

Development of Moodle: case of Riga Technical University

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Abstract— E-learning is a new methodology in the field of education that has risen since the widespread of personal computers and the worldwide web. Nowadays, e-learning method became very popular. Universities, organizations, individual teachers and other educational institutes use it intensely. The main purpose of this paper is to present a development of the LMS experiences through use of Moodle and its functions in Riga Technical University.

Keywords— Moodle platform, e-learning, integrated learning management system

I. Introduction

Today internet is very important technology. It makes life easy and it is used at almost all part of human live from shopping to watching television programs. One of the most important areas is education or learning. Education, in its entirety, is a time independent concept. Time of development of global information and telecommunications technologies, with simultaneous development of web based educational material imposes a change in the philosophy of educational content delivery.

E-learning is a new methodology in the field of education that has risen since the widespread of personal computers and the worldwide web. Nowadays, e-learning method became very popular. Universities, organizations, individual teachers and other educational institutes use it intensely. E-learning is the delivery of learning to learners who are in different places and independent from time. Educational materials must be used for communication between teachers and learners. [15]

The modern form of education offers a user appropriate and adaptable education system. Unlike traditional education, here the student and teacher are generally physically separated. Educational materials are distributed through various media, in the classical and/or electronic form. The combination of e-learning and face-to-face teaching increases accessibility, flexibility, and choices for interactivity [25].

The term Learning Management System (LMS) refers to an integrated set of networked, computerized tools that support online learning. Traditional instructional activities such as presenting information, managing course materials, and collecting and evaluating student work can be completed online using an LMS [28].

An LMS provides an array of tools and functions to support teaching and learning, usually including course management tools, online group chat and discussion, homework collections and grading, and course evaluation. Moodle is widely used in education and becomes a mainstream e-Learning platform.

Building an on-demand full-featured educational management system is an important issue for an educational institution. In Riga Technical University (RTU), Moodle system is established not only as an open courseware e-Learning platform, but also as a tool for educational managements. Several useful educational management modules have been successfully integrated into the Moodle system.

The main purpose of this paper is to present a development of the LMS experiences through use of Moodle and its functions in Riga Technical University.

II. MOODLE platform

There are three type teaching in distance education: synchronous, asynchronous and mixed. If teachers and learners communicate at the same time, it is synchronous type. If teachers provide course materials and learners can use them without communication with teacher at the same time, it is asynchronous type. If synchronous and asynchronous type is used together by institute, organization or individual entrepreneur, it is mixed type. According to before studies Moodle is the best free and open-source software [16]; [17].

Moodle (Modular Object-Oriented Dynamic Learning Environment) is a learning management system and it is a free web application that teachers can use to create effective online learning sites. There are 79439 currently active sites that have registered from 232 countries. Up to date there are 97 sites total in Latvia [20].

Moodle is a Course Management System (CMS); a free package designed using known pedagogical principles to help the educators to create effective online learning communities. Moodle is provided freely as open source software under the GNU Public License. Moodle can be installed on any computer that can run PHP, and can support a SQL type database. The word Moodle was originally an acronym for

Modular Object-Oriented Dynamic Learning Environment, which is mostly useful to programmers and education theorists. Moodle has three types of management: site management, user management, and course management. It also has several modules to improve interaction between users. Moodle has a large and diverse user community with over 330,000 registered users only in <http://moodle.org>, speaking over 70 languages in 196 countries. Some of the main characteristics of this platform are: suitable for online classes as well as supplementing face-to-face learning, simple lightweight, efficient, compatible, low-tech browser interface, easy to install, full database abstraction supports all major brands of database, and emphasis on strong security throughout [6]; [12]; [23].

Moodle is an open source LMS, based on sound pedagogical principles, which was mostly developed in academic context. It is open to registered users and offers many different functions, ranging from course management to monitoring students' activities; it can be used as a repository for course material, but it also offers the possibility to develop forums, wikis, quizzes, surveys and other interactive in-built activities, without any need for particular computer skills. The main advantage of such an environment is that it is self-contained and all the above described functions are seamlessly integrated on the same platform, thus creating the feeling of being in a classroom – though a virtual one [11].

Moodle is chosen LMS, because it has high grade of acceptance in the community and in a number of institutions, and has a wide variety of active courses, supports many languages and open to add new languages. The most important feature of the reason for choosing Moodle as follows [1]:

- It is open-source and users are free to download it, use it, modify it, develop plug-ins for it and even distribute it under the terms of the GNU license.
- It allows teachers provide and share documents, graded assignments, discussions forums, on-line exams, questionnaires and etc. with learners in easy to learn fashion.
- Moodle can run on almost all servers that can use PHP. Users can download and use it on any computer, also upgrading is easy.
- The strongest feature of Moodle is developed with pedagogy and technology in mind. It has good social and pedagogic plug-ins and tools.
- Moodle is widely used all over the world by individual teachers, schools, universities and companies.
- Moodle run without any modification on a system that supports PHP such as Linux, Unix, Windows. It is compatible with MySQL, PostgreSQL and Oracle database and others are also supported.
- It has many useful features to potential students such as easy installation, customization of options and settings, good support/help from community, and good plug-ins. Moreover documentation, strong support for security and administration.

- Moodle supports other content creating tools such as Flash, Word, and PowerPoint.
- Plug-ins provides shearing files which are in different formats.
- Moodle supports video conferencing.
- It provides detailed logs, calendar and chatting.
- Backup support is useful.
- It supports different authentication methods.

Moodle is a Learning Management System, it structured as an application core, surrounded by plugins to provide specific functionality. The easiest and most maintainable way to add new functionality to Moodle is by writing plugin. According the “developer documentation” on [http:// docs.moodle.org](http://docs.moodle.org), there are about 40 standardized types of plugin and more than 30 groups of Core APIs under three heads provided to be call. Refer to the online document, one can develop Moodle style functional module.

Moodle features can be divided in two large blocks – learning resources and activities. Learning resources create one way communication from teacher to student. They are not limited by file type or file format. Everything from textbooks to video or audio files can be added as a learning resource, including even interactive resource combinations or learning objects. In cases when specific software is necessary to open file, it has to be installed in users' computer.

Second block of elements – activities. They create two-way communication link between student and teacher thus including both sides in learning process. Three main goals for e-learning activities – save teacher's time, ease organization of workflow and promote cooperation between all course participants. Unfortunately not all activities help to reach those goals. For example, course forums help to create communications between participants, but certainly do not help to save teachers time, since it is necessary to log in and post frequently not only to answer questions and participate in discussions but also to encourage activity.

System is object-oriented. This means users are able to customize elements in way how they serve them the most. There are no limitations for combinations are number of course elements.

More than 10 different user authentication methods exist to integrate users from external databases and servers (LDAP, RADIUS, IMAP etc.) [8] Administrators can choose desirable method. However assistance from database maintainers' side is necessary and it is not possible to configure advanced authentication methods for common user with Moodle administration skills. If necessary, it is possible to lock Moodle for outside users, not allowing them to sing up or see any content. Security is a major topic for Moodle developers. Every action in Moodle role capability table is analyzed and potential security threats for that particular action have been determined. Every Moodle admin receives email from developers in case any dangerous threats have been discovered and there is a dedicated issue tracker for security tasks.

Number of concurrent users in Moodle can vary differently – it depends from hardware. Basically there are two types of system loads – when large number of users request same resource (for example they attempt a quiz in the same time) and when they are scattered in different courses. First case puts load on server RAM and this problem can be solved by adding more RAM if necessary. In second scenario Moodle data base is the bottleneck thus overloading CPU (there is extended load on RAM in this case as well). General suggestion from developers is to put 1 GB of RAM for every 10 to 20 expected concurrent system users. [9]

III. Development of Moodle at RTU

A. Use of Moodle at RTU: Background

There are many approaches to employ an E-learning system in universities and educational institutes, one of which is to design a customized system in-house by the institute itself. Nowadays, considering the rapid improvement of the technology, especially that of the educational technologies, networks and software, design and implementation of an E-learning system from scratch is not an economically and technically sound option in general.

Riga Technical University is the oldest technical university in Baltic States and the second largest university in Latvia now. With a strong academic base in engineering fields, RTU offers a wide range of technical programmes. The physical facility of RTU is spread throughout Riga and includes branches in other cities in Latvia. RTU has eight faculties and a student population of over 17,000.

RTU has had pockets of early adopters of technologies for various academic and institutional needs. In the late 1990s, the RTU Riga Business School (RBS) created its own course content management system, known as On-line Assistant. It began as a relatively straightforward means for faculty to provide class and course content to students. The functionality was extended to include student course registration and student financial management, such as providing semester bills. Instructors used the system largely as a platform to supplement in-class materials. RTU's Center of Distance Education used the commercial Blackboard product for similar purposes. By 2006, there was no common platform to support the substantial use of course content management at RTU. Administration recognized the need to develop a coherent IT strategy for RTU. To save resources where reasonable, a strategy was developed with the University of Latvia, Latvia's largest university, to use common standards and software platforms [26].

In 2006, RTU undertook an institution-wide review of its IT use, needs and strategy. The review looked at all systems in place at RTU, examined their advantages and disadvantages, surveyed functionalities that might be available, and made recommendations regarding future IT needs and institutional strategy for IT development. Stakeholder groups included students, faculty, administrative workers and academic administration. The review was both broad and deep.

The review made a number of recommendations. The primary recommendation was that as many services as possible should be made available through an online portal, and that there should be a single portal entry for all services. Among the services that were to be made available online were: library services, including database access; financial services, including the ability for students to check their financial status.

In addition, there was a need for course content management with a wide range of functionalities including:

- document posting
- multimedia posting
- grade posting
- blogging
- discussion and discussion groups
- personnel matters such as checking on vacation time availability
- email access
- phone and university contact database

During introduction stages of eLearning components into university courses RTU made a decision to use and possibly extend an existing eLearning platform, more precisely LMS system for our eCourses instead of developing a new one from the ground up. After testing several systems, consulting a number of comparative studies and papers [7]; [12]; [21]; [26], we could draw initial conclusions on the available products.

The evaluation of Open Source LMSs was done using the following criteria: active community, stable development status, good documentation, didactical objective and focus on the presentation of content or communication functionalities. Afterwards LMSs that met the criteria were analysed in detail regarding communication tools, learning objects, management of user data, usability, adaptation, technical aspects, administration, and course management. The final choice fitting necessary requirements was Moodle [12]; [24], for its good basic features, great extensibility potential and even some potentially adaptive features.

RTU chose Moodle based on these criteria:

- the IT Institute at RTU had used Moodle and found it stable and reliable;
- the University of Latvia was going to move to a Moodle platform;
- the number of Moodle installations was constantly growing;
- the modular structure of Moodle made it easier to change, extend, create, and individualize its structure;
- Moodle was cheaper than comparable commercial products with little functional difference;
- Moodle has a large and active developer community;

- the next iteration of Moodle was already in development and RTU and its developers could be actively involved;
- an understanding that open source is the future for this type of technology.

It has to be added that Moodle has a rapidly increasing popularity at universities and new features are developed continuously.

The implementation process involved all important stakeholder groups with a plan including functional development, testing and active education of the various user groups. A full-time, dedicated database manager was hired and various academic departments were involved in supporting or creating user training projects. RTU also did small research projects with the aim of demonstrating the effectiveness of the use of course content management systems to instructors. The University has a dedicated help desk for problems and questions.

B. Use of Moodle at RTU: Functions

A Moodle site is set to provide e-learning services in RTU and its called ORTUS. ORTUS is an acronym for Open Riga Technical University Services and provides the single point of entry into electronic services for the University. The low layer libraries of Moodle are well developed, it includes classes and functions covered database abstraction and user managements. The base codes can be reused in new software development. The applications integrated in Moodle seamlessly with the benefits of mature user authorities and privileges mechanisms. By modify some core codes of Moodle we made it fit the education activities of RTU well. Refer to Figure.1, there are three educational managements modules that are integrated into the Moodle system, that means Moodle is the unique portal of all applications in RTU.

Most members of the RTU community have been enrolled in the portal and there are up to 4,000 users logging into the system per day. The portal provides single password entry, filtered by authorities, into all services that are available online. Training for academic personnel is offered on an as-needed and as-requested basis. E-learning system using per month shown in Figure 1.

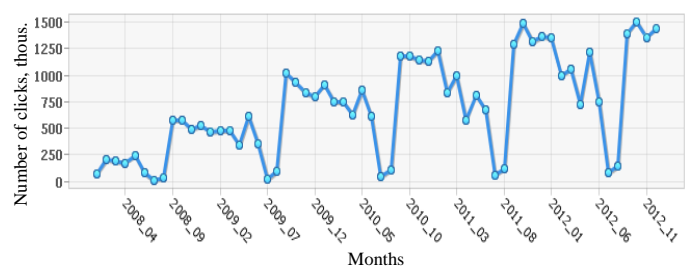


Fig. 1. E-learning system using per month, thousands clicks

For 5 years already there is University-wide ORTUS website that combines all the necessary information to students, administrative and scientific staff. University strategy is to

move to a single campus in both organizational and IT areas. Therefore all RTU IT systems are gradually being integrated into site. Screenshot in Figure 2 shows current design of ORTUS site. However it is based on outdated open source platform and should be upgraded to keep users contented.

University has its own data center, which provides a stable and complete framework for the delivery of administrative and academic functions. Data center receives permanent investment to its elaboration and improvement. Currently new data center with greatly improved capacity is under construction

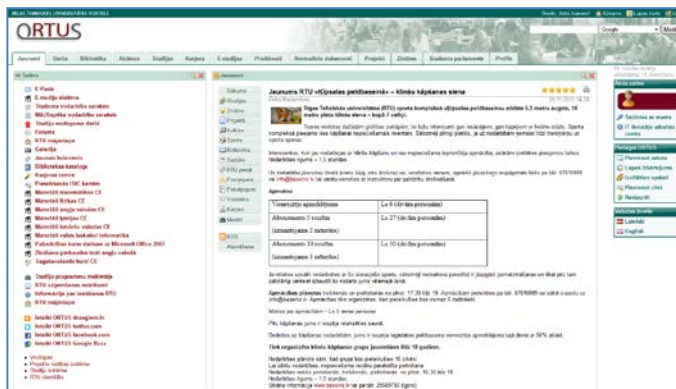


Fig. 2. Current design of ORTUS site

All subsystems of ORTUS website have development environments. Before launching them in production, all changes are tested there.

In order to ensure successful e-learning process, a special synchronization process is created. It involves systems from all important registries (resource planning system, employees' database and student record management system). Synchronization process occurs on a daily basis and any changes in any of the systems are quickly reflected in the e-learning system. All University information systems are based either on the world's leading open-access platforms, or are being developed by leading best practices and standards of the Latvian legislation.

RTU has chosen Moodle e-learning system as default service provider. Moodle platform offers a set of different tools that allows a teacher to choose freely during the course, when students can test their skills. These tools allow teacher involvement as well as automatic assessment and feedback provision. Arrangements for using Moodle are not defined, leaving amount of usage up to teachers.

In order to improve study results, students are divided in study flows. Division is determined after results from pre-topic quizzes. During following term each flow receives adapted teaching and consulting schedule, as well as different formative assessment.

All study subjects have their own e-learning course, which automatically enrolls course-related people (students, teachers, and inspectors). Student activity in e-learning course and test marks are important to obtain a summative Assessment.

Each year students and instructors are enrolled automatically in e-learning courses, thus providing a virtual community building, and not just a student - student or student - teacher relationship, but also a teacher - teacher relationship formation in the same environment. There is an order issued by pro-rector of studies to insert electronic learning resources in e-courses. This again declares RTU important approach to e-learning process. In some cases, industry experts also take part in e-learning, for example they participate in discussion forums. Unfortunately, this option is currently not widely used and it could certainly be promoted.

In the beginning of each term, every subject gets new empty e-learning course on Moodle. Students and teachers are automatically enrolled to their courses, according to data entered in student record management system. Teachers can import their courses from previous years and choose which study resources are needed for new term. It is possible to add new materials at any time. Each study subject has its own e-course, where one can always find a description of learning objectives and subject schedule. This information is placed as set of hyperlinks and is visible once course is generated (Figure 3).



Fig. 3. Design of study subject

Students also have access to learning resources and learner support systems. The e-learning system provides:

- access to library resources;
- support for the development of key skills (including support for e-learning skills, collaborative working online and contributing to on-line communities which are key skills in an e-learning context);
- advice and counseling over choice of courses and progression through the program;
- an identified academic contact, tutor and/or mentor who provides constructive feedback on academic performance and progression access to help desk, administrative support and advisory services;
- opportunities to provide and receive formal feedback on their experience on the course;
- procedures to handle and resolve any difficulties or disputes which may arise;
- alumni access.

E-learning component is not the primary one in study process. Study results are achieved on the basis of learning objective which are set in each subject. Methods to achieve these goals depend from lecturer's style of teaching.

Development part is done by lecturers themselves. In that way academic quality is guaranteed. Unfortunately their technical skills are not always high enough. To advance IT competitiveness, IT department provides regular training workshops and there is IT Helpdesk with opportunity to receive support on the phone or apply for individual training session. Evaluation of subjects is done by students with dedicated questionnaire system (integrated in ORTUS). Still it is important to spread the word around campus each term, to promote this activity.

Formative assessment is widely used in subjects. Academic staff searches for positive examples of summative assessment in methodological workshops and in some cases, partial component of evaluation are the achieved e-learning results. All final works are loaded in a special database, where they are compared with existing ones, to prevent the possibility of plagiarism.

University policy for e-learning currently is not supporting additional financial funds for teachers who wish to become particularly active in e-learning field. At the beginning stages of e learning implementation there were no funds at all to invest in development of qualitative e learning resources. That was the main reason why decision to make e learning as self-evident, non-funded part of every subject, was made. In this way formation of good quality e-courses is slower, but still happens and it is not facing problems with teacher dissatisfaction because of sudden lack of funds.

IV. Conclusions

In the paper authors presented the analysis of RTU experiences through use of Moodle. RTU's experience in choosing and implementing Moodle was a great success. It was simple enough to integrate Moodle with the existing student management system, student portal, and the service for single sign on.

Students arrive very well prepared for online work and there are no special guidelines or unified environment about online community creation. User groups choose solution most suitable for them. University offers some free public e learning courses. They are always available, if there is need to refresh knowledge.

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