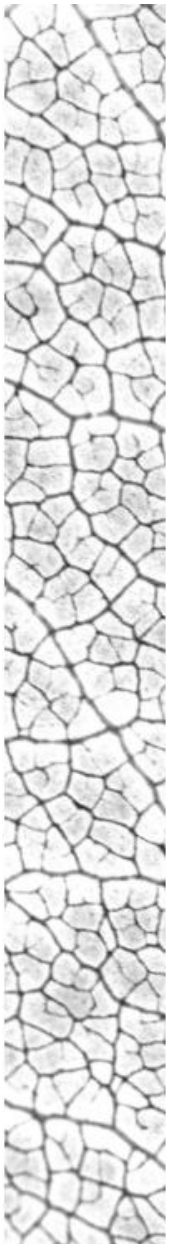

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Learning management system: Integration models of conventional and distance education of students

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Abstract
During global informatization of all life spheres, the most important are support of advanced technologies and encouraging the users to work and to learn using remote systems. The research was aimed at a comparative analysis of learning management systems (LMSs) for the integration of conventional forms of learning in the context of distance learning. In order to solve the problems posed in the work, general scientific methods were used: a) theoretical: analysis of scientific sources on the research problem to clarify the elaboration of the integration of conventional forms of learning into distance learning through LMSs. b) empirical: online survey of experts for the comparative analysis of LMSs used for distance learning, as well as determining the psychological, pedagogical and organizational and technical advantages, disadvantages and key features of the LMSs under consideration. The survey involved 40 experts – scientific and pedagogical workers, whose activity was associated with the introduction of cloud services in the educational process of higher education institution for at least three years. This article substantiates the importance of development of distance learning and discusses the integration models of conventional learning forms under conditions of distance learning; peculiar features of LMSs are defined. On the basis of expert survey, the LMSs used for distance learning have been compared; organizational, psychological and educational advantages, disadvantages, and key features of top LMSs have been defined.

Keywords: higher education institution, distance education, organizational model, learning management system, LMS platform

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INTRODUCTION

Worldwide establishment of information society, where knowledge plays the key role, inevitably leads to necessity of reformation of conventional learning (Skripak, et al. 2020, Mayorova, et al. 2018). Such necessity is stipulated, firstly, by increasing commitment of people to obtain free access to education and training; and, secondly, by urgent request of society to prepare qualified experts for various spheres of public activities, capable for efficient work in the selected specialty, ready for personal and vocational enhancement, social and vocational mobility, competitive in the labor market (Dudin, et al. 2019. Sharafanova, Fedosenko, Skhvediani., 2017. Ivanova, 2020).

The most efficient solution to the mentioned issues could be provided by modern learning techniques, including distance learning (Shtukareva, et al. 2020. Simonova, Egorova, Akhmadiev, 2020. Korneev, et al. 2020).

Several methods of organization of distance education in higher education institutions are highlighted. The first one is when all activity of educational entities operates in global network environment. Such higher education institutions are referred to as virtual universities. In such entities overall educational process (selection of training sphere, classes, execution of tests and their checking, current and final assessment, fee for educational services) is carried out online (Ak et al., 2018; Sejzi, Aris, Yahya, 2012).

More common are the educational entities with mixed (or hybrid) learning, which assumes combination of conventional (full time) and distance learning, integration of conventional form of student learning under conditions of distance learning (Masie, 2002). It is

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accepted that such form of learning allows combining the advantages of conventional classes with flexibility and convenience of distance education. Among two main advantages of such approach, Picciano (Picciano, 2009) mentioned possibility to adjust learning and automatic personalized data acquisition with regard to material assimilation and subsequent assessment. Learning according to mixed model can also be used for redistribution of resources aimed at improvement of user progress in studies.

According to the researchers (Osguthorpe, Graham, 2003. Garrison, Kanuka, 2004), the main aims of mixed learning are accounting for individual educational demands and expansion of opportunities to obtain educational services; enhancement of learning efficiency due to higher motivation, independence, social activity of students; personalization of learning process; modification of teacher role from plain transfer of knowledge to interactive communication with student, provision of possibility to improve professionalism by continuous updating and structuring of own knowledge.

Analysis of the publications (Miller, King, 2003. Smith, 2005. Bernard, et al. 2014. Falconer, Littlejohn, 2007) has demonstrated that the four main organizational models are distinguished, according to which the conventional forms of student learning can be integrated under conditions of distance learning:

1) the rotational model, according to which students in the course of group learning use certain schedule or at discretion of teacher change various formats of learning, including distance (online) learning as at least one of the formats. Other learning formats can be working in minor groups, individual teacher consultations, group projects, written tests, etc.;

2) the flexible model, where distance learning is the main component. Each student has flexible individual learning plan, it is followed with support of teacher or consultant. Students mainly study in classes and execute individual homework. When necessary, the teacher's support can be provided by means of working in small learning groups, group projects, individual or group consultation;

3) the model of independent mixing according to which students study certain disciplines online under the guidance of teacher who participates in this process only remotely. Such learning can be carried out both at home and at school (with sufficient classes and equipment). It is assumed that such model should be combined with in-class learning of other disciplines;

4) the model of enriched virtual learning proposes combination of conventional and distance learning in the following form: at first, students learn a discipline in the form of conventional classroom training, and then complete their education remotely. Accordingly, teacher works both conventionally and remotely, providing the required online consultations.

Bozkurt (Moore, Dickson-Deane, Galyen, 2011) declares that introduction of new distance form of learning increases the rate of openness of educational environment and makes it possible to acquire education using alternative methods in the cases, when conventional learning is not used.

Therefore, distance learning is a flexible system of acquisition of knowledge and skills, available to anyone without consideration for educational level and preset frames of periodicity and period of studying certain disciplines, which is based on the principles of knowledge management, knowledge formalization, knowledge transfer and monitoring using procedures of distance learning.

The latter are the procedures of intermediate active communication between teachers and students using telecommunications and procedures of individual work of students with structured learning aids presented in electronic form (Anderson, Dron, 2011).

Aiming at development, transfer, and storage of teaching and learning aids, organization and support of distance learning using telecommunications, the information techniques of distance learning are used. Such techniques are known as learning management systems (LMSs) and applied for development, management, and online distribution of learning aids (Moonsamy and Govender, 2018).

LMSs provide safe access for all categories of users. The learning aids, comprised of compendium of lectures, individual assignments, projects for small groups, etc., are arranged in certain sequence in visual environment and can be presented in the form of texts, spreadsheets, visual presentations, video fragments, separate scripts, PC software, etc. (Wang, Wang, Shee, 2007).

Not only content is important in LMSs but also communication component, which stipulates opportunity to establish feedback among all participants in the learning process. The most convenient and required communicative means are comprised of e-mail, instant messaging, forum, comments, integration with social networks (Petter, DeLone, McLean, 2008).

There are two general approaches to organization of distance learning using LMSs (Park, 2011). The first one stipulates deployment of such system on own server hardware, in local networks (LAN), thus, it requires for a group of qualified experts capable to provide its faultless and safe operation. It means that the higher educational institution bears the costs of equipment, arrangement of broadband connection, labor costs of the experts.

The second approach stipulates the use of third-party service, which is already full-featured LMS platform. In this case, in order to arrange distance course, it is required to register and to obtain access as a participant in learning process. Generally, the access to expanded opportunities of such platform is available for additional subscription fee.

Table 1. Comparison of LMSs used for distance learning

	Moodle	Claroline	Docebo	ATutor	Blackboard Learn	Sakai
Software programming language	PHP, MySQL, PostgreSQL	PHP, JAVA, MySQL	PHP, MySQL	PHP, MySQL	PHP, MySQL	Java, MySQL, Oracle
Platform	Windows, Linux, Unix MacOS	Windows, Linux, Unix, MacOS	SaaS/ Cloud	Windows, Linux, Unix, MacOS	Windows, Unix or SaaS/ Cloud	Windows, Linux, Unix, MacOS
Multilanguage interface	+	+	+	+	+	+
Structure	Core + modules	Monolith	Cloud service	Core + modules	Core + modules / cloud service	Core + modules
Interactive communications: forums, graphic chats, virtual classes, trainings	+	-	+	+	+	+
Possibility to create interactive courses using audio, video.	+	+	+	+	+	+
Video conferences	third-party service	third-party service	+	third-party service	+	+
Knowledge assessment system	tests, assignments, seminars	tests, exercises	tests	tests	tests	tests, assignments
Adaption for mobile devices	-	-	+	+	+	+
Cost	free	paid	paid	free	paid	free

Note: compiled based on expert survey

The most common modern LMSs, which allow performing distance learning, are Moodle, Claroline, Docebo, ATutor, Blackboard Learn, Sakai (Paulsen, 2003). The most popular and well-known LMS in Russia is a free and open-source Moodle (Belozubov, Nikolaev, 2007).

The research by N.A. Zakharova, A.F. Yudintseva provides an insight into how to use Moodle Reports as a Learning Analysis (LA) tool to analyze the use of Hands-on-Activities (HOA), labs and assignments provided in technology-related courses, and suggests a new LA use case for improving Quality Assurance (QA) (Zakharova, Yudintseva, 2019). The study by K. Nagi presents the possibilities of online courses in foreign languages that meet the main trends in distance and online education - the globalization of online education and its individualization - and also identifies trends in the development of distance education in Russia (Nagi, 2019).

Therefore, LMSs are a powerful software package to administrate e-learning courses and online examinations.

This research is aimed at comparative analysis of LMSs for integration of conventional forms of learning under conditions of distance learning.

The research hypothesis is as follows: under conditions of distance learning, the selection of LMSs depends on the features of integration of conventional forms of student learning.

On the basis of research results, it is possible to conclude that the aim of the research has been achieved.

METHODS

General scientific methods were used to solve the formulated problems:

a) theoretical: analysis of scientific publications devoted to the subject in order to clarify the state of development of integration of conventional forms of learning under conditions of distance learning using LMSs.

b) empirical: expert survey of participants in academic and scientific community of higher educational institutions for comparison of LMSs used for distance learning, as well as to determine psychological and organizational advantages, disadvantages, and key features of the considered LMSs.

The survey was performed among 40 experts: scientists and teachers involved for at least three years into implementation of cloud services into learning process of higher education institution, i.e. it was possible to assume that these people were familiar with the newest trends of technological development and worked mainly in educational entities well equipped and oriented at usage of modern information and communication technologies.

Knowledge level of the experts was not assessed additionally by the organizers of the survey.

RESULTS

LMSs used for distance learning were compared on the basis of expert survey (**Table 1**).

DISCUSSION

Let us start our discussion of modern systems of distance learning with Moodle.

Moodle supports multilevel hierarchy of users, who are provided with various rights of access and control. Learning courses can contain not only texts but also any information in the form of PC file (presentation, audio, video, test assignments, reference books, etc.). Time for tests can be determined by teacher. The completed tests are automatically sent to teachers' e-mail for examination, assessment, and comments, when required.

The main advantages of Moodle, according to the experts' opinion (65% of the surveyed), are as follows: high compatibility; modularity; scaling-up; free of charge basis and availability; popularity; opportunity to adapt for specific demands; opportunity to establish the required time for students to execute the assignments.

The experts (55% of the surveyed) have mentioned certain organizational and psychological and educational disadvantages of Moodle: the grades of a student can be used only inside the course; difficult administration; learning groups can be created only inside the course; insufficient technical support, hence, a qualified Moodle expert is required.

Summing up the discussion of Moodle, it is possible to conclude as follows: its main feature is the system modularity, which allows expanding the required functionality and applying third-party modules, thus improving organizational and psychological and educational advantages of Moodle.

Another analyzed system of distance learning is Claroline.

The experts (50% of the surveyed) mention that Claroline is characterized by the following opportunities: ability to create lessons, edit their content and manage them; the user activity statistics can be monitored.

The main advantages of Claroline, according to the experts' opinion (45% of the surveyed), are as follows: simplicity of control; messaging to students; good adaptability to academic environment; reliable operation; possibility to use Wiki technology for team writing. Among disadvantages of Claroline, the experts have mentioned restricted functionality; insufficient localization of documentation and moderate distribution in CIS.

According to one of the surveyed, "Claroline is characterized by orientation to academic environment, higher educational institutions, its organizational opportunities are subordinate to this".

Claroline is used in more than 100 countries of the world, it is translated into 35 languages. It is applied in L'Université catholique de Louvain, University of Vigo, Université du Québec, and others (Norkhushaini, Darus, 2012).

Another considered system is Docebo, its main advantages (55% of the surveyed) are as follows: support of several learning models (independent, mixed, in collaboration, social learning). The authoring tools are available allowing to control tests, uploading of files of any format, web sites, FAQ, glossary, link collections. Opportunities for cooperation are available: forum, chat, project management, repository. Smart and competent management, gap analysis, personal plan of developments, support of third-party interfaces to manage human resources and other services of software developer.

The main advantages of Docebo according to the experts' opinion (55% of the surveyed) are universality, possibility of integration with other products, social networks, popular applications and services of web and video conferences (Webex, OnSync, BigBlueButton, Adobe Connect), PayPal, as well as possibility to sell courses using plastic cards, extensive accounting system and possibility to expand functionality.

Among disadvantages of Docebo, the experts (45% of the surveyed) mentioned SaaS model of distribution (software as a service), high cost, insufficient documenting and its localization, additional fee for additional functions.

Summing up the discussion of Docebo, it can be concluded that the key psychological and organizational features of this system of distance learning are integration of functionality and expanded opportunities to integrate the system with social networks, website builders, and web services.

Docebo is used by more than 500,000 customers, the system is translated into 30 languages (4). Numerous companies are the customers of the system, including Metro Cash &Carry Italy, Leroy Merlin, McAfee, Panda Security, Suor Orsola Benincasa University of Naples, and others (E-Learning Market Trends & Forecast 2014).

As mentioned by Geiko, the efficiency of Docebo platform has been verified experimentally. The results confirm improvement of learning. The researcher believes that these positive results are based on the following functions and features of Docebo platform: learning aids are better visualized due to availability of multimedia opportunities; conditions for efficient application of learning interactivity are created, that is, feedback for students; discrete oriented approach to learning is provided, etc. (Croitoru, Dinu, 2016).

Another considered system of distance learning is ATutor, its main opportunities according to the experts' opinion (65% of the surveyed) are as follows: testing and recitation; opportunity to edit directly navigation through material; synchronous (chats, teleconferences) and asynchronous (forums, internal messages, e-mail, blogs, Wiki, comments in file hosting services) means of communication among participants in learning process; file sharing service to upload and to exchange files in the frames of learning course or group.

The experts (45% of the surveyed) mention such psychological and organizational advantages of ATutor as flexible design, availability and ease of use; operation with media (FlowPlayer, Vimeo, YouTube, and etc.); integrated photo gallery; support of mobile devices; free of charge basis; support of guest access. As for disadvantages of ATutor, then the experts (40% of the surveyed) mention the following: restricted functionality; insufficient localization of documenting; domain authentication is not supported.

According to the opinion of one of the surveyed, "the main feature of ATutor is ease of use".

ATutor is used in various countries, it is translated in more than 15 languages, it has more than 40 additional language modules, at present its development is being continued (Jiugen, Ruonan, Luyao, 2011).

Another considered system of distance learning is Blackboard Learn.

Among psychological and organizational advantages of Blackboard Learn, the experts (55% of the surveyed) highlight SafeAssign firmware which detects plagiarism; integration with Facebook; analysis of learning activity and accounting; content of learning course can be automatically adjusted to a certain student depending on the rate at which the student learns the course materials, in which sequence and which results are achieved during testing. In addition, integration with open source systems and software is possible, in particular with Sakai and Moodle; support of mobile devices.

Among disadvantages of Blackboard Learn, the experts (50% of the surveyed) mention the following: one-year license; high cost of license and hosting; public access to the system documentation is unavailable; poor description of the system architecture; poor description of database control system.

Among noticeable features of Blackboard Learn, the experts mention the opportunity to adapt the learning rate concerning actual user and to integrate with other systems of distance learning.

In recent years this system has become highly popular and, as evidenced by studies, many companies and entities plan to substitute outdated systems of distance learning with Blackboard Learn. It is used in University of Houston, Princeton University, Johns Hopkins University, and many others (Bradford, 2006).

Sakai is another system of distance learning.

In order to organize efficient learning in Sakai, according to the experts' opinion (55% of the surveyed), there are the following opportunities: support of network and distance learning; development of user sites, courses, project portfolio; workplace and remote communication; it can serve as interaction environment, for instance, for research teams; fine tuning; automated testing, provision and acquisition of ready assignments, as well as synchronization with calendar.

Let us consider the main advantages of Sakai mentioned by 60% of the surveyed experts: cross-platform (multiplatform) interface; video conference is the basic function; ease of use and reliability; support of joint investigations; open source architecture; scaling-up; availability for disabled persons.

Among disadvantages of Sakai, the experts (45% of the surveyed) mention the following: complicated integration with corporate software; insufficient opportunities for complete profiling of competences and control.

Among psychological and organizational features of Sakai, the experts (50% of the surveyed) first of all mention orientation of the system for its usage by higher educational institutions, scaling-up, and functionality to create virtual educational space.

Sakai as a system of distance learning has been selected by University of California, Berkeley, Stanford University, Yale University, University of Cambridge, University of Oxford, Cornell University, etc. (Caminero, Hernandez, Ros, 2013)

Therefore, the performed analysis has demonstrated that at present each of the considered systems of distance learning has its advantages and disadvantages, while fulfilling important functions for distance learning.

CONCLUSION

Distance learning becomes very important for future learning. Herewith, development of distance courses requires for distinct definition of final target of their application: either simple material review, or review with subsequent studying, or mastering of already acquired knowledge, etc.

On the basis of comparative analysis of modern systems of distance learning available for distance courses, their main psychological and organizational opportunities, features, technical and educational advantages and disadvantages have been revealed, their usage and efficiency have been exemplified. Most of the considered systems of distance learning possess sufficient opportunities for organization of efficient learning, interactive communication between teachers and students, flexible interface and scaling-up required for integration of conventional learning of students under conditions of distance learning.

The trend to virtualization of distance learning systems should be mentioned, using integrated cloud and SaaS services for maintenance and hosting and to deal exclusively with organization and execution of online trainings, distance learning courses or other distance learning; as well as important role of mobile devices in this process.

While analyzing the modern courses of distance learning and assessing their opportunities, it is possible to recommend the following selections:

1. In order to perform webinars, video conferences, the functionality of the following systems should be considered: Docebo and Sakai.

2. In order to perform short-term or irregular online trainings or distance courses, ATutor or Docebo are recommended.

3. In order to perform long-term or regular online training and distance courses in the frames of an educational entity, Moodle, Claroline, Blackboard Learn, Sakai are the most suitable.

4. In order to organize learning using mobile devices, Sakai could be used.

Therefore, the obtained results have confirmed the hypothesis that under conditions of distance learning, selection of LMSs depends on the features of integration of conventional forms of learning.

The prospect of further research may be the development of guidelines and guidance materials in order to select LMSs for distance learning.

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