of a VLE is much more convenient. The following stages of Web Integration into Teaching and Learning process of university are exists:
Administrative information only;
− Administrative information plus some supplementary course content and resources;
− Some materials or activities essential to learning;
− Extensive use for materials, discussion, collaboration and assessment;
− Occurs entirely online (usually distance learning).

During the last decade we work on application of ICT in the learning process at National university of Uzbekistan (NUUz). During this time, we managed to win several NATO, TEMPUS, Soros foundation grant in the area. As a result of enthusiasts’ efforts, we have built computer infrastructure of the NUUz, administer the network, provide Internet access. VLE NUUz is being created based on open recourse Moodle, but our experience of creating e-courses is lack.

The limited resources and high cost of telecommunication services, especially broadband network connections, as well as the high cost of the corresponding equipment, the most advanced and sophisticated ways of distance learning, such as real-time video conferences, are not affordable for most universities of Uzbekistan yet, and therefore cannot be the core part of the e-learning services in the framework of today’s E-Learning projects. Moreover, Distance Learning cannot be the sole purpose of ICT application in education. The more appropriate paradigm is so-called “hybrid” form of distance education which combines more cost-efficient tools of e-learning and traditional forms of education (blended learning). Among these relatively inexpensive tools are e-mail, web-based and CD-based multimedia textbooks and training aids, synchronous and asynchronous testing systems, etc.

Summarizing the above mentioned the following major directions of application and content development can be realized:

− Virtual workspace creation for everyday life based on Intranet, communication and collaboration environment, both for educational and management purposes;
− Electronic libraries and archives development;
− Network-based e-learning solutions, both web-based online ones and less expensive off-line and asynchronous solutions;
− Creation of Internet resources related to education, such as universities websites, file archives, directories, list-servers, etc.;
− Resource and process management software for systematic planning, control and development of the learning process. Continuing the international collaboration for adoption and migration of most efficient and proven solutions within the frameworks of most suitable co-operation programs, like Tempus, ERASMUS MUNDUS and NATO Science-Committee.

The importance of ICT for education is obvious. This fact is mentioned in the National Program of Personnel Training and the Governmental regulations stating that the development of information technologies and Internet are 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 as catalyst in this development process.
In the light of these serious and substantial issues hindering the ICT development in Uzbek Universities still there are opportunities. One of them is the international co-operation programs for Academic and Educational institutions. The illustration of this is the example of the NUUz. Management and staff of University is keen on development of ICT application in education project. This interest has extended from networking and infrastructure creation till the e-learning and Virtual University projects. Below we shall discuss this evolution.

2 Review of ICT Infrastructure Creation at NUUz

From the very beginning, the development of University in the ICT fields was planned according to the Concept of Corporate Network. The Concept was presented at the 2nd UNESCO Conference on Education development in Uzbekistan held in Tashkent. The special attention was paid to the further expansion of technical and software capacity to allow the on-line lecturing. The gradual construction of technical infrastructure involved the following major milestones.

The first Fiber-Optic network of University in Uzbekistan was created within the frameworks of the TACIS-Tempus project UZBEKINFO. The pilot network experience was further disseminated to other Universities of Uzbekistan during the other Tempus project UZNANETU implementation. As a result of these projects, the pilot education network of Universities was created in Uzbekistan.

We can say that as a result of these two Tempus projects the technical infrastructure of NUUz was created. UZBEKINFO project accomplished in cooperation among the NUUZ, Fontys University of the Netherlands and University of Central Lancashire, Preston, Great Britain, aimed at improved University management through the creation of the network based on fiber-optic channels between three main buildings. 8 faculties and administrative building of the University was covered by the network and Network-Operation Centre was established. Within the UZBEKINFO Tempus Project the NOC Centre was established and for this purpose PC and Servers, communication equipment were purchased, system managers were trained.

In the course of the project the top-managers of the University had also a number of training courses, among them: Comparative Study of VET System of European States, ICT in Education, Quality Aspects in Education, Project Development and Management, etc. The effects of the project to the University were quite positive and these results were further developed.

By the years 1999–2001 the first scientific and educational network of Uzbekistan – UZSCINET, http://www.uzsci.net – was already operational and this fact allowed using its facilities for communication with external world. Connection to UZSCINET gave advantages to not only to Uzbekistan higher educational institutions to contact with the Western ones but vice versa, the Western audience obtained the opportunity to familiarize with the Oriental mentality. NUUz received access to Internet, and the educational and research network of Uzbekistan was enlarge by the campus network of NUUz, the largest of its kind. This was an important development and NUUz as well as other Tempus Beneficiary organizations, became the major participant of the growing educational network.
The example of such a co-operation is the joint accomplishment of the NATO Science Committee project named as UZUNINET “Uzbekistan Universities Network” by the specialists of the Physics Faculty of NUUz (co-director of project - prof. Robert Janz from University of Groeningen, NL). The objective of the project was the construction of the unified virtual network of the Universities of Uzbekistan. This process included the following stages: the initial connection media for all participating Universities was the Radio-Ethernet technology and the leased-lines. The full installation was successfully completed by the middle of 2002.

During 2003–2004, in the second stage of the project, all buildings of NUUz and TSTU were connected via Fiber-Optic channels and Campus network was created, the distant Faculties were still using the Radio-Ethernet over the node antenna located on the main administrative building of the University.

By 2004, in the third stage of the project the connection to UZSCINET was installed via the Fiber-Optic channels, and Radio-Ethernet channel was the service media for Educational Institutions in the North-West of Tashkent.

The next stage of UZUNINET was the creation of Medical Campus network with all the educational and clinical buildings of the Tashkent Medical Academy are connected by the fiber-optics and the access to Internet is accomplished via Radio-Ethernet.

The infrastructure created within the frameworks of UZUNINET comprise the largest segment of “UZSCINET” by the number of users [6,7].

This work of networking was continued also throughout the implementation of another Tempus project Uzbek National Network of Universities - UZNANETU. This project involved the joint activities of 8 Uzbekistan Universities combined with the efforts of FONTYS, NL and UCLAN, UK and was directed at the dissemination of the best practice of UZBEKINFO project in the eight Universities of Uzbekistan. In contrast with the UZUNINET of NATO this project has the inner centralization and has developed the internal network or LAN of Universities including the full-functional NOC. The capacity of Universities was increased by the creation of connectivity and staff development activities. As a result of this project eight Beneficiary Universities had a well trained and highly qualified ICT staff responsible for the sustainability of technical connectivity and the content was developed and offered to the stakeholders.

LAN and Internet connection comprise the major part of the ICT infrastructure, but in order to provide the most efficient use of these structures by students and faculty/staff for free Internet access, creation of an Internet Public Access Site (Open Learning and Information Center, OLIC) was proposed. This activity was supported by Open Society Institute Assistance Foundation – Uzbekistan (OSI AF) through its Internet Program.

In the period of 2000–2005 the following activities were accomplished by staff of OLIC to achieve the objectives set:

1. The technical solution of Internet access and creation of Campus network
2. Developed and implemented the DBSM of users
3. The system of electronic communication is implemented
4. Training process is established
5. Creation, implementation and management of electronic learning materials

In the indicated period over 1600 users had undergone training in the Centre. Below are some of the statistics (Fig. 1 and 2).

![Fig. 1. Participants of internet training course.](image1)

![Fig. 2. Internet users of NUUz.](image2)

We can say that the establishment of this type of Center in Uzbekistan was the breakthrough as it combines the several functions and provides the widest range of services to the all levels of Academic and Scientific community of the University.

In 2009 the LAN NUUz was modernized in the framework of NATO project “e-Workspace” and all distant buildings were connected via the One Mode Fiber-Optic channels (Fig. 3).
3 Results and Outcomes: E-Learning Environment

The education quality issues were addressed in the UNIQUM project within the frameworks of Tempus program and the special software named SAMMER for the knowledge support and control as well as the student registration and administration has been developed.

SAMMER consists of four main components: knowledge support system, knowledge testing system, student registration and university administration. The workplace of student, administrator, administration officer, lecturer are available based on the profile of the user and allowed access levels.

SAMMER was programmed exclusively for NUUz and is executed in the open-source resources based on Web-technologies and PHP. The databases utilize apache server. Users of system can access the resources offered by the system using the Internet browser and this makes the access very simple and easy-to-learn.

The software uses the frame of the education program and curricula of Uzbekistan and developed according to the requirements of the National program of professionals training. This makes the software very convenient for the use in Universities of Uzbekistan. The project has automated the collection of information on the main parameters of the education process, this made possible to gauge the quality of education in various elements of learning.

As the logical continuation of the Quality management was issue the e-resources management at the University. For this purpose, the project named UNIQERM was submitted to Tempus and approved. E-resources management system is being developed and implemented. The contents of network should be enriched by the localized learning materials that are pedagogically and technologically adapted for the transmission and delivery over the virtual media. Provided the quality of these materials being intact with the requirements the issue of the resources management will arise.
All the learning materials will comprise the e-learning resources, and the problems related with their timely delivery, everyday management, control of copyrights will be resolved by the system of the e-Resources management. As such system implemented well known LMS MOODLE within the frameworks of the UNIQERM project [8].

Electronic learning management systems (LMS) allow you to automate an exhaustive list of functions for administering the learning process and delivery of e-education systems among the most common and popular LMS. Moodle, like any other learning management system, possessing all the basic capabilities of commercial systems, provides a number of additional features that stem from its initial pedagogical orientation to the active involvement of students in the learning process.

The documentary portal is a simple, fast and effective tool to access printed and electronic documents. The end-user will access, via a single interface of simultaneous questioning, to heterogeneous documentary sources (catalogues, data bases, reviews, theses and electronic books, multimedia documents).

After consolidation, personalization, localization we have now one portal running in NUUz, including some services. The services at the moment include the communication tools (Internet, Intranet, mail, chat, document exchange, etc); administrative tools (SAMMER QAS, OAS, etc.); and pedagogical tools Moodle, etc. As it can be seen the services can be as the open-source resource as well as the commercial software. The software for the quality assurance (SAMMER) developed at the University is also integrated into the portal. Next step is to add some more courses and disseminate to students and teachers.

4 Why LMS MOODLE as VLE

Moodle is an acronym for Modular Object-Oriented Dynamic Learning Environment. The open source software offered by Moodle is designed around constructivist pedagogy. Moodle software is free to the user and is copyrighted under the GNU Public License, allowing the user a freedom in copying, modifying and sharing. The software is compatible with both Windows and Mac operating systems and many Linux distributions.

Moodle is not a company, but rather a collaborative project organization. It is a technological mosaic of activity modules that can be customized as deemed necessary by anyone involved in the learning community.

Developers of Moodle include an in-house team in collaboration with a worldwide professional network. This collaborative group continually creates and writes a variety of modules and plug-ins. The developers meet in online forums and rooms. Documentation that includes software specifications, brainstormed ideas, implementation procedures, necessary standards for use and guidelines can be found on Moodle Docs. The site, Moodle Roadmap, provides the latest additional features and update information. Users can find out about both negative and positive development issues on Moodle Tracker.

The Moodle learning community consists of a collaboration of participants found in wikis, blogs and/or participating in forums and events. The virtual,
global community is measured by registered users who log onto the various sites. This community communicates by postings in forums within “courses” that are accessed through free enrollment. Events or Moddlemoots happen in posted rooms where conferencing occurs.

To ensure the continual operation of this open source LMS, Moodle Partners, a worldwide group of service companies, have committed financial backing and support services to the cooperative effort. This group underwrites and provides technical support to the sites that supply needed information to Moodle users.

Moodle is the most user-friendly and flexible free open-source course ware products available all over the world. Moodle is a VLE that lets teachers provide and share documents, assignments, quizzes, forums, chats, etc. with students in an easy-to-learn and user-friendly interface [9].

Moodle is CMS designed to help educators who want to create quality online courses. It has excellent documentation, strong support for security and administration, and is evolving towards Information Management System/Shareable Content Object Reference Model (IMS/SCORM) standards. Moodle has a strong development and large user community and users can download and use it on any computer they have at hand. Currently, Moodle has a large and diverse user community with over 1,077,969 users on this site, speaking 86 languages in 112 countries around the world [10].

We list here the most important reasons for choosing this package:

1. Moodle is OSS, which means users are free to download it, use it, modify it and even distribute it under the terms of GNU;
2. Moodle is CMS & VLE, and lets teachers provide and share documents, graded assignments, quizzes, discussion forums, etc. with their students in an easy-to-learn manner and to create quality online courses;
3. Moodle can be used on almost all servers that can use PHP;
4. The key to Moodle is that has been developed with both pedagogy and technology in mind. One of the main advantages of Moodle over other systems is a strong grounding in social constructionist pedagogy with good educational tools;
5. It works well with languages and is currently being used in 86 languages in 112 countries;
6. Users can download and use Moodle on any computer they have at hand;
7. It has excellent documentation, and strong support for security and administration and easy to upgrade from one version to the next;
8. It has many user-friendly features such as easy installation, customization of options and settings, good support/help and good educational tools;
9. It demonstrates the use of OSS in creating a high quality e-learning environment that incorporates many other subjects;
10. Moodle is the LMS most often recommended of all the OSS packages, as well as being the most popular;
11. The credibility of Moodle is very high. At present, there are 52289 web sites from 193 countries that have registered with it;
12. The importance of Moodle is its good reputation according to good reports, grade of admission in the community and number of places, existing languages, etc;
13. Moodle should be able to be used in conjunction with other systems. It keeps all files for one course within a single, normal directory on the server. Administrators allow the provision of seamless forms of file-level access for each teacher, such as SMB, FTP, and so on. Currently, there is work on more features planned for Moodle in future versions, such as export and import data using XML that can be integrated visually into other web sites. In addition, has presented a good solution for this integration, enabling more VLEs to work together by using Web services and related techniques (Al-Ajlan, et al., 2008);
14. Moodle runs without modification on Unix, Linux, Windows, Mac OS X, Netware and any other systems that support PHP;
15. Data is stored in a single database: MySQL or PostgreSQL are best but it also supports Oracle, Access, Interbase, ODBC and others; Some universities integrate Moodle with other VLE products, such as Oxford University which has integrated two OSS learning environments, Bodington VLE and Moodle although they are slightly different to each other.

5 Conclusion

The limited resources and high cost of telecommunication services, especially broadband network connections, as well as the high cost of the corresponding equipment, the most advanced and sophisticated ways of distance learning, such as real-time video conferences, are not affordable for most universities of Uzbekistan yet, and therefore can not be the core part of the e-learning services in the framework of today’s E-Learning projects. Moreover, Distance Learning cannot be the sole purpose of ICT application in education. The more appropriate paradigm is so-called “hybrid” form of distance education which combines more cost-efficient tools of e-learning and traditional forms of education. Another issue requiring attention is the institutionalization of Distance Learning practices with the corresponding legal basis behind it. This touches upon the political solutions and managerial concern on results outcomes from combining the ICT and education.

Summarizing the above mentioned the following major directions of application and content development can be mentioned:

Virtual workspace creation for everyday life based on Intranet, communication and collaboration environment, both for educational and management purposes electronic libraries and archives development network-based e-learning solutions, both web-based online ones and less expensive off-line and asynchronous solutions creation of Internet resources related to education, such as universities web-sites, file archives, directories, list-servers, etc. Resource and process management software for systematic planning, control and development of the learning process.
While now these components are being developed mostly independently from each other, they in fact can be easily integrated in an efficient virtual learning space within the university intranet because of their web-oriented nature.

As noted above, in the light of innovative transformations in the field of HE, the status of the flagship calls the NUUz to take appropriate measures: to modernize the infrastructure of the VLE, improve the qualification of teaching staff, and retain highly qualified technical staff. All this together affects the quality of the created educational materials. Unfortunately, during the transition period, it was not possible to maintain the quality of education, mainly due to financial difficulties. The widespread forced transition to the form of distance learning, due to the Covid 19 pandemic, exposed these shortcomings in an obvious way (http://webdars.nuu.uz/).

To become a smart university, NUUz has a lot to do. We are ready to cooperate with HEI within the framework of projects of international donor organizations in the implementation of the following tasks: equipping education and training systems to face the challenges presented by the recent sudden shift to online and distance learning, including supporting teachers to develop digital competences and safeguarding the inclusive nature of learning opportunities.

References

1. President of RUz: Decision No. PP-4358 of the President of the Republic of Uzbekistan “On measures to radically improve the training system of required qualified personnel and develop scientific potential at the National University of Uzbekistan named after Mirzo Ulugbek in 2019-2023” dated 17 June 2019 (2019a). https://lex.uz/pdfs/4380626. Accessed May 2020
2. President of RUz: Decree of the President of the Republic of Uzbekistan No. UP-5847 “On approval of the Concept of development of the higher education system of the Republic of Uzbekistan until 2030” dated 8 October 2019 (2019b). https://lex.uz/ru/docs/4545887. Accessed May 2020
3. Cabinet of Ministers of RUz: Resolution No.287 “On measures to organize the National system of development of professional qualifications, knowledge and skills in the RUz” dated 15 May 2020 (2020). https://lex.uz/docs/4814154. Accessed May 2020
4. Imamov, E., Khodjaev, A., Karimkhodjaev, A.: Guidelines on the formation of the NQF CES RUz, Nodirabegim, Tashkent, 32 p. (2019a). ISBN 978-9943-5222-6-8. https://ec.europa.eu/programmes/erasmus-plus/project-result-content/1defadc8-d204-43cc-87f2-1d14defa8125/Guidelines_NQF_final_en.pdf. Accessed May 2020
5. Imamov, E., Khodjaev, A., Karimkhodjaev, A.: National qualifications framework of the continuing education system of the Republic of Uzbekistan. Basic Regulations, Nodirabegim, Tashkent, 95 p. (2019b). ISBN 978-9943-5222-5-1. https://ec.europa.eu/programmes/erasmus-plus/project-result-content/af62df3c-7888-4f6d-8a92-370ed92c4658/General_Regulations_NQF_final_eng.pdf. Accessed May 2020
6. Karimkhodjaev, A., Garnov, S., Norboev, T.: Implementation of the information technologies on educational process in NUUz. In: contribution Second International Workshop on “Intelligent Data Acquisition and Advanced Computing Systems: Technology and Applications” (IDAACS 2003), 8–10 September 2003, Lviv, Ukraine (2003)
7. Karimkhodjaev, A., Garnov, S., Norboev, T.: Towards creation of virtual learning environment in Uzbekistan universities. In: First International Congress on Higher Education: Perspectives on University Education in the 21-Century, Fatih University, 27–29 May 2004, Istanbul, Turkey (2004)

8. Karimkhodjaev, A., Akramov, S., van Zantvoort, G.: E-learning: from informatics to digital university. In: Contribution Papers: Tempus III in Uzbekistan, Tashkent, Uzbekistan, pp. 180–188 (2007)

9. Dougiamas, M.: Moodle, 17 June 2011. www.moodle.org

10. Al-Ajlan, A., Zedan, H.: Why moodle. In: Proceedings of 12IEEE International Workshop on Future Trends of Distributed Computing Systems (FTDCS), pp. 58–64. IEEE Press, Kunming (2008)