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Analysis of functionality of distance learning platform moodle

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Abstract

The authors of this article, conducting the classes using the blended-learning method, focus their interest on the analysis of functionality of the Learning Content Management Systems software class. Architecture of open source distance learning platform Moodle was analyzed. The Author's experience with teaching students and student suggestions allow to present the influence of architectural design on functionality of the software. Facing with growing interests of usage of Moodle in the Polish universities, the authors present some advantages and disadvantages concerning the functional design and possibility of deployment in similar environments. They also suggest a few ways of improving the system architecture and give some clues that could be helpful for the deployers.

1. The presence of the Blended Learning method in the offers of universities

Universities more and more often include Distance Learning (DL) and Blended Learning (BL) courses into their educational offer. Most frequently it takes place in single faculties or for a few student groups. Then it is not necessary to develop the administration system. In the Faculty of Mathematics, Physics and Computer Science there are classes in which 300 participants are facilitated using the BL method.

Our students participate in 5 courses based on Distance Learning Platform, Java Programming, Introductory to Computer Science, Operating Systems (three editions), Architecture of Digital Systems and Networks (two editions), Postgraduates Courses (Computer Science Basis). We created the Dashboard for Master Degree preparing students too.

Such a small number of course students is adequate because it brings long term effects [1]. The most important of them is education effectiveness, which, due to competition in educational market, is of significant importance. However, optimism resulting from some advantages should not prevent from critical outlook at this method and characteristics of the tools used.

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2. Online education system

In the Distance Learning education type, the students participate in the class single-handed learning at home. Cooperation with the group consists in discussion forum participation, exchange of emails with the tutor and sometimes in making two or three common projects also online) and physical presence in a fixed number of meetings or examinations in the university buildings. The classes are conducted using the synchronous and asynchronous methods.

Blended Learning, also called the hybrid method [2] is the form supported with online elements. It takes place in the university buildings, at least partially in the room equipment forms on the server are the source of knowledge, instructions, references and places for storage of students' papers. As in the case of DL it is possible to use the discussion forum and chat, though they are not mainly used elements of platform not only because the classes are conducted in the synchronous way but first of all due to possibility of direct contact.

Advantages of both methods are invaluable in some cases. The main argument for using DL methods are economy of time and participating costs (commuting, accommodation, gratuitous holidays in the cases of working students) and possibility of choosing convenient time of learning in the case of asynchronous course.

Well prepared e-learning courses have an attractive and rich form. Students have easier and relatively lower in costs access to many educational materials. This allows them to focus on learning.

Figure 1 presents the exemplary view of part of the course Master Degree Students Dashboard.

In the case of being absent, the student can check the contents studied during the last classes, what he should prepare individually, and even (having an access to the internet) participate in distance learning and ask questions in forum.

From a lecture's point of view, classes conducted using the BL method allow to check tests and exams with help of an automatic machine [3].

The advantage of BL and DL methods is enabling a direct contact of students with a lecturer and a group of colleagues. However, as shown before single absence during the classes (BL) does not contribute to gap in knowledge and it does not possess the largest fault of the DL method which is lack of integration in the academic environment.

We used one of the most popular open source platforms, Moodle, for conducting classes in our faculty.

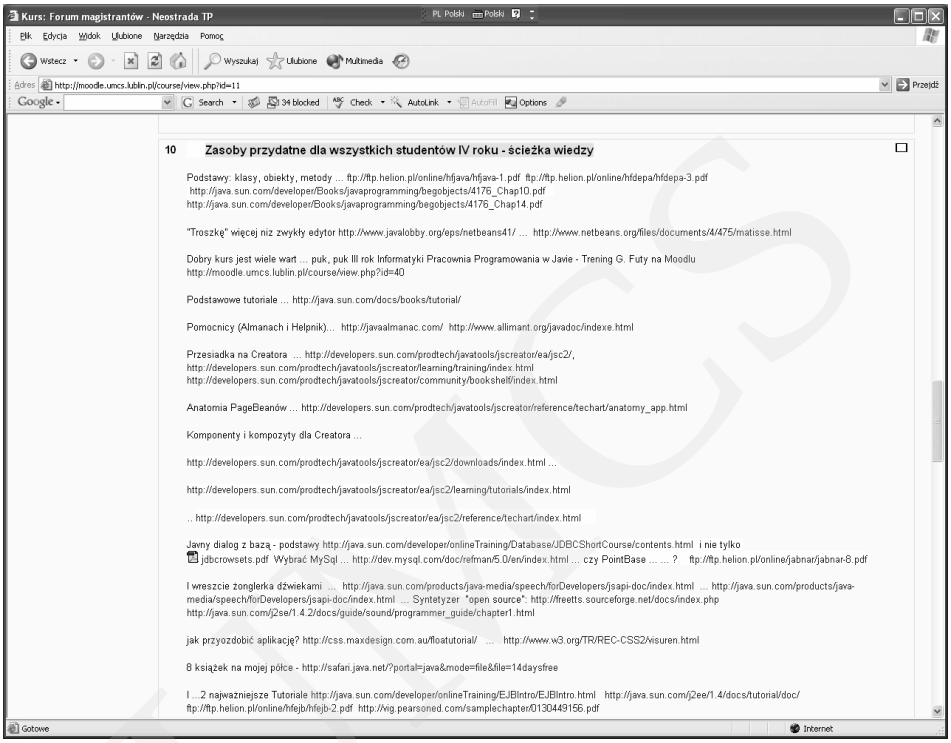

Fig. 1. Master Degree Student Dashboard with the proposal of sources and materials

3. System architecture

Analysis of learning assisting software should include, among others, the element of system architecture. The software Moodle is available from General Public License (GNU). as most "open source", it has also common advantages and disadvantages of this class systems [4].

Moodle is designed as an open and modular system of educational content distribution and user management. This feature enables development of new functionalities indispensable in realization of educational tasks and aims. If necessary, a program can design new teaching tools. The specific Application Programmers Interface (API) system allows for relatively easy integration of new tools with the existing platform. This solution also allows for independent distribution of extra additional tools.

According to the authors, the proposed mechanism of modular service structure is not very efficient. Particular components of application, independent of each other, send requests to the database server in order to get information already taken by other components. In many cases this fact can slow down the server performance.

3.1. Applied technologies

Moodle was made by means of free of charge web technologies. The exemplary diagram of the system application is presented in Figure 2. The web server was programmed using PHP technologies [5]. The authors recommend one of the two relation data bases (RDBS): MySQL [6] or PostgreSQL [7]. It is possible to use other commercial systems of relational database and access through the Open Database Connectivity (ODBC) mechanism. This fact allows choosing any available system. Similar commercial systems like R5 Generation, iOracle, Lotus Learning Space frequently make use of expensive database systems which increases costs of implementing DL or BL.

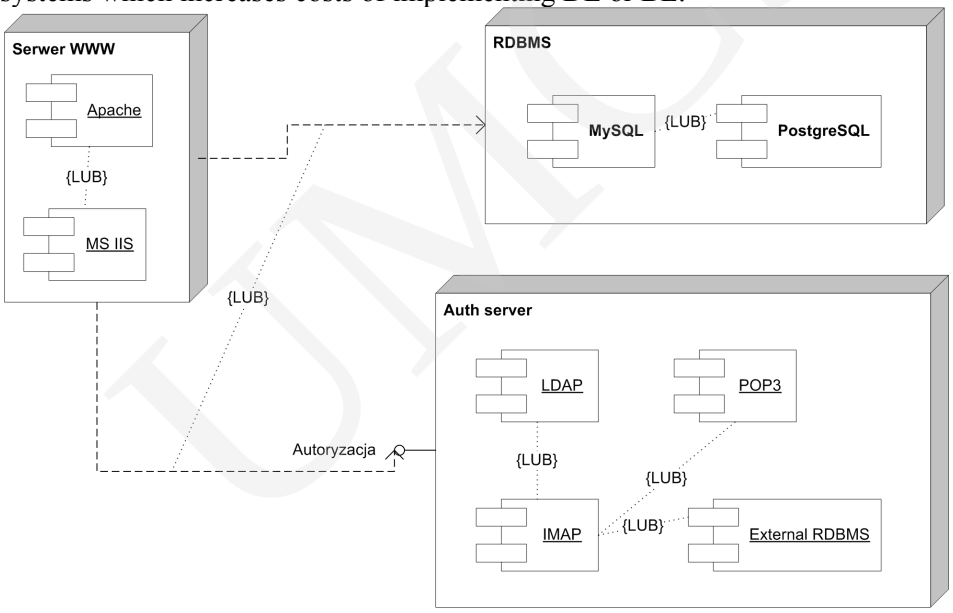

Fig. 2. Moodle system architecture

Implementation by means of PHP technology also allows to choose one of many web servers whose task is to make teaching contents accessible. In this case, the authors choose open source technologies – Apache software. From a technical point of view it is also possible to make use of other commercial web servers. This is significantly important for companies and institutions whose security policy forbids using chosen, open source software.

The important advantage of Moodle is possibility of separation of users' authorization mechanisms from the tasks realized by the platform. The authors of software [8] anticipated possession of the users' data in other existing database systems. This can be of significant importance in software implementation in the institutions possessing a large number of potential users like university. Administrator can change the assumptive base learning platform.

This role is generally performed by servers communicating by means of protocols:

- Lightweight Directory Application Protocol (LDAP),
- Internet Message Access Protocol (IMAP),
- Post Office Protocol (POP).

The users' data can be derived also from other databases (e.g. data of the deanery system). Properly implemented authorization structure does not violate confidentiality of other data stored by those servers.

Though the system design assumes easiness of graphics change, it does not work fully. The application of Cascading Style Sheets (CSS) as the main technology confines possibilities of graphics design adjustment to the institution corporate identity. That is of special importance in the case of platform exploitation by commercial firms.

We believe that extension of some software components by the Model – Viewer – Renderer model (MVR) allows to separate the data (model) and the way of their visualization (renderer) from the actual element of the page (viewer) in a very precise way.

3.2. Construction of courses and web pages

The schematic diagram of Moodle course space components is presented in the figure below (Fig. 3). The course page consists mainly of some thematic blocks (CourseBlock). They are shown in the central part of the page. Left and right sides of the page can include navigation elements directly connected with the course as well as with the tools given by software (OutlinedNavigation, OutlinedTool).

In some particular cases, usage of a large number of tools in the courses overloads the page with excessive information. This can force the user to make a great cognitive effort not connected with this teaching. Separation of functional elements responsible for the educational materials presentation from the additional tools available for the user seems to be justified. Division of tools into the course tools and those of general application (e.g. "users files", "internal mail") [9] is also a good practice. This allows to present essential materials and to avoid information overload. The proposed division requires re-analysis of the platform navigation structure and patterns.

The navigational patterns implemented in the system create some difficulties in the intuitive navigation on the web pages. Overloading the page with a large number of navigational elements, their disappearance in the case of using particular tools or change of their localization on the computer screen are only some functional defects connected with the internal architecture of software. The system modularity, being its advantage, affects navigation structures significantly, particularly the breadcrumb menu. The students have large

difficulties in browsing the pages due to "surprising behavior" of some particular tools. The Internet users accustomed to the use of some navigational patterns in other internet websites can feel discomfort and sense of getting lost in the learning platform. Learning different not intuitive use of links can be troublesome even for the experienced users of Moodle.

The above features, advantages and disadvantages result directly from the internal structure of the system. In the further part we will focus on functionality of single resources.

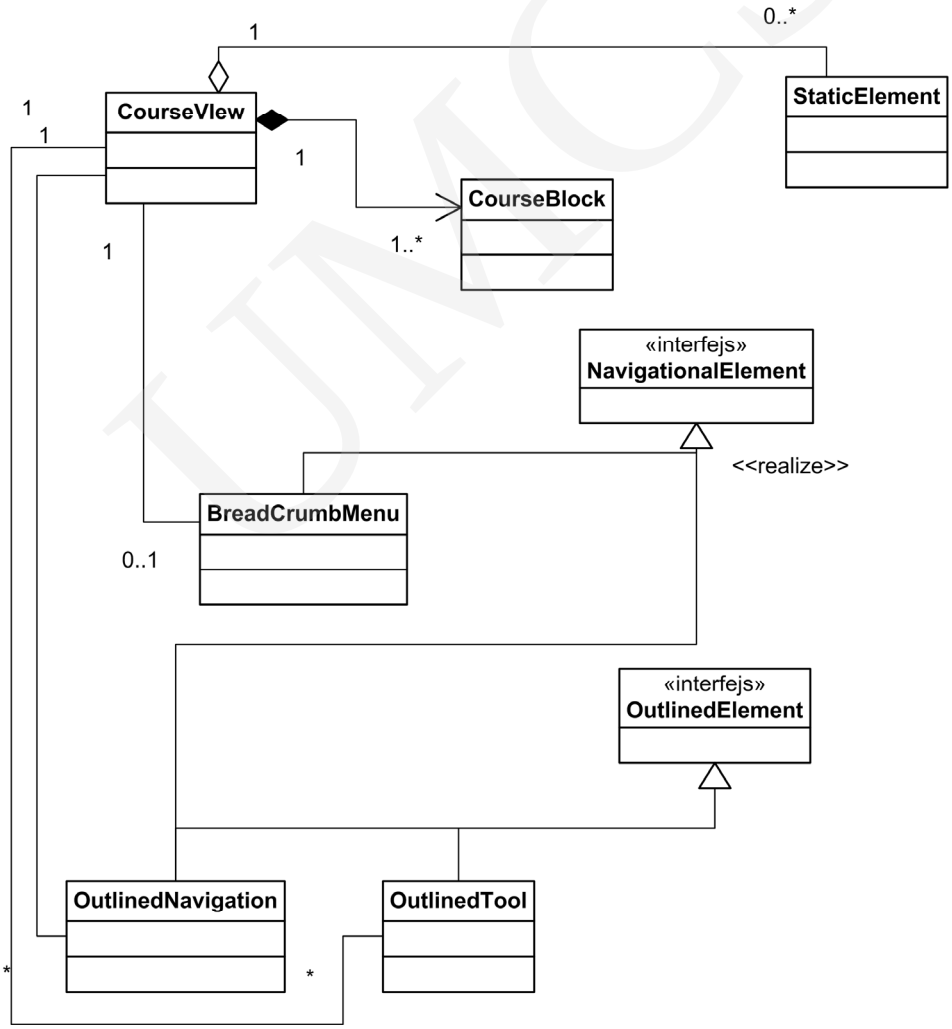

Fig. 3. Components of Moodle web pages

3.3. Functional analysis

Construction on platform allows for intuitive creation of new courses, adding students, their combination in groups and making use of resources addition possibilities.

One of the great advantages of Moodle is possibility of using some resources. For example, "tasks" are a resource which we placed under the headline "send here the task solved during the classes". We use it due to its high functionality. This resource allows to introduce the contents (graphical, textual, numerical) of the problem to be solved by the student and to send the solution onto the server. In this way, there is formed a collection of the course in various contexts (single student's activity, single task solvability, etc.).

From the students' point of view, easy insight in various ways can be helpful e.g. while preparing for the exam. This is even more highly appreciated by the students who rarely have regular classes at university. After sending the work done at home to the database, they can obtain the reversible information about mistakes from the lecturer. These options are exploited e.g. during the classes Technical Mean of Learning (extra – manual studies) where the contact with students is too rare to convey critical remarks about the work done.

Unfortunately, this resource does not allow to create history of changes in the file prepared by the student. Each sending the file into the database (e.g. Task 3) removes the previous file which is replaced by the new one. This makes difficult for the facilitator to check who cheated and to analyze the correlation of student's progress and his use of educational content (see also: [3]). Moreover, the error by inexperienced students can lead to data loss. Some of our students finish the task started during classes, using the computer in the university library. Then the data are irretrievable.

Lack of intuitive navigation allowing for the use of some more advanced resources is the most serious drawback for the instructor. A good compact guide book could solve this problem.

According to the authors the bases of forming some educational resources should be searched in pedagogy rather than in construction. Unfortunately, their methodical applicability is doubtful (satisfaction tests, workshops). However the authors of the platform intend to initiate the discussion on works revising and developing Moodle. Perceiving the work by Finish scientists in this way, we focus on picking up or even eliminating some mistakes as well as making changes allowing for more effective way of facilitating classes with platform usage. Such changes were made reorganizing the system of logs recorded in the database. That gave us better view on student's activity on the platform. Analysis of logs is an invaluable source of information about the ways of site penetration by students which results in revision and elimination of mistakes prepared by the course lecturers.

4. Conclusions

Practice and experience of the authors in conducting classes using the platform Moodle indicate its great applicability not only for instructors but also for students, particularly those who did not use blended learning or e-learning. Despite some inconveniences, students use the software regularly. According to the interviews with students, we have observed the increasing interest in the subject.

Despite some drawbacks, the system possesses many advantages, thus increasing functionality of the tools used during classes. Their competent use enriches and intensifies the educational process [3]. Awareness of existing inconveniences in software allows to avoid mistakes which can be made while designing and conducting courses. The navigation of the page is complicated and unfriendly, but the solution will require the system architecture to be redesigned. There is also the lack of possibility to add interesting materials by students, that they could be a course creator in some part. This problem can be patched somehow by using Forum or Glossary tools. There are also great possibilities of integrating the Moodle software with external systems. Included API allows to develop additional modules. Nevertheless, programmers have to be aware that extensions may not be compatible with further versions of framework.

Open access, possibility of easy development encourages technological and educational experiments. However, there are some problems for students and instructors that should be improved.

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